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ADVISORY GROUP FOR AEROSPACE RESEARCH & DEVELOPMENT

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AGARD LECTURE SERIES No. 112

Patents – An Information Resource

NORTH ATLANTIC TREATY ORGANIZATION

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ON BACK COVER

NORTH ATLANTIC TREATY ORGANIZATION

ADVISORY GROUP FOR AEROSPACE RESEARCH AND DEVELOPMENT

(ORGANISATION DU TRAITE DE L'ATLANTIQUE NORD)

AGARD Lecture Series No.112

PATENTS – AN INFORMATION RESOURCE

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- Continuously stimulating advances in the aerospace sciences relevant to strengthening the common defence posture;
- Improving the co-operation among member nations in aerospace research and development;
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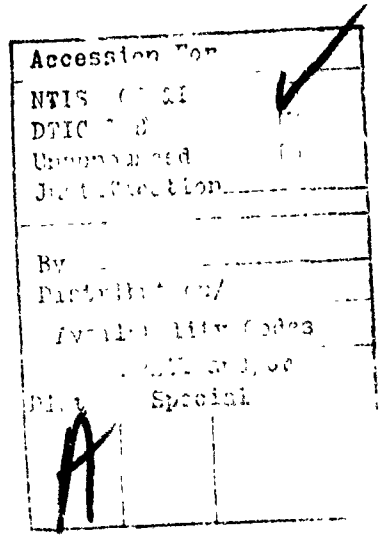
FOREWORD

Patents, an important part of the total spectrum of scientific and technical information, are often overlooked by the information community and the scientific and technical community. The purpose of this Lecture Series is to make these communities more aware of the importance of patents to the research, development and engineering efforts in each country. The focus of the lecture series will be first on the wide range of applications for information from patents and second on the methods that can be used for acquiring that information. Methods used for indexing and classifying will be discussed, the various available abstracting services will be compared and techniques for searching, including automated systems, will be described. Participants, thus having a better understanding and appreciation of the bibliographic methods that are used for the control of patent literature, will be in a better position to use this valuable information resource.

This Lecture Series is sponsored by the Technical Information Panel of AGARD and implemented by the Consultant and Exchange Programme.

M.W.Hill
Lecture Series Director



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Introductory Paper

The place of patents in the field of scientific and technical information.

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Science Reference Library
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"Knowledge is power" said Francis Bacon - and as one who rose to be Lord Chancellor in the Elizabethan era he should have known. In recent times, however, it has been not uncommon for those who confuse information with knowledge to use this remark to prove that the possession of information is the touchstone of success in the modern world. Nevertheless, we live and work in a part of the world where the possession, reception and transmission of information is a vital part of successful existence and becomes more so every year.

The American economist, Professor Daniel Bell, drew our attention to this state of affairs very forcibly in his book, "The coming of post-industrial society" (1973), while a very recent and important report from the Commission of the European Communities, "European society faced with the challenge of new information technologies: a community response" (1979) makes at its outset the categoric statement, "Modern European society is already an 'information society', which scientific and intellectual activity of all kinds, economic transactions and the whole pattern of daily life on a subtle network of information" (the quotation is exact and although some words are missing, just as they are in the original text, the sense is obvious). In Britain the latest in the set of ACARD* Reports published by the Cabinet Office (ref 3) draws attention to the need to learn from others, to exploit new technology quickly and to innovate effectively.

Pulling these threads together we can see that if those countries which are members of NATO are to continue to develop, are to continue to maintain a high standard of living and of defence capability, then we must seize and exploit all the scientific and technical information we can and put the pieces into that "correct sequence between factual order and logical order" on which knowledge depends (ref Bell). Although Emerson cautioned us that, "It is as difficult to appropriate the thoughts of others as to invent", it is possible to appropriate and build on the outcome of those thoughts, namely what was invented.

Patents, which are the subject of our lecture series, are the physical embodiment on paper of those ideas, written down for all to see and for those with the necessary knowledge to understand. As you know, what we now loosely call "patents" are really Letters Patent for Invention. Letters Patent are open letters, from the head of state to a person, conferring on that person a privilege in such a way that everyone shall know both that the privilege has been conferred and precisely what that privilege is.

Patents are discrete packets of information. Sometimes several can be seen to be linked together illustrating the way one idea has led to another, how a basic invention has been improved and refined into an eventually highly sophisticated product. The successive Newcomen, Watt and Trevethick steam engines are a well known case. Nevertheless, each patent is a discrete packet and even if the patent specification reviews "prior art" to show how the new invention came about it still remains a statement about an isolated event in time.

Of course, patents are only one source among many of information about technical progress. They have to be seen in the context of the way technical and other information is disseminated, stored and retrieved, particularly by those who work in industry or in research and development establishments. However, as we shall learn from M. Lenoir, in certain respects they are a unique source of information.

We must also be aware that these discrete packets of information are not, on their own, complete information packages. Other ingredients are needed and this is recognisable in the patenting system which specifies that the description of a new invention shall be such that it can be used by one skilled in the art. Anyone who has taken out a patent knows from experience that two things happen during the drafting of the specification. First, it is broadened to cover as wide a range of ways of carrying out the invention as can reasonably be conceived. This is to avoid a competitor easily finding a way round the monopoly claimed. The second is that the specification is limited to what needs to be said to describe the invention. There is no need, so it is omitted, to describe other technological processes which need to be used in association with the invention. There is a third factor: because a competitor may steal a march if one delays too long, many inventions are patented before the product is ready for production. Indeed, the lead time in some industries between patenting and marketing may be so lengthy that the monopoly has almost expired before profits are earned to pay for the development costs. It is easy (relatively) to produce a chemical in the laboratory by a particular process. It is another thing altogether to convert that laboratory process to full manufacturing scale.

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*Advisory Council on Applied Research and Development

So intelligent use of patents for technical information may - it is not always the case by any means - require substantial know-how in that line of manufacture if one is to benefit from the knowledge.

Brown (ref 4) points out that patents are an important component of bringing inventions to the market place with technology transfer in view, though he draws particular attention to the way that the variety of national laws and practices impedes its realisation. Finnegan (ref 5) looking at the alternative to patents points out that, "Where trade secrets are relied upon there is less technology transfer, because prospective licensees have little knowledge of the existence or extent of the technology involved. Nor", he continues, "are those who would build upon state-of-the-art concepts apprised of what the state-of-the-art is, since there is no general disclosure to the public". Thus in one sense a patent is a form not merely of disclosure but of publicity: a statement "here be technology".

It is an advert, but a fairly discreet one, for a select audience. We shall be hearing from Dr Gee more about this important role of patents with particular reference to technology transfer from government.

The need for technological know-how is often quoted as a draw back to the use of patents as a source of information and so it is if one is trying to use them as a way of entering a new line of business in which one has no prior skill. But the same would apply if one tried to carry out experiments described in, say, the Journal of the Chemical Society without having any previous training and experience as a research chemist and secondly in the context of our present lecture series, those seeking information from patents will largely be doing so in the field of their own or their company's knowledge and experience.

Further, as we shall discuss during our sessions, patents should not be seen merely as a way of learning how to make or improve a particular product. One of Daniel Bell's five dimensions (ref 1) of the post-industrial society is the creation of a new intellectual technology of decision-making. The study of the quantity, scope and direction of development revealed by the study of a company's patents, can well affect the relationship one wants one's own organisation to develop with that company. Will it make a lively trading partner in the years to come? Patents are an indication - but only one indication - of future performance, as trade catalogues are of today's, and hence provide useful input to decisions on company policy. We shall be learning from Mr Marmor another aspect, namely how a study of patents can be used to plot the course of technological progress and the sort of lessons to be derived from such a study.

Another variation of this theme: the study of patents of other firms can lead to new markets for one's own products. This then is an intelligence base for the sales force. At the same time it can and often does lead an instrument or component manufacturer to foresee the probable need to develop a new product. Indeed, the use of patent information is as wide as the fertile minds of intelligent men can make it.

However, in a world where there is far more information than we can possibly absorb, patents must compete for attention with other sources of information. Patents may provide information other sources cannot but is the expenditure of time - that precious commodity - on becoming familiar with this strange resource justified in terms of return on time which could be spent on other activities or learning different information from easier sources?

In trying to persuade those concerned with technological and business decisions, that patents provide a potentially valuable input of information, we are in a very similar situation to those trying to market the invention itself. With but few exceptions, the object of invention is to innovate and there are, I submit, valuable lessons we can learn from the innovative mechanism.

Innovation has been defined as, "the technical, industrial and commercial steps which lead to the marketing of new manufactured products and the commercial use of new technical processes and equipment". Only very slight adjustments are needed to make the transition from innovation of artefacts (machinery, goods) to the intellectual products which are the "manufactured products" of the information society. And if patents as a category are not new, the idea of using them as a source of information will be new to some clients and, anyway, each newly published patent is quite new and quite different from what has gone before in a way that each successive item of a mass manufacture is not.

A number of excellent studies of innovation have been carried out to establish what makes one innovation more successful than another. There seems to be a general consensus of opinion which can be clearly expressed in the words of the Sappho report (ref 6).

This study, you will remember, compared a number of successful and unsuccessful innovations and concluded that the factors which made the difference between success and failure were:-

(a) successful innovations have a much better understanding of user needs. This imaginative (I would emphasise that word) understanding is the hallmark of success

(b) successful innovators pay much greater attention to marketing. Failures were sometimes characterised by neglect of market research, publicity, user education and customer problems

(c) successful innovators perform their development work more efficiently than failures. They get the bugs out of the product before it is launched, not after the user complains

(d) successful innovators make more effective use of outside technology and scientific advice. They have better contacts with the scientific community in the specific area concerned (not necessarily in general)

(e) the responsible individuals in the successful attempts are usually more senior and have greater authority than their counterparts who fail.

If we apply, mutatis mutandis, these precepts to the use of patents as a source of information on technological developments, it will not be difficult to see that we are up against enormous difficulties. Whether intentionally or not, those concerned with getting the most out of their invention, aided and abetted by those concerned with legally defining the precise industrial property rights, have successfully made a mockery of the public side of the patent bargain, full disclosure in order to stimulate technological development and progress. This is, of course, no new complaint. It has been made often before, very effectively, for example, by my former chief Viscount Eccles in an address to the UK Chartered Institute of Patent Agents in 1974. But let us for a moment look at the product we have to sell against the five Sappho criteria.

Patent specifications are published by patent offices and largely drafted by patent agents. They are not part of the sales literature nor a manual of instructions for the invention. With great respect to both patent examiners and patent agents, who are both excellent members of the community, neither would claim, I am sure, to have researched or in any other way sought to acquire a deep understanding of the needs of any category of users of patent documents other than patent examiners and patent lawyers from attorneys to judges.

Only recently have we started to give attention to marketing patents as a source of information. Depositing sets of patents in libraries is not marketing. This conference is a bit nearer it. Both WIPO and the European Commission have tried to give a lead with varying success. Some patent offices - one thinks immediately of the American, Danish, French, German and Swedish ones - have launched efforts to improve awareness and provide at least a modicum of facilities to satisfy the demand. In the UK, the Science Reference Library and the Research and Development Department of the British Library are involved in creating the necessary infrastructure to enable marketing to proceed, with organisations like Aslib, Derwent Publications Limited and several polytechnics in the vanguard. Thanks to Chemical Abstracts most chemists are aware of patent information in a way those in many other disciplines are not although, curiously, it seems as though one "spin-off" of the advent of the on-line age is an increased interest in patents, because several data-bases include or are devoted to them. Nevertheless, all this does not add up to real marketing.

If I may digress for a moment, I suspect that in some instances even the company librarian or information officer may not be entirely guiltless when it comes to transmitting patent derived information (a term I prefer even though it is longer) to his clients. I do not wish to enter here into the long running debate about the extent to which an information officer should assess or predigest information before passing it to his client. Circumstances vary from one company to another, from one client to another and from one information officer to another. But assuming that there is no time constraint which unduly limits what he can do, the information officer can do much to increase the value of the information to the recipient.

To give but one example, if he has found a patent document which will interest his enquirer, would it help to find out if there are any equivalents applied for or granted in other countries? One can learn more than just the extent, geographically, of the protection sought, though even this gives some idea of the anticipated market area or sources of possible competition. A United States equivalent may give fuller details of the invention and the best mode of working. An equivalent granted in Germany or the Netherlands is commonly regarded as evidence of a strong patent while a failure to be granted in some country or other will give an obvious contraindication.

Again, it may be that one of the cited documents (a patent nowadays contains a list of other literature deemed relevant) contains information which could usefully supplement the answer to the enquiry.

That was by way of a digression. Let me now return to reviewing how effectively the official system of disseminating patent information in return for the monopoly granted meets the requirements of a successful marketing operation.

As was mentioned earlier, there are difficulties when patent documents are used as a source of information. A specific example of this would be the continuing problems encountered with the name indexes to patentees as published by certain patent offices. This is a case of inadequate development work, work which should have been completed before the product was launched or, to be more realistic, should have been the subject of continuous or frequent revision to ensure continued usability.

Since patent documents have been conceived and developed for use principally by patent examiners and patent lawyers, as far as I can trace the advice of professional information scientists has not been deemed necessary in their design, certainly until recently. Nevertheless, we must acknowledge that great improvements have been made in recent years. However, we must also comment that curiously for organisations so intimately concerned with invention, patent offices do not seem to have successfully made as much use of modern information technology as one would expect.

So all in all, in respect of meeting the requirement to make information about each invention available the patents community has hardly shown those symptoms which mark the successful entrepreneur with a product to sell.

Let us now turn and look at these patent documents themselves and sketch in some of the available information services as framework for the detailed presentations and discussions which will follow.

For most scientists and engineers, reports, books and journals are normal sources of published information. Data comes from books or manufacturer's specifications. News of recent developments from reports and from journal articles of varying degrees of readability and, of course, from and at meetings such as those organised by AGARD. Standards, too, must not be forgotten as an invaluable tool, especially in any field concerned with one form or another of engineering. But for all the time there have been scientific journals, or report series, or standards or even scientific congresses there have also been patents - longer in fact.

One of my predecessors (ref 7 A Gomme) wrote that the earliest patent for an invention was probably that granted under the practices of the Sybarites tribe in Southern Italy. Whenever one of the ladies of the tribe invented a new culinary dish which the men deemed of great merit, she was allowed a year's monopoly of its manufacture but when the year had elapsed she had to disclose the method of its manufacture to other cooks.

Patents for inventions, so called to distinguish them from Letters Patent granted by sovereigns for other privileges, certainly date back into and before Renaissance times The patent granted by the English King in 1449, to Edward Utynam for a method of manufacturing glass for the windows of Eton College Chapel is an example. In Italy, Galileo was awarded patents for an irrigation method in 1594 and in France there is a record of the grant of letters patent for the manufacture of glassware in 1551.

In the USA local patents were being awarded as early as 1641, well before the War of Independence.

The earliest legislation governing the rewarding of invention seems to have been the Venetian Patent Law of 1474. Other countries do not seem to have followed suit until very much later.

In the early days, patents were granted without the precise details of the invention being written down. The inventor was expected to pass the details on to his apprentices and work-force so that details of it would spread. At a time when literacy was not common, this made sense but it was also open to abuse. It also, even when observed scrupulously, meant that knowledge of the new art would spread only very slowly.

The first written specification in England was that of Sturtevant in 1611 but the practice was not adopted as standard until the 18th century. Even then, this did not help in disseminating details of the invention, only in enabling legal quarrels about infringement to be decided more easily. The reason that these written descriptions did not help dissemination was that they were only manuscripts entered in the Patent Rolls, one of the legal archives. Printed patent specifications were published by the USA and France by the end of the 18th century and the German states followed suit early in the 19th.

Britain did not print until 1852 but then the indefatigable Mr Woodcroft printed all patents which had been enrolled from 1618 onwards. So in each country it was then possible to know precisely what had been patented and to get copies of the Specification, as the technical description is called.

In fact in a number of countries the practice quickly grew up of depositing copies of the patent specifications in libraries to which the public had access. At a time when travelling was not all that common, this practice made their use as an everyday tool quite feasible. Today, with rising travel costs a few easily accessible local centres may be as important as ever. A later paper will elaborate on the current situation.

Today, getting hold of a copy of any patent specification you want to see is very easy, easier than for most other publications. The reason is that copyright restrictions have been waived by the Patent Offices of the world. Published copies can be obtained from the appropriate national patent office. Prices vary widely. In the US and France, prices are very low (50 cents and 3 francs respectively) whereas in Britain, Germany and from the European Patent Office prices are much higher (£1.20, 4DM and 4DM respectively). The regional libraries will also supply photocopies of their national patents but in some cases the cost is higher than that of the copy from the Patent Office. Photocopies of foreign patent specifications can be obtained from the national patent office or from any regional library that holds the patent documents of the country required. Some national centres, the Science Reference Library in Britain for example, will supply copies of the patent documents of any publishing country to any requester whether resident in the UK or abroad.

All this assumes that publishing patent specifications enables anyone who wishes to get access to the information. Even more, perhaps, it assumes that the development scientist or engineer will come across, or have drawn to his attention, useful patents, useful either as a source of mental stimulation or, because they present a solution to at least part of the problem he is working on, to be used as they stand or, if use is not permissible, to be avoided.

Just as no scientist can keep up with all the articles published in his general subject field, be it organic chemistry or radio astronomy, so no development engineer can possibly keep up with all the patent literature. Overall something approaching one million patent documents are published each year and even though the requirements of the patent system are such that many are mere repetitions of the description of a single invention, there are still about 150,000 new inventions each year. Even if one could spot and sift out those which are very unlikely to achieve commercial success, one is likely to be left with a hard core of about 100,000 each year.

At one time it was common for engineering journals to contain a section in which significant recent patents in their field were reviewed. This practice seems largely to have died away, its place apparently being taken by new product reviews. So this way of "keeping up" generally does not exist except through a few abstracting journals.

Those who have a company librarian/information officer who includes relevant new patents in his in-house current awareness journal are lucky. Mr Chasen may be indicating how lucky. For those without this facility, current awareness can be a serious problem unless one makes special arrangements, for example with a professional patent searcher, for a watching brief to be kept.

But if current awareness may be a problem, what about deliberate searching among that vast pile, now 20 million strong, of patent documents to see if anything has been previously patented which would help with one's immediate problem? Since patent examiners are faced with the same problem, patent offices have been active in producing solutions. In addition a number of professional and commercial abstracting and indexing organisations provide services covering patents.

Incidentally, can I make it clear that whenever I use at this meeting the terms classify or classification I am not referring to security ratings. I am referring to a scheme for the arrangement of documents in a logical order which depends on the topic of the document. The basic logic is that all documents on the same topic - e.g. new turbine blades - should be filed together, even if it does not always work out that way.

The Americans started arranging their patent specifications in a subject classified order early in the 19th century. In 1831 they published a list of 16 classes. Today, as Mr Chasen indicates in his paper, there are some 355 main classes and nearly 100,000 subclasses. Each year about 2,500 new subclasses have to be created in order both to allocate new inventions (many of which - being inventions - fail to conform to existing subclasses) to a meaningful section and also to accommodate some re-grouping of the existing documents to meet new requirements. A major objective of a patent office classification is to present the examiner with all the past documents relevant to a new invention and only those that are relevant. This is a very tough objective and is one which no classification scheme fully achieves.

Until recently, most examining patent offices devised and used classification schemes of their own. However, since 1968 there has been available the so called International Patent Classification, developed collaboratively by the examining patent offices. It is now revised every five years - most national schemes in contrast are revised continuously - and the third version was published earlier this year. Mr Schiffels and Mr Plevier will no doubt be talking in some detail about the IPC but it is necessary at this stage to note that although IPC classes are allocated to all patent documents by the office publishing them, so far no English speaking country organises its own collections of documents by IPC - each still uses its national classification scheme.

Patent classification schemes are designed by patent offices for the purpose of facilitating work concerned with questions of industrial property rights. Although they can be successfully used for some other information retrieval purposes, it is important to bear this fact in mind. It is novelty which is the important feature in classifying and thus a machine for making butter may not be classified as such if the novelty is a new shape of mixer blade which could well have applications other than for making butter.

Many but not all patent offices make subject classified files of their documents and sometimes of foreign ones too available to the public. All publish listings of the allocation of national patents to each class and these listings can be used for searching in libraries where the documents are arranged by serial number.

Of course, patent offices also do their best to make information about patents widely available. They publish gazettes which contain at least bibliographic details of the latest issues and index them in various ways. Most publish abstracts of patents either in the gazette or as a separate publication (there is usually nowadays an abstract on the first page of the patent itself just as many scientific articles are prefaced by an abstract).

The Americans, instead of publishing separately the abstract, publish the main claim in their Gazette.

All patent offices also index their patents by name of applicant and/or inventor. Where, as is usually the case, the applicant is an industrial firm, many problems can arise because the name of the company can vary from country to country, while a large company may have subsidiaries of totally different name. Patent libraries will have directories of company names available and in addition the services of two organisations, INPADOC and Derwent Publications Limited enable variant names to be identified.

A later paper will list many of the sources other than those produced by patent offices for identifying patent documents on topics of interest, just as they enable relevant technical articles or reports to be identified. Views differ on their value which usually means that either the official and the commercial services serve a different information purpose or they serve a different clientele. Many chemists, I am sure, would never refer to a patent document if they did not come across the reference in Chemical Abstracts.

It is, perhaps, obvious that if you want to encourage someone to buy your product, you must make it easy for him to do so; if you want him to use your service, it must equally be easy for him to do so. Few people will learn Arabic the better to appreciate Omar Khayyam; few engineers, I suspect, will learn the IPC in order to search patents.

Our thesis then must be that in some easy way, the engineer or other information consumer can avail himself of patent-derived information. We must show what are those things that, if he wishes, the engineer can do for himself. We must also show what are those things which he can gain more effectively - and easily - from the service of an agent. The situation is analogous to curing a malady: some things we cure by ourselves getting medicines from the chemist; for others we consult the medical doctor. It will also be our objective to show the "information doctors" present what the wonderful remedy patents will do and how to administer it to the patient.

In concluding this paper let me say that this Lecture Series should be regarded as another stage in the programme of meetings developed by NATO. In particular, it logically follows both the Information for Industry Conference in Paris two years ago and the Estoril Conference, Technology Transfer in Industrialised Countries. Our present meeting looks first at what research and development, industry and commerce can do with patent information and then, having identified the range of things we may want to achieve, looks at the ways and means of getting that information.

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LES RAISONS D'UTILISER LA DOCUMENTATION BREVETS

(Exclusivité de son contenu - Exemples d'application)

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RESUME:

Les situations auxquelles les économies ont à faire face depuis quelques années ont, parmi d'autres conséquences, celle d'amener les industries à entreprendre puis à développer rapidement de nouvelles recherches et actions d'innovation. A cette occasion, de nombreuses voix s'élèvent pour conseiller d'utiliser toutes les possibilités qu'offre la documentation brevets.

Or il est manifeste que de nombreux techniciens et documentalistes ignorent encore la qualité documentaire du brevet ou, à tout le moins, la saisissent mal, donc n'y font pas appel comme il conviendrait. Une des raisons probables de cet état de fait est qu'ils ne sont pas vraiment convaincus de cette réalité.

Et pourtant, l'information détenue par les brevets, d'une part est exclusive dans une très grande proportion, et, d'autre part présente un ensemble de qualités et de caractéristiques qui permettent des conclusions et des prises de décisions que les supports habituels de la documentation technique n'autorisent pas toujours.

En conséquence cette étude se propose: d'apporter à ce qui vient d'être déclaré des preuves et des démonstrations, mais aussi, de présenter un certain nombre de schémas d'applications possibles.

Ainsi espérons nous convaincre les utilisateurs potentiels des avantages que peut leur procurer le recours à ce type d'information et donc de les amener à l'utiliser plus largement et plus profondément que tel n'était le cas jusqu'ici dans de nombreux secteurs.

INTRODUCTION:

Parmi les différents supports de l'information technique, le brevet est bien celui au sujet duquel les documentalistes se posent le plus de questions. Ils se posent des questions parce que: il n'a pas les mêmes origines que les autres documents avec lesquels ils sont plus volontiers habitués à travailler, il n'est pas intégré de façon systématique et cohérente dans les opérations de traitement documentaire (en particulier les revues bibliographiques secondaires et les bases de données), il ne se procure pas aux mêmes sources, son aspect physique est tout différent de celui des documents conventionnels, son style particulier l'dispose et rend sa lecture difficile, il existe des redondances (brevets correspondants) que les chaînes de traitement documentaire ne cherchent pas à éviter, on assimile les revendications à des résumés techniques, et enfin, les données administratives plus complexes que pour les autres documents donnent lieu à des difficultés voire à des anomalies à l'occasion de traitements informatisés.

Bref, pour tous ceux qui n'ont pas eu l'occasion de découvrir dans un brevet quelquechose qu'ils n'avaient pas trouvé par ailleurs, et pour tous ceux qui, n'étant pas un tant soit peu avertis des caractères spécifiques des brevets ont encouru des échecs à l'occasion de recherches documentaires, le brevet reste un document suspect: en conséquence de quoi on le rejette à sa vocation juridique.

Egalement, pourquoi le cacher, il existe dans certaines entreprises des sortes de concurrence entre les services de propriété industrielle et ceux de documentation à l'occasion de l'existence d'un fonds documentaire spécifiquement brevets, le traitement à prévoir n'étant pas le même dans l'un et l'autre cas, ce qui n'est pas fait pour encourager les utilisateurs venant de la documentation.

Tout ceci se traduit bien dans les chiffres. puisque les résultats d'une des dernières enquêtes réalisées sur ce point (1) indiquent:seulement 10 à 15% des utilisateurs potentiels font appel aux brevets, les utilisateurs potentiels pouvant être aussi bien des techniciens que des documentalistes. Cette enquête a été réalisée dans les pays de la Communauté Européenne Economique, mais les résultats sont du même ordre de grandeur que ceux obtenus à l'occasion d'enquêtes analogues réalisées en particulier aux U.S.A..

Et pourtant, depuis disons une dizaine d'années les incitations et les encouragements ne manquent pas pour remédier à cet état de fait:

-Nouvelles lois ou même nouveaux systèmes de Propriété Industrielle aménagés ou développés ici ou là.Mise enplace du Brevet Européen et de l'accord P.C.T. (Patent Cooperation Treaty). Dans tous les cas il a été prévu des dispositions donnant une plus large part à la fonction documentaire du brevet.

-Efforts simultanés des Offices Nationaux de Propriété Industrielle en vue, de développer leurs fonds documentaires, de les étendre en province, d'en faciliter l'accès aux utilisateurs, d'accélérer l'impression des documents, d'améliorer la qualité de toutes leurs publications (fascicules, gazettes, tables).

-Actions de Normalisation réalisées sur les brevets,grâce aux travaux du Comité I.C.R.E. .A.T. de l'Organisation Mondiale de la Propriété Intellectuelle,et à la publication d'une Norme ISO, afin d'aménager les modalités de publication des do-

cuments, l'enregistrement des informations, la citation des brevets en tant que références bibliographiques, etc.
-Tout ceci est venu s'ajouter à d'autres actions destinées à mieux faire connaître les brevets, à développer l'innovation, à assurer une meilleure dynamique de la Propriété Industrielle et à en faciliter la mise en oeuvre.

Il faut bien constater que toutes ces dispositions n'ont pas encore été suffisantes pour créer le mouvement escompté.On est alors fondé à se poser la question de savoir pourquoi, malgré toutes ces actions d'importance, le résultat obtenu chez les documentalistes a été aussi minime.

Il me semble, quant à moi, que toutes ces actions ont manqué d'une information de base, et qu'elles n'ont pas, de ce fait entraîné la conviction nécessaire pour une réelle adhésion dans les faits. Il s'agit donc d'un problème de formation ou au minimum d'information, qui une fois traité devrait alors jouer le rôle de révélateur pour les différentes actions envisagées.

D'ailleurs un certain nombre d'organismes concernés l'ont bien ressenti comme tel, qu'il s'agisse de l'Organisation Mondiale de la Propriété Intellectuelle, des Communautés Européennes ou de la Fédération Internationale de Documentation.

Pour ce qui me concerne, dans cette enceinte,je vais donc, en m'appuyant sur des arguments pratiques, essayer d'éclairer certaines zones d'ombre qui contribuent à une mauvaise ou une incomplète utilisation du brevet en tant que source de documentation technique.

LE BREVET EST UN DOCUMENT TECHNIQUE:

On reste, en général, sur l'idée que le brevet est le titre juridique accordé à un inventeur pour lui permettre de profiter de la découverte qu'il a faite, et que ma foi, accessoirement on peut trouver dans ce titre des informations techniques intéressantes.

La vérité est toute autre, car il suffit de se référer à de nombreuses législations aux plus importantes, même anciennes, pour se rendre compte que le brevet est à l'origine, un "document de divulgation".

Le législateur a en effet pensé, dès le départ de l'institution des brevets, que toute nouvelle invention devait contribuer au bien-être et au progrès de la Société, et que , pour en être ainsi, elle devait être rendue publique,assurant ainsi la diffusion de nouvelles connaissances, stimulant la créativité des chercheurs, et, de proche en proche accélérant le développement technique puis économique.

Et c'estseulement si la publication -ou divulgation- a été faite correctement et totalement pour permettre, selon l'expression consacrée, à l'homme de l'art de la reconstituer, que l'inventeur peut prétendre recevoir son titre juridique qui lui permettra d'exploiter son invention à son profit, pendant un temps limité. Il s'agit d'une sorte de contrat entre la Société et l'inventeur. On peut du reste se rendre compte qu'il en est bien ainsi, dans toutes les législations récentes, soit à l'occasion des procédures d' examen,soit à l'occasion des jugements rendus: les brevets dont la description est jugée insuffisante sont purement et simplement annulés.

Il va sans dire que ces aspects de description et de divulgation interviennent en plus des trois critères classiques de nouveauté, de hauteur inventive, et de réalisation industrielle nouvelle qui sont retenus, eux, pour juger de la qualité de l'invention. Même si le schéma présenté ainsi peut paraître un peu simpliste à des juristes qualifiés, les choses se passent comme tel, et les faits le confirment tous les jours.

On peut alors se demander pourquoi, dans un certain nombre de pays industriels pourtant développés, il n'a pas été fait plus largement appel à la fonction documentaire du brevet.Une raison possible, qui a été avancée par différents spécialistes, est que dans la période d'après guerre, l'expansion étant garantie, la recherche a pu progresser de façon plus ou moins cohérente. On pouvait prendre un brevet de plus ou moins bonne qualité, ce que permettaient certaines législations, et on ne se préoccupait pas, en conséquence de l'aspect documentaire du brevet,ni dans le cadre de l'obtention du brevet, ni dans le cadre de la recherche proprement dite.

Mais compte tenu des situations nouvelles créées d'abord par le ralentissement de l'expansion, puis par la crise de l'énergie,la recherche est devenue plus chère, et il est apparu qu'elle devait être mise en oeuvre puis développée de manière rationnelle, calculée, sans perte de temps,sans duplication. Ceci a conduit l'industrie à mieux s'informer sur les problèmes techniques, sur les perspectives économiques et sur la concurrence, le brevet étant comme nous allons le voir , un des plus sûrs moyens d'y arriver.

Et cet intérêt pour la fonction documentaire du brevet,ainsi mis en évidence, a été traduit dans les faits par de nouvelles dispositions, tant sur le plan national que sur le plan international, dispositions devenues nécessaires pour faire face à la conjoncture d'ensemble. Ceci explique en particulier pourquoi l'obtention des brevets a été mieux contrôlée et leur publication accélérée, ce dont n'ont eu qu'à se réjouir les documentalistes.Les différents orateurs qui me suivront vous parleront des dispositions mises à cet effet à notre disposition; pour ce qui me concerne, je m'attacherai à vous parler des caractéristiques propres de cette information.

CARACTERISTIQUES DU BREVET COMME SUPPORT D'INFORMATION:

De par sa nature, de par son élaboration, de par sa finalité, le brevet est donc différent des supports auxquels les documentalistes sont plus volontiers habitués.

1-Tout d'abord, le brevet est un document de divulgation et il existe une différence importante entre la publication et la divulgation.La publication (on pense en général aux revues), propose un article lorsque une recherche a abouti sur une réalisation effective et de préférence digne d'intérêt; le brevet, lui, dans sa divulgation, apparaît plus modeste en ce sens qu'il procède de façon plus continue, faisant connaître tout nouveau pas franchi même modeste, et même s'il n'a pas encore débouché sur une réalisation de fait:par exemple, on estime que 60% des brevets déposés font ou feront l'objet d' applications effectives, et il n'en reste pas moins vrai que les 40% qui restent détiennent une information technique à ne pas négliger.En plus la divulgation doit, nous l' avons vu, aux termes de la loi, permettre à l'homme de l'art de reconstituer l'invention. Or on sait bien que les déposants n'aiment pas en dire plus qu'il ne faut pour ne pas trop tôt découvrir leurs batteries, mais justement dans un brevet ils sont tenus de le faire, quitte à s'en abstenir par ailleurs, dans d'autres types de publications.
On peut encore dire (2) que si les publications scientifiquse et techniques informent de préférence sur les recherches et réalisations sur lesquelles elles ont débouché, elles n'indiquent rien sur la manière dont se sont développées ces recherches et ces réalisations.Elles ne permettent pas de savoir avec précision l'état de la technique. On voit donc la différence fondamentale entre ces deux types de documents.

2-Les informations contenues dans un brevet se doivent d'être exactes; elles sont donc fiables, car là aussi , devant une juridiction d'experts, le brevet qui aurait présenté d'une invention soit une description soit des résultats incorrects, ne résisterait pas, lui non plus, aux conclusions du jugement.
Je voudrais faire remarquer, qu'il a existé dans le passé, et dans certains pays ne pratiquant pas l'examen des brevets,certaines descriptions d'une hauteur inventive plus que douteuse. En fait, s'ils ont pu subsister, c'est qu'ils n'ont pas été suivis d'une quelconque mise en exploitation, ou bien n'ont pas eu l'occasion d'être examinés par des experts. De toute façon, il s'agit là d'une situation révolue.
On peut facilement déduire, de ce qui vient d'être dit, qu'à cause de telles contraintes, le brevet doit être dégagé de tout effet littéraire, de toute emphase injustifiée qui pourrait être contestée par des tiers. Ceci contribue à donner au brevet cet aspect sérieux voire même rébarbatif que nous lui connaissons, d'autant que les lignes étant numérotées, il n'est pas prévu d'aménagement typographique qui pourrait en faciliter la lecture.

3-Ensuite, les brevets contiennent des informations complémentaires, qui leur sont propres, et qui relèvent, elles aussi, d'une très grande précision.

-Les figures, ou plus exactement les schémas et les tableaux. La présentation en est faite à partir de règles rigoureuses, car elles ont un rôle important dans ce type d'information,et également en cas de litige par rapport au texte. Il est connu que ce sont elles que l'homme de l'art consulte en priorité, et qu'elles donnent d'une même invention de multiples possibilités de réalisation, ce qu'une revue ou un ouvrage ne prend pas forcément la peine de faire.

-Les documents rencontrés par l'examinateur au cours de l'examen sont cités dans certains brevets, et même pour le brevet européen, l'avis documentaire est joint au fascicule. Tous ces documents cités relèvent à la fois des bibliographies et des recherches d'Etat de la Technique; ils permettent aux documentalistes d'entreprendre ultérieurement d'autres recherches en connaissance de cause,puisqu'aussi bien tous les documents cités disposent d'une classification, soit nationale soit internationale.

-Les multiples indications administratives: caractéristiques du dépôt, de la priorité, de la publication du brevet, noms du déposant et des inventeurs, localisation de ceux-ci, sont des informations complémentaires qui, pour administratives qu'elles soient, nous le verrons plus loin, permettent par leur interprétation d'en tirer des conclusions d'ordre technique.

4-Il y a ce qui est en quelque sorte la qualité propre du brevet, à savoir la délimitation très nette entre ce qui était connu avant l'invention (et qu'on rappelle à l'occasion dans le sommaire), et ce qui est nouveau.Le sommaire contient en outre un rappel de l'art antérieur, positionne l'invention quant à ses domaines d'application et indique les avantages revendiqués.Or l'article courant ne permet pas toujours d'apprécier ce qu'a effectivement apporté une invention, d'autant que cet apport peut être très minime dans sa définition, tout en apportant des perfectionnements importants à l'invention à laquelle il peut être rattaché. De la même manière, lorsque différentes applications ont été envisagées, elles font l'objet de revendications sucessives, voire même de brevets successifs.

5-Enfin, sur un fascicule de brevet sont systématiquement indiquées les classifications proposées par les Offices. Ces classifications sont beaucoup plus fines que les mots-clefs que beaucoup de nous connaissent bien. Elles sont tout à fait adaptées aux problèmes de classement des brevets. Là aussi,elles peuvent rendre des services aux documentalistes à l'occasion de recherches ultérieures.

Je voudrais faire ici une remarque au sujet du style très particulier utilisé pour la rédaction des brevets, que l'on appelle souvent le "patentese", au sujet duquel beaucoup se posent des questions, et contribue à faire croire que le brevet, décidément n' est pas un document technique.Il s'agit d'un style feutré et embarrassé qui s'apparente d'avantage au style d'un acte notarié plutôt qu'à celui d'un texte technique.

On a pu penser qu'il était employé pour dissimuler certains éléments de l'invention.C'est peut être vrai dans certaines rédactions, mais nous avons vu qu'il n'y avait aucun intérêt aller trop loin dans ce sens. En fait il y a deux raisons:

La rédaction se doit, tout en présentant une réalisation précise, rester néanmoins assez ouverte pour laisser la place à d'éventuels développements futurs, ou à de nouvelles applications, en s'assurant en quelque sorte un glacis de protection à l'intérieur duquel des tiers auraient des difficultés à pénétrer.

Il y a aussi le fait que certains rédacteurs estiment prudent de préparer une rédaction accessible à des juristes pour le cas où un procès surviendrait.

Il est non moins vrai que certains déposants ou leurs mandataires ont dans le passé abusé de ces circonstances pour entourer leurs textes d'une sorte d'ésotérisme qu' ils croyaient pouvoir les protéger.Les réglementations actuelles essaient d'éviter de tels abus.(3) (4).

EXCLUSIVITE DE L'INFORMATION CONTENUE DANS LES BREVETS:

La qualité de l'information n'est pas pour autant l'exclusivité, car on pourrait imaginer en effet que les brevets ne sont finalement qu'une forme plus précise ou plus exacte de ce qui peut être publié par ailleurs dans les documents conventionnels. Ce serait déjà un progrès. Mais en fait, il n'en est pas ainsi, car le fait est que les informations contenues dans les brevets ne se retrouvent dans les autres documents que dans une très faible proportion. Nous allons en étudier les raisons, puis je vous en donnerai confirmation au moyen de résultats d'études conduites au cours de ces dernières années dans différents pays et secteurs techniques.

Pour ce qui est des raisons de l'exclusivité, on peut en déceler au moins trois:

1-D'une manière générale,-et ceci ne constitue pas une critique-, les publications sont en main d'éditeurs et sont gérées par des comités de rédaction qui doivent réaliser un compromis entre le prix de revient donc le volume de leurs publications et l'intérêt de leurs lecteurs sur tel ou tel problème. Leurs colonnes ne peuvent donc pas prétendre couvrir toutes les connaissances brevets des sujets incriminés vu, comme nous nous en rendrons compte,la masse des documents en cause, et d'autant que les Ministères spécialisés assurent cette diffusion aux termes de la Loi.Lorsqu'une revue présentera une réalisation directement issue d'un brevet, elle n'en reprendra pas tous les détails; elle fournira des idées générales, apportera des commentaires, se contentera dans la plupart des cas de citer le numéro du brevet.

2-Ensuite l'invention ayant été brevetée, et au besoin décrite dans une revue, est susceptible, par la suite, de recevoir des mises au point, des compléments, ou des améliorations,soit parce quelque chose n'a pas marché comme prévu, soit parcequ'on a pensé à de nouvelles applications ou à des procédés de réalisation nouveaux. Dans de tels cas, il y aura peu de chances pour que ces brevets d'addition ou de perfectionnements fassent l'objet d'une nouvelle publication dans cette même revue: je dirai plus, c'est qu'il peut y avoir des cas pour lesquels l'inventeur ne souhaite pas faire connaître qu'il a eu des problèmes de mise au point , non plus que les moyens auxquels il a dû recourir pour les résoudre.
Comme le faisait remarquer le regretté LIEBSNY (5)," Un éditeur n'est pas un historiographe, et ces problèmes de mise au point, pour être techniquement importants, sont sans intérêt pour lui". En outre, "Il est par exemple peu pensable qu'un éditeur, même spécialisé, consacre 267 pages de texte et 780 dessins au perfectionnement d'un ordinateur tel qu'il est présenté dans le brevet anglais n%749836. Et il est certain que le brevet anglais n%1108800 qui comporte trois volumes et est vendu par l'Office au prix de 1£ contient plus d'informations que n'importe quel ouvrage ou revue a pu en publier sur le sujet".
Ces cas sont peut être extrêmes quant au volume des documents incriminés, mais ils ne sont pas isolés

3-Il y a un troisième élément qui est le suivant:certaines inventions sont normalement divulguées par le brevet, mais il se passera un temps très long avant qu'elles ne soient reprises dans une autre publication, ou simplement citées. Il peut se faire en effet qu'à un moment donné une invention paraisse mineure ou isolée, et donc qu'elle ne soit pas jugée digne d'être citée par d'autres publications; ce n'est que beaucoup plus tard, qu'associée à d' autres inventions ou technologies, qu'elle deviendront un maillon petit mais essentiel permettant la mise en oeuvre d'un nouveau processus industriel. Ou alors, d'une manière inverse,il peut manquer à certaines inventions une technologie périphérique qui faciliterait sa mise en oeuvre. Ou encore, à un moment donné, certaines inventions ne sont pas suivies de réalisations pour des raisons de prix de revient, mais la situation économique changeant,peuvent ultérieurement retrouver une deuxième jeunesse (c'est le cas de beaucoup de brevets sur l'énergie actuellement).En voici quelques exemples:

Un brevet pris par CHARLES aux U.S.A. le 22 octobre 1880, qui prévoyait l' enregistrement optique du son, n'a été publié qu'en 1916, et n'a pu être mis en oeuvre que beaucoup plus tard encore.

Un brevet d'HOLLEVITH sur les cartes perforées datant de 1885 n'a été repris pour la première fois dans la littérature classique qu'en1914.

Le brevet de BAIRD sur la télévision date de 1923 et n'a été effectivement publié dans la littérature qu'en 1928 (6).

Les brevets de ZIEGLER et NOTTE sur certaines conditions de polymérisation des oléfines ont été décrits dans les brevets dix ans avant leur publication dans les revues (7).

Ces différentes raisons sont je crois tout à fait compréhensibles, et elles conduisent finalement au résultat suivant: que seulement 10% des informations contenues dans les brevets se retrouvent dans les autres supports de la littérature technique.C'est dire dès maintenant les risques pris en négligeant délibérément une telle source d'information ou bien, et nous en reparlerons,en faisant une confiance aveugle à certaines bases de données sous l'angle de la couverture brevets.

Quelle est la valeur à accorder à ce chiffre, comment a-t-il été obtenu?

1-Tout d'abord son ordre de grandeur est connu depuis de nombreuses années par les différents Offices chargés de l'examen des brevets.(Offices Nationaux des pays à examen, Institut International des Brevets devenu l'une des Directions Générales de l'Office Européen des Brevets). Ces Offices, pour leurs recherches, disposent aussi bien de brevets que de livres, revues, rapports, notices, etc. Mais enfin, ces Offices étant mieux organisés pour le traitement des brevets, pour lesquels ils disposent de classifications appropriées et remarquables, on pourrait penser qu'ils sont plus tentés de citer dans leurs avis des brevets que d'autres références. Aussi d'autres enquêtes ont été réalisées dont je rappellerai les principales.

2-En 1969, dans un article sur la littérature brevets, (8),un organisme de Moscou se livrant à une exploitation systématique de l'information brevets (Institut Central de Documentation sur les Brevets et la Recherche Economique en U.R.S.S., ou Ts N.I.I.P.I.) a cité , lui, le chiffre de 10 à 15%, mais sans donner de précision sur la manière dont il avait opéré pour parvenir à ce chiffre.

3-Ensuite LIEBSNY, HEWITT, HUNTER, HANNAH, auteurs déjà cités (6), ont réalisé en 1974 un essai sur un échantillon de plus de 1000 brevets anglais ou étrangers couvrant de la chimie, de la mécanique et de l'électricité.Sans s'étendre de trop sur la méthode expérimentale, on indiquera toutefois qu'elle consiste pour l'essentiel à une recherche comparative avec les articles de revues et ouvrages spécialisés dans la discipline considérée, ou de revues secondaires ,et enfin une comparaison des noms d'inventeurs dans les Science Citation Index.Pour cet essai, il est apparu que 5,77% seulement des informations contenues dans cet échantillonnage de brevets avaient été reprises ailleurs: en toute précision 8,6% pour la chimie, 3,3% pour la mécanique et 7,5% pour l'électricité.

4-Plus récemment, une étude a été conduite par OPPENHEIM et SUTHERLAND (9) sur certain procédé métallurgique donné, en comparaison avec une vingtaine de revues devant en principe être intéressées par ce procédé et des revues secondaires (bibliographiques). L'étude a confirmé , qu'à une exception près ces revues, ou bien ignoraient les brevets, certaines ne s'en sont pas caché, ou bien le traitaient d'une manière très restrictive. Le résultat a été que sur 49 brevets déposés sur ce procédé, une seule revue arrivait à en citer 30 d'entre eux, les autres se contentant d'en citer 4, 5 ou 6 au mieux.

5-OPPENHEIM et SUTHERLAND (10), ont également réalisé sur les brevets canadiens et américains la même étude qu'avait réalisé antérieurement LIEBSNY ,voir 3 ci-dessus, sur les brevets anglais. Les résultats se sont recoupés à savoir que 6% des brevets américains et 11% des brevets canadiens seulement ont été retrouvés dans la littérature des périodiques.

6-Le dernier exemple auquel je ferai allusion est celui qui nous est fourni par les travaux de l'O.T.A.F. (Office of Technology Assessment and Forecast)(11), qui, depuis plusieurs années réalise de façon systématique et continue des statistiques sur les brevets américains et qui arrive aux conclusions qu'en ce qui le concerne,

13,3 % de l'information brevets se retrouve partiellement ailleurs, 16 % se retrouve substantiellement ailleurs et enfin 70,7 % ne se retrouve nulle part ailleurs.

On constate donc qu'il existe quelques écarts entre les résultats de ces différents essais,dus au fait que les échantillonnages ne sont pas les mêmes dans les différents cas: certains sont faits par pays , d'autres par disciplines techniques.Néanmoins ils confirment le chiffre proposé de 10 % qui peut être en conclusion retenu, et qui confirme d'une manière indiscutable l'exclusivité de l'information brevets.

STATISTIQUES:

Je voudrais maintenant vous fournir quelques chiffres statistiques sur les brevets car si tout le monde est d'accord désormais pour convenir des qualités et de l'exclusivité de cette information, il faut aussi montrer ce qu'elle représente en quantité, et montrer ainsi qu'il ne s'agit pas de quelque chose de marginal, et donc d'un simple appoint.

Mais ici je crois utile de faire quelques remarques sur la manière dont ces chiffres ont été obtenus et seront présentés.

Pour une même invention, et donc pour un même brevet, il peut, au titre de certaines législations y avoir plusieurs publications successives du texte de l'invention.

La règle la plus générale, actuellement, est celle de la publication à 18 mois, qui peut concerner soit des publications examinées (U.S.A. et Canada par exemple), soit des publications non examinées, pouvant dans certains cas (Brevet Européen, France) être accompagnées d'un Avis Documentaire.

Mais il peut exister une deuxième publication lorsque les demandes précédentes ont subi, ou des amendements volontaires de la part du déposant, ou des coupures à la suite d'un examen caractérisé, voire même une troisième publication au moment de l'accord définitif, en particulier après une procédure de mise à l'inspection publique.

Si dans certains cas (analyses fines, étude de l'impact de l'Avis Documentaire, contentieux technique ou juridique), il peut être intéressant pour les comparer entre eux de disposer de ces publications successives, les documentalistes, quant à eux, peuvent se contenter de la seule première publication, attendu qu'elle est sans aucun doute la plus complète en même temps que la plus rapidement disponible.

Il m'a donc paru utile de faire apparaître la différence entre les deux ensembles, pour ne pas gonfler inconsidérément les chiffres avancés, et permettre le recoupement avec des chiffres proposés par d'autres sources ou auteurs, et qui, apparaissant divergents, pourraient provoquer un doute dans certains esprits.

Les Tableaux qui suivent ont été établis à partir des statistiques officielles (12) éditées par l'O.M.P.I. pour l'année 1977.

Le Tableau I indique les chiffres d'ensemble de dépôts et accords de brevets.

Le Tableau II, quant à lui concerne les chiffres équivalents pour les modèles d'utilité, qui sont des documents de propriété industrielle apparentés aux brevets et dont la consultation n'est pas à négliger tout au moins pour certains pays et pour certaines techniques.

Tableau I

DEMANDES ET DELIVRANCES DE BREVETS POUR L'ANNEE 1977 (1)

PAYS	Demandes de brevets déposées par des			Brevets délivrés à des		
	Résidants	Non-résidants	Total	Résidants	Non-résidants	Total
Allemagne (Rép. Féd)	30247	30154	60401	10815	10934	21749
Australie	4364	9882	14246	768	8868	9636
Belgique	1073	11453	12526	1060	11386	12446
Canada	1832	23337	25169	1291	19502	20793
Espagne	1863	9040	10903	3052	15831	18883
Etats Unis	62863	38068	100931	41383	23886	65269
France	11811	28167	39978	8361	22684	31045
Italie (1)	6000	20000	26000	6000	20000	26000
Japon	135991	25015	161006	43047	9561	52608
Pays Bas	1960	12669	14629	396	3296	3692
Royaume-Uni	21114	33309	54423	7722	28827	36549
Suède	4503	10476	14979	1960	6220	8180
Suisse	5542	10801	16343	6320	16235	22555
URSS (2)	121647	4038	125685	46123	230	46353
Total partiel	410810	266409	677219	178298	200459	378757
Autres pays	45956	74525	120481	27272	48442	75714
TOTAL GENERAL	456766	340934	797700	205570	248901	454471

(1) estimation

(2) y compris les certificats d'Auteurs

Tableau II

ENREGISTREMENTS DEPOSES ET ACCORDES POUR LES MODELES D'UTILITE EN 1977

	Demandes d'enregistrements déposées par des			Enregistrements accordés à des		
	Résidants	Non-résidants	Total	Résidants	Non-résidants	Total
Allemagne (Rép. Féd)	28627	11958	40585	12719	2222	14941
Espagne	6485	1131	7616	8890	1705	10595
Japon	178207	1495	179702	53992	812	54804
Total partiel	213319	14584	227903	75601	4739	80340
Autres pays	11493	514	12007	2542	37	2579
TOTAL GENERAL	224812	15098	239910	78143	4776	82919

La présentation de détail des ces Tableaux a été limitée aux seuls pays déposant plus de 10.000 brevets par an: ceci montre , au passage que la consultation des brevets et modèles d'utilité de ces seuls pays permet néanmoins d'appréhender près de 90% de l'ensemble des informations disponibles au travers des documents de propriété industrielle.

Le Tableau III a été présenté pour ne tenir compte, conformément à ce qui a été annoncé, que des documents à retenir en première main par les documentalistes;si,d'autre part en première analyse on admet que les brevets de non résidants correspondent à des brevets d'extension pris à partir du brevet de priorité, on arrive au chiffre de 377.000 documents, et on se rend compte alors qu'il ne s'agit pas d'un simple appoint aux autres documents habituels: on peut du reste le comparer aux chiffres connus des publications annuelles: 30.000 pour les ouvrages
220.000 pour les thèses et les rapports
1.500.000 pour les articles de revues (y compris les redondances)

CE QU'ON PEUT TIRER D'UN BREVET:

De tout ce qui vient d'être dit et démontré, on peut aisément en déduire que le brevet doit permettre, par ses qualités intrinsèques, ou bien certains types de recherches impossibles par ailleurs, ou bien de disposer de résultats qui permettent des prises de décisions à la mesure des enjeux mis en cause dans les brevets. Il en est bien ainsi et je vous proposerai quelques exemples de ce qu'il est possible de tirer des brevets.

1-Les recherches techniques: Elles vont de soi bien sûr, mais elles peuvent se situer à différents niveaux.La plus courante est celle qui consiste à établir l'état de la technique, et par laquelle on recherche les documents concernant une invention ou un problème technique donné, à un certain moment. Elle s'apparente aux recherches bibliographiques de la documentation générale, à ceci près:
-qu'elle peut être guidée à l'aide des classifications propres aux brevets,
-qu'elle est mieux positionnée dans le temps (toutes les dates sont authentifiées),
-qu'elle permet une appréciation beaucoup plus nette: des documents pertinents, de la hauteur inventive, et de l'environnement technologique auquel, nous le savons, les chercheurs sont particulièrement attachés.
En conséquence elle permet d'émettre un jugement en connaissance de cause sur une invention, mais aussi de connaître avec précision les créneaux disponibles, ou, au contraire les obstacles à contourner ou à franchir à l'occasion de nouvelles recherches, et tout ceci à partir d'éléments parfaitement sûrs.

Et puis on pourrait citer, pour mémoire, les autres types de recherches telles que recherches d'antériorité, recherches de surveillance, recherches de sondage.

Tableau III

DOCUMENTS (Brevets et Modèles d'Utilité) DISPONIBLES EN 1ère OU UNIQUE PUBLICATION

(pour les pays déposant plus de 10000 demandes par an)

	Résidants	Non-Résidants	Total
Brevets			
Allemagne (Rép. Féd)	30247	30154	60401
Australie	4364	9882	14246
Belgique	1073	11453	12526
Canada	1291	19502	20793
Espagne	3052	15831	18883
Etats-Unis	41383	23886	65269
France	11811	28167	39978
Italie (1)	6000	20000	26000
Japon	135991	25015	161006
Pays Bas	1960	12669	14629
Royaume-Uni	7722	28827	36549
Suède	4503	10476	14979
Suisse	6320	16235	22555
URSS	46123	230	46353
Total Brevets	301840	252327	554167
Modeles d'U			
Allemagne (Rép. Féd)	12719	2222	14941
Espagne	8890	1705	10595
Japon	53992	812	54804
TOTAL GENERAL	377441	257066	634507

(1) estimation

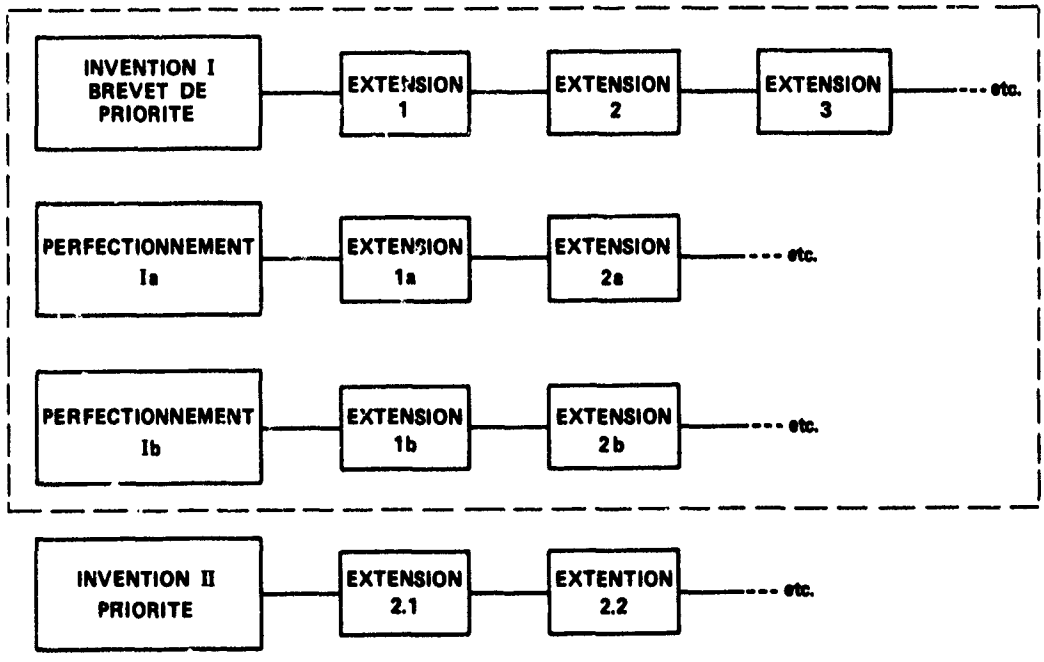
2-Recherches sur les familles de brevets: A partir d'une invention initiale, donc d'un brevet dit de priorité, deux filiations peuvent se développer:
-directement, par le dépôt de brevets d'extension dans différents pays,
-indirectement, par le dépôt de brevets d'addition ou de perfectionnement.
L'ensemble donne naissance à une véritable "famille" de brevets, c'est le terme officiellement utilisé désormais, et dont une idée de schéma est proposé sur la figure qui suit: or l'examen de ces familles ne manque pas de fournir des indications de qualité sur le point et le développement de l'invention.

-Les extensions: Leur nombre est à considérer par exemple, compte tenu de la notoriété ou de la position industrielle du déposant: en effet, on peut dans beaucoup de cas, apprécier le cas du brevet de barrage ou de caractère local, ou, dans le cas de multiples (et coûteuses) extensions, discerner une volonté politique quant à la propriété industrielle ou les espérances placées par leurs auteurs sur leur nouvelle invention.

Il est tout aussi intéressant de vérifier si, dans les pays pratiquant l'examen, les extensions ont été accordées dans leur intégralité, ou si elles ont subi des limitations, de voir lesquelles, et donc d'en tirer un jugement de valeur.

-Les additions et perfectionnements: Leur nombre, leurs dates, leur fréquence , leur liaison directe ou non à un premier brevet (il peut s'agir, en fait, de nouveaux brevets), indique si le déposant poursuit le développement de sa technique, s'il rencontre des difficultés, s'il a trouvé de nouvelles applications ou formes de réalisation. On peut découvrir ainsi, chez des concurrents, des nappes de brevets visant à un même résultat industriel, mais par le biais non seulement de moyens, mais aussi d'évènements différents.

-Les annuités: Dans la plupart des pays, un brevet ne reste en vigueur que pour autant que soit payée chaque année une taxe d'annuité, dont le montant s'accroît sensiblement jusqu'à la vingtième année qui est la limite. Un industriel n'engage donc de tels frais qu'à condition que son invention soit ou encore exploitée ou encore ouverte à des développements possibles; mais il ne le fera pas si cette technique est dépassée ou si, dans l'intervalle il a déposé un nouveau brevet sur la question.



-Le registre national des brevets (C'est le terme en français): Bien qu'il ne soit pas toujours systématiquement utilisé, il doit être consulté à l'occasion pour savoir si le brevet a fait l'objet d'une concession de licence et à qui, quelle est la qualité du licencié, et obtenir par là de nouveaux éléments de jugement.

- Le rapprochement des noms: qu'il s'agisse du nom des inventeurs ou de celui du déposant, est intéressant à analyser. C'est un type de recherche extrêmement fréquent et qui fait apparaître: les accords et liaisons entre Sociétés, les accords entre Sociétés et Organismes par exemple à l'occasion de contrats signés pour la réalisation d'un objectif donné, les fusions (ou rachats de Sociétés), les contrats entre universitaires et industriels ou organismes, et enfin l'appartenance de certains spécialistes à telle ou telle entreprise.

- Les statistiques: dont on commence à saisir l'intérêt, et qui sont devenues plus fiables avec les délais plus rapides de publication des brevets et le meilleur catalogage de leurs données administratives. Chacun est à même de réaliser et de suivre de telles statistiques, à partir desquelles (11) il est possible de découvrir ou de ressentir les poussées technologiques du moment, les stades de développement et de la mise au point et prévoir ainsi l'apparition vraisemblable de nouveaux produits sur le marché. Ceci rejoint en quelque sorte ce qui a été dit au sujet de l'examen des familles de brevets, mais cette fois sur un plan large et plus élevé.

On peut voir ainsi, par de tels exemples, toutes les possibilités offertes par une rationnelle et complète exploitation de l'information brevet. Mais toutefois, comme toute médaille a un revers, je ne voudrais pas conclure cet exposé sans évoquer quelques précautions à prendre dans leur traitement et leur utilisation. Car je crois que beaucoup de déceptions et d'échecs dans le recours à ces documents ont été mis sur le compte du brevet lui-même, alors qu'il s'agissait plus vraisemblablement d'un simple problème de méthodologie dans son exploitation.

PRECAUTIONS D'EXPLOITATION:

Ces précautions visent surtout, nous allons le voir, à ne pas laisser perdre une information qui est en général très fine à rechercher relativement à certains systèmes de classification (en particulier les mots-clefs dans certains domaines techniques), qui doit être appréhendée sur de longues périodes de temps, et pour laquelle certaines infrastructures documentaires ne sont pas adaptées à ce type de travail.

S'il est vrai , par exemple, que certaines revues secondaires prennent en compte l'information brevets, le fait est qu'elles ne le font pas toutes avec la même exhaustivité et avec la même constance dans le temps. Si certaine revue , très connue des chimistes arrive à une couverture de l'ordre de 85%, beaucoup d'autres n'arrivent qu'à 10 ou 20% et quelquefois encore moins. Nous en avons parlé à l'occasion de l'exclusivité de l'information. En outre ces revues bibliographiques doivent disposer d'un certain délai pour préparer leurs propres résumés et mettre en oeuvre leur édition, et certains délais sont de l'ordre de plusieurs mois à un an.

De ce fait, il est conseillé, dès que les enjeux sont d'importance ou qu'il s'agit de techniques évoluant rapidement, de recourir directement aux revues primaires qu'éditent tous les offices de propriété industrielle et qui sont, pour les principaux pays, d'une excellente tenue et en particulier complétées par différents types d'index qui facilitent les travaux de surveillance.

En outre les méthodes d'interrogation attachées aux bases de données multi-documents ne sont pas, tant s'en faut, adaptées à l'interrogation du contenu des brevets, ce qui entraine des échecs que certains responsables de ces bases de données reconnaissent eux mêmes. En outre beaucoup de ces bases sont de création relativement récente, et n'assurent donc pas la couverture suffisante à de telles interrogations. Ce sont là des raisons supplémentaires pour s'adresser dans les cas importants à des bases spécifiquement brevets, en complément de ce qui pourrait être fait par ailleurs. Il existe quelques bonnes bases brevets, d'autres sont en cours de mise en place.

Ensuite, une fois les brevets repérés, il est indispensable de passer au document complet, car lui seul permet de faire connaître quels ont été les différents modes de réalisation d'une invention donnée, alors que le résumé, bien sûr n'a présenté qu'un seul d'entre eux, mais pas forcément celui qui vous intéresse directement.Ainsi, indépendamment de ce qui a été dit au sujet de la différence entre revendication et résumé technique, il faut savoir que 40% de l'information technique se trouve dans la première revendication, que 60% se trouve dans l'ensemble des revendications , les autres 40% se trouvent dans la description proprement dite.

Enfin, il est sûr que, comme la chose à rechercher est en général très fine, les classifications ont été élaborées en conséquence, mais que s'agissant d'outils à la fois importants et sophistiqués, leur utilisation requiert une formation préalable et une certaine pratique, d'autant qu'elles ont été crées plus a l'attention des examinateurs qu'à celle des chercheurs.

Mais néanmoins, tous les travaux réalisés ces dernières années et les dispositions mises en place par les parties concernées permettent de traiter désormais les brevets avec beaucoup plus de sérénité que tel n'était le cas il y a disons une dizaine d'années.

CONCLUSIONS:

J'espère, par ces exemples, avoir prouvé que le brevet détenait une information à la fois riche et exclusive. Il importe donc, surtout dans la conjoncture actuelle d'y faire systématiquement appel afin d'éviter le plus possible les situations de dépendance.

Je cois d'ailleurs,que pour tirer tout le profit de cette information, il y a le plus grand intérêt à la traiter de façon indépendante de la documentation conventionnelle et non pas comme un complément à celle-ci, car, nous l'avons vu, le catalogage n'est pas le même et n'a pas la même signification, les classements sont différents,et l'usage qui en est fait est beaucoup plus large et multiple.

En vous remerciant de votre attention, je souhaite avoir été assez convaincant pour lever la méfiance et la suspicion qui trop souvent ont freiné ou empêché l'utilisation du brevet comme document technique majeur.

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THE CASE FOR USING PATENT DOCUMENTATION

(Its Unique Content, Illustrations of its Application)

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SUMMARY:

Among other consequences, the situations with which the economies have been confronted for the last few years have led the industries to undertake, then develop rapidly new research and innovation actions. At this juncture it is being advised in many quarters to use all the possibilities offered by patent documentation.

Now, it is evident that many technicians and documentalists are still unaware of the documentary value of patents or, at least, do not grasp it correctly, and therefore do not resort it as they should. One of the probable reasons of this situation is that they are not truely convinced of this truth.

However, the information contained in patents is largely exclusive. on the one hand, and, on the other hand, offers qualities and characteristics enabling one to reach conclusions and make decisions which the usual technical documentation material does not always permit.

Consequently, the purpose of this paper is not only to prove and demonstrate the above statement, but also to present a number of possible patterns of application.

Thus, we hope to convince potential users of the advantages which they are likely to derive from this type of information, and, consequently, to induce them to use it to a greater and deeper extent than previously in many sectors.

INTRODUCTION:

Among the various technical information dissemination media, the patent is indeed that which gives rise to the greatest number of questions from documentalists. As a matter of fact, the patent does not have the same origins as the other documents with which documentalists are used to working; it is not systematically and consistently integrated in document handling operations (particularly bibliographical reviews and data bases); it is not obtained from the same sources; its physical aspect is quite different from that of conventional documents; its particular style is unattractive and makes its reading difficult; it includes redundancies (corresponding patents) which document processing sequences do not attempt to avoid; claims are regarded as technical abstracts; and, finally, the administrative data which are more complex than in the case of other documents give rise to difficulties, or even anomalies in the case of computer processing.

In short, for those who did not have the opportunity to discover in a patent something which they had not found elsewhere, as well as for those who, being not in the least aware of the specific characteristics of patents, were unsuccessful in data retrievals, the patent remains a questionable document; as a result, they send it back to its juridical vocation.

In addition, why make a secret of it?, in certain firms, there is a sort of competition between the industrial property sections and the documentation sections regarding the existence of a documentary files consisting exclusively of patents, as the processing to be applied varies from one case to the other, which is not incentive for the users coming from the documentation services.

All that precedes is clearly reflected in figures, since the results of one of the last surveys on this subject (1) reveal that only 10 to 15% of potential users resort to patents, these potential users being either technicians or documentalists. This survey was made in the European Economic Community; however, the results are of the same order of magnitude as those of similar surveys carried out in the United States, in particular.

Nevertheless, incentives and inducements intended to remedy this situation have been numerous for the last ten years or so:

- -New laws, or even new Industrial Property systems were either up-dated or developed here and there: Enforcement of the European Patent Convention and of the Patent Cooperation Treaty (P.C.T.). In all cases, provisions have been contemplated to increase the documentary role of patents.
- -Efforts have been made simultaneously by the National Industrial Property Offices towards developing their documentary files, extending them to the provinces, facilitating their access for users, speeding up the printing of documents, improving the quality of all their publications (patent documents, Official Gazettes, Cumulative Index).
- -Standardization efforts on patents, thanks to the activities of the ICIREPAT (Committee of the World Organization for Intellectual Property), and to the publi-

cation of an ISO standard, in order to adjust the modes of publication of documents, the recording of information, the quotation of patents as bibliographical references.
-To all this should be added other actions aiming at making patents better known, at developing innovation, improving the dynamics of the Industrial Property and facilitating its implementation.

However, it must be admitted that all these provisions have not been sufficient to create the anticipated trend. We are therefore justified in wondering why, in spite of all these important actions, the result obtained among documentalists has been so trifling.

In my opinion, in all these actions, basic information has been lacking; therefore they have failed to create the conviction necessary to a real adhesion. The problem involved is thus an education, or at least an information problem which, once handled, should play the part of a developer for the various actions contemplated.

This has been understood by a number of organizations concerned with this problem: the World Organization for Intellectual Property, the European Communities, or the Fédération Internationale de Documentation.

Therefore, my purpose in this paper is to resort to practical arguments to try to throw some light on certain dark areas which contribute to a poor or incomplete use of the patent as a source of technical documentation.

THE PATENT IS A TECHNICAL DOCUMENT:

The general idea which still prevails is that the patent is the legal document granted to an inventor to enable him to take advantage of the discovery he has made, and that, accessorily, interesting information can be found in this document.

However the truth is different, as it is enough to refer to the most important laws, even if they are old, to realize that the patent is originally a "divulgation document".

In fact, from the very creation of patents, the legislator believed that any new invention should contribute to the welfare and progress of society and, to achieve this aim, was to be made public, thereby spreading new knowledge, stimulating the researchers' creativity and, by degrees, speeding up the technical, then economic development.

Unless the publication -or divulgation- has been correctly and totaly effected to enable the person skilled in the art to repeat it, the inventor cannot claim to receive his monopoly right, which will enable him to exploit it for his own benefit during a limited period of time. This is a sort of contract between society and the inventor. It is easy to realise that such is the case in all recent laws, on the occasion either of examination procedures or of judgments passed: the patents whose description is regarded as insufficient are purely and simply cancelled.

It goes without saying that these description and divulgation aspects come in addition to the three conventional criteria of novelty, inventive step and new industrial development, which are used to judge the quality of the invention. Even if this pattern may appear slightly over-simple to qualified jurists, it is daily confirmed by facts.

Now, we may wonder why, in a number of industrial, well developed countries, the documentary function of the patent has not been more extensively resorted to. One possible reason, which was put forward by various specialists, is that, during the post-war period, expansion was guaranteed and therefore research progressed in a more or less coherent fashion. The quality of the patents could vary (which was authorized by certain laws), and consequently one was not concerned by the documentary aspect of the patent, either for the granting of the patent or for research proper.

However in view of the new situations created first of all by the slowing down of expansion, then by the energy crisis,research has become increasingly expensive and it became evident that it has to be implemented then developed in a rational and well planned manner, without waste of time nor duplication. This induced the industry to get better informed on technical problems, economic prospects and competition, and the patent is one of the safest means to achieve this result, as explained in the following section.

Once it has been brought out, this interest in the documentary function of the patent was reflected in new provisions, at both the national and international levels; these provisions were required to deal with the overall juncture. This explains in particular why the granting of patents was more closely controlled and why their publication was accelerated, which was a good thing for documentalists. The provisions made available to us in this field will be presented by the various speakers in this lecture series; as far as I am concerned, I shall deal with the specific characteristics of this type of information.

CHARACTERISTICS OF THE PATENT AS AN INFORMATION MEDIUM:

Due to its nature, its preparation and its finality, the patent is different from the media with which documentalists are more familiar.

1- First of all, the patent is a divulgation document, and there is a considerable difference between publication and divulgation. Publications (essentially reviews) propose articles when some research has led effectively to a development, preferably worthy of interest; patents, in their role of divulgation, appear as more unpretentious, as they proceed in a more continuous way, informing their readers of any new step taken, even if

it is small and if it has not yet let to actual developments: for instance, it is believed that 60% of the patents filed are followed by real applications; nevertheless, the remaining 40% contain technical information which should not be disregarded. In addition, as mentioned above, in accordance with the law, divulgation is to enable the specialist to carry out the invention. Now, we know that the applicants do not like to say more than is needed, to avoid showing their hand too early; however, they are precisely obliged to do so in a patent, even though they refrain from doing it in other types of publications. In addition, while scientific and technical publications provide information preferably on the research and developments to which they have led,they do not indicate how this research and these developments have evolved. They provide no means of being accurately informed on the state-of-the-art. This points out the fundamental difference between these two types of documents (2).

2- The information contained in a patent has to be accurate; it is therefore reliable because, there again, when submitted to the juridiction of experts, the patent which would give a poor description of an invention, or present incorrect results, would not hold out against the conclusions of a judgment.

I wish to point out that, in the past, and in certain countries which do not examine patents, there have been some descriptions of a highly questionable inventive step. In fact, they remained in existence because they were not followed by any utilization, or were not surveyed by experts. In any case, such situations are over.

It can be inferred from what precedes that, in view of such constraints, the patent must be free from any literary effect, or any unjustified bombast which could be disputed by a third party. This contributes to giving the patent its severe, not to say dull aspect especially since the numbering of the lines precludes any typographical lay-out likely to make its reading easier.

3- Then, patents contain additional information which is quite peculiar to them, as well as highly accurate.

- Figures and more precisely diagrams and tables. Their lay-out must comply with very strict rules, as they play an important part in this type of information, especially in the case of a dispute on the text. It is a well known fact that they have a number one priority for the specialist and that they offer multiple possibilities of application for the same invention, which is not necessarily the case for any review of work.

- The documents encountered by the examiner during his examination are quoted in certain patents and even, for the European Patent, the search report is attached to the patent document. All these quoted documents offer the characteristics of both bibliographies and research on the state-of-the-art. They enable documentalists to undertake research later on with full knowledge of the facts, since a classification, either national or international, is assigned to all the documents quoted.

- The numerous administrative indications: characteristics of the filing, priority and publication, applicant's and inventor's names and locations, are additional items of information which, while they are of an administrative nature, make it possible to derive conclusions of a technical nature.

4- We must mention the intrinsic quality of the patent, that is to say the very clear distinction between what was known prior to the invention (and which is sometimes reviewed in the summary) and what is new. In addition, the summary contains a brief history of the previous state-of-the-art, identifies the fields of application of the invention as well as the advantages claimed. Now, an ordinary article does not always provide a means of appreciating what an invention has actually contributed, especially as this contribution can be very small in its definition, while bringing considerable improvements to the invention to which it can be linked. Likewise, when various applications have been contemplated, they give rise to successive claims, or even to successive patents.

5- Finally, the classifications proposed by the Offices are systematically indicated on a patent document. Such classifications are much finer than the key-words which many of us know well. They are quite suited to the patent classifying problems and can be very useful to documentalists in further investigations

Here, I would like to express a remark on the very particular style used for the writing of patents and often called "patentese", about which many questions are asked, and which contributes to the belief that the patent is decidely not a technical document. This is a sort of highfalutin which is more akin to a legal writ than to a technical text.

It has sometimes be thought that this style was used to conceal certain elements of the invention. This may apply to the writing of certain patents, but we have seen that there is no point in carrying things too far in this direction. In fact the reasons are twofold:

While presenting a precise development, the writing of a patent must remain sufficiently open to leave possibilities for eventual future developments, or new applications, establishing, so to speak, a protective "no man's land" through which it would be difficult to penetrate. In addition, certain attorneys deem it advisable to use a style accessible to jurists, should a lawsuit take place.

It is true, however, that certain applicants or their patent agents have sometimes taken undue advantage of these circumstances in the past to render their texts esoteric for possible protection purposes. Present regulations try to avoid such excesses.(3)(4)

EXCLUSIVENESS OF THE INFORMATION CONTAINED IN PATENTS:

However, the quality of information is not exclusiveness, as a patent could be regarded, after all, as a more accurate and exact form of what can be published in conventional documents. This would be a step forward, anyway. But in fact, this is not the case, as it is true that only a very small part of the information contained in patents is to be found in other documents. We shall consider the reasons thereof, then I shall confirm this fact by using the results of studies conducted for the last few years in various countries and technical sectors.

There are three reasons for this exclusiveness:

1- Generally speaking - and this should not be regarded as criticism -, publications are in the hands of publishers, and are managed by boards of editors who must reach a trade-off between the cost, therefore the volume of their publications, and their readers' interest in specific problems. Therefore, their columns cannot claim to cover all the knowledge included in patents on the subject dealt with, in view of the mass of documents involved, especially since the specialized Ministries are in charge of disseminating this information in accordance with the law. When a review describes a development directly resulting from a patent, it does not provide all the details; it supplies guidelines and formulate comments and, in most cases, is content with quoting the reference number of the patent.

2- Then, once patented and, if necessary, described in a review, the invention is likely to be up-dated, completed, or improved, either because of unexpected incidents, or because new applications or new implementation procedures have been envisaged. In such cases, these additional or improvement patents are very unlikely to be published again in the same review: in fact, there may be cases when the inventor does not wish to reveal that he has been faced with adjusment problems nor to disclose the means he had to use to solve them.

As the late LIEBSNY (5) remarked, "a publisher is not a historiographer, and these adjustment problems, although they may be important technically, are not of interest for him". In addition,"it is hardly conceivable that a publisher, even specialized, should devote 267 pages of text and 780 drawings to the improvement of a computer, such as it is presented in the British patent n° 749836, and it is certain that the British patent n° 1108600, which consists of three volumes and is sold by the Office at the price of 1 £ , contains more information than any work or review ever supplied on the same subject". These may be extreme cases, as far as the volume of the documents in question is concerned, but they are not isolated cases.

3- There is a third element which is as follows: certain inventions are normally disclosed in the patent, but a long period of time will elapse before they are taken up again in another publication, or only quoted. As a matter of fact, at a given time, an invention may appear of minor importance or isolated and therefore may not be considered as worth being mentioned in other publications. It's not until much later that, associated with other inventions or technologies, it will become a small, however essential, link permitting the implementation of a new industrial process. Or else, inversely,a peripheral technology which would facilitate the implementation of an invention, may be missing. Or else, at a given time, some inventions are not followed by developments for cost reasons; however, they may find a "second youth" later on if the economic situation is modified (this applies now to many patents on energy).

I shall give you a few examples:

A patent taken out by CHARLES in the United States, on 22 october 1880, which provided for the optical recording of sound, was not published until 1916, and could not be implemented until much later.

A patent by HOLLEVITH on punched cards, dating back to 1885, was not taken up again for the first time in conventional literature until 1914.

BAIRD's patent on television, dating back to 1923, was not published in the literature until 1928 (6).

ZIEGLER's and NOTTE's patents on certain conditions of olefin polymerization were described ten years before their publication in reviews (7).

I believe that these various reasons are quite understandable, and they finally lead to the following results: only 10% of the information contained in patents is to be found in other technical literature media. This emphasizes the risks taken by deliberately ignoring such a source of information or else (we shall consider this point again), by trusting blindly some data bases as far as patents are concerned.

What value should be given to this figure, and how was it obtained?

1- First of all, its order of magnitude has been known for many years by the various Offices in charge of examining patents: National Offices of examining countries, International Patents Institute which is now the Searching Branch of the European Patent Office. For their investigations, these Offices have patents, as well as books, reviews, reports and pamphlets available. However, as these Offices are better organized for the handling of patents, for which they have suitable and remarkable classifications available,one may think that they are more tempted to quote patents than other references in their search reports. Therefore additional investigations have been carried out, and I shall review the main ones.

2- In 1969, in an article on patent literature (8), a Moscow organization making a systematic use of patent information (Central Institute of Documentation on Patents

and Economic Research in U.S.S.R., or Ts.N.I.I.P.I.) mentioned the percentage of 10 to 15%, but without specifying how this figure had been calculated.

3- Finally, in 1974, LIEBSNY, HEWITT, HUNTER, and HANNAH, (mentioned previously) (6), prepared a survey on a sample of more than 1000 British or foreign patents covering chemistry, mechanics and electricity. Without dwelling too much on the experimental method, we can indicate that it consists essentially of comparative research using articles from reviews and works specialized in the discipline considered, or from bibliographical reviews, and finally of a comparison of inventor's names in the Science Citation Index. It appeared in this survey that only 5.77% of the information contained in this patent sampling had been taken up again in other documents; to be precise, the respective percentages were 8.6% for chemistry, 3.3% for mechanics and 7.5% for electricity.

4- More recently, a survey has been conducted by OPPENHEIM and SUTHERLAND (9), on patents dealing with a given metallurgical process, as compared with approximately twenty reviews which were supposed to be interested in this process, and bibliographical reviews. This survey confirmed that, with one exception, these reviews, either disregarded the patents -and they made no secret of it- or dealt with them in a very restrictive way. As a result, out of 49 patents which had been filed on this process, a single review managed to quote 30 while, the other reviews were content with mentioning 4, 5 or 6.

5- The same type of survey which had been conducted previously by LIEBSNY (see 3 above) on British patents, was also carried out by OPPENHEIM and ALLEN (10) on Canadian and U.S. patents. The results obtained were similar, that is only 6% of the U.S. patents and 11% of the Canadian patents were to be found in periodical publications.

6- The last example which I shall give for illustration purposes is that provided by the work of O.T.A.F. (Office of Technology Assessment Forecast) (11) which, for several years, has been conducting systematic and continuous statistics on United States patents; the conclusions reach as follow:

13.3% of patent information is to be partly found elsewhere, 16% is to be substantially found elsewhere and, finally, 70.7% do not appear anywhere else.

We note, therefore, that there are some divergences between the results of these various surveys, due to the fact that the samples are selected differently: some are selected by country, other by technical discipline. Nevertheless, they confirm the proposed figure of 10% which can be retained in conclusion, and which unquestionably confirms the exclusivity of patent information.

STATISTICS:

Now, I would like to give you a few statistical figures on patents, because, while all agree now on the qualities and exclusivity of this information, it remains to show what it represents in terms of quantity, and thus demonstrate that it is not a marginal element, therefore a mere contribution.

However, I think it is useful, at this point, to make a few comments on the way these figures were obtained and will be presented.

According to certain legislations, there may be several successive publications of the text of the invention for the same invention, therefore the same patent.

Currently, the most usual rule is that of publication within 18 months of filing; it may concern either publications which have been examined (U.S. and Canada for instance) or publications which have not yet been examined and which, in certain cases (European patent, France) may be accompanied by a search report.

However, a second publication can take place when the previous applications have been either intentionaly modified by the applicant or curtailed following the official examination; there may even be a third publication at the time of the final agreement, in particular after opening the patent to public inspection.

While in certain cases (fine analyses, study of the impact of the search report, technical or juridical litigation), it may be interesting to have these successive publications available, for comparison purposes, documentalists can be content with the only first publication, since it is undoubtely the most complete and the most rapidly available.

Therefore,I have deemed it useful to bring out the difference between the two sets in order not to inflate unduly the figures put forward and to permit a correlation with the figures proposed by other sources or authors, which may give rise to doubt in certain minds because they appear divergent.

The following tables were prepared from official statistics (12) published by W.I.P.O. for the year 1977.

Table I indicates the overall figures of patent applications and grants.

Table II gives the equivalent figures for utility models, which are industrial property documents akin to patents, and which one should not fail to consult, at least for certain countries and certain techniques.

The detailed presentation of these Tables has been limited to the only countries which file more than 10,000 patents per year; this show, incidentally, that consulting the patents and utility models of these only countries provides however a means of grasping nearly 90% of the overall information available in all the industrial property documents.

Table I PATENT APPLICATIONS FILED and PATENT GRANTED DURING 1977

PAYS	Patent applications filed by			Patents granted to		
	Residents	Non-residents	Total	Residents	Non-residents	Total
Germany (Fed. Rep)	30247	30154	60401	10815	10934	21749
Australia	4364	9882	14246	768	8868	9636
Belgium	1073	11453	12526	1060	11386	12446
Canada	1832	23337	25169	1291	19502	20793
Spain	1863	9040	10903	3052	15831	18883
United States	62863	38068	100931	41383	23886	65269
France	11811	28167	39978	8361	22684	31045
Italy (1)	6000	20000	26000	6000	20000	26000
Japan	135991	25015	161006	43047	9561	52608
Netherlands	1960	12669	14629	396	3296	3692
United Kingdom	21114	33309	54423	7722	28827	36549
Sweden	4503	10476	14979	1960	6220	8180
Swirzerland	5542	10801	16343	6320	16235	22555
USSR (2)	121647	4038	125685	46123	230	46353
Partial total	410810	266409	677219	178298	200459	378757
Other countries	45956	74525	120481	27272	48442	75714
GRAND TOTAL	456766	340934	797700	205570	248901	454471

(1) estimation (2) Author's certificates included

Table II APPLICATIONS FILED AND REGISTRATIONS GRANTED FOR UTILITY MODELS DURING 1977

	Applications for registration filed by			Registrations granted		
	Residents	Non-residents	Total	Residents	Non-residents	Total
Germany (Fed. Rep)	28627	11958	40585	12719	2222	14941
Spain	6485	1131	7616	8890	1705	10595
Japan	178207	1495	179702	53992	812	54804
Partial total	213319	14584	227903	75601	4739	80340
Other countries	11493	514	12007	2542	37	2579
GRAND TOTAL	224812	15098	239910	78143	4776	82919

Table III has been presented in such a way as to take only in account (in conformity with what was stated) documents to be retained preferably by documentalists. If, on the other hand, we admit that non-resident patents correspond to equivalent applications taken out from the priority application, we reach the figure of 377,000 documents; then we realise that this is not a simple contribution to the other usual documents, and we can draw a comparison with the known figures of annual publications:

30,000 for books
220,000 for theses and reports
1,500,000 for review articles (including duplications).

Table III

DOCUMENTS (Patents and Utility Models) AVAILABLE AS A FIRST OR ONLY PUBLICATION (for countries filing more than 10000 applications per year)

	Residents	Non-residents	Total
Patents			
Germany (Fed. Rep)	30247	30154	60401
Australia	4364	9882	14246
Belgium	1073	11453	12526
Canada	1291	19502	20793
Spain	3052	15831	18883
United - States	41383	23886	65269
France	11811	28167	39978
Italy (1)	6000	20000	26000
Japan	135991	25015	161006
Netherlands	1960	12669	14629
United - Kingdom	7722	28827	36549
Sweden	4503	10476	14979
Switzerland	6320	16235	22555
USSR	46123	230	46353
Total Patents	301849	252327	554167
Utility Models			
Germany (Fed. Rep)	12719	2222	14941
Spain	8890	1705	10595
Japan	53992	812	54804
GRAND TOTAL	377441	257066	634507

(1) estimation

WHAT CAN BE DERIVED FROM A PATENT:

We can easily infer from all that has just been stated and demonstrated that the patent, thanks to its intrinsic qualities, should either permit certain type of investigations which would otherwise prove impossible, or provide results necessary to the making of decisions proportional to the consequences implied in the patents. I shall give you a few examples of what can be derived from patents.

1- Technical research:

This goes without saying, but such research can take place at various levels. The most usual is that which consist in determining the state-of-the-art, and which implies the retrieval of the documents related to a given invention or technical problem at a given time. It is akin to bibliographical search in general documentation, with the following exceptions:

- It can be guided by means of the classifications peculiar to the patents;
- It is more precisely located in time (all the dates are authenticated);
- It permits a more accurate appreciation of: pertinent documents, inventive step, and the technological environment in which,as we know, researchers are particularly interested.

Consequently,it provides the means of judging an invention on good grounds, and also of knowing precisely the opportunities offered, or, on the contrary, the obstacles to overcome or circumvent when undertaking new research, all of this from perfectly safe elements.

The other types of search can be mentioned as a reminder: novelty search, surveys, pre-ex-search.

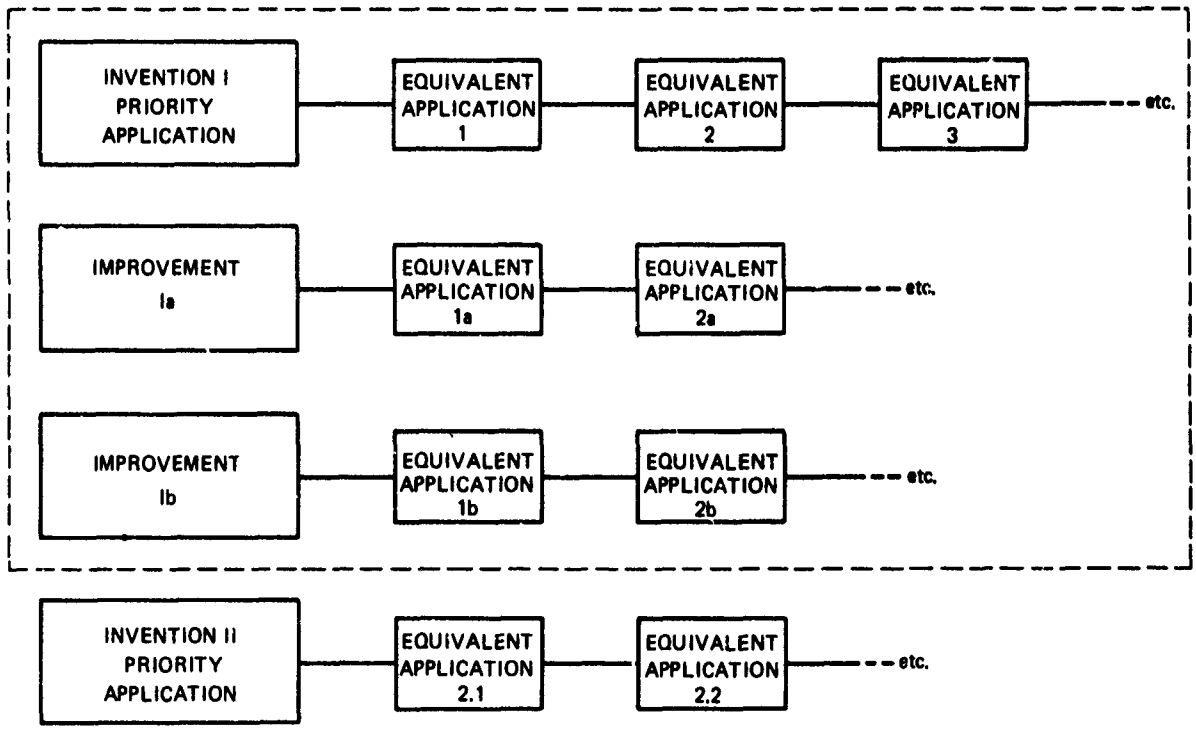
2- Research on patent families:

From an initial invention, therefore, from a so-called priority application, two filiations can develop:

-directly, by the filing of equivalent applications in various countries

-indirectly, by the filing of additional or improvement patents

These overall patents constitute a real "family" of patents; this is the term now officially used to designate them, and a block diagram is proposed on the following figure; now, examining these families provides indeed valuable indications on the state of progress and development of the invention.



Equivalent applications: Their number is to be taken into consideration for instance in view of the applicant's repute or industrial position: in fact, in many cases, one can appreciate the case of an application for local purposes or, in the case of multiple (and costly) equivalent applications, one can detect a political will as regards industrial property or the hopes founded by authors on their new inventions. It is equally interesting to check whether, in the countries which conduct the examination, the equivalent applications were granted in their entireness, or whether they were subjected to limitations, to find out which limitations and therefore to be able to pass a value jugement.

Additions and improvements: Their number, dates, frequency, direct or indirect connection with a first patent (in fact they can be new patents) are indications whether the applicant proceeds with the development of his technique, whether he meets with difficulties, or whether he has found new applications or forms of implementation. It is thus possible to discover among competitors, batches of patents aiming at the same industrial product or result, not only through different means, but also through different events.

Annuities: In most countries, a patent does not remain in force unless an annuity tax is paid each year; its amount increases appreciably until the 20th year,which is the limit. Therefore, a manufacturer does not incur such expenses unless his invention is either still utilized or still open to possible developments; he will not incur them, however, if this technique has become obsolete or if, in the meantime he has filed an application for a new patent on the same subject.

The National Register of Patents: Although not always systematically used, it should be occasionally consulted to find out whether the patent has been licensed, to whom the licence has been granted, what is the licensee's capacity, in order to obtain new bases for judgment.

The connection between names: Whether the inventors' names or the applicant's name are involved, this connection is interesting to analyze. This is an extremely frequent type of research which reveals: agreements and connections between Companies, agreements between Companies and Organizations, for instance on the occasion of contrats signed for the fulfilment of a given objective,mergings (or repurchases of Companies),contracts between academics and manufacturers or organisations and finally the affiliation of certain specialists with a given firm.

Statistics: Their value is beginning to be appreciated, and they are becoming increasingly reliable because of the shorter delays of patent publication and the improved cataloguing of their administrative data. Everyone is able to perform and follow such statistics, from which (11) it is possible to discover or feel the technological breakthroughs of the moment, the design and developing stages, and thus to predict the probable emergence of new products on the market. This corroborates what has been stated previously concerning the examination of families of patents, but this time to a greater extent and on a higher level.

Such examples illustrate all the possibilities offered by a rational and complete utilization of the patent information. However, as every rose has its thorn, prior to concluding this paper, I would like to mention the precautions to be taken in their handling and use, as I believe that many disappointments and failures, when resorting to these documents, have been ascribed to the patent itself, while they were more likely to result from a simple methodology problem in their utilization.

PRECAUTIONS FOR UTILIZATION:

The main obective of these precautions is to avoid losing an item of information which is usually very delicate to retrieve with some classification systems (particularly key-words in certain areas), which must be searched over for long periods of time, and for which certain documentation infras'ructures are not suited.

While it is true, for instance, that some bibliographical reviews take patent information into account, they do not always do it exhaustively, nor with the same persistence in terms of time. While a given review which is well known by chemists achieves a coverage of the order of 85%, many other reviews reach only a 10 to 20% coverage, and sometimes even less. We have already mentioned this fact when dealing with the exclusiveness of information. In addition, these bibliographical reviews must have some time available to prepare their own abstracts and implement their publication, and this time may vary from several months to a full year.

Therefore, if the consequences are important or the techniques addressed rapidly evolving, it is recommanded to resort directly to official Gazettes published by all the industrial property Offices, which are of an excellent quality in the main countries, and are completed by different types of index, making surveys easier.

Besides, the query processing used for multi-document data bases are far from being suited to queries on the content of patents; this leads to failures which are recognized by some of the people responsible for these data bases. In addition, many among these bases have been created recently, therefore do not ensure a sufficient coverage for such queries. These are additional reasons why one should resort to specific patent bases for important cases, as a complement to what could be done otherwise. There are already a few good patent bases, and others are being set up.

Then, once the patents are identified, it is indispensable to pass on the complete document, as it is the only means to find out what the various modes of implementation of a given invention have been, whereas the abstract, of course, has only presented one of them, and not necessarily that in which you are directly interested. Thus, independently of what has been said on the difference between claim and technical abstract, one must know that 40% of the technical information is to be found in the first claim, 60% in the overall claims, and the remaining 40% in the description proper.

Finally, as the item is to be retrieved is usually very fine, the classifications were made accordingly; but they are both important and sophisticated instruments, their use requires training and practice, especially as they have been intended for examiners rather than for researchers.

Nevertheless, all the work carried out during the last few years, as well as the arrangements made by the parties concerned now provide the means of dealing with patents in a much more serene way than about ten years ago.

CONCLUSIONS:

By means of all these examples, I hope to have demonstrated that the patent contains both rich and exclusive information. It is therefore important, especially in the present juncture, to resort systematically to patents in order to avoid dependance situations to the greatest extent.

I believe that, to derive every advantage from this information, one should handle it in quite a different way from conventional documentation and not regard it as a complement to the latter; in fact, as we have seen, the cataloguing is not the same and does not have the same meaning, the classifications are different, and the use made of it is much larger and multiple.

Thanking you for your attention, I hope to have been sufficiently convincing to remove the mistrust and suspicion which have too often hampered or prevented the use of patent as a major technical document.

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CORPORATE MANAGEMENT OF PATENTS: ROLE OF THE INDUSTRIAL LIBRARIAN

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SUMMARY

This paper is directed for the most part to the Corporate Management of Patents from a technical information viewpoint. The librarian, who is seldom the direct user of patents, should become knowledgeable in the rich resources of patent data. Technology transfer can be accomplished by the engineer and scientist having the complete picture which the librarian offers in response to a search request. The General Electric Company is used as an example of corporate patent management. The author prepared two surveys. Major library schools were questioned on whether courses in Patent Information is part of the curriculum requirements of a special librarian. The other survey directed itself to several dozen major industrial libraries in the United States on patent handling and management. The results of these surveys are given. Although there are over 30 patent depositories in the United States, the "average" research librarian does not make complete use of these depositories. In some cases, the survey indicated they were unaware of these data sources.

The paper describes several key patents within the General Electric Company supported by library research, and specifically, man-made diamonds. On-line retrieval systems where patent license data is offered by NASA and DTIC is an example of sources available to the aerospace librarian and the paper concludes with a forecast of how libraries and special libraries will retrieve patents and patent applications before the next century commences.

CORPORATE PATENT INVOLVEMENT

This paper is directed to librarians for the most part, our gate keepers of knowledge in both science and technology. As a librarian, I have become very much aware of the need to learn as much as possible about patents.

As a point of interest, my organization, the General Electric Company, according to the U.S. Patent Office, has close to 50,000 patents. General Electric has led the list year after year. In 1978, General Electric was awarded 865 patents. Mr. Reginald H. Jones, Chairman and Chief Executive Officer of the General Electric Company made a decision in 1974 and 1975 to keep the corporate research and development budget as high as possible, although there was a sharp drop in sales and income. In 1978 the R&D budget expenditures went up 27%, to more than a half billion dollars. When we include the work done on contracts for the government and the electric utilities, GE's total R&D expenditures amounted to $1.3 billion, and that is a lot of science and engineering money.

Concomittant with a general R&D budget, the Corporation has more technical libraries and information centers - over 70, than any comparable industrial organization in the United States.

Patents, therefore, are basic to R&D efforts. To cite a few patents granted the General Electric Company which has changed and advanced our technology, I would cite some of the more known ones:

PETER EASTCOTT: Producing more than 40 patents that have changed the character of the mining industry.

FRANCISCO VELASQUEZ: Adapting U.S. products to the needs of his native Columbia.

BENJAMIN HORVAY: Whose genius resulted in perfecting refrigeration systems with 33 patents to his credit.

EMMETT WILEY: Who has made himself a world authority on high-brightness lamps and projection systems with multiple patents.

KEITH HOWELL: Wtih 29 patents and more pending in electronic gear.

ARTHUR ADAMSON: Whose engineering and innovative genius has 27 patents including small electric motors to electronic controls, rocket motors, and most notably, aircraft gas turbines.

RICHARD SAMSEL: A pioneer in sonar systems, and a leading scientist in a defense technology.

THOMAS SNYDER: Solving the mysteries of nuclear physics and power reactor fuel design.

GEORGE SCHEPER: Many patents granted in the perfection of gas turbine aerodynamics.

KARL STEINMETZ: World renowned scientist and inventor, who needs no further discussion.

This, I believe, vividly illustrates General Electric Company's corporate interactions with patents. I am certain other corporations in the United States realize patents mean not only knowledge gained - but ultimately the profits of the labor. Now, how does this affect the manager or director of technical libraries?

SPECIAL LIBRARIES AND PATENT LITERATURE

The reference librarian, and indeed, all professional employees in a technical library should be knowledgeable in the following areas:

(A) Who in my organization is the Patent Attorney or Patent Reviewer? In the survey I conducted it was surprising to discover in the replies received, that there was a patent office, but contact between the library and the patent expert was minimal.

(B) Where can I obtain a patent? We are aware that the U.S. Patent Office in Washington can supply patents. However, 20 states have an active Patent Depository Library and these depositories are strategically located across the United States for convenient access. (See Figure 1 for a Summary Listing of Patent Depository Libraries in the U.S.)

(C) Foreign patents are an invaluable property. Many of the depository libraries have a rich collection of foreign patents available for reference and sale at a minimal price. I found in my research that only 20% of libraries utilized foreign patents in report bibliographies or literature searches.

(D) In R&D, as well as in organizations producing hardware, The Official Gazette is the best means to disseminate information to the public. The Official Gazette has been in print since 1872. Each Week, about 1,500 patents are granted by the U.S. Patent Office. A drawing or sketch, as well as a summary text, describes the respective inventions.

The summaries of patents are arranged in The Official Gazette according to subject matter. By this arrangement the library user seeking current patent data can go to only those disciplines he needs, and not have to wade through excessive reading matter.

According to the patent office, The Official Gazette is sent to about 6,000 individual subscribers in the United States; to about 600 libraries, located in the United States. Of interest to NATO community libraries, copies of The Official Gazette are sent to National Depository Libraries in each country.

Of special interest to librarians, with chronic storage space problems, The Official Gazette is republisned by several firms in microform formats on a commercial basis, with many subscribers.

(E) Of invaluable use as a reference library tool is the Index of Patents. This index is published annually by the U.S. Patent Office and it contains all of the weekly Official Gazettes for the preceding year. The first part of the Index of Patents is a summary of the list of patentees, arranged in alphabetical order, and recorded patent assignee who received a patent during that year. The second part of the Index of Patents is the subject of the invention (classification of patents). It is usually issued as a separate bound volume furnishing classes and subclasses of all patents issued the preceding year.

(F) Of special interest is the agency known as OTAF, or, Office of Technology and Forecasting, which was organized in 1972 as a medium to exploit for practical applications the use of the patent file by assembling, analyzing, and making available data for a technology concept. A data base has been built by the Office of Technology Assessment and Forecasting covering U.S. patents.

The data base is applied in several basic methods. It publishes general distribution type of publications. These comprise reports on highly active technology areas; areas experiencing high levels of patenting by residents of foreign countries as well as outlines of patenting patterns of residents in selected countries and states within the United States. With the stress now on energy alternatives, a number of publications have been issued by OTAF in energy potentials. OTAF also makes use of this data base for preparation of specialized reports, tailored and designed to meet individual requirements. The reports are available at reasonable costs and have been used by a number of corporations as, of course, by U.S. government agencies.

For the benefit of the library community in NATO countries, I would like to describe and discuss the U.S. patent classification method. At the present moment, in the U.S. patent classification system, all patented technology is broken down to about 340 or 350 classes of subject matter. Because of the tremendous diversity of technology reaching the patent office, 100,000 subclasses have been created. Each class and the subclasses are numbered and each titled.

The U.S. Patent Office, as new technology comes to light, revises the classification scheme. There are many additions and deletions, so gaps in the sequences can be found. I have selected CLASS 244 - AERONAUTICS as can be seen in Figure 2. Every class and subclass has a designator - or description of that particular subject matter which is denoted by its title; in some instances, there are "notations" or cross-references to other classes and subclasses which may have technically related information.

The position of the subclass within a class is an essential feature of the total classification scheme. Listings such as the one on Figure 2 in which the subclasses are arranged in their proper position relative to one another are called "Class Schedules." This system reminds one of the Library of Congress schedule systems of subject or discipline interrelationship. In the Class Schedules, as you can note in Figure 2, the titles of some of the subclasses are indented with respect to the others. Subclass 3.1 - Missile Stabilization or Trajectory Control shows Subclass 3.15 - Automatic Guidance with seven subclasses related to Automatic Guidance. In Subclass 158 - Spacecraft, we note that attitude control has 7 unique subclasses intertwined to attitude control 165-by gyroscope or flywheel, 166-by magnetic effect, 167-by gravity gradient, 168-by solar pressure,

169-by jet motor, 170-by nutation damper, 171-with attitude sensor means, 172-with propulsion and, 173-with solar panel. The U.S. Patent Office had sufficient prescience to include the spacecraft category as far back as three decades ago.

All of the subclasses whose titles begin in vertical alignment are said to be "Coordinate" with respect to one another. Subclass 158, 62 and 53 are coordinate subclasses. Coordinate subclasses are those whose titles begin furthest to the left - and not indented at all.

These are termed "Mainline" subclasses and serve as the headings of the primary divisions of the subject matter of the class. They are always printed in capital letters. Coordinate subclasses such as 110-A to 110-H which are indented one level to the right under a Mainline title are a secondary division of the subject matter of the primary division. Coordinate subclasses such as subclass 129.2 to 133 indented under subclass 129.1 represent a division of the subject matter of the secondary division, and so on. The system is logical and if one studies the Class 244 of Aeronautics, one notices it is a built-in bibliography, as it were, of Aerospace Technology on Basic Technologies.

Accordingly, the subject matter of an indented subclass is indicated not only by its title but by the titles of each succession of the subclass under which it is indented. The complete title of subclass 3.18 (Celestial Navigation) has an interconnect with 3.15 (Automatic Guidance) as a logical offshoot of the main heading 3.1 (Missile Stabilization or Trajectory Control).

The Patent Office has done a remarkably fine job, from a library information retrieval viewpoint, of narrowing-down-by-indentation of scope of the subject matter of indented subclasses, which is always made clear and explicit in the corresponding subclass definitions.

All current Class Schedules are then collected in a volume titled Manual of Classification, which is available to the public, patent searchers and librarians.

PATENTS AS A SOURCE OF TECHNICAL INFORMATION

Within the United States government, I consider the Department of Defense Technical Information Center (DTIC) and the National Aeronautics and Space Administration to be the leaders and motivators in technical information. Both agencies are responsive to the needs of their users in the space and defense communities in the United States.

A number of years ago, NASA made an intensive survey of corporate libraries (NASA Contractors), and other NASA technical information users to determine which industries are completely aware of advances in technology, technology transfer, and new products and inventions. The results of this NASA survey indicated that the users of NASA technical information services evaluated patents as low-use information sources. "On a scale of 100, patents ranked 5 for usefulness in both 'awareness' and 'problem solving,' while trade and professional journals, meetings, supplier personnel and vendor catalogs ranked above 30 in nearly every instance." These results came as a surprise to NASA.

HISTORY OF PATENTS

In reviewing the literature as to where patents originated, we find that in several of the Italian states, in the 15th century, the first known grant to an inventor took place in Florence in 1421. In 1474, the City of Venice had an ordinance enacted. The idea of protecting the inventor's right to any reward for his patent soon spread to other European countries, and during the next 2 centuries, patents were being issued on a regular basis. In the beginning, these grants were ordinarily made without any specific statutes on the subject but by virtue of the general authority and power of the ruler or government.

We find that in Elizabethan England, Queen Elizabeth I issued grants relating to inventions. These were grants of exclusive rights and privileges regarding the importation of industries new to the kingdom, and monopoly grants relating to known commodities. There was a great deal of dissatisfaction over these monopoly grants. Consequently, in 1623, the Parliament declared such grants unlawful, but, as an exception, tion, confirmed the authority to grant exclusive rights for new inventions for a period of 14 years. Thereafter, invention patents were granted on a fairly continuous basis in England. Study of the history of patents would indicate England was more prolific in patent granting than any other European country at that time. It would appear that the general system of patents grew by custom, rather than statute.

It was not until near the close of the 18th century that formal comprehensive patent laws appeared in 1790 in the United States, and one year later, in revolutionary France. When we trace the historical reasons, as in the case of the United States, these patent laws enactments were a mark of democratic expression; in the instance of France, a change of spirit from the rights of kings to the rights of man were expressed. The French statute was very explicit in declaring the natural rights of the inventor to the exclusive rights of his invention. In the United States, it became necessary to centralize patent administration and control, from the individual states to the union, to the Federal government.

The U.S. Constitution of 1787 gave the Congress the power to "promote the progress of ... the useful arts, by securing for limited times to ... inventors the exclusive right to their ... discoveries." In accordance with this provision,the first patent law was enacted.

In the 19th century, the enactment of laws governing patent rights was enacted in Europe: The Netherlands in 1809, Austria in 1810, Russia in 1812 (by some coincidence the 1812 Overture comes to mind), Bavaria in 1812, also, in Prussia in 1815, in Sweden in 1826. It is interesting from a historical perspective to see that the Republic of Texas passed patent laws in 1839, before joining the United States.

There was no general statute in England until 1852. Eventually, most of the German states enacted provisions for the granting of patents, and, after unification, the new Germany passed a general patent law which became effective in 1877. In Italy, we read that the Sardinian patent law of 1859 was extended to the rest of that country in stages - as Italy became unified from 1860 to 1870.

It is interesting to note that by the end of the 19th century, a large number of countries had enacted patent laws, and some progressive countries were writing revisions to improve their earlier patent statutes.

At the present time, there are about 100 independent jurisdictions having patent statutes. In addition, there are about 20 countries which rely solely on the registration therein of a patent ordinarily in a specific foreign country; for most, this is the United Kingdom, of which they were former colonies, and about two dozen British Colonies have patent ordinances that provide for registering British patents therein, and, in some instances, for independent patents also. There are, today, only about 6 countries having no patent laws.

In 1970 a new treaty called the Patent Cooperation Treaty was drawn up and signed in Washington in June 1970 by 20 countries adhering to the International Convention. Its main goal was to facilitate the filing of patent applications in a number of countries. A single application can be filed in a single office by the inventor or patent attorney and the application can be effective in any of the participating countries that the applicant designates.

This brief history was presented to acquaint librarians in the NATO and defense community with the history of patents - a subject which could certainly be covered by many volumes.

SURVEY OF RANDOM LIBRARIES IN THE UNITED STATES IN REGARD TO PATENT DATA

In order to obtain a "feel" on the subject of patent literature, I prepared a Survey Questionnaire (See Figure 3).

Three types of institutions were surveyed at random:

(a) A Public Library
(b) A School of Library Science
(c) A Special or Corporate Library

I wanted to obtain a fairly wide area of disciplines and technologies to give this audience and the readers of this paper a better insight as to how librarians can make optimum use of patent data.

Of the four schools of library science analyzed, not one school had a course in patent literature, per se. Several of the schools did indicate that in teaching government publication courses, the instructors and professors covered patents, but certainly not to the intensity the subject deserves.

Further, in my survey I requested the respondees to tell whether the students were fully aware of the value of patents in science and technology searches. Each of the respondees felt that there was a weakness in this area. I then asked the respondees for their comments, which, as you can see in Figure 3 were affirmative for further patent education of our future librarians.

The survey polled two public libraries in the U.S. and both libraries surveyed indicated they were the focal point in their community to assist readers and library users with data on patents and were aware of the patent repositories available to them, which laymen, as a rule, do not know in performing literature research. One public library included patent data, the other did not.

In response to the question as to whether the public librarians had any patent literature training, the answer was 100% yes. For my question as to whether we overlooked patents as a valuable resource, the replies were affirmative. I have cited the comments from all libraries surveyed in Figures 4 and 4A.

Corporate and special librarians by the score of seven to four did not have their library or technical information center as the prime source for patent information. In large corporations, a Patent Attorney, as a rule, manages patent data. It is evident that the value of patent information has become increasingly vital, since 9 out of 11 special libraries, did, indeed, include patent technical information, wherever possible. In regard to training the librarians on patents, five respondees had some training and six did not. In my question covering the library community overlooking patents in research projects which they perform, seven of the eleven polled said patents did not get the special care and handling which books, technical reports and journals received.

THE MAN-MADE DIAMOND-SYNTHESIS-PATENT TECHNOLOGY IN ACTION

The history of General Electric Company in man-made diamonds is one of the most fascinating technological triumphs of interest to the scientist, as well as the layman.

Because the story of the development can fill page after page, the history of this accomplishment will perforce be limited.

The tantalizing respect of converting an inexpensive substance, carbon, to a comparatively precious material, diamond, has been a tremendous temptation to scientists, inventors, and pseudo-scientists since the Middle Ages. Indeed, in 1797, when diamonds were shown to be a form of carbon, the impetus was on to duplicate nature.

In 1951 the General Electric Company Research Laboratory, located at Schenectady, New York, made a decision to bring its fine technical talent and research capability to make a diamond. It goes without question that this scientific adventure would have many booby-traps, blind alleys and heaps of frustration.

General Electrid was primarily interested not only in the scientific challenge, but the economic as well, since the Metallurgical Products Department of the company was a very large consumer of industrial diamonds. This type of diamond was essential in the processing of cemented carbide materials. Carbides and diamonds are very hard substances for cutting, grinding and many other applications.

The research team selected on the man-made diamond program included Dr. John Fisher, Dr. F. P. Bundy, Dr. H. T. Hall, Dr. H. M. Strong, and Dr. J. E. Cheney and others.

The research was to be vast - with all sorts of failures to be expected. Just as the miners who in 1849 thought they struck gold, confusing the metal with pyrite, or fool's gold, sc the investigators ran across similar high hopes. To illustrate, one member of the team wrote in his notebook: "I've been looking in the microscope all day at the material from runs made yesterday and today. I think I have made diamonds in these runs! In each sample I found many absolutely perfect octahedrons! Some octahedrons scratch glass. There are thousands of triangles. Most of them have pits and steps (as do also the octahedrons). They certainly look like the real thing."

After critical examination during the following week, a brief, and not so enthusiastic notebook entry states: "Examination of new runs octahedra present here, but since there was no carbon present in this run, the octahedra cannot be diamond." It turned out that the hoped for "diamonds" in this particular experiment were chromite, originating in the chromium of the stainless steel reaction chamber.

These were preliminary experiments, with much hard work to follow. A vast and intensive library literature search was undertaken by the GE Research Laboratory library. Of specific interest was patent data, in addition to the tremendous quantity of journal literature.

The scientists engaged in the project had little practical experience with high pressure technology, but in a way this proved to be a plus factor. Since they had no set convictions about what could or could not be done.

In the initial phases of the research it seemed that high pressure and high temperature were about the best choices. However, Dr. John Fisher and Dr. Turnbull had a "scientific hunch" that the diamond crystals could be grown in a low pressure environment.

A study of phase transition data for graphite and diamond work was the initial phase of high pressure work. The General Electric Research Laboratory was working at this time with temperature of 750°C and pressure up to 50,000 atmospheres. Although the thermodynamic data provided essential guidance, the range of uncertainty in calculated pressures and temperatures was quite large.

On February 15, 1955, after many experiments and partial successes, the first man-made diamond was produced! Synthetic diamonds are identifical with natural diamonds in their fundamental properties but differ in those characteristics that depend on the process of manufacture, such as impurities, size and shape. Synthetic diamonds are made in grit sizes (about 0.1 mm). These sizes are in greatest demand for the manufacture of bonded diamond-grinding wheels for shaping and sharpening tundsten carbide tools. This, I feel, is the greatest single use of industrial diamonds, and because of its importance in Defense Industries, these GE diamonds have been classed as a special strategic material. Interestingly enough, synthetic diamonds are superior to natural diamonds for industrial use because they are single crystals, roughly octahedral in shape, with many cutting edges. If industry uses the expensive natural diamond, there are many elongated slivers and flats which reduce its efficiency.

At the GE Research Laboratory, it was discovered that a small amount of impurity present in diamonds made by man does not reduce the hardness but does discolor many of the minute crystals. It is possible to manufacture larger, single diamonds a few millimeters in diameter, but the cost is so great they are not competitive with natural stones 0.5 mm in diameter or larger. There seems little liklihood that single crystals of gem quality will be developed, as of now. The higher pressures and temperatures in the range where synthetic diamonds are made give purer crystals.

Because GE used R&D money to develop the synthetic diamond (not funded by the U.S. Government), the United States became independent of this enormously valuable product which theretofore had to be imported from the Congo.

My reason for presenting this phase of the paper was to illustrate the many, many hours of patent searching which went into this program. Not only was the search needed to exclude possibilities of infringement but, equally important, the patent literature was a rich harvest for our research laboratory to not re-invent the wheel. In discussions with scientists engaged in the project, the rule-outs from the patent data review saved years of extra R&D.

Figure 5 is the patent granted to GE for the "man-made" diamond.

LIBRARY COMPUTERIZED DATA BASES FOR SEARCHING PATENT LITERATURE

As the information explosion affected all libraries and information centers, both in the U.S. and in NATO affiliated countries, the need for adequate and prompt response bibliographical control was recognized in the mid-1950's and 1960's by the largest United States Government handling technical information centers. Amont the leaders were the Defense Technical Information Center (formerly DDC), NASA, and,of course, the Patent Office.

The NASA/RECON Data Base, operating from the Baltimore/Washington International Airport areas, has included all patent applications and those patents under U.S Government control in all of the NASA/RECON On-Line searches, in NASA's prime field of aerospace technology.

The Defense Technical Information Center, likewise, has done a magnificent job in providing the defense community libraries with a rich source of patent information and patent licenses arising from military R&D.

DIALOG Services - A Division of the Lockheed Missiles and Space Company - has incorporated in their over 100+ data bases the following patent literature search capabilities. This service is available on the On-Line mode in the United States, Canada and to multiple NATO countries in Europe.

The data bases are known as CLAIMS. There are five separate data bases under this acronym, all dealing with the following specifics of patent literature. The IFI/PLENUM DATA COMPANY, Arlington, Virginia is the supplier to the DIALOG system.

1. CLAIMS TM/CHEM

   This data base contains over 265,000 U.S. chemical and chemically related patents issued from 1950 to 1970, covering NATO nations such as Belgium, United Kingdom, West Germany and The Netherlands. Approximately a little over 20% of these European country patents are in this data base. It is estimated that 60% of the records produced by this data base include chemical abstracts numbers. All patents in the chemical section of The Official Gazette of the U.S. Patent Office together with any patents in the general, electrical and mechanical section of the Gazette which are considered to be chemically oriented are included in this file.

2. CLAIMS TM/CLASS

   Claims/Class is a classification Code and Title Dictionary for all classes and selected sub-classes of the U.S Patent classification system. Using this data base will be of significant help to retrieve patent data from the other 2 data bases, CLAIMS/CHEM and CLAIMS/U.S. PATENTS.

3. CLAIMS TM/U. PATENTS, 1971-1977

   This patent data base has over 500,000 patents which are listed in the General, Chemical, Electrical, and Mechanical sections of The Official Gazette of the U.S. Patent Office. About 20% of this file includes European countries such as Belgium, France, United Kingdom, West Germany and The Netherlands.

4. CLAIMS TM/U.S. PATENT ABSTRACTS, 1978 TO THE PRESENT

   This contains an estimated 10,000 patent records with monthly updates. Of specific interest in this data base are disciplines in aeronautical engineering, agricultural engineering, chemical engineering, chemistry, civil engineering, electrical and electronics engineering, electromagnetic technology, mechanical engineering, nuclear science, as well as general science and technology. It differs from the aforementioned data base in that it includes abstracts for the patents from 1978 to the present time.

5. CLAIMS TM/U.S. PATENT ABSTRACTS WEEKLY

   This data base is a "companion" to the aforementioned data base. It includes the most current weekly update and records for the month. It is estimated that over 3,000 citations are added monthly.

6. INTERNATIONAL PATENTS RETRIEVAL

   An interesting data base for patent retrieval, also, under the DIALOG Information Service is scheduled for operational use in 1980. This system is known as INPADOC - and is organized by the International Patent Documenter Center. There will be about 16,000 patents per week from 45 countries.

   Every patent in the INPADOC data base contains the standard bibliographic data, including patent equivalents in more than one country. Patents in the INPADOC file are classified according to the International Patent Classification System. The file will be updated weekly and will include the most recent six weeks of INPADOC records. The file has a corresponding COM (Computer Output Microform) microfiche publication - INPADOC PATENT GAZETTE.

There are other commercial and government data bases to tap in a patent search.

The critique which most special libraries have of extant automated patent retrieval is that the data bases do not go far enough back in time, so material not recently filed with the Patent Office must be searched manually.

The information retrieval organization which can index and abstract the 3 million plus patents in the U.S. Patent Office, plus all of the European patents, will have made a tremendous accomplishment not only for the special librarian but for the patent searcher and patent attorney as well.

Looking into our crystal ball, this does not seem as impossible as it appears. As one looks back a mere quarter of a century, the computers, CRTS and terminals for libraries and all the peripheral information retrieval tools the librarian has at his or her disposal didn't exist. I envision, before this century comes to an end, that the complete indexing of all viable U.S. and European patents for computer terminal searching will be indeed achieved.

Furthermore, with the rapid growth in the technology of the microfiche format for reading technical information plus the rapid advancements in computer graphics, the probability of a library performing a patent literature search, and producing the patent(s) needed as a result of the search in either microfiche or other readable mode, is not too far away.

The most important message I have for this symposium is that the special librarians in government and industry know and use patent literature for any substantive literature search in depth.

I wish to thank my audience for their kind attention and my thanks to Hu Sauter, Administrator of the Defense Technical Information Center, DoD, for recommending me to lecture and to M. W. Hill of The British Library. I have been honored to address this gathering.

Thank you.

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State	Name of Library	Telephone Contact
Alabama	Birmingham Public Library	(205) 254-2555
California	Los Angeles Public Library	(213) 626-7555 Ext. 274
	Sunnyvale Patent Library#	(408) 736-0795
Colorado	Denver Public Library	(303) 573-5152 Ext. 223
Georgia	Atlanta: Price Gilbert Memorial Library, Georgia Institute of Technology	(404) 894-4519
Illinois	Chicago Public Library	(312) 269-2814
Massachusetts	Boston Public Library	(617) 536-5400 Ext. 265
Michigan	Detroit Public Library	(313) 833-1458
Missouri	Kansas City: Linda Hall Library, St. Louis Public Library	(314) 241-2288
Nebraska	Lincoln: University of Nebraska-Lincoln, Love Library	(404) 472-3411
New Jersey	Newark Public Library	(210) 733-7740
New York	Albany: New York State Library	(518) 474-5125
	Buffalo and Erie County Public Library	(716) 856-7525 Ext. 267
	New York Public Library (The Research Libraries)	(212) 790-6291
North Carolina	Raleigh: D. H. Hill Library, N.C. State University	(919) 737-3280
Ohio	Cincinnati and Hamilton County Public Library	(513) 369-6969
	Cleveland Public Library	(216) 623-2932
	Columbus: Ohio State University Libraries	(614) 422-6286
	Toledo/Lucas County Public Library	(419) 242-7361 Ext. 258
Oklanoma	Stillwater: Oklahoma State University Library	(405) 624-6546
Pennsylvania	Philadelphia: Franklin Institute Library	(215) 488-1226
	Pittsburgh: Carnegie Library of Pittsburgh	(412) 622-3128
Rhode Island	Providence Public Library	(401) 521-7722 Ext. 224
Tennessee	Memphis and Shelby County Public Library	(901) 528-2965
Texas	Dallas Public Library	(214) 748-9071
	Houston: The Fondren Library, Rice University	(713) 527-8101 Ext. 2587
Washington	Seattle: Engineering Library University of Washington	(206) 543-0740
Wisconsin	Madison: Kurt F. Wendt Engineering Library, University of Wisconsin	(608) 262-6845
	Milwaukee Public Library	(414) 278-3043

Collection organized by subject matter

Figure 1. Patent Depository Libraries in the United States

1 R	MISCELLANEOUS
1 N	..Noise abatement
1 A	..Lightning arresters and static eliminators
1 TD	..Trailing devices
2	COMPOSITE AIRCRAFT
3	.Trains
3.1	MISSILE STABILIZATION OR TRAJECTORY CONTROL
3.11	.Remote control
3.12	..Trailing wire
3.13	..Beam rider
3.14	..Radio wave
3.15	.Automatic guidance
3.16	..Optical (includes infrared)
3.17	...Optical correlation
3.18	...Celestial navigation
3.19	..Radio wave
3.2	..Inertial
3.21	..Attitude control mechanisms
3.22	...Fluid reaction type
3.23	.Stabilized by rotation
3.24	.Externally mounted stabilizing appendage (e.g., fin)
3.25	..Removable
3.26	..Sliding
3.27	..Collapsible
3.28	...Longitudinally rotating
3.29	...Radially rotating
3.3	..Extending beyond rear of missile
158	SPACECRAFT
159	.Space station
160	.Reentry vehicle
161	..Rendezvous and docking
162	..Manned
163	...Environmental control
164	.Attitude control
165	..By gyroscope or flywheel
166	..By magnetic effect
167	..By gravity gradient
168	..By solar pressure
169	..By jet motor
170	..By nutation damper
171	..With attitude sensor means
172	.With propulsion
173	.With solar panel
4 R	AIRCRAFT, HEAVIER-THAN-AIR
4 A	..Body attached
5	.Airplanes, weight diminished by bouyant gas
6	.Airplane and helicopter sustained
7 R	..Convertible
7 A	....Rotary wing
7 B	....Tail sitters
7 C	....Tilting wing
8	.Airplane and auto-rotating wing sustained
9	.Airplane and paddle wheel sustained
10	.Airplane and cylindrical rotor sustained
11	.Airplane and beating wing sustained
12.1	.Airplane and fluid sustained
12.2	..Circular
12.3	..Dual propulsion
12.4	..Thrust tilting
12.5	..With thrust diverting
12.6	..Channel wing
13	.Airplane sustained
14	..Aerial torpedoes
15	..Fluid propelled
16	..Glider
17.11	.Helicopter or auto-rotating wing sustained i.e., gyroplanes
17.13	..Automatic or condition responsive control
17.15	..With safety lowering device
17.17	..With landing, mooring, or nonaerial propellant or steering gear
17.19	..With auxiliary propulsion, counter-torque or steering device
17.21	...Auxiliary rotor
17.23	..Having plural lifting rotors
17.25	..Lifting rotor having lift direction varying means
17.27	..Lifting rotor supports, e.g., pylons
19	.Paddle wheel sustained
20	..Feathering
21	.Cylindrical rotor sustained
22	.Beating wing sustained
23 R	.Fluid sustained
23A	...Lifting thrusters
23 B	...Dual propulsion means, horizontal and vertical
23 C	...Circular configuration
23 D	...Thrust diverters
24	AIRCRAFT, LIGHTER-THAN-AIR
25	.Airships with sustaining wings
26	.Airship and helicopter sustained
27	.Airship and paddle wheel sustained
28	.Airship and beating wing sustained
29	.Airship and fluid sustained
30	.Airships
31	.Balloons
32	..With parachutes
33	..Captive
34 R	AIRCRAFT SUSTENTATION
34 A	..Annular airfoils
35 R	.Sustaining airfoils
35 A	...Compressible flow
36	..Lifting fuselages
37	..Lifting struts
38	..Resiliently mounted
39	..Rotatable
198	..With lift modification
199	...By vortex generator or dissipator
200	...By characteristics of airfoil's skin
201	...Variable
202	....With landing gear
203	....Condition responsive
204	....By controlling boundary layer
205	.....With ionic or electrostatic surface
206	.....With rotating member
207	.....With blowing
208	......And suction
209	.....With suction
210	.....With nose slot
211	......Having trailing edge flap
212	.....Having trailing edge flap
213	....By flap and/or spoiler
214	.....At leading edge
215	.....At trailing edge
216	.....Variable gap type, e.g., "Fowler Flap"
217	.....Plural, relatively pivotable
218	....Area
219	....Camber
45 R	..Arrangement
45 A	....Canard
46	...Variable
47	....Dihedral
48	....Incidence
49	....Folding
50	AIRCRAFT PROPULSION AND STEERING ON LAND OR WATER
51	AIRCRAFT, STEERING PROPULSION
52	.Fluid
53 R	AIRCRAFT POWER PLANTS
53 A	..Starters
53 B	..Air intakes
54	.Mounting
55	.Arrangement
56	..Tilting
57	.Radiator arrangement
58	.Auxiliary
59	.High altitude
60	.Transmission of power
	AIRCRAFT POWER PLANTS
61	.Power plant using airship gas as fuel
62	AIRCRAFT PROPULSION
63	.Launching
64	.Manual
65	.Screw
66	..Tilting
67	..Body encircling
68	..Elongated
69	..Contra-propeller arrangements
70	.Paddle wheel

Figure 2. Class 244 - Aeronautics

71 .Reciprocating propeller
72 .Beating wing
73 R .Fluid
73 B ...Vacuum induced by radial flow
73 C ...Radial outward and downward flow
74 ..Explosive jet
75 R AIRCRAFT CONTROL
75 A ..Flutter prevention
76 R .Automatic
76 A ...Motor torque control of flaps or tabs
76 B ...Velocity operated devices
76 C ...Gust compensators
76 J ...Steerable jets
175 ..Electric course control
176 ...Spaceship control
177 ...Multiple-axis altitude stabilization
178 ....Trim control
179 ....By change in bank
180 ...By change in altitude
181 ....by change in pitch, angle of attack or flight path
182 ...By change in speed
183 ...Of aircraft on its landing course
184 ....By steering or yaw
185 .....And vertical glide path control
186 ....Vertical glide path control
187 .....With "flare-out" detection
188 .....Slope control by throttle
189 ...By remote radio signal
190 ...Of pilotless aircraft
191 ...Acceleration control
192 ...Wtih "dead-zone" control
193 ...With "softener" circuit
194 ...Monitoring circuit or response
195 ....Self-adaptive control
196 ...Override of automatic control by human pilot
197 ....By engaging manual control system
78 ..Fluid
79 ..Gyroscope actuated
80 .Gravity actuated
81 ..Operated by landing
82 ..Vane operated
83 R .Pilot operated
83 A ...Locking devices
83 B ...3-way steering, single control
83 C ...Plural surface by single control
83 D ...Feel
83 E ...Electrical pick up
83 F ...Controllers
83 G ...Control systems
83 H ....Variable
83 K ....Cable
83 J ....Linkage
84 ..Dual
85 ..Hydraulic
86 ..Rudder bars and pedals
87 .Rudders and empennage
88 ..Rudders universally mounted
89 ..Elevators both front and rear
90 R ..Ailerons and other roll control devices
90 A ...Roll control spoilers
90 B ....Balanced air pressure
91 .Vertical fins
92 .Stabilizing propellers
93 .Stabilizing weights
94 ..Ballast storage and release
95 ..Ballast making
96 .Airship control
97 ..Buoyancy varying
98 ..Gas bag inflation
99 ..Gas release
100 R LANDING GEAR
100 C ..Endless track
100 A ..Inflatable
101 .Amphibian
102 R .Retractable
102 A ...Interconnected elements
102 SL ...Strut locks
102 SS ...Strut shortening
103 R .Wheel
103 S ...Prerotation
103 W ...Crosswind gear
104 R ..Resiliently mounted
104 CS ....Coil spring
104 FP ....Fluid pressure
104 LS ....Leaf spring
105 .Water landing
106 ..Flying boat
107 ..Emergency
108 .Skids
109 .Tail supports
110 R RETARDING AND RESTRAINING DEVICES
110 A ..Brake
110 B ..Thrust reversers
110 C ..Cable or net support
110 D ..Aerodynamic braking
110 E ..Landing platforms
110 F ..Snares
110 G ..Arresting hoods
110 H ..Friction brakes
111 .Wheel brake arrangement
112 .Water brake arrangement
113 .Aerodynamic retarders
114 R LANDING FIELD ARRANGEMENT
114 B ..Blast deflectors
115 .Mooring devices
116 ..Movable
117 R AIRCRAFT STRUCTURE
117 A ..Skin cooling
118 R .Special passenger and cargo accommodations
118 P ...Passenger
119 .Fuselage and body construction
120 ..Sectional
121 ..Shields and other protective devices
122 R ..Seats and safety belts
122 A ....Ejection seats
122 AB .....Catapult and rocket combined
122 AC .....Catapult
122 AD .....Rocket
122 AE .....Automatic sequence
122 AF .....Canopy release
122 AG .....Restraint positioning and protective devices
122 AH .....Seat separation
122 B ....Safety belts
123 .Airfoil construction
124 ..Sectional
125 .Airship hull construction
126 .Airship skin construction
127 .Airship load attachment
128 .Airship gas cell construction and arrangements
129.1 .Details
129.2 ..Fire prevention devices
129.3 ..Windows
129.4 ..Closures
129.5 ...Door
129.6 ..Steps
130 ..Aerodynamic resistance reducing
131 ..Joints and connections
132 ..Skin fastening devices
133 ..Materials of construction
AIRCRAFT STRUCTURE
134 R .Ice prevention
134 A ...Flexible surfaces
134 B ...Heating fluid in airfoil
134 C ...Deicing fluid on airfoil exterior
134 D ...Electric
134 E ...Nature of surface
134 F ...Initiators and indicators
134 R .Fuel supply
135 A ...Aircraft refueling
135 B ...Flexible containers
135 C ...Fuel balancing systems
136 .Material discharging and diffusing
137 R .Passenger and cargo loading and discharging
137 P ...Passenger
138 R SAFETY LOWERING DEVICES
138 A ..Rotating vanes

Figure 2. Class 244 - Aeronautics (Continued)

139	.Entire aircraft
140	.Passenger compartment
141	..Seat
142	.Farachutes
143	..Garment attached
144	..Aircraft element convertible to parachute
145	..Canopy construction
146	..Inflated bracing
147	..Storage and release
148	...Packs
149	...Opening devices
150	...Timing mechanism
151 R	..Harness
151 A	....Parachute harness connection
151 B	....Parachute load releasing
152	..Control devices
153 R	KITES
153 A	..Rotating
154	.Airplane type
155 R	.Accessories
155 A	...Kite controls
	DIGESTS
DIG 1	Flex wing
DIG 2	Inflatable evacuation slides

Figure 2. Class 244 - Aeronautics (Continued)

(1) In your School of Library Science is there a specific course in Patent Literature?

Response: There was no Library of Science School who has a regular course in Patent Literature.

(2) If you said, yes, to the above question, how intensive in the span of time is the Patent Literature course?

Response: None

(3) As a Professor in Library Science, do you feel you have (or have not) made students in Library Science fully aware of the value of patents as an important phase of our technical/scientific literature?

Response: 4 Professors in Library Science surveyed said they had NOT.

(4) Can you offer ideas and suggestions to make the future librarians more knowledgeable in Patent Literature?

Response: (a) Librarians should definitely be trained to know patents.

(b) There should be a distinct cource on Patent Literature and a Workshop Seminar. No such workshop is planned in the immediate future.

(4 Schools Surveyed)

Figure 3. Survey of Selected Schools of Library Science in the United States Responding as a Source of Technical Information

SCHOOLS OF LIBRARY SCIENCE

University of Chicago
Graduate Library School
Chicago, IL

University of Maryland
College of Library & Information Sciences
College Park, MD

State University of New York at Albany
School of Library & Information Science
Albany, NY

University of Pittsburgh
School of Library & Information Science
Pittsburgh, PA

PUBLIC LIBRARIES

Brooklyn Public Library
Science & Industry Division
Brooklyn, NY

Buffalo & Erie County Public Library
Buffalo, NY

SPECIAL LIBRARIES

Associated Technical Services
Research Library
Glen Ridge, NJ

Brush Beryllium Co.
Technical Library
Cleveland, OH

Cutler-Hammer, Inc.
Airborne Instruments Laboratory
Research Library
Melville, NY

SPECIAL LIBRARIES (Continued)

E.I. du Pont de Nemours & Co.
Chemicals, Dyes and Pigments Department
Jackson Laboratory
Library
Wilmington, DE

FMC Corporation
Chemical Research & Development Center
Technical Information Services
Princeton, NJ

General Mills, Inc.
James Ford Bell Research Library
Minneapolis, MN

Gulf Research & Development Co.
Technical Information Services
Pittsburgh, PA

Hercules Incorporated Library
Wilmington, DE

Litton Industries, Inc.
Data Systems Division
Engineering Library
Van Nuys, CA

Martin Co.
Orlando Division
Technical Information Center
Orlando, FL

Sylvania Systems Group
GTE Products Corp.
Library
Mountain View, CA

Figure 4. Organizations Who Responded to the Survey Questionnaire on Library Interactions With Patent Literature

2 Public Libraries
11 Special Libraries

The Questionnaire read:

(1) My library is the central point in my organization to handle and order patents

Response: Yes - 2 Public Libraries
Yes - 4 Special Libraries
No - 7 Special Libraries

(2) When performing a literature search,patent literature is included in the final results

Response: Yes - 1 Public Library
No - 1 Public Library

Response: Yes - 9 Special Libraries
No - 2 Special Libraries

(3) Are you, or is any member of your library staff trained in patent searching?

Response: Yes - 2 Public Libraries

Response: Yes - 5 Special Libraries
No - 6 Special Libraries

(4) Do you believe, as a professional librarian, we have overlooked patents as a valuable information resource?

Response: Yes - 2 Public Libraries
Yes - 7 Special Libraries
No - 4 Special Libraries

(5) Any comments on the value and pertinency of patent literature as an integral part of a literature search would ge greatly appreciated:

FROM PUBLIC LIBRARIES

"A literature search would be of greater value if it included patent literature as well."

"The Brooklyn Public Library subscribes to The Official Gazette- for full patents we send patrons to the New York Public Library."

FROM SPECIAL LIBRARIES

"Look upon patents as just another piece of published technical information. Wasn't this settled years ago? Why another study? It seems we keep re-inventint the wheel."

"I am sure all major libraries in research oriented firms such as GE and Dupont include and pay close attention to patent literature, when performing technical literature searches. However, this is certainly not the case in many literature searches from other sources."

"One member of the library staff attended a half-day seminar on patent searching: Thus, we have a cursory understanding of the process and its inherent problems."

"I think it is just now becoming important as a source of information since the advent of the on-line systems and the numerous data bases. Our appreciation of this type of information will greatly increase in the next several years."

"My staff engages in a great deal of literature searching to provide evidence of patent infringement."

"In many, many cases, the patent literature is the most relevant."
"This is very important for commercial ideas."

"We have a patent attorney at our company, and his office takes care of all patent matters. We do searches for our patent attorney."

Figure 4A. Survey of Special Libraries and Public Libraries in the United States Responding on Patents as a Source of Technical Information

Aug. 2, 1960 H. T. HALL ET AL 2,947,610

METHOD OF MAKING DIAMONDS

Filed Jan. 6, 1958

Fig. 1.

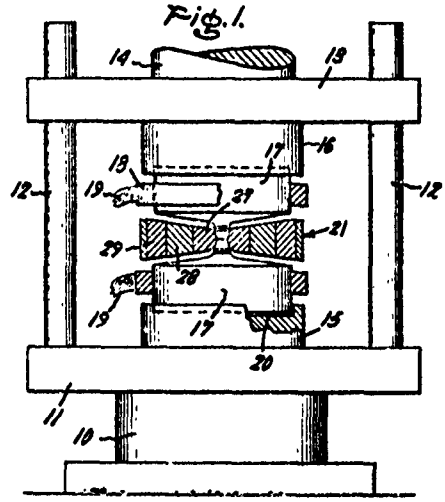
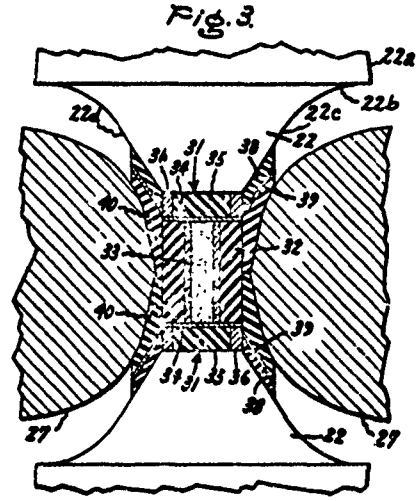


Fig. 3.



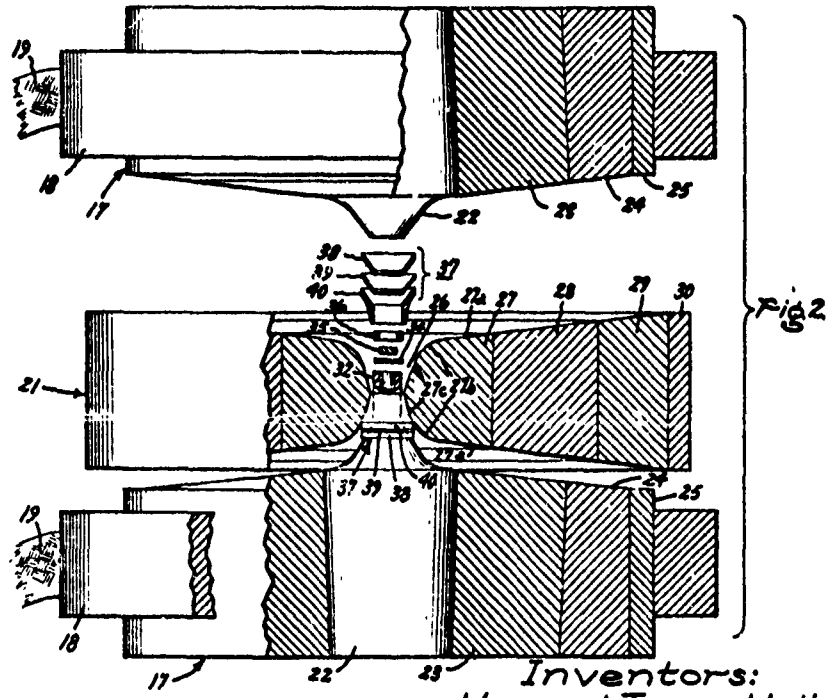


Fig 2.

Inventors:
Howard Tracy Hall,
Herbert M. Strong,
Robert H. Wentorf Jr.,
by Paul A. Frank
Their Attorney.

For the purpose of example the pages of Figure 5 have been reproduced from a document of the United States Patent Office, whose permission to reproduce is acknowledged.

Figure 5

United States Patent Office 2,947,610 Patented Aug. 2, 1960

2,947,610

METHOD OF MAKING DIAMONDS

Howard Tracy Hall, Provo, Utah, and Herbert M. Strong and Robert H. Wentorf, Jr., Schenectady, N.Y., assignors to General Electric Company, a corporation of New York

Filed Jan. 6, 1958, Ser. No. 707,435

18 Claims. (Cl. 23—209.1)

This application is a continuation-in-part of our copending application Serial No. 633,505, filed January 10, 1957, and now abandoned, which in turn is a continuation-in-part of our copending application Serial No. 488,-16, filed February 14, 1955, and now abandoned, both assigned to the same assignee as the present invention.

This invention relates to a method for converting non-diamond carbon into diamond carbon.

In the past, a great deal of effort has been expended in attempts to convert more abundant and less expensive forms of carbon into the diamond form. In connection with these efforts, a great deal of attention has been directed towards speculation as to the method by which diamond is formed in nature. However, no satisfactory explanation of the natural process by which diamond has been formed has ever been given and it is unlikely that the natural process of diamond formation will be understood in the near future.

The need for a readily available source of diamond has arisen because of its increasing usage and the very few known sources of diamond carbon in the world at present. Attempts to prepare diamonds from less expensive forms of carbon in the past, have generally taken the form of attempts to apply heat and pressure to amorphous carbon or graphite to cause a transformation from one allotropic form to another. Attempts have also been made to convert other forms of carbon to diamond by catalytic transformations using various metals and salts as the transformation catalyst. However, despite the great need for success in this field and the intense desires and wishes of the many workers, to date these attempts have been unsuccessful.

An object of this invention is to transform non-diamond carbon into diamond.

A further object of this invention is to convert non-diamond carbon into diamond under the action of extremes of heat and pressure

A still further object of the present invention is to provide a proved process for converting non-diamond carbon into diamond by the action of heat and pressure in the presence of a metallic catalyst or a material which will yield a metallic catalyst under the extreme pressures and temperatures employed.

We have discovered unexpectedly that the common types of carbon such as coal, coke, charcoal or graphite may be readily and rapidly converted into diamond by a unique process involving specific ranges of temperatures and pressures with a particular group of catalysts. More particularly, we have found that non-diamond carbon may be transformed into diamond by subjecting the carbon to a pressure of at least about 75,000 atmospheres, preferably from about 80,000 to 110,000 atmospheres, and specifically about 95,000 atmospheres while subjecting the compressed material to a temperature of from about 1200 to about 2000° C., and preferably about 1400 to 1800° C. This high temperature-high pressure reaction is conducted in the presence of a catalyst which is a member selected from the class consisting of iron, cobalt, nickel, rhodium, ruthenium, palladium, osmium, iridium, chromium, tantalum, manganese, and compounds of these metals which decompose to a metallic form at the elevated temperatures and pressures employed in this reaction. We have found that diamonds may be formed from non-diamond carbon in a period which varies from a few seconds up to several hours depending on the particular temperature, pressure and catalyst employed.

This invention may be best understood by reference to the following description taken in connection with the drawing in which:

Fig. 1 is a front elevational view, partly in section, of a hydraulic press with a high pressure-high temperature apparatus which may be employed in practicing this invention;

Fig. 2 is an enlarged, exploded sectional view of the high pressure-high temperature apparatus of Fig. 1; and

Fig. 3 is an enlarged, sectional view of a portion of the high pressure-high temperature apparatus of Figs. 1 and 2.

The diamonds formed by the process of the present invention have been examined chemically, physically, and by X-ray crystallographic methods and are indistinguishable from those diamonds which occur in nature.

The compounds of the metal catalysts listed above which decompose into pure metals under the temperatures and pressures employed in the present invention include, for example, the carbides, sulfides, carbonyls, cyanides, ferrotungstates, ferritungstates, oxides, nitrides, nitrates, hydrides, chlorides, molybdates, arsenates, acetates, oxalates, carbonates, chromates, phosphides, permanganates, sulfates, tungstates, etc. Specific examples of decomposable compounds usable as catalysts in the present invention include ferrous sulfide, iron carbonyls, palladium chloride, chromium carbide, tantalum hydride, nickel permanganate, cobalt acetate, etc. All of the specific compounds listed above decompose into a metal component at pressures of at least about 75,000 atmospheres and at temperatures of from about 1200 to about 2000° C. in the presence of carbon.

We have found that the proportions of the various ingredients employed in the practice of this invention are not critical so that the ratio of the non-diamond carbon to the catalyst material may be varied within an extremely wide range. We have discovered no limitation on this range. However, we prefer to have present more, by volume, of the carbon than of the catalyst material. The time required for effecting the transformation of the present invention varies somewhat with the particular system employed, but times as low as thirty seconds to three or four minutes have been satisfactory to cause the transformation with all of the systems employed. No disadvantage has been observed in exposing the reactants to the high pressure and high temperature for extended periods of time.

The process of the present invention may be carried out in any type of apparatus capable of producing the pressures required at the temperatures required. However, we prefer to employ apparatus of the type described in the applications of H. T. Hall, Serial No. 488,050, filed February 14, 1955, now abandoned, and Serial No. 707,432, filed concurrently herewith, now U.S. Patent No. 2,941,248, issued June 21, 1960, both assigned to the same assignee as the present invention. This apparatus defines a reaction zone of controllable dimensions in which controllable temperatures and pressures may be obtained and maintained for desired periods of time. The disclosure of these Hall applications is hereby incorporated by reference into the present application. The apparatus disclosed in the aforementioned Hall applications is a high pressure device for insertion between the platens of

Figure 5 continued

a hydraulic press. The high pressure device consists of an annular member defining a substantially cylindrical reaction area, and two conical piston-type members or punches designed to fit into the substantially cylindrical portion of the annular member from either side of said annular member. A reaction vessel which fits into the annular member may be compressed by the two piston members to reach the pressures required in the practice of the present invention. The temperature required is obtained by any suitable means, such as, for example, by induction heating, by passing an electrical current (either alternating or direct) through the reaction vessel, or by winding heating coils around the reaction vessel.

The drawing illustrates a specific apparatus which has been successfully employed for maintaining the sustained pressures and temperatures required for the practice of the present invention. In Fig. 1 of the drawing a hydraulic press capable of applying a force of 450 tons comprises a base 10 with a press bed 11 on which are mounted a plurality of vertical shafts 12 to support a movable carriage 13 with a hydraulic shaft 14. A pair of opposed recessed pistons 15 and 16 formed of hard steel on bed 11 and carriage 13 are recessed to partially position punch assemblies 17 therein, each of which punch assembly is provided with an electrical connection in the form of an annular copper conducting ring 18 with a connector 19 to supply electric current from a source of power (not shown) through assemblies 17 to the high temperature-high pressure reaction vessel which is described below. A layer of electrical insulation (laminated phenol formaldehyde impregnated paper) 20 is provided between lower punch assembly 17 and its associated piston 15 to prevent conduction of electrical current through the press. A lateral pressure resisting assembly or belt 21 is positioned between opposed assemblies 17 to provide a multistaging pressure effect.

In Fig. 2 is shown a partially exploded view, partly in section, of the punch assemblies 17 and the lateral pressure resisting assembly 21 of Fig. 1. To facilitate the practice of the present invention by persons skilled in the art, Fig. 2 is drawn to scale with each element of the drawing proportional to its actual size and shape in the specific apparatus successfully employed. In Fig. 2 the outside diameter of punch assemblies 17 is equal to 6 inches. Each punch assembly 17 comprises a punch 22 with surrounding binding rings 23 and 24 with a soft carbon steel safety ring 25 located around binding ring 24. Punch 22 is formed of Carboloy grade 44A cemented carbide which comprises 94 percent tungsten carbide and 6 percent cobalt. This material is more completely described in the publication "Properties of Carboloy Cemented Carbides," April 2, 1951, issued by Carboloy Department, General Electric Company, Detroit, Michigan. Binding rings 23 and 24 are formed of AISI 4142 alloy steel, commercially available, and comprising, by weight, 0.4 to 0.5 percent carbon, 0.71 to 1 percent manganese, 0.4 percent phosphorus, 0.4 percent sulfur, 0.2 to 0.35 percent silicon, 0.8 to 1.1 percent chromium, and 0.15 to 0.25 percent molybdenum. Binding ring 23 is hardened to 50 Rockwell C and binding ring 24 is hardened to a Rockwell C hardness of 40. It is seen from Fig. 2 that the members of punch assembly 17 are slightly tapered on their sides. This taper is employed so as to provide a force fit so that punch 22 is under high compression in the punch assembly. Assembly of these elements is accomplished by first forcing ring 24 into safety ring 25 in a suitable press and subsequently forcing ring 23 into binding ring 24. Finally punch 22 is forced into ring 23.

As is best shown in Fig. 3, which is a scale drawing with the faces 31 of punches 22 having a diameter of 0.350 inch, each punch 22 has a generally cylindrical portion 22A having a diameter of about 1.5 inches and a height of about 2.07 inches. Each punch 22*a* has a tapered portion having a vertical height of about 0.47 inch which comprises a first frustoconical portion 22*b* at an angle of about 7° from the horizontal, a curved portion 22*c*, and a second frustoconical portion 22*d* which has a slant length of about 0.25 inch and extends at an angle of about 30° from the vertical. Binding ring 23 has an outside diameter of about 3.9 inches, binding ring 24 has an outside diameter of about 5.5 inches, and, as previously mentioned, the outside diameter of soft, safety ring 25 is 6 inches. As best seen in Fig. 2 each punch assembly 17 is flat on one side and tapers gently on the opposite side. This taper is about 7° from horizontal.

As best shown in Figs. 1 and 2, lateral pressure resisting assembly 21, which is positioned between opposed punch assemblies 17, tapers inwardly toward the center to provide an aperture 26 in axial alignment with opposed punches 22. Assembly 21 comprises an inner annular ring 27 formed of the aforementioned Carboloy grade 44A cemented carbide and two concentric binding rings 28 ad 29 formed of AISI 4142 alloy steel. Rings 28 and 29 have Rockwell C hardnesses of 50 and 40, respectively. A soft carbon steel safety ring 30 surrounds outer binding ring 29. Rings 27, 28 and 29 are slightly tapered at their contact faces so as to provide the force fit arrangement previously described in connection with punch assembly 17. The individual rings of lateral pressure resisting assembly 21 are assembled in the same manner as were the various rings of punch assembly 17.

As is best shown in Fig. 2, inner annular ring 27 has an outside diameter of about 2.4 inches, a maximum height of about 1.2 inches, and a minimum inside diameter of about 0.4 inch. Ring 27, which is substantially symmetrical about a horizontal plane, comprises portions 27*a* which are tapered at an angle of about 7° from horizontal, curved portions 27*b*, and tapered portions 27*c*, which taper at an angle of about 11° from the vertical. Binding ring 28 has an outside diameter of about 4.8 inches, binding ring 29 has an outside diameter of about 6.4 inches, and safety ring 30 has an outside diameter of about 6.9 inches. Lateral pressure resisting assembly 21 tapers gently from the area of ring 30 to the area of ring 27 with the taper being equal to about 7° from the horizontal

As is best shown in Fig. 3, punches 22 and ring 27 of lateral pressure resisting assembly 21 define a controllable reaction zone in which material to be subjected to elevated pressures and temperatures is positioned. As previously mentioned, Fig. 3 is a scale drawing with the faces 31 of punches 22 having a diameter of 0.350 inch. All elements in Fig. 3 conform to this scale except elements 33, 34 and 39, whose thicknesses have been exaggerated. The specimen to be subjected to high pressure and high temperature is positioned in a hollow cylindrical reaction vessel 32, which in this specific illustration is formed of pyrophyllite. Reaction vessel 32 has a height of about 0.4 inch, an outside diameter of 0.35 inch, and an inside diameter of 0.125 inch. Pyrophyllite has been chosen as the material of construction for cylindrical reaction vessel 32 for the reasons, among others, that it is readily machinable to the desired shape and is inert to the reactants under the conditions of reaction employed in the practice of the present invention. The specimen to be subjected to elevated pressures and temperatures is then positioned within the central aperture in reaction vessel 32. In this specific illustration the specimen consists of a hollow spectroscopic graphite cylinder 33 having a height of 0.4 inch, a wall thickness of 0.0225 inch and an outside diameter of 0.125 inch. Into cylinder 33 is compacted a mixture of powdered graphite and one or more of the catalysts of the present invention. The reaction vessel 32 is closed or sealed at each end by conducting metal end disks 34 which have a thickness of 0.010 inch and a diameter of 0.350 inch. Positioned adjacent each disk 34 is a disk 35 of pyrophyllite having a diameter of about 0.250 inch and a thickness of about 0.10 inch. An annular conducting ring 36 of AISI 4142 alloy steel having a Rockwell C hardness of 50 surrounds

Figure 5 continued

...n of the disks 35. Ring 36 has an outside diameter of 0.350 inch and a thickness of 0.10 inch.

Inside of ring 27 of lateral pressure resisting assembly 21 and surrounding reaction vessel 32 and partially surrounding the tapered portion of each punch 22 are gasket assemblies 37, each of which comprises an inner conical pyrophyllite washer 38 having a thickness of 0.030 inch, a slant height of approximately 0.25 inch, and making an angle of 30° with the vertical. Washer 38 is surrounded by a soft carbon steel conical washer 39 having a thickness of approximately 0.010 inch and a slant height of about 0.25 inch and an angle of about 30° with respect to the vertical. Each of washers 40 has an inside diameter at its narrowest portion of 0.35 inch and an outside diameter at its narrowest portion of 0.40 inch. The 0.35 inch inner cylindrical surface of washer 40 has a height of about 0.2 inch. Washer 40 also has a tapered conical interior portion designed to cooperate with the outer surface of washer 39 and which has a taper with respect to the vertical of about 30°. The overall vertical height of washer 40 is approximately 0.43 inch and the outer surface of washer 40 is designed to conform to the shape of that portion of ring 27 with which washer 40 comes into contact.

In the operation of the high pressure-high temperature apparatus of the drawing to produce the pressures and temperatures required in the practice of the present invention, opposed recessed pistons 15 and 16 are attached respectively to pressed bed 11 and carriage 13 by any suitable means (not shown). Insulation layer 20 is then placed in the recess in piston 15 and lower punch assembly 17 is positioned in the recess in piston 15 on top of insulation layer 20. Upper punch assembly 17 is then fastened into the recess in upper recessed piston 16 by suitable means (not shown). Lower gasket assembly 37 is then positioned over lower punch 22, lower insulating disk 35 and conducting ring 36 are then positioned within lower gasket assembly 37 and conducting disk 34 is put in place. Lateral pressure resisting assembly 21 is then positioned around the parts previously assembled. Cylindrical reaction vessel 32, which contains graphite tube 33 and its contents is then added to the assembly. Subsequently, upper conducting disk 34, upper insulating disk 35 and upper conducting ring 36 are put into place. The final operation is the positioning and assembly of upper gasket assembly 37.

Reaction vessel 33 is subjected to the pressures required in the practice of the present invention by applying force to the high pressure-high temperature apparatus by means of shaft 14 of the press. The method of correlating the press load required to produce a given pressure within reaction vessel 33 is discussed below. After the desired pressure is reached the reaction vessel is brought to the desired temperature by electrical resistance heating of the contents of reaction vessel 33. Specifically, electrical current is supplied from one electrical connector, such as upper connector 19 to upper conducting ring 18, upper rings 25, 24, 23, upper punch 22, upper ring 36, upper disk 34, and to the graphite tube 33 and its contents. The electrical path from the bottom of tube 33 to lower connector 19 is similar to the conducting path described above. After the reaction vessel has been held at the desired pressure and temperature for the desired time, the electrical current to the reaction vessel is cut off and the pressure is released. Diamonds which have been formed are then removed from the reaction vessel.

The reaction vessel or cylinder 32, described above as being formed of pyrophyllite, may also be formed of any of the conventional metals of construction or of graphite. Where the reaction vessel is constructed of a metal it is convenient to employ one of the metals which acts as a catalyst in the process of the present invention. This vessel may be filled with non-diamond carbon and compressed so that the metal present in the vessel will serve as a catalyst for the transformation to diamond. Where the reaction chamber or vessel is formed of graphite, it may be filled with catalyst material and the compression of the graphite vessel with the catalyst at the pressures required by the present invention results in the transformation into diamond. Regardless of the material of construction of the reaction vessel the non-diamond carbon and the catalyst may be admixed inside the vessel. Thus, mixtures of powdered graphite and metal or metal compounds may be employed as the charge in the reaction vessel and compression of the vessel and charge at the required temperature effects the transformation to diamond.

In the preferred embodiment of our invention we employ a reaction vessel comprising a cylinder of pyrophyllite surrounding a cylinder of graphite having a hollowed-out cylindrical center portion, the axis of the center portion being coaxial with the axis of the reaction vessel. Into this graphite cylinder is placed a powdered mixture of graphite and the catalyst employed. This reaction vessel is sealed at its ends by metallic disks which may or may not act as a catalyst for the reaction depending on their composition. Plugs of non-diamond carbon or metal may be placed in the ends of the reaction vessel before sealing. This sealed reaction vessel is then placed in the apparatus described in the above-mentioned Hall application and subjected to the elevated temperature and the pressure required to effect the transformation to diamond. Alternatively, instead of employing a reaction vessel, a cylinder of carbonaceous material, such as graphite, may be sandwiched between two disks formed of a metal which may act as a catalyst for the transformation and the sandwich placed in the pressure apparatus and subjected to the conditions required to cause the transformation to diamond. As a further alternative a metallic reaction vessel may be sealed with carbonaceous material in powder or solid form and the catalyst for the reaction may be supplied by admixing it with the powdered carbon or by forming end disks to seal the reaction vessel and subjecting this assembly to high pressures and temperatures. A reaction "vessel" may be formed by compressing a mixture of non-diamond carbon and the catalyst material until a cylinder is formed which fits into the substantially cylindrical aperture described in the Hall apparatus. Again this latter apparatus may be employed in the usual manner at elevated temperatures and pressures to effect the transformation.

In preparing diamond by the method of the present invention it is difficult to measure the pressure and temperature to which the reactants are subjected by direct means because of the extreme pressure employed. Therefore, each of these conditions is measured by indirect means. In measuring the pressure, recognition is made of the fact that certain metals undergo distinct changes in electrical resistance at particular pressures. Thus, bismuth undergoes a phase change which results in a change in electrical resistance at 24,800 atmospheres, thallium undergoes such a phase change at 43,500 atmospheres, cesium undergoes such a change at 53,500 atmospheres, and barium undergoes such a change at 77,400 atmospheres. We have found that the melting point of germanium varies directly with pressure over an extremely wide pressure range, including pressures up to and above 110,000 atmospheres and it is known that the electrical conductivity (and resistance) of germanium undergoes a marked change in the transition of germanium from the liquid to the solid phase. Thus, by determining the hydraulic press load necessary to cause a phase change in a metal such as bismuth a point on a pressure-press load curve is determined. By filling a reaction vessel in the Hall apparatus with germanium and applying the same press load employed to obtain the phase change in bismuth, and by then heating the germanium to the temperature at which the germanium

Figure 5 continued

melts (as measured by a large decrease in electrical resistivity) a point on a pressure-melting point curve for germanium is determined. By carrying this same operation out with other metals such as thallium, cesium and barium, whose phase change points are known, a series of points on a melting point-pressure curve for germanium are obtained. We have found that this melting point-pressure curve is a straight line. Therefore, by applying other press loads with the hydraulic press apparatus while the reaction chamber is filled with germanium and determining the melting point of the germanium at the different press loads, the actual pressure in the chamber at a given press load is determined. The phase changes recited for the above metals were the standards for determining the pressures employed in the practice of our invention and are the basis for the pressures recited in the appended claims.

The temperature in the reaction vessel is determined by fairly conventional means such as by placing a thermocouple junction in the reaction vessel and measuring the temperature of the junction in the usual manner. We have found that one suitable method of positioning a thermocouple in the apparatus for the measurement of temperature is to run a pair of thermocouple wires between outer pyrophyllite gasket 40 and lateral pressure resisting assembly 21. These wires then pass through the joint between upper and lower gasket assemblies 37 and through holes drilled in reaction vessel 32 with the thermocouple junction being positioned inside of the reaction vessel. When a graphite cylinder 33 is employed, the thermocouple also passes through a hole drilled through this cylinder. The material to be subjected to the elevated pressure and temperature is then compacted into the cylindrical aperture defined by reaction vessel 33 and the apparatus is assembled and subjected to a high pressure, such as a pressure of 2,000 to 100,000 atmospheres. Electrical energy at a predetermined rate is then supplied the apparatus and the temperature produced by this power is measured by the thermocouple assembly. This same procedure is repeated a number of times with different power inputs to produce a calibration curve of power input versus temperature in the reaction vessel. After calibration of the apparatus by this method, the temperature of the contents of the reaction vessel is determined by the power input to the apparatus in conjunction with the calibration curve. In general, to produce a temperature of about 1600° C. in the apparatus specifically illustrated, an alternating current voltage of from about 1 to 3 volts at a current up to about 800 amperes is used to deliver the required 700 to 800 watts through the contents of reaction vessel 32.

The temperature of the reaction chamber may also be determined by measuring the resistance of heating coils, such as platinum heating coils, wound around the reaction chamber. The temperature of platinum is determined from its well known temperature coefficient of resistance. Thus, the temperature within the reaction vessel is determined by relatively simple means during the course of the reaction and the pressure within the vessel is read from a plot of the relationship between the force applied by the platens of the press to the pressure within the reaction vessel.

The temperatures measured by the methods above and referred to throughout this application are the temperatures in the hottest portion of the reaction vessel. It should be understood, however, that the temperature may vary over a range of 100 to 200° C. between spaced points in the reaction vessel.

The following examples are illustrative of the practice of our invention and are not intended for purposes of limitation.

In Examples 1 to 15, which follow, the specific apparatus illustrated in the drawing and alternating current heating were employed. In all cases the graphite cylinder or tube 33 was packed fully with either spectroscopic or reactor grade graphite with or without a catalyst. In all of the examples the parts of the ingredients which make up the charge are given in terms of parts by volume. The apparatus employed in Examples 16 to 22 differed from the apparatus illustrated in the drawing by the elimination of graphite cylinder or tube 33.

In all of the examples the diamonds formed were examined by at least one of the following methods to make sure that the product formed was actually diamond: X-ray crystallography, refractive index, density, chemical analysis, infra-red analysis, and hardness tests. The diamonds were removed from the matrix in which they formed by dissolving the matrix in fuming red nitric acid.

EXAMPLE 1

A cylindrical graphite tube 33 having an annular cross-section was filled with five parts powdered graphite, one part powdered iron, one-third part manganese, and one-third part vanadium pentoxide. This cylindrical tube was sealed with a graphite end plug at the top and a tantalum disk 34 at each end. This tube was placed in the apparatus described and heated under a pressure of about 95,000 atmospheres at a temperature of about 1700° C. for about two minutes and then cooled to about 1500° C. in eight additional minutes. This resulted in a plurality of diamonds having a great variety of octahedral faces and corners. These diamonds were separated from the matrix in which they were formed by solution of the matrix in fuming red nitric acid. X-ray diffraction patterns obtained from diamonds prepared in this experiment by taking a Debye-Scherrer photograph in a cylindrical camera of 5 cm. radius with a CuK_α radiation showed overwhelmingly that diamonds had been formed. The interplanar spacings (d in Angstrom units) measured from these photographs are compared with the theoretical values for diamonds in the table below

Interplanar spacing (d in Angstrom units)

Plane	Measured	Natural Diamond
(111)	2.05	2.060
(220)	1.26	1.262
(311)	1.07	1.076
(400)	0.89	0.8920
(331)	0.82	0.8185

The refractive indices of a number of diamonds formed in this example were measured in white light and found to be in the range of 2.40 to 2.50. The refractive index of natural diamond chips, examined simultaneously, also lay in the range of 2.40 to 2.50. Several samples of diamonds prepared in this example were analyzed for carbon by micro-combustion. The results were 86 percent carbon and 81 percent carbon in two runs. Iron, aluminum, silicon, manganese, and vanadium were present in both residues and one residue also contained a trace of tantalum. This compares with natural diamonds which are carbon crystals of varying purity and may contain up to 20 percent ash consisting mainly of oxides of silicon, iron, calcium, magnesium, aluminum, and titanium. The diamonds prepared in this example were found to scratch polished boron carbide plate.

EXAMPLE 2

A graphite tube as described above was loaded with a mixture of one part, by volume, of nickel powder and three parts, by volume, of graphite powder. The ends of the tube were sealed with tantalum disks and the tube was exposed to a pressure of 95,000 atmospheres at a temperature of about 1700° C. for six minutes. Examination of the reaction mixture showed many small diamonds.

EXAMPLE 3

The procedure of Example 2 was repeated with the exception that manganese powder was substituted for the

Figure 5 continued

nickel powder. This also resulted in many diamonds in the reaction mixture. This procedure was also followed to produce diamonds in a graphite tube filled with four parts of graphite powder and one part of palladium chips.

EXAMPLE 4

Following the general procedure of Example 2, a graphite tube was charged with two parts of graphite powder and one part of cobalt powder with tantalum end disks. Diamonds were formed after the reaction chamber had been heated at 1700° C. under a pressure of 95,000 atmospheres for two minutes and then cooled under the same pressure to 1400° C. in twelve additional minutes.

EXAMPLE 5

A graphite cylinder had its central third filled with sodium metal and the end thirds with graphite powder. This cylinder was sealed with tantalum end disks and subjected to a pressure of 95,000 atmospheres at a temperature of from 1500 to 2000° C. for a period of from about five to ten minutes. This resulted in a plurality of relatively small diamonds. Following this same procedure diamonds were formed using chromium in place of the sodium.

EXAMPLE 6

Diamonds were formed by filling a graphite tube with graphite powder and sealing the ends with tantalum disks. This sealed tube was then subjected to the same pressure and temperature conditions for the same time as was done in Example 5, yielding several diamonds.

EXAMPLE 7

Diamonds were formed from graphite and iron by filling a cylindrical graphite tube with a mixture of 98 parts of powdered graphite and two parts of powdered iron. This tube was sealed with tantalum end disks and was subjected to a pressure of about 95,000 atmospheres at 1800° C. for about two minutes, then cooled in eleven minutes more to 1400° C

EXAMPLE 8

The procedure of Example 6 was followed except that the charge to the graphite tube consisted of a mixture of three parts powdered graphite and one part powdered vanadium pentoxide. After exposing this tube vessel to the conditions of Example 6 a plurality of diamonds had formed.

EXAMPLE 9

Diamonds were formed under the physical conditions described in Example 5 by filling a cylindrical graphite tube with a mixture of four parts of potassium pyrosilicate monohydrate, four parts of an equimolar mixture of iron and ferric oxalate dihydrate, and one part of carbon black. One end of this tube was closed with a graphite plug and both ends were sealed with tantalum disks.

EXAMPLE 10

Diamonds were formed under the conditions of pressure, temperature and time described in Example 6 employing a cylindrical graphite tube filled with fifteen parts of powdered graphite, three parts of powdered iron, one part powdered manganese, and one part of powdered vanadium pentoxide with the ends of the tube sealed with tantalum disks.

EXAMPLE 11

Diamonds were formed by subjecting a cylindrical graphite tube to a pressure of 95,000 atmospheres at a temperature of about 1900° C. for three minutes and then at a temperature which decreased down to about 1400° C. in eleven additional minutes. This graphite tube was filled with a mixture of five parts graphite powder, two parts iron powder, and one part manganese powder with the ends of the tube closed with tungsten disks. Diamonds were also formed when this experiment was repeated except that titanium end disks were used instead of tungsten and a small piece of pyrophyllite (wonderstone) was placed in the tube near the top end.

EXAMPLE 12

A cylindrical graphite tube was filled with a mixture of 92 parts graphite powder, five parts iron powder, and three parts of manganese powder. After sealing with tantalum end disks, the tube was subjected to a pressure of 95,000 atmospheres during which time it was maintained at 1700° C. for two minutes and then cooled to 1200° C. in about twenty minutes.

EXAMPLE 13

Following the procedure of Example 2, diamonds were formed by filling a cylindrical graphite tube with a mixture of two parts iron powder, one part manganese powder, and two parts of fine copper powder (containing cuprous oxide) and eighteen parts graphite. This tube was maintained at a pressure of 95,000 atmospheres while heated at 1700° C. for two minutes and cooled to 1400° C. in twenty-one additional minutes.

EXAMPLE 14

Diamonds were formed in a cylindrical graphite tube filled with ferrous sulfide and sealed with tantalum disks. This tube was subjected to a pressure of 95,000 atmospheres at 1620° C. for two minutes and then allowed to cool over a ten minute period under pressure.

EXAMPLE 15

Diamonds were formed in a graphite tube which contained an iron rod surrounded by powdered graphite and which was sealed with platinum end disks. This tube was subjected to 95,000 atmospheres at a temperature of 1450° C. for four minutes and then allowed to cool under pressure for ten minutes.

EXAMPLE 16

This example illustrates the conversion of graphite to diamond employing nickel as a catalyst. In this example, diamonds were formed employing a number of different pressures and a number of different temperatures. The sample comprised a nickel wire surrounded by a graphite sleeve with this sleeve being inserted into the opening in a hollow pyrophyllite cylinder. Nickel end disks were placed at each end of the assembly with the nickel disks in contact with the nickel wire. The reaction vessel assembly thus formed was heated by passing an electric current through the nickel end disks and the central nickel wire. In each run, this assembly was brought to the desired pressure and then brought to reaction temperature in two or three seconds, held at the reaction temperature for about three minutes and then cooled in about three additional seconds. The table below lists the pressure employed and the temperatures employed in forming diamonds.

Approximate Pressure, Atm.	Approximate Temperature, °C.
105,000	1,780
100,000	1,650
81,000–83,000	1,700
76,000	1,650

EXAMPLE 17

Manganese was employed as the catalyst in converting graphite to diamond in a reaction vessel comprising a hollow cylinder of pyrophyllite. Into the central portion of this cylinder was placed a carbon rod with the remainder of the cylindrical opening being sealed with manganese rods. Tantalum end disks were then placed around this assembly. When this assembly was heated at a temperature of about 1600° C. and a pressure of

Figure 5 continued

about 95,000 atmospheres for three minutes, graphite was converted to diamond in the area of the interface between the graphite and the manganese.

EXAMPLE 18

Following the procedure of Example 17, palladium was employed in place of manganese as the diamond-forming catalyst. When this assembly was subjected to about 105,000 atmospheres at a temperature of about 1800° C. for about three minutes, diamonds were formed at the interface between the carbon and the palladium.

EXAMPLE 19

The procedure of Example 18 was repeated except that ruthenium was substituted for the palladium and molybdenum end disks were substituted for the tantalum end disks. Again diamond formed at the interface between the carbon and the ruthenium.

EXAMPLE 20

The procedure of Example 17 was repeated employing cobalt in place of the manganese and employing a temperature of about 1800° C. rather than about 1600° C. This resulted in the formation of diamond at the interface between the graphite and the cobalt.

EXAMPLE 21

The procedure of Example 17 was repeated employing rhodium in place of the manganese at about 100,000 atmospheres and about 1900° C., yielding a number of diamonds at the interface between the rhodium and the graphite.

EXAMPLE 22

The procedure of Example 20 was repeated except that chromium was substituted for the cobalt. This resulted in a plurality of diamonds at the interface between the chromium and the graphite.

While the foregoing examples disclose the use of separate source materials for the non-diamond carbon and for the catalyst employed in the present invention, it should be understood that naturally occurring materials which contain both non-diamond carbon and at least one of the catalysts described above may be transformed to diamond under the conditions described. Examples of such naturally occurring materials include certain anthracite and bituminous coals having a high mineral content, graphitic carbon having a high mineral content, etc.

Since diamonds prepared by the method of this invention are indistinguishable from natural diamonds, they have the same utility as natural diamonds, e.g., as gems for use in jewelry and other ornamental articles, as the cutting edge of a glass cutter, as the abrasive ingredient in abrasion wheel formulations, etc.

The use of alloys for converting carbonaceous materials to diamond at elevated temperatures and pressures is more particularly disclosed and claimed in the copending application of Herbert M. Strong, Serial No. 707,433, filed January 6, 1958, and assigned to the same assignee as the present invention.

What we claim as new and desire to secure by Letters Patent of the United States is:

1. The method of synthetically making diamonds which comprises (1) combining a carbonaceous material with a catalyst material selected from the class consisting of iron, cobalt, nickel, rhodium, ruthenium, palladium, osmium, iridium, chromium, tantalum, and manganese, (2) subjecting the aforesaid carbonaceous material and catalyst material in the diamond forming region to a pressure of at least about 75,000 atmospheres at a temperature of from about 1200° to about 2000° C., and (3) recovering the diamond formed.

2. The method of claim 1 in which the pressure is from about 80,000 atmospheres to 110,000 atmospheres.

3. The method of claim 1 in which the pressure is about 95,000 atmospheres.

4. The method of claim 1 in which the catalyst is iron.

5. The method of claim 1 in which the catalyst is nickel.

6. The method of claim 1 in which the catalyst is cobalt.

7. The method of claim 1 in which the catalyst is manganese.

8. The method of claim 1 in which the carbon is employed in its amorphous form.

9. The method of claim 1 in which the carbon is used in its graphitic form.

10. The method of synthetically making diamonds which comprises (1) combining graphite with iron as a catalyst, (2) subjecting the said graphite and iron in the diamond forming region to a pressure of at least about 95,000 atmospheres at a temperature of from about 1200° to about 2000° C., and (3) recovering the diamond formed.

11. The method of synthetically making diamonds which comprises (1) combining graphite with tantalum as a catalyst, (2) subjecting the said graphite and tantalum in the diamond forming region to a pressure of at least about 95,000 atmospheres at a temperature from about 1200° to about 2000° C., (3) isolating the diamond formed.

12. The method of synthetically making diamonds which comprises (1) combining graphite with cobalt as a catalyst, (2) subjecting the graphite and cobalt in the diamond forming region to a pressure of at least about 95,000 atmospheres at a temperature of from about 1200° to about 2000° C., and (3) recovering the diamond formed.

13. The method of synthetically making diamonds which comprises (1) combining graphite with nickel as a catalyst, (2) subjecting the said graphite and nickel in the diamond forming region to a pressure of at least about 95,000 atmospheres at a temperature of from about 1200° to about 2000° C., and (3) thereafter recovering the diamond formed.

14. The method of synthetically making diamonds which comprises (1) combining graphite with manganese as a catalyst, (2) subjecting the graphite and manganese in the diamond forming region to a pressure of at least about 95,000 atmospheres at a temperature of from about 1200° to about 2000° C., and (3) recovering the diamond formed.

15. The method of making diamonds which comprises (1) defining a reaction zone, (2) positioning in said reaction zone a mixture of non-diamond carbon and a metal selected from the class consisting of iron, cobalt, nickel, rhodium, ruthenium, palladium, osmium, iridium, chromium, tantalum, and manganese, (3) subjecting said mixture to a pressure of at least about 75,000 atmospheres at a temperature of from about 1200 to 2000° C. until said non-diamond carbon is converted to diamond, and (4) removing said mixture from said reaction zone and (5) recovering the diamonds formed from said mixture.

16. The method of making diamonds which comprises positioning in a graphite tube a mixture of non-diamond carbon and a metal selected from the class consisting of iron, cobalt, nickel, rhodium, ruthenium, palladium, osmium, iridium, chromium, tantalum, and manganese, subjecting said tube and its contents to a pressure of at least about 75,000 atmospheres at a temperature of from about 1200 to 2000° C. until said non-diamond carbon is converted to diamond, and removing said formed diamonds from the matrix in which the diamonds were formed.

17. The method of making diamonds which comprises confining in an inert container a mixture of non-diamond carbon and a metal selected from the class consisting of iron, cobalt, nickel, rhodium, ruthenium, palladium, osmium, iridium, chromium, tantalum, and manganese, subjecting said mixture to a pressure of at least about 75,000 atmospheres at a temperature of from about 1200

Figure 5 continued

to 2000° C. until said non-diamond carbon is converted to diamond and recovering said formed diamonds from said inert container and from the matrix in which said diamonds are formed.

18. The method as in claim 1 in which the catalyst material is employed with the carbonaceous material in the form of a compound of said metal in which the metal is present as an ion therein whereby the compound is decomposable to the metal state under the conditions of reaction recited in section (2) of claim 1.

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Figure 5 concluded

TECHNOLOGY ASSESSMENT - A TOOL FOR EXPLOITING PATENTS

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SUMMARY

Patent document collections, chronologically arranged and technically categorized, represent unique records of technological change. Continuously generated and catalogued, patent literature can be drawn upon as valuable input to technology assessment processes, both from a current and an historical perspective. Comprehensive patent information packages can be developed and tailored to benefit corporate strategists, policy analysts, educators, entrepreneurs, future innovators and the like.

For example, a retrospective examination of invention disclosures catalogued through the years in categories of the U.S. Patent Classification system demonstrates the potential value of a substantive record of step-by-step, technical development in assessing and understanding the state-of-the-art of an industry. What really is "new"? What are the trends in such Aerospace technologies as sustentation, VTOL vehicles, spacecraft?

At the U.S. Patent and Trademark Office, the recently established Technology Assessment and Forecast Program has helped, through computerized manipulation of patent bibliographic and classification data, to expand and facilitate the use of patent information in this way. Their special reports may graphically tabulate, for instance, the quantity of spacecraft inventions patented. They can profile the patent-active corporations and government organizations in the field, and identify national origin of the technology. Patenting by selected corporations may be reviewed to explore the depth and range of their technological activity.

Given the rapidly developing pace of information processing and analysis techniques, and the steady flow of new information generated from patents, the possibilities for exploiting patent information appear virtually limitless.

# # #

I. Introduction -- Intent of this Paper

At the outset, it must be recognized that the purpose of this paper is not to convey the latest technological information in aerospace research and development. Indeed, an attempt by this author to present such a paper to this collection of aerospace experts would be presumptuous, at best. Rather, the intent here is to introduce, discuss, and demonstrate a developing research tool which is broadly applicable in technology assessment processes for virtually any technical field. However, given the obvious technical commonality represented by the Advisory Group for Aerospace Research and Development (AGARD), this discussion is best framed in an aerospace industry context to facilitate and maximize understanding of the applicability and potential usefulness of this tool.

Utilizing aerospace technology information in this context may serve an additional purpose, as well. Since the product examples relied upon in this paper for demonstration purposes are themselves drawn from an in-depth analysis of patenting activity in aerospace-related technologies, generally by the aerospace industry, it is likely that this paper will find direct application in the work of AGARD participants.

# # #

II. The Growing Need to Monitor the Flow of New Technology

As much as, and perhaps more than, any other field of innovative endeavor, "Aerospace" reflects the supersonic pace of technological change. Even before people the likes of Samuel Pierpont Langley began to apply the equations of Daniel Bernoulli to give "lift" to the wings of man, the names of aviation's pioneers were legion -- each a benchmark along a timeline that stretches around the world.

Based upon their own technology assessments, of sorts, reviewing the results of struggles past, innovators such as Montgolfier, Lilienthal, the brothers Wright, Curtiss, Sikorsky, Bleriot, de Havilland, Godard, Whittle, and scores of others built upon previous successes and failures and applied themselves to further advance the state-of-the-art. Thus, within the history of aerospace technology is demonstrated the value of the information transfer process. The act of innovation is based upon modifying existing technology or applying the new knowledge which flows from research and development. Efficiency in R&D depends on the use of the most relevant information. All ideas come from information -- all discoveries or new developments begin with it.

Now, the pace of "change" in this, and indeed most, technological fields is rapidly accelerating; so much so that the "Wrights" of today can no longer build upon, or even know about, the work of the would-be "Lilienthals". This is an age of "info-systems"--a time when the increasing flow of technical information so vital to any innovative effort or corporate and government R&D decision requires enhanced monitoring and reporting techniques. The quest, then, is to determine the availability of information believed to be particularly representative of technological "change" and to discern which of these data can be monitored and measured.

# # #

III. The Patent File, A Record of Change

Throughout the world, national patent systems have been developed specifically to promote production of new technology, encouraging invention by a system of reward. For example. in the U.S. and other countries, the act of disclosing a new discovery is rewarded with a measure of protection embodied in a patent -- a government grant recognizing for a set time period the inventor's exclusive rights to the invention. Thus, patents are frequent products of R&D and invention.

The occasion of each "patent grant" represents a recorded technological event -- an event particularly appropriate for monitoring -- an event involving a technical development which is, by definition in most national legal systems, "new". Patent documents, therefore, identify principal agents of technological change and graphically describe the nature of the new developments. Wide utilization of national patent systems results in a virtual stream of patent grants -- in effect, a measurable flow of technology.

Collected and chronologically sequenced in appropriate technical categories, unique assemblages of documents are formed. These collections are known as "patent files", or "search files", each a dynamic and comprehensive record of technological change. Reflected in such a file are both current and historic perspectives of innovation, revealing the "who", "what", "when", and "where" of developments in almost every technical field.

The focus of this paper is on the United States Patent File, one of the most comprehensive collections of technical information in the world. In the U.S., there is a burgeoning interest in accessing the information, both technical and bibliographic, recorded in the patenting process. Besides looking closely at specific technical developments with significant potential impact, there is occurring a "stepping back" to view patenting in the aggregate. Analysts have begun to study the inventing process as a whole and to assess trends, domestic and foreign, which perhaps reflect innovative spirit, industrial strength, and economic health.

The computer age has given new capabilities to those who recognize and would tap the wealth of useful information to be gleaned from this vast assemblage called the patent file. Combined with automated data processing, imaginative thinking has resulted in improved techniques and products to make this information available to researchers, innovators, corporate strategists, and policy makers everywhere.

# # #

IV. Patent Information -- An Important Element in Technology Assessment

Nearly two centuries of activity in the U.S. patent system have resulted in an enormous collection of invention disclosures. Long ago, the massive flow of information continually generated in the patenting process called for the design and maintenance of an extensively categorized search file where disclosures could be stored for retrieval, chronologically and by technology.

The U.S. Patent Classification (USPC) System identifies more than 350 major categories or classes of technology, subdivided into approximately 100,000 subcategories or subclasses, where copies of the patent documents (U.S. patents and patent copies from other nations) and other technical literature are placed and cross-referenced. In all, the U.S. patent file has grown to include a total of more than 24 million technical documents reflecting nearly every significant technological development in the past 200 years.

Importantly, this collection continues to grow. Each week, nearly 5000 U.S. patent documents (including cross-reference copies) enter the categorized file. Thus, the expansion of these categories of invention occurs with a natural flow of time-series data, virtually welcoming monitoring and analysis.

While the U.S. Patent and Trademark Office (PTO) long recognized that this dynamic file held great potential for use in forms of technology assessment, monitoring, and analysis, it was not until fairly recently that developments in official record keeping through automated data processing made such uses feasible. To maximize the utilization of the U.S. patent file for the greatest public benefit, the PTO, in 1971, established its Technology Assessment and Forecast Program, the essence of which has been the construction of a computer data base to monitor and measure, systematically, the flow of patent documents into the U.S. patent file. The information generated by this system has proven useful to researchers and policy analysts both inside and outside the traditional patent community.

The Office of Technology Assessment and Forecast (OTAF), among its many diverse duties in administering this program, prepares and publishes periodic, general distribution reports. These reports profile U.S. patenting activity from a number of perspectives. They identify highly active and fast-growing technical fields, review and report apparent trends in patent procurement (by selected corporations, by state or national origin, or by independent or non-corporate inventors) and examine, in-depth, the expansion of patent-generated knowledge in such selected technologies as solar energy and synthetic fuels.

Another function of OTAF -- one which should be of particular interest in this forum -- is the generation of reports, specially tailored to specific requests. These reports, prepared and delivered on a cost-reimbursable basis, may take a variety of forms. The majority, however, utilize OTAF's standard format computer programs designed to provide a wide range of information about, for example, the U.S. patenting in a particular technology or by a given company. Reports of this type, profiling bibliographic data in tabular form, may (when resources permit) be expanded to include in-depth substantive reviews, as well. These OTAF products embody, in effect, a form of "technology assessment" from a patent activity perspective.

Usually focusing only upon the patent literature, an OTAF "assessment" effort is limited in comparison to full-blown technology assessment projects of a traditional nature, which might include socio-economic analyses and environmental impact projections. However, OTAF's systematic compilation of patent data, combined with the near "text-book" substantive content of the patent documents themselves, is often sufficient to paint a clear picture of the past and present state of almost any technical subject, as well as give some indication of where that technology is headed.

Of course, reliance upon patent "output" alone as wholly indicative of the character of a particular technology or industry would be imprudent, given a number of factors which should be recognized. First and most obvious of these is the variance between patents in importance and degree of invention. Another significantly influential factor, especially for such a sensitive technology as Aerospace, is the necessity for national security -- occasionally a reason for the non-grant of patents.

Then, too, there is the question of the inventor's "propensity to patent" which may depend almost entirely upon economic conditions. In this context, it is widely felt that Government's role in R&D, especially in a field such as Aerospace, frequently influences corporate attitudes concerning patenting -- perhaps discouraging the investment of time and expense in patenting by effectively negating any prospective proprietary advantage. Another factor for consideration is the development of intellectual property "protection" forms which are, in effect, alternatives to the patent process. Trade secrets, black-box techniques, and market leadtime are among the alternatives sometimes selected.

So, in "assessing" a technology from a patent activity standpoint, it is important to understand that conclusions drawn solely from an analysis of patent statistics may be affected by the noted factors. However, the good news is that the influence of all such factors is greatly diminished at higher levels of data aggregation. Patent data literally flow in abundance. Through the work of OTAF and others in the field, these data are becoming more available, detailed, and useable every year.

As an illustration of the type and range of information generated in the patenting process and the value of the patent file as a research tool, this paper presents a cursory review and analysis of activity in sectors of aerospace technology as defined in selected categories of the USPC, as well as a profile of recent patenting by a selected aerospace corporation. Since the quantity of aerospace related data available in this file is very large, only a segment is presented as a tutorial outline.

Prior to presentation of the aerospace patent review, however, a brief overview of current U.S. patent activity trends across all technologies and in all industrial sectors is offered as a comparison base.

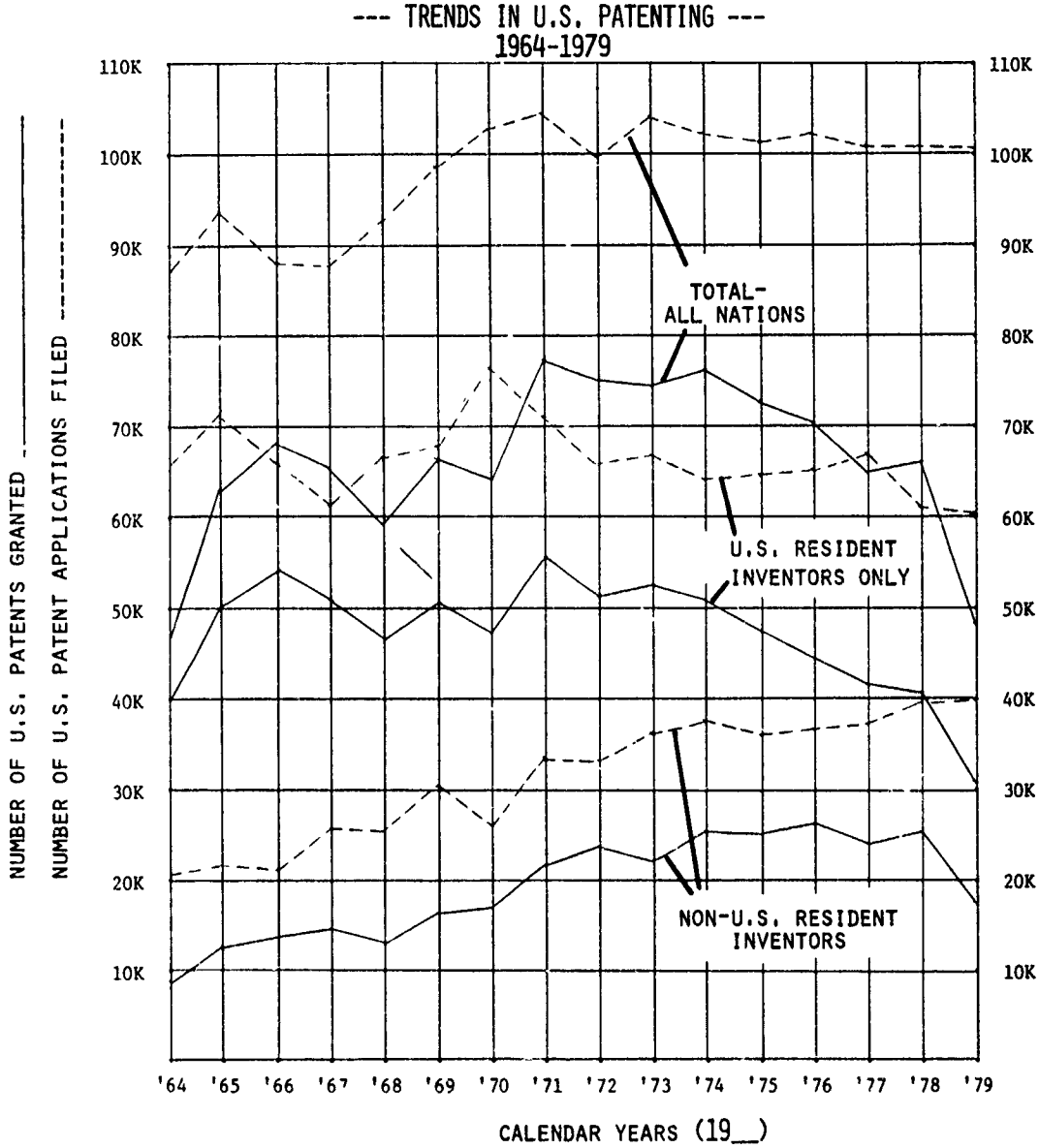
# # #

V. Trends in U.S. Patented Technology -- An Overview

In recent years, application filings covering virtually every imaginable area of technology have averaged more than 100,000 annually, approximately two-thirds of which

eventually result in patent grants. Profiling those patent grants, it can be seen that these patented inventions are not limited to United States-origin technology.

Indeed, since 1970, residents of more than one-hundred nations (from Algeria to Zambia) have been granted nearly a quarter million U.S. patents. World-wide interest in the U.S. system grows. In 1979, 37.4% of the U.S. patents granted were to non-U.S. residents -- although almost 9% of these were owned by U.S.-based corporations. So, the scope of U.S. patenting is neither technically limited nor regionally confined. The generated flow of information may be uniquely characterized as "transnational-multitechnic."



As indicated earlier, the technological knowledge represented by the dynamic collection of patents continually expands as more and more patents are granted, categorized, and cross-referenced into the 100,000 subclasses of the file. OTAF figures show that average growth of all of these technological subclasses for the most recent 3-year period, as compared to measured expansion in the last decade, was 28%.

Most technology, as represented in granted patents, is corporate-owned. The average corporate ownership in recent years has been around 80% at time of grant. As technology has become more complex and capital intensive, the age of the low-overhead, independent inventor has long passed. Of course, the U.S. Government, with its large investments in R&D, also holds title to a percentage of the patents granted -- around 3%, last year.

It should be noted that while the number of patent applications remained at a fairly constant level, the quantity of patents actually granted in the U.S. system was reduced significantly, last year, due to PTO budgetary limitations. Thus, fluctuations in the number of patents produced in any technical category may often depend more upon official work-processing than on the invention rate, itself. For this reason, OTAF generally encourages reliance, for trend analysis purposes, upon patent grants distributed by date

of application rather than by grant date. The date of patent application is considered more reliably time-related to the actual event of technological discovery.

So, interesting data can be generated about the patenting process and patented technology as a whole, the national sources and ownership of new information, and the overall expansion rate of knowledge. Opening the patent file to particular categories of interest results in an outpouring of information of unexpected depth and detail. For example, witness a very brief look at a few categories associated with aerospace technology.

# # #

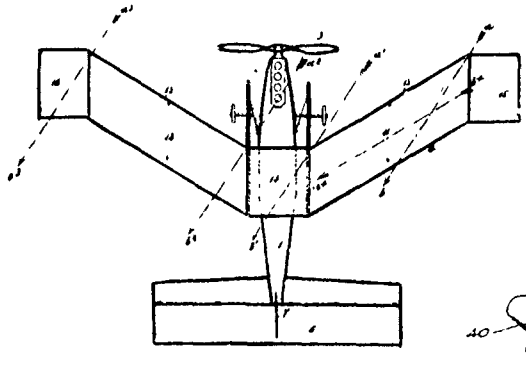
VI. AERONAUTICS AND THE PATENT FILE

Within the U.S. patent file, among its more than 350 major invention class categories, is stored a vast quantity of patent literature bearing directly or indirectly upon the aerospace industry. The USPC System delineates a number of categories which are especially pertinent. For example, the subject matter included in Class 244 is entitled "Aeronautics" and ranges in content from balloons to space shuttles, aircraft doors to autopilot systems, and kites to rockets. Apart from Aeronautics Class 244, there are a number of other areas of the patent search file where aerospace-related technology may be found. For example, in Class 60 are found the aircraft power plants and power plant controls. Classes 415 and 416 include propellers and rotor systems, and Class 428, various stock materials, where lightweight, high strength materials are classified. Pragmatically, the number of the USPC categories which are, in one way or another, "related" to the aerospace industry, is considerable since many fields of inventive endeavor have multi-industry application.

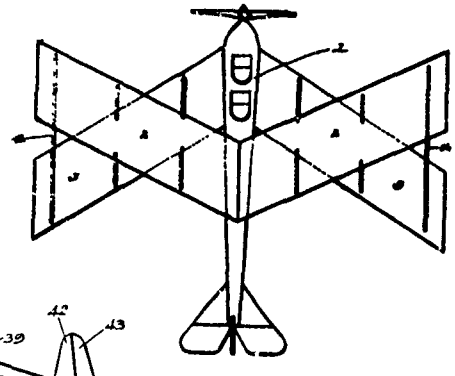
For purposes of illustration, attention is directed only to Class 244, Aeronautics. A portion of the official schedule for Class 244 is presented in the Appendix. This class is divided into approximately 300 subclasses where a wealth of technical information is cataloged. In fact, these 300 subclasses contain a total of more than 40,000 U.S. patent documents, literally a library of aerospace engineering, with categories covering all types of aircraft (heavier and lighter-than-air), missiles, spacecraft, and helicopters. Some subclass categories relate particulars of aircraft design, i.e., wings and wing arrangements, landing gear, and various other structural details. Further included in Class 244 are auxiliary devices particularly designed for or directly related to aircraft such as restraining and retarding devices, parachutes, and landing field arrangements. Kites and hang gliders are found in this patent file area, as well.

Viewing Class 244 on a subclass level, and studying the variously categorized patent disclosures, it becomes apparent that the patent file directly reflects nearly all significant technological developments in the history of the aerospace industry. This should be especially valuable to aero-information researchers in at least two respects.

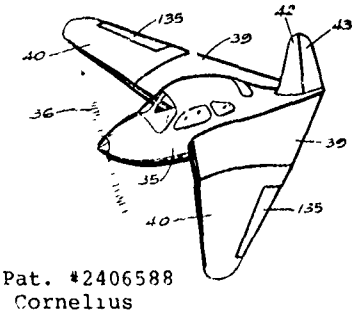
First of all, a retrospective look at the recorded achievements of the past enhances one's understanding and appreciation of current developments. For example, it is interesting to note that many aerospace design concepts heralded as totally new in recent years originally appeared in basic form in the patent literature as much as sixty years ago. A case in point, the "forward-swept-wing" concept of current coverpage fame rests quietly in the archives of patent libraries, disclosed in patents granted in 1917, 1918 and 1946 -- as old as the aircraft industry itself. The advent of new composite high-strength materials made this design feasible.



U.S. Pat. #1241860
J. S. Lang 1917

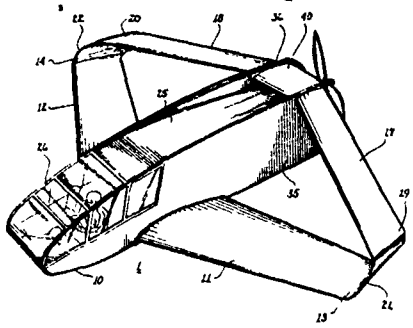


U.S. Pat. #1264037
R. A. Emmons
1918

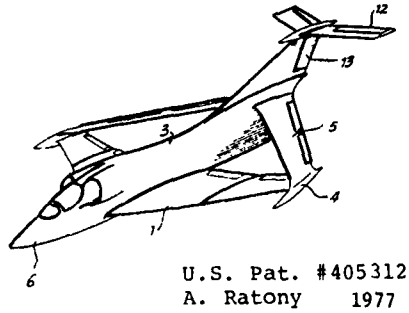


U.S. Pat. #2406588
G. W. Cornelius
1946

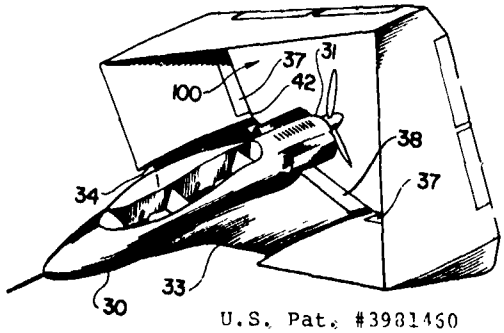
Other examples of this déjà vu phenomenon can be seen throughout the file. Obviously, the "box-wing" designs presented in a number of recent U.S. patents are not totally "new". For example, see the illustrations from patents granted to Ratony, Miranda, and Wenzel. Remember the biplane? Has it returned?



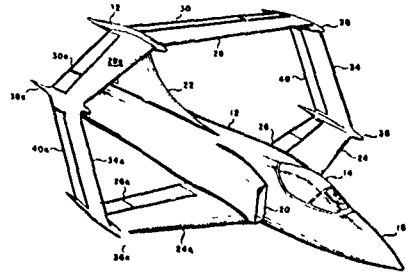
U.S. Pat. #4146199
H. A. Wenzel 1979



U.S. Pat. #4053125
A. Ratony 1977

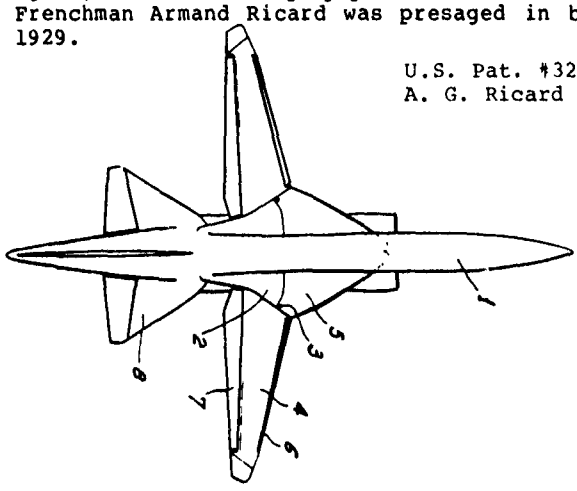


U.S. Pat. #3981460
A. Ratony 1976

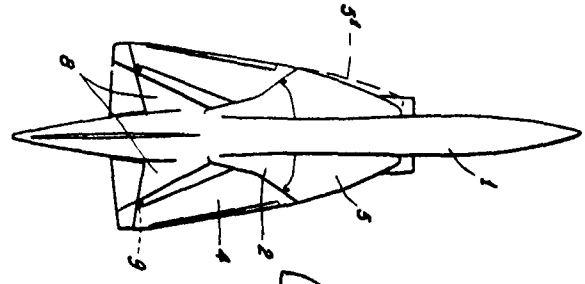


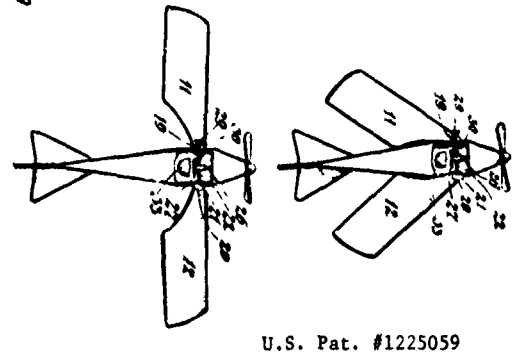
U.S. Pat. 3834654
L. R. Miranda 1974

Again, the currently popular "variable-sweep-wing" typified by the 1966 patent to Frenchman Armand Ricard was presaged in basic concept by patents granted in 1917 and 1929.

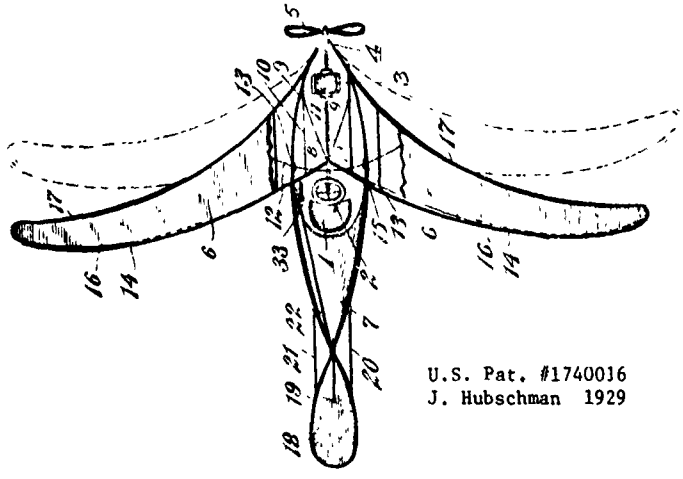


U.S. Pat. #3292881
A. G. Ricard 1966



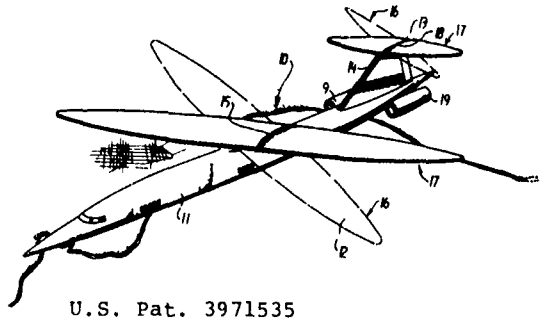


U.S. Pat. #1225059
J.W. Ruben 1917

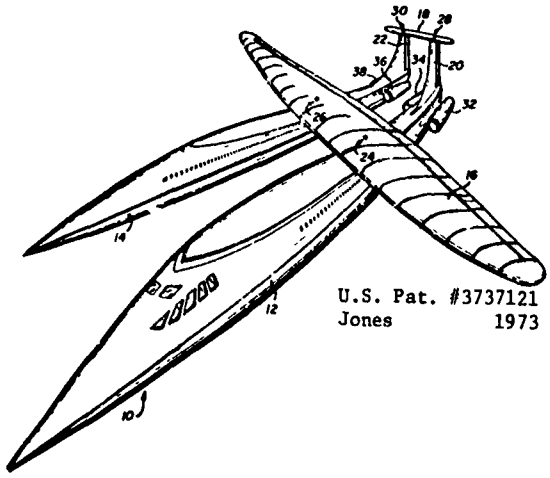


U.S. Pat. #1740016
J. Hubschman 1929

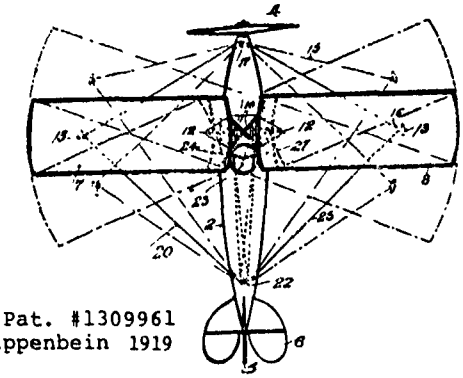
Additionally, those interested in the oblique-wing configuration developed by Jones for NASA (No. 3971535 and No. 3737121) should not overlook the 1919 patent to Nicholas Rippenbein of New Jersey (No. 1309961). Incidentally, the dual fuselage arrangement of one of Jones' patents likewise turns up in a very early Glenn Curtiss patent (1919).



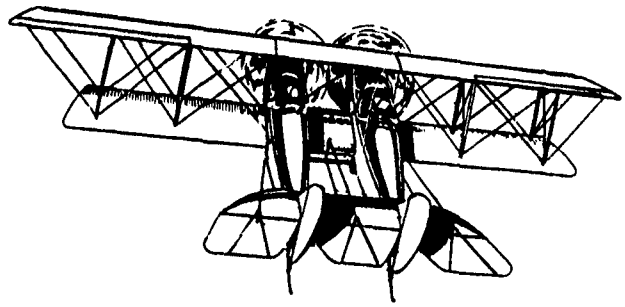
U.S. Pat. 3971535
R. T. Jones



U.S. Pat. #3737121
Jones 1973



U.S. Pat. #1309961
N. Rippenbein 1919

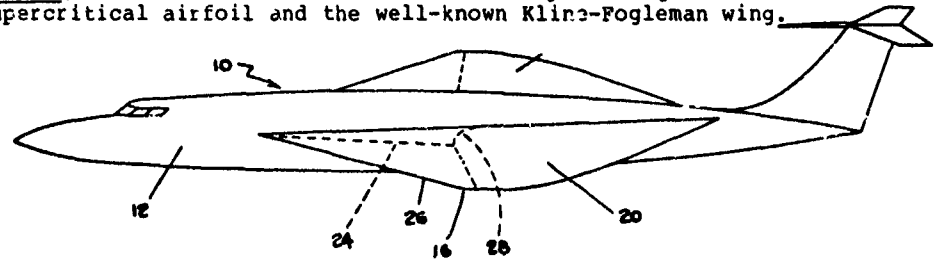


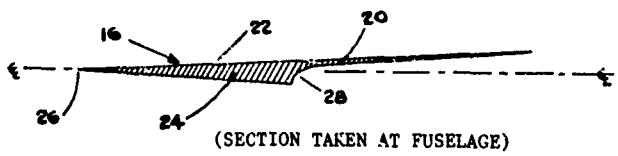
U.S. Pat. #1294412
G. Curtiss 1919

The lesson to be learned from the examples just cited is that an assessment of the state-of-the-art in any technology -- aerospace or otherwise -- should not overlook those earlier developments which lie dormant in the background, awaiting supportive or "enabling" breakthroughs (such as the development of new, stronger materials or a slight but ingenious design change). Successful technological innovation depends as much, upon intelligent application of information about past development than upon new inventive efforts.

In another respect, review or recent patenting activity in selected subclass groupings can provide a valuable assessment of the current status and direction of whole sectors of aerospace technology. For example, patterns or trends in such areas as aircraft sustentation, helicopter designs, or spacecraft, are frequently visible and may prove to be highly valuable input to corporate planning and policy making.

For instance, one can trace the recent innovative steps in the subclass grouping entitled AIRCRAFT SUSTENTATION, where disclosures of airfoil designs are presented. These include Whitcomb's supercritical airfoil and the well-known Kline-Fogleman wing.

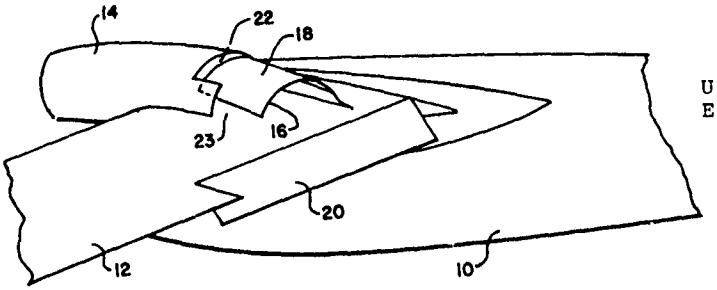




(SECTION TAKEN AT FUSELAGE)

U.S. Pat. #3706430
Kline & Fogleman 1972

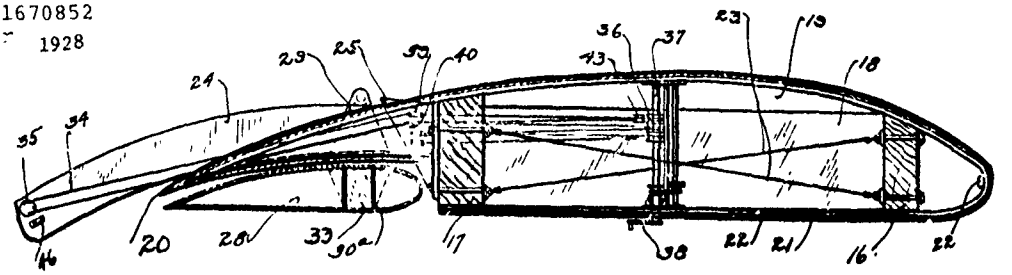
Trends in boundarylayer-control inventions are within this category, as well. These are exemplified by the disclosure in the 1976 patent to Farris successfully applied in Boeing's YC14 where the engine itself is mounted over the wing so that air is accelerated across the wing and flaps to increase lift for short takeoff and landing.



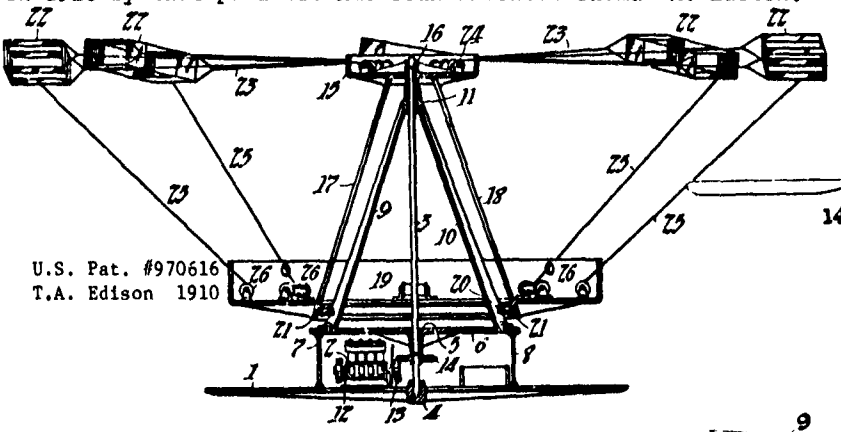
U.S. Pat. #3940092
E. S. Farris 1976

Incidentally, the famous "Fowler flaps" patent No. 1670852 granted to H. D. Fowler in 1928 is also included in the subclass grouping entitled "AIRCRAFT SUSTENTATION."

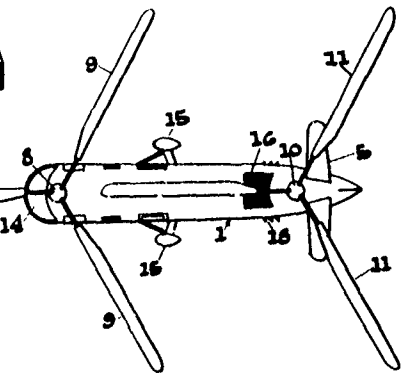
U.S. Pat. #1670852
H. D. Fowler 1928

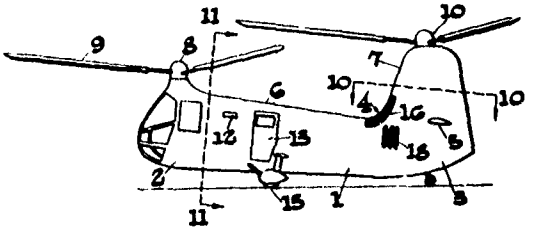


In a number of Class 244 subcategories especially designed for vertical take-off and landing (VTOL) craft lie the milestones in "HELICOPTER" progress -- inventions by Sikorsky and Piasecki and even a rather elaborate system of rotating box kites described in 1910 by that prolific American inventor Thomas A. Edison.

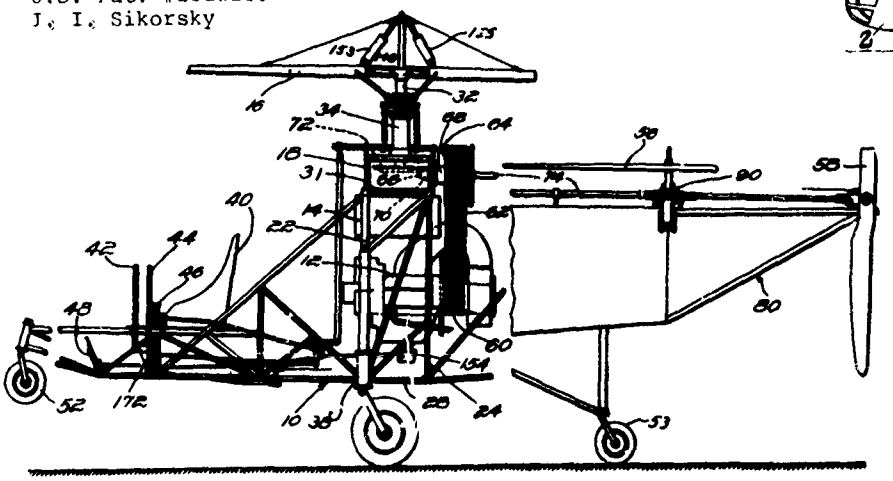


U.S. Pat. #970616
T.A. Edison 1910





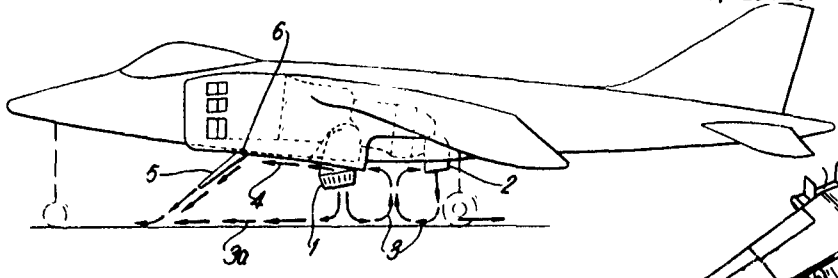
U.S. Pat. #2318260
J. I. Sikorsky



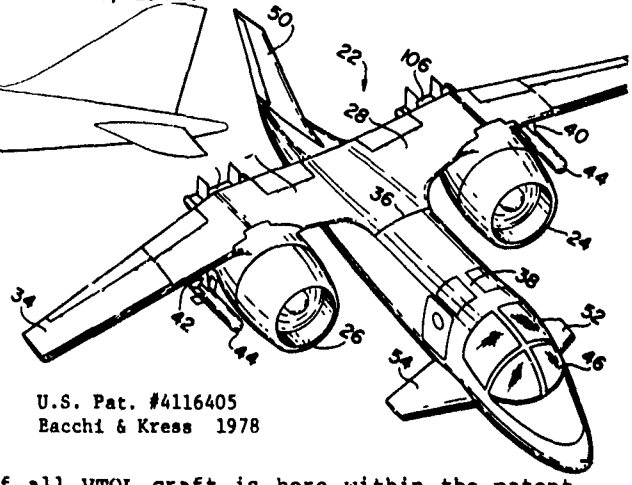
U.S. Pat. #2507993
F. N. Piasecki

Evident in more recent helicopter patenting are the attempts to convert vehicle designs developed for the rigors of combat, to cosmopolitan commuter craft -- an effort obviously requiring more than the selection of attractive decor. Design concepts based upon the need for maneuverability and rugged durability must also accommodate environmental concerns and the absolute necessity for passenger comfort. Representative of this trend are the relatively large number of vibration dampening inventions set forth in the VTOL/helicopter subclasses.

Other VTOL craft represented in this subcategory area are the "Harrier" type as shown in No. 4004755, granted to Ralph Spenser Hooper of England, where rotatable nozzles direct a jet stream either vertically or horizontally. More recently, modifications have involved rotation of the engine itself to vary thrust direction as shown in patent grant No. 4116405 to inventors Bacchi and Kress of New York, 1978.



U.S. Pat. #4004755
R. S. Hooper 1977



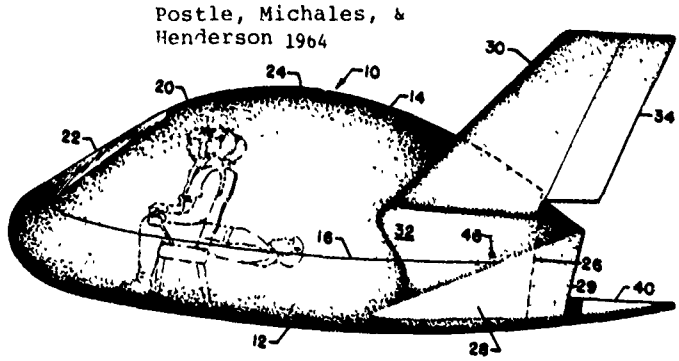
U.S. Pat. #4116405
Bacchi & Kress 1978

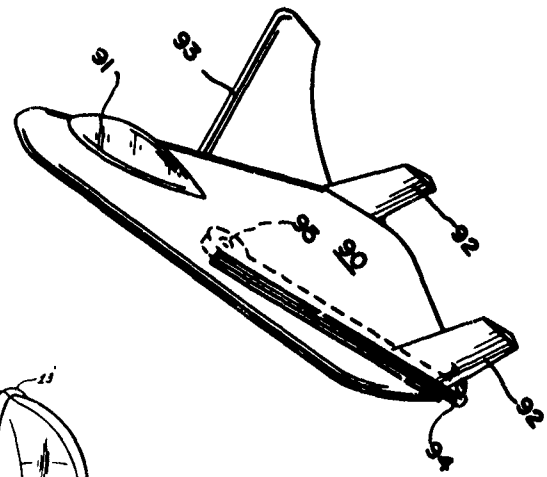
Virtually the entire developmental history of all VTOL craft is here within the patent file. The patent information researcher can follow VTOL craft history from its early status as a mere novelty to the efficient and effective designs of today.

Another interesting subclass grouping within the Aeronautics class concerns "SPACECRAFT" a technology which has long held the fascination of many. Sixteen subclasses accommodate a variety of spacecraft types and their various control aspects. What, one may ask, are the trends in spacecraft patent activity?

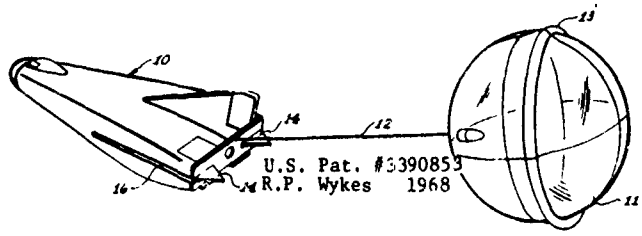
A review of the substantive content of recent patent activity shows that from the very beginning of the U.S. space program, "cost" has, of course, been a prime concern. As a result, the idea of a space shuttle was seen as a viable cost saving innovation early in the program. Beginning in the early 1960's, a wave of ideas was advanced to provide a versatile and reusable spacecraft, and the patents clearly reflect this trend. Even before April of 1961, when the Russian astronaut Yuri Gagarin made his historic orbit of the Earth, numerous patent applications had been filed presenting a variety of shuttle-type craft that, allegedly, could be launched into space and safely returned for reuse. Early designs included numerous forms of variable geometry or completely retractable wing arrangements. The intent, of course, was to provide a streamlined craft that could be efficiently launched into orbit, reenter the atmosphere, deploy wings, and land conventionally at existing airfields. A large assortment of patents present variations on this theme.

U.S. Pat. #3132825
Postle, Michales, & Henderson 1964



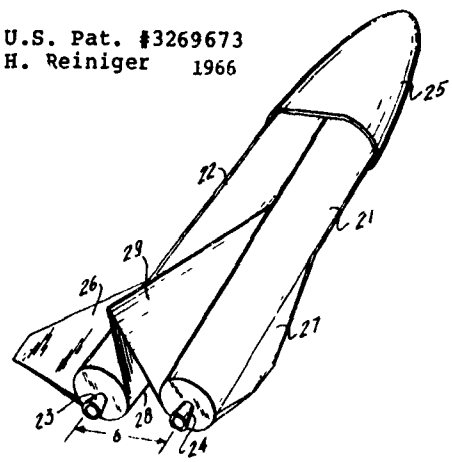


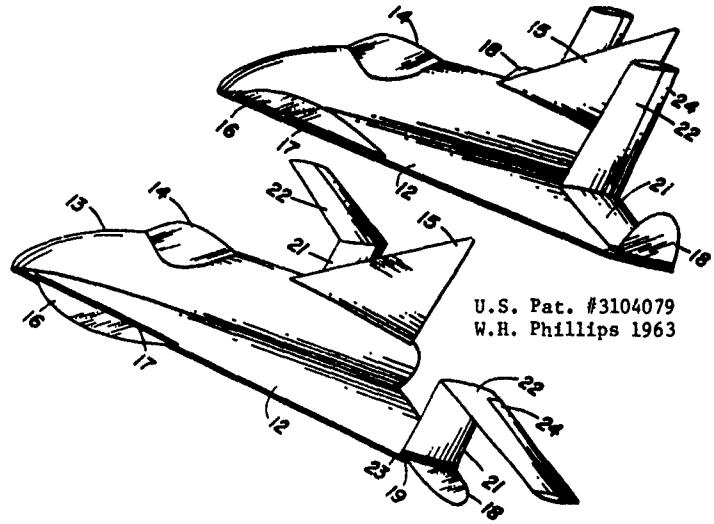
U.S. Pat. #3743218
T.E. Sweeney 1973



U.S. Pat. #3390853
R.P. Wykes 1968

U.S. Pat. #3269673
H. Reiniger 1966

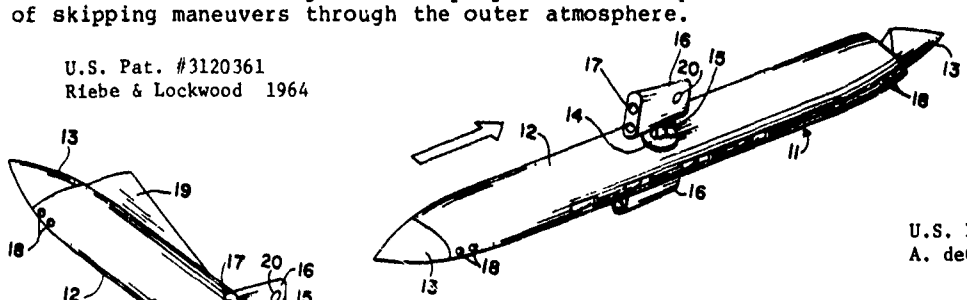


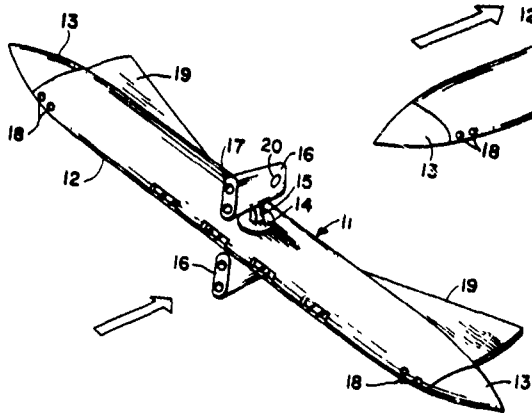


U.S. Pat. #3104079
W.H. Phillips 1963

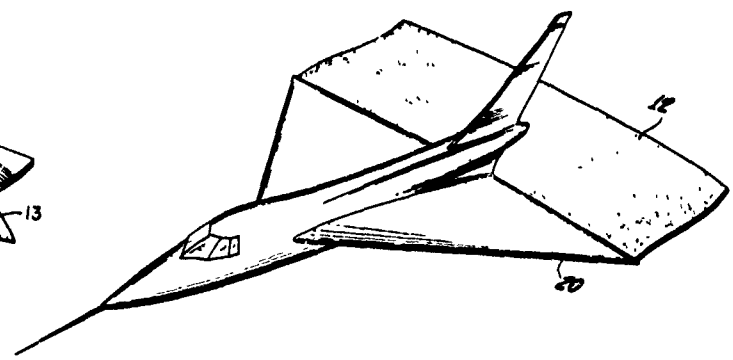
Most ideas showed real imagination, although not always practical in nature. For example, a patent to Riebe and Lockwood suggested a craft to be launched in a longitudinal arrangement with a low aspect ratio, for low drag, and then landed transversely with a high aspect ratio, for increased lift. In 1964, Albert de Graffenried, another patentee (U.S. Patent No. 3160366), described a large "variable-area trailing sheet" deployed behind a space craft to slow it down in a series of skipping maneuvers through the outer atmosphere.

U.S. Pat. #3120361
Riebe & Lockwood 1964



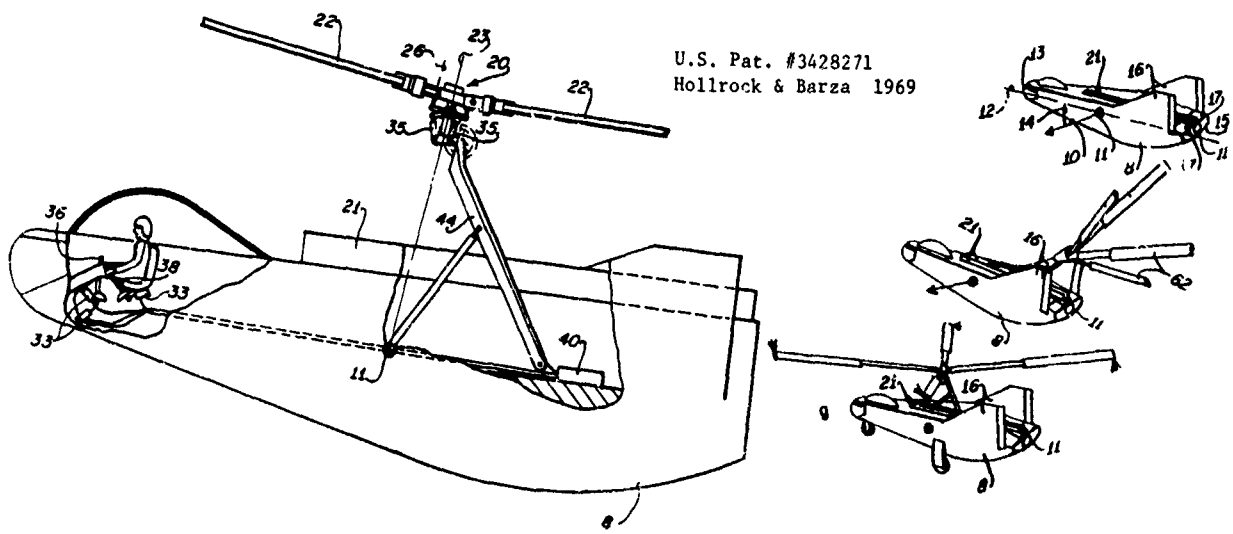


U.S. Pat. #3160366
A. deGraffenried 1964

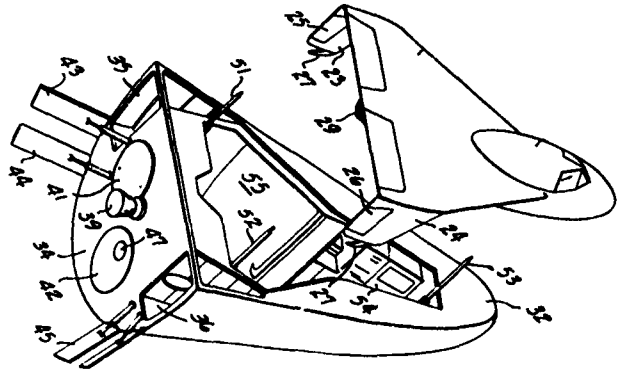


Some designs considered the use of deployable rotor blades as in U.S. Patent No. 3428271 to Hollrock and Barzda.

U.S. Pat. #3428271
Hollrock & Barza 1969

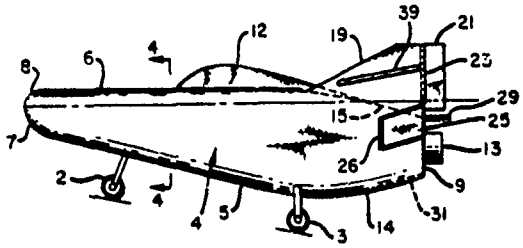


Others involved inflatable structures designed to serve alternatively as heat shields for the craft or as a lifeboat arrangement for astronauts stranded at sea. Contemplated by inventors Cohen, Schetzer, and Sellars in U.S. Patent No. 3289974 was the idea of a nested type craft where the outside structure formed the reentry vehicle and, once shed, revealed a landing craft inside.



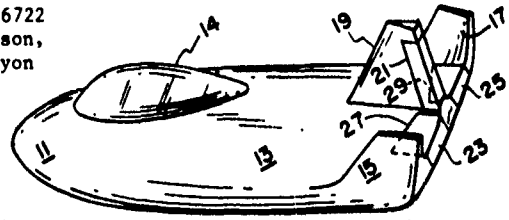
U.S. Pat. #3289974
Cohen, Schetzer, &
Sellars 1966

NASA employees, who had been working on hypersonic aircraft designs since around 1957, provided what was to become the basic conceptual design from which the latest shuttle form would evolve. Embodiments of this concept are illustrated, for example, in patents granted to Eggers and Rainey. Such a craft uses a lifting body design with acceptable aerodynamic characteristics in both hypersonic and subsonic flight.

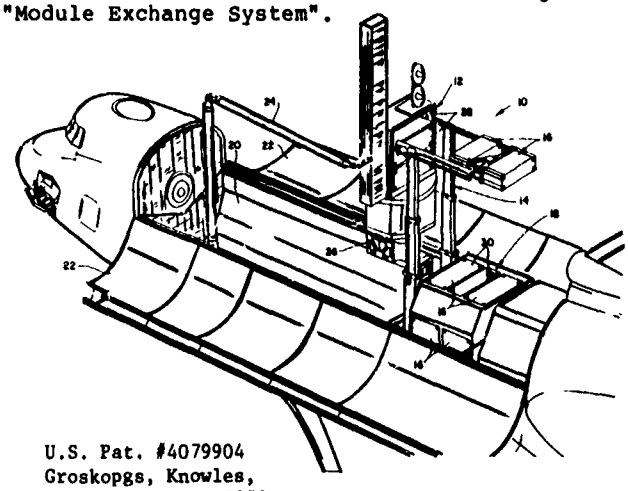


U.S. Pat. #3276722
Eggers, Syvertson,
Edwards, & Kenyon
1966

U.S. Pat. # 3570789
R.W. Rainey 1971



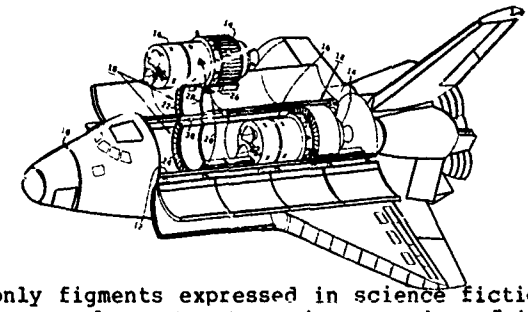
Since the current space shuttle design was adopted in the early 1970's, the majority of subsequent research and development effort in this area has involved auxiliary systems to utilize the shuttle. Again, this pattern or trend is directly reflected in the patents granted. These developments focus upon the shuttle's main purpose of ferrying cargo into outerspace and its intended application in satellite servicing. A typical example of these development trends is U.S. Patent No. 4079904 granted in 1978 to four Canadian inventors of a "Module Exchange System".



U.S. Pat. #4079904
Groskopgs, Knowles,
White, & Dennys 1978

Interestingly, the latter patent discloses what may be termed a dramatic new concept in satellite technology, that of modular construction readily serviceable in situ. The system described includes service modules carried into space by a shuttle craft along with probes for retrieving and replacing defective satellites.

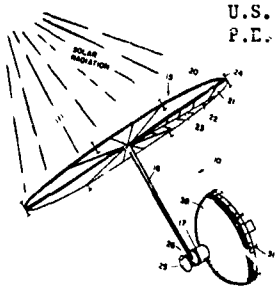
The patent literature in this area shows how shuttle craft can be utilized for carrying satellites into orbit. An example of such a system is illustrated in General Dynamics' patent (4043524) granted in 1977 to Californian inventors Dreyer and Huntington. This particular patent document additionally discloses a technique for giving the satellite an initial spin when released from the shuttle.

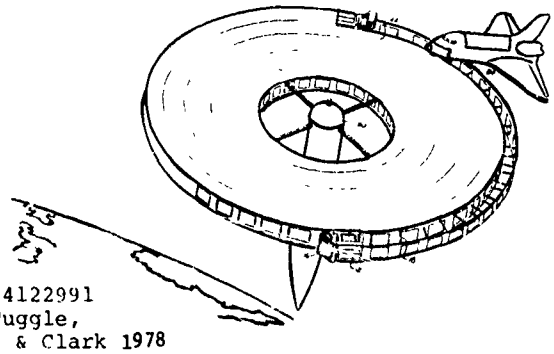


U.S. Pat. #4043524
Dreyer & Huntington
1977

Once considered only figments expressed in science fiction literature, space power stations and large space-colony structures have now been "shuttled" into the realm of reality. The space power stations receive energy from the sun, convert it to a coherent energy beam such as a laser or microwave. This beam is then transmitted to an earth-based receiver site for energy distribution. Such a system is illustrated in Glaser's 1973 patent. Construction of satellites for colonies or other large space structures is shown in representative patent No. 4122991 where the materials and equipment are transported by the shuttle for assembly in space.

U.S. Pat. #3781647
P.E. Glaser 1973





U.S. Pat. #4122991
Johnston, Tuggle,
Huntsville, & Clark 1978

The substantive information available from this multitude of patent disclosures is virtually endless. So, too, is the information available through manipulation of the bibliographic data which accompany the thousands of patents flowing into the file. To briefly demonstrate the potential value of this bibliographic information as a contribution to technology assessment processes, attention is again directed to the "Aeronautics" class just discussed. Focusing upon those sixteen subclasses noted above as defining "Spacecraft" technology, a computerized profile of recent patenting activity reveals a number of interesting facts. The following are highlights and a quick analysis of the technology profile report appearing in abridged form in the Appendix.

First of all, it is seen in the graph displayed on the next page that U.S. patenting activity in Spacecraft technology has declined significantly since a peak in 1966. In fact, the decline is nearly 70% in the last 14 years. Interestingly, this decline is not reflected in the use of the U.S. patent system abroad. Due to the fact that U.S. origin activity has so dramatically declined, while non-U.S. activity has remained fairly constant, the non-U.S. inventor share of the patent grant receipts has increased 5-fold in ten years, though at 28% it still remains considerably below the all-technology average of 37.4%. Growth in the number of documents collected in this file sector was lower than average (21% as compared to the all-technology average described before as 29%).

Of the nearly 700 patent documents filed and cross-referenced in the subject subclasses, nearly half were corporate-owned at time of grants. In the most recent 3-year period, corporate share has increased to around 65%, again, less than the 80% all-technology average described earlier. U.S. Government R&D involvement, of course, has a large impact on these comparisons. During 1977-1979, Government ownership of all patent documents within the Spacecraft subclass area of Aeronautics was almost 23% -- more than seven times the all-technology average.

CORPORATION/ORGANIZATION PATENTING

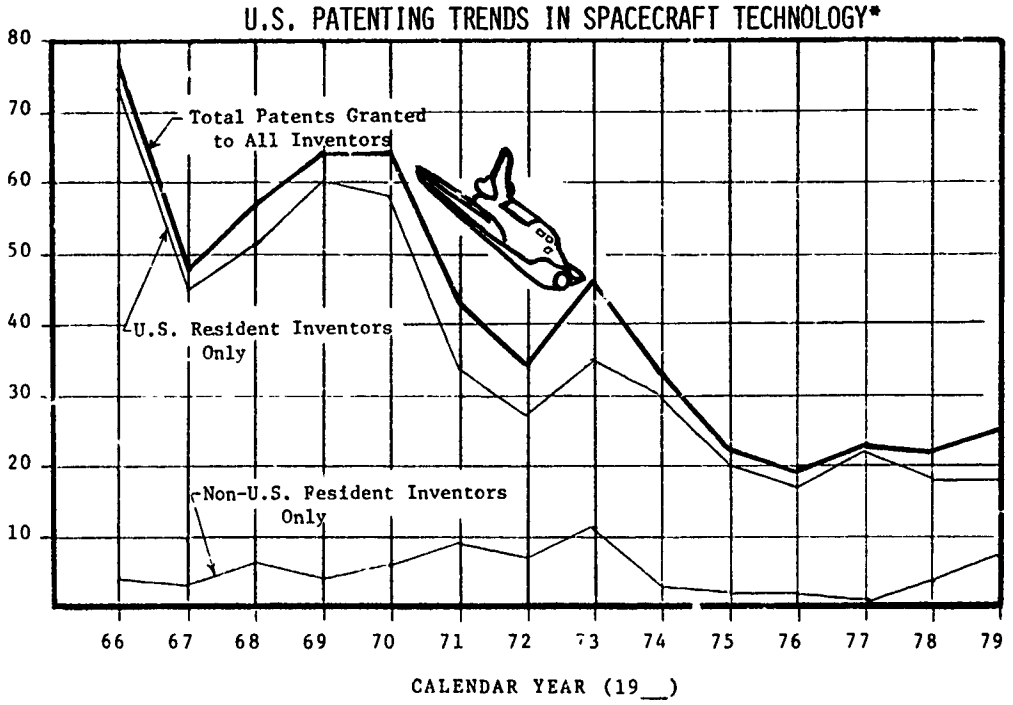
IN SPACECRAFT TECHNOLOGY*

(1969-1979)

*Defined as USPC Class 244, Subs. 158-173

CORPORATIONS OR ORGANIZATIONS HOLDING FOUR OR MORE PATENTS	TOTAL PATENTS HELD	CORPORATIONS OR ORGANIZATIONS HOLDING FOUR OR MORE PATENTS	TOTAL PATENTS HELD
USA/NASA	75	MARTIN-MARIETTA CORP.	8
USA/NAVY	30	WESTINGHOUSE ELECTRIC CORP.	7
RCA CORP.	26	SOCIETE NATIONALE INDUSTRIELLE AEROSPATIALE	6
TRW, INC.	19	BRITISH AIRCRAFT CORP., LTD.	6
HUGHES AIRCRAFT CO.	17	ORGANISATION EUROPEENE DE RECHERCHES SPATIALES	5
USA/AIR FORCE	14	TOKYO SHIBAURA ELECTRIC CO., LTD.	5
GENERAL DYNAMICS CORP.	11	LTV AEROSPACE CORP.	4
GENERAL ELECTRIC CO.	9	COMMUNICATIONS SATELLITE CORP.	4
ROCKWELL INTERNATIONAL CORP.	8	USA/ARMY	4

U.S. PATENTING TRENDS IN SPACECRAFT TECHNOLOGY*



*(NOTE: AS DEFINED IN THE U.S. PATENT CLASSIFICATION SYSTEM, CLASS 244, SUBCLASSES 158-173)

NATIONAL ORIGIN OF SPACECRAFT* PATENTING (1963-1979)

NATION (INVENTOR'S RESIDENCE)	NUMBER OF PATENTS GRANTED
UNITED STATES	624
FRANCE	18
GERMANY	15
UNITED KINGDOM	12
CANADA	8
NETHERLANDS	6
JAPAN	5
SWEDEN	2
ITALY	2
AUSTRALIA	1
U.S.S.R.	1
AUSTRIA	1

*AS DEFINED IN THE U.S. PATENT CLASSIFICATION SYSTEM, CLASS 244, SUBCLASSES 158-173

Looking at the national and corporate actors should reveal no surprises. Residents of eleven non-U.S. nations received spacecraft patents in the 14 years reviewed. Besides those spacecraft inventors residing in the U.S., the most frequent recipients of U.S. patents were from France, West Germany and the U.K. Of nearly 90 corporations and organizations, both international and domestic, to which 344 spacecraft patents were listed as assigned during the subject period (1969-1979), just ten corporations (RCA, TRW, Hughes Aircraft, General Electric, General Dynamics, Martin Marietta, Rockwell International, Westinghouse, Societe Nationale Industrielle Aerospatiale, and British Aircraft) received more than one-third of that total. Only three organizations shared another third. Those organizations were agencies of the U.S. Government: NASA and the Departments of the Navy and Air Force.

A full Technology Profile Report of the type suggested here will reveal the names of all nations and every corporation or organization involved in spacecraft patenting and, in tabular form, the extent and timing of their involvement. Such a profile can be considerably expanded by the inclusion of specific patent numbers and invention titles associated with each corporation.

Other computerized approaches to the bibliographic data can be taken to further explore the patenting activity of a selected organization or corporation. For example, the Appendix demonstrates an abridged version of an OTAF Organizational Profile for one of the major aerospace corporations, Boeing. In the format shown, Boeing's patenting activity during the period spanning 1969-1979 is tabulated by category of the USPC. The data-base listed 700 patents assigned to Boeing Corporation at time of grant. It may surprise many that this, the most aerospace-patent-active corporation, has received less than one-forth of those patents (1969-1979) in the "Aeronautics" Class 244 discussed earlier -- mainly concentrated in subclass areas related to "Aircraft Sustentation" and "Aircraft Control." The other three-fourths is spread amongst more than one hundred of the U.S. Patent Classes. This is evidence of a diversified technical effort. Diversification is considered a corporate "lifeline" in an industry generally afloat on the rising and falling tide of government defense contracts and the ever-present threat of obsolescence brought by technological change.

Many of Boeing's patents fall into such technical categories as Metal Working, Geometrical Instruments, Power Plants, Metal Deforming, Measuring and Testing, Fluid Pressure Brakes, and Communications. Others notably range from Buckles to Bonding Adhesives and Plastics to Pipe Joints.

PATENT CLASSIFICATION DISTRIBUTION
FOR BOEING CORP. -- 1969-1979

CLASS	TITLE	% OF ALL BOEING CORP. PATENTING (1969-1979)
29	Metal Working	2.1
33	Geometrical Instruments	1.1
60	Power Plants	3.5
72	Metal Deforming	3.5
73	Measuring & Testing	5.1
74	Machine Elements & Mechnanisms	2.1
114	Ships	2.9
137	Fluid Handling	1.4
156	Adhesive Bonding & Misc. Manufacture	2.5
181	Acoustics	1.7
204	Chemistry, Electrical & Wave Energy	1.4
219	Electric Heating	1.0
239	Fluid Sprinkling, Spraying and Diffusing	1.8
244	Aeronautics	23.0
303	Fluid Pressure Brake & Analogous Systems	1.7
307	Electrical Transmission or Interconnected Systems	1.1
324	Electricity, Measuring & Testing	1.7
340	Communications, Electrical	1.8
343	Communications, Radio Wave	2.6
356	Optics, Measuring & Testing	1.2
364	Electrical Computers & Data Processing Systems	1.8
410	Freight Accommodation on Freight Carrier	1.5
416	Fluid Reaction Surfaces (i.e., Inpellers)	1.4
428	Stock Material or Misc. Articles	1.7
Ninety-three other classes		30.4

It must be emphasized that the extensive data just discussed is not the result of what once was an extensive manual effort, where weeks or perhaps months might have been spent culling through stacks of patents to compile a listing of nations or corporations contributing to a selected field of technology, or identifying technological fields in which selected corporations are patent-active. To the contrary, and happily, this information is readily available through specially designed programming techniques accessing the U.S. patent classified file.

# # #

IX. CONCLUSION

Thus, in review, it has been shown that the massive and dynamic collection of information which is known as the "patent file" can tell us as much or more in substance about any particular technical subject than can any other single resource. It can help us define what is really "new" in the field, and give us clues as to what the future holds. Beyond that, analysis of the continuing flow of bibliographic data accompanying the thousands of patent transactions can give us unique insights to interesting characteristics of the patent information source -- the inventor, the corporation, or the industry as a whole.

Computerized manipulation of patenting data can provide extremely useful products and services to researchers, future innovators, corporate strategists and government policymakers. Indeed one can know, almost at the push of a button, the technological activity in nearly any field -- the corporate actors, the nature of their innovations. Taken together, the substantive disclosures and statistical information born from the use of the patent system offer an unmatched profile -- an assessment of technological change.

Considering the rapid advancements in informational technology, our opportunities for effectively utilizing patent information appear only as limited as our imagination.

# # #

X. REFERENCES

All information and material for this paper were drawn from the United States Patent File. Principal source within the file was Class 244, "Aeronautics." Information concerning the patent literature contained in this, and any other, portion of the patent file -- along with specific classification guidance for accessing the file -- may be obtained form the U.S. Patent & Trademark Office, Washington, D.C. 20231, U.S.A.

# # #

XI. ACKNOWLEDGEMENTS

Appreciation is expressed for the valuable contribution to this presentation by the following individuals:

Principal Author -- Donald G. Kelly, B.S. Mechanical Engineering/Aerospace Engineering
Senior Analyst
Office of Technology Assessment and Forecast
U.S. Patent and Trademark Office

Galen Barefoot, M.S. Aerospace Engineering
Primary Examiner
Patent Examining Group 310
U.S. Patent & Trademark Office

# # #

XII. APPENDICES

A1-- Portion of Class 244, Aeronautics, schedule extracted from the Manual of Classification, U.S. Patent Classification System.

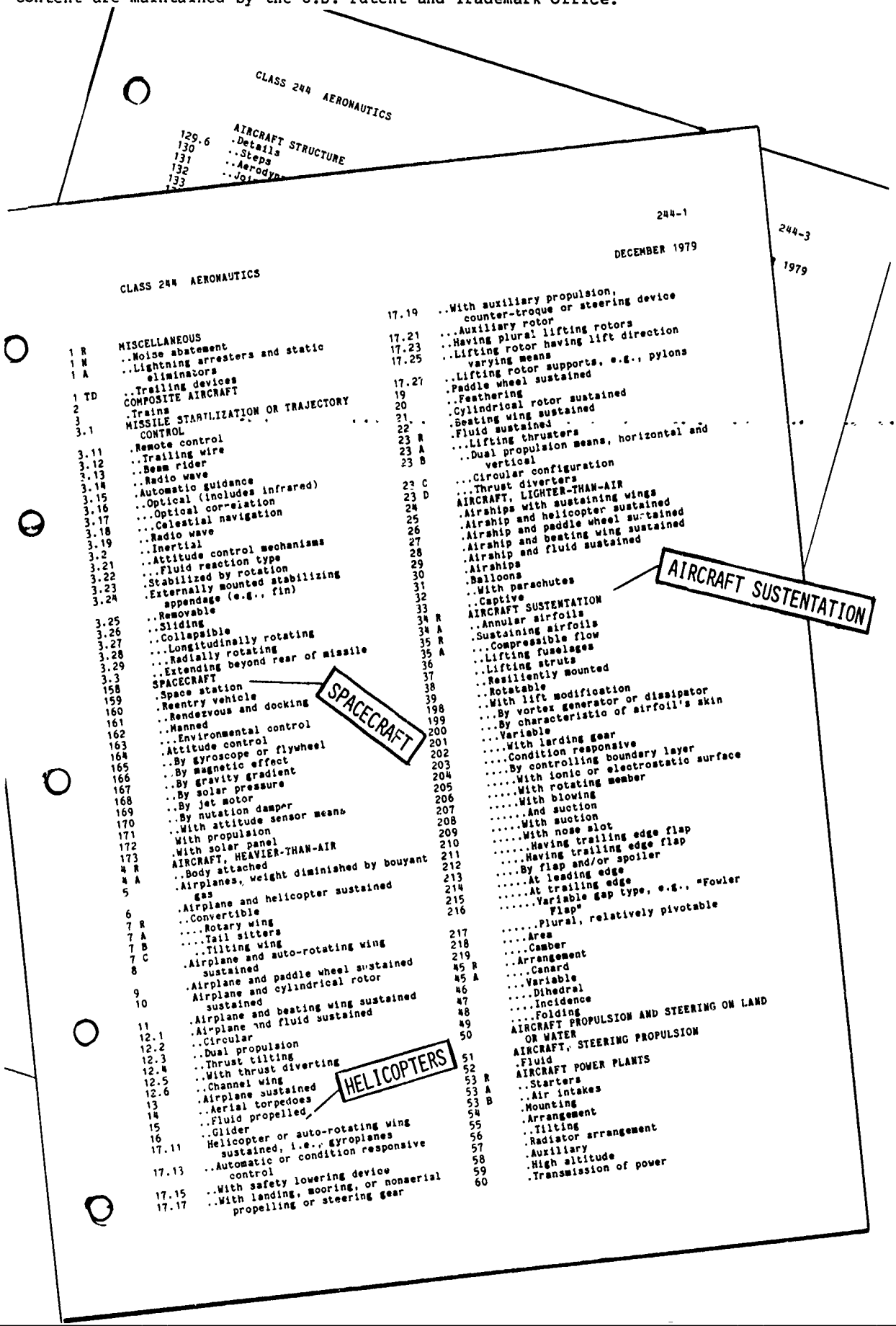
A2-- An abridged version of a Technology Profile generated by the Office of Technology Assessment & Forecast (OTAF) of the U.S. Patent & Trademark Office. Profile subject is "Aeronautics" Class 244, "Spacecraft" subclasses 158-173. Only a few pages of a multipage computerized report are shown. Full version may be ordered from OTAF/USPTO.

A3-- An abridged version of an Organizational Profile prepared by OTAF to reflect patenting activity by Boeing Corporation. The full version of this report may be ordered from OTAF.

# # # #

APPENDIX I

Below are displayed pages from the Manual of Classification for the USPC system. A por- of Class 244 is shown with selected subclass areas highlighted as pertinent to the dis- cussion in this paper. For each of the subclasses listed, as well as for the remainder of the 100,000 subclasses in the system, extensive and detailed definitions of scope and content are maintained by the U.S. Patent and Trademark Office.



CLASS 244 AERONAUTICS

129.6 AIRCRAFT STRUCTURE
130 .Details
131 ..Steps
132 ..Aerodyn
133 ..Joi

244-1

DECEMBER 1979

CLASS 244 AERONAUTICS

1 R MISCELLANEOUS
1 N ..Noise abatement
1 A ..Lightning arresters and static eliminators
1 TD ..Trailing devices
2 COMPOSITE AIRCRAFT
3 .Trains
3.1 MISSILE STABILIZATION OR TRAJECTORY CONTROL
3.11 .Remote control
3.12 ..Trailing wire
3.13 ..Beam rider
3.14 ..Radio wave
3.15 .Automatic guidance
3.16 ..Optical (includes infrared)
3.17 ...Optical cor-elation
3.18 ...Celestial navigation
3.19 ..Radio wave
3.2 ..Inertial
3.21 ..Attitude control mechanisms
3.22 ...Fluid reaction type
3.23 .Stabilized by rotation
3.24 .Externally mounted stabilizing appendage (e.g., fin)
3.25 ..Removable
3.26 ..Sliding
3.27 ..Collapsible
3.28 ...Longitudinally rotating
3.29 ...Radially rotating
3.3 ..Extending beyond rear of missile
158 SPACECRAFT
159 .Space station
160 .Reentry vehicle
161 ..Rendezvous and docking
162 ..Manned
163 ...Environmental control
164 .Attitude control
165 ..By gyroscope or flywheel
166 ..By magnetic effect
167 ..By gravity gradient
168 ..By solar pressure
169 ..By jet motor
170 ..By nutation damper
171 ..With attitude sensor means
172 With propulsion
173 .With solar panel
4 R AIRCRAFT, HEAVIER-THAN-AIR
4 A .Body attached
5 .Airplanes, weight diminished by bouyant gas
6 .Airplane and helicopter sustained
7 R ..Convertible
7 A ....Rotary wing
7 B ....Tail sitters
7 C ..Tilting wing
8 .Airplane and auto-rotating wing sustained
9 .Airplane and paddle wheel sustained
10 Airplane and cylindrical rotor sustained
11 .Airplane and beating wing sustained
12.1 .Airplane and fluid sustained
12.2 ..Circular
12.3 ..Dual propulsion
12.4 ..Thrust tilting
12.5 ..With thrust diverting
12.6 ..Channel wing
13 .Airplane sustained
14 ..Aerial torpedoes
15 ..Fluid propelled
16 ..Glider
17.11 Helicopter or auto-rotating wing sustained, i.e., gyroplanes
17.13 ..Automatic or condition responsive control
17.15 ..With safety lowering device
17.17 ..With landing, mooring, or nonserial propelling or steering gear
17.19 ..With auxiliary propulsion, counter-troque or steering device
17.21 ...Auxiliary rotor
17.23 ..Having plural lifting rotors
17.25 ..Lifting rotor having lift direction varying means
17.27 ..Lifting rotor supports, e.g., pylons
19 .Paddle wheel sustained
20 ..Feathering
21 .Cylindrical rotor sustained
22 .Beating wing sustained
23 .Fluid sustained
23 R ...Lifting thrusters
23 A ...Dual propulsion means, horizontal and vertical
23 B ...Circular configuration
23 C ...Thrust diverters
23 D AIRCRAFT, LIGHTER-THAN-AIR
24 .Airships with sustaining wings
25 .Airship and helicopter sustained
26 .Airship and paddle wheel sustained
27 .Airship and beating wing sustained
28 .Airship and fluid sustained
29 .Airships
30 .Balloons
31 ..With parachutes
32 ..Captive
33 AIRCRAFT SUSTENTATION
34 R .Annular airfoils
34 A .Sustaining airfoils
35 R ...Compressible flow
35 A ..Lifting fuselages
36 ..Lifting struts
37 ..Resiliently mounted
38 ..Rotatable
39 ..With lift modification
198 ...By vortex generator or dissipator
199 ...By characteristic of airfoil's skin
200 ...Variable
201 ....With larding gear
202 ....Condition responsive
203 ....By controlling boundary layer
204 .....With ionic or electrostatic surface
205 .....With rotating member
206 .....With blowing
207 .....And suction
208 .....With suction
209 .....With nose slot
210 .....Having trailing edge flap
211 ....Having trailing edge flap
212 ....By flap and/or spoiler
213 .....At leading edge
214 .....At trailing edge
215 .....Variable gap type, e.g., "Fowler Flap"
216 .....Plural, relatively pivotable
217 ....Area
218 ....Camber
219 ..Arrangement
45 R ....Canard
45 A ...Variable
46 ....Dihedral
47 ....Incidence
48 ....Folding
49 AIRCRAFT PROPULSION AND STEERING ON LAND OR WATER
50 AIRCRAFT, STEERING PROPULSION
51 .Fluid
52 AIRCRAFT POWER PLANTS
53 R ..Starters
53 A ..Air intakes
53 B .Mounting
54 .Arrangement
55 ..Tilting
56 .Radiator arrangement
57 .Auxiliary
58 .High altitude
59 .Transmission of power
60 .Transmission of power

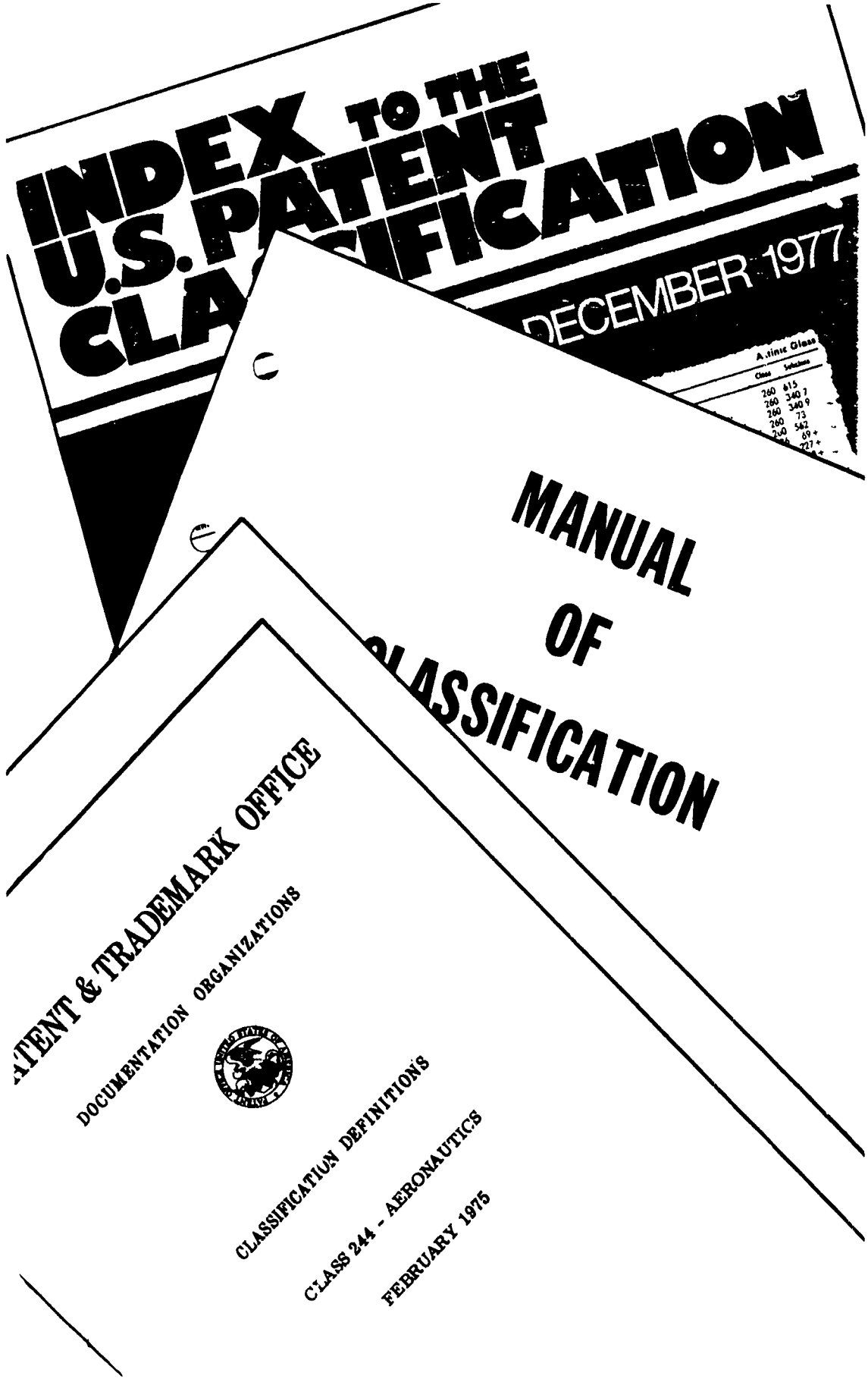
SPACECRAFT

HELICOPTERS

AIRCRAFT SUSTENTATION

244-3

1979


INDEX TO THE
U.S. PATENT
CLA
DECEMBER 1977
MANUAL
OF
ASSIFICATION
ATENT & TRADEMARK OFFICE
DOCUMENTATION ORGANIZATIONS
CLASSIFICATION DEFINITIONS
CLASS 244 - AERONAUTICS
FEBRUARY 1975

APPENDIX II

OTAF SPECIAL REPORT - SPACECRAFT

ABRIDGED REPORT FROM THE
OFFICE OF TECHNOLOGY ASSESSMENT & FORECAST
U.S. PATENT & TRADEMARK OFFICE
"TECHNOLOGY PROFILE" -- SPACECRAFT PATENTING (U.S.)

1977-79 AVERAGES

PERCENT GROWTH	21.15
PERCENT FOREIGN	17.14
PERCENT CORPORATE OWNED	65.71
PERCENT GOVERNMENT OWNED	22.86
PERCENT U.S. OWNED OF FOREIGN	0.00
1977-79 XR/OR	.94

DEFINITIONS

PERCENT GROWTH = 1977-79 PATENTS/1970-79 PATENTS X 100.

PERCENT FOREIGN = 1977-79 U.S. PATENTS WITH A FOREIGN RESIDENT INVENTOR/1977-79 PATENTS X 100

PERCENT CORPORATE OWNED = 1977-79 U.S. PATENTS ASSIGNED TO CORPORATIONS/1977-79 PATENTS X 100.

PERCENT GOVERNMENT OWNED = 1977-79 U.S. PATENTS ASSIGNED TO THE U.S. GOVERNMENT/1977-79 PATENTS X 100.

PERCENT U.S. OWNED OF FOREIGN = 1977-79 U.S. PATENTS WITH A FOREIGN RESIDENT INVENTOR THAT ARE ASSIGNED TO A U.S. ORGANIZATION/1977-79 U.S. PATENTS WITH A FOREIGN RESIDENT INVENTOR X 100.

1977-79 XR/OR = 1977-79 U.S. PATENTS WITH A CROSS REFERENCE DESIGNATION/1977-79 U.S. PATENTS WITH AN ORIGINAL PRIMARY DESIGNATION.

PATENT ACTIVITY (1963-1979) BY DATE OF PATENT GRANT

	NUMBER OF PATENTS															
	63-65	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	TOTAL
TOTAL	118	77	48	57	64	64	43	34	46	33	22	19	23	22	25	695
U.S. ORIGIN	116	73	45	51	60	58	34	27	35	30	20	17	22	18	18	624
FOREIGN ORIGIN	2	4	3	6	4	6	9	7	11	3	2	2	1	4	7	71
FRANCE		1			2		3	1	4	2		1		1	3	18
GERMANY		2		2		2	2	2	2		1	1			1	15
UNITED KINGDOM	1		2	1		1	1	2	1	1			1		1	12
CANADA	1	1				2	1							3		8
NETHERLANDS			1		1				2		1				1	6
JAPAN							2	1	2							5
SWEDEN						1		1								2
ITALY				2												2
AUSTRALIA				1												1
U.S.S.R.					1											1
AUSTRIA															1	1
U.S. ORIGIN	116	73	45	51	60	58	34	27	35	30	20	17	22	18	18	624
U.S. CORP. OWNED	57	38	16	25	35	29	19	6	15	16	7	11	16	12	8	310
U.S. GOVT. OWNED	40	26	21	20	12	26	12	16	17	13	10	4	3	5	8	233
U.S. INDIV. OWNED	19	8	8	6	12	3	2	5	3	1	3	2	3	1	2	78
FOREIGN OWNED		1			1		1									3
FOREIGN ORIGIN	2	4	3	6	4	6	9	7	11	3	2	2	1	4	7	71
U.S. OWNED		1		1			1	1								4
FOREIGN OWNED	2	3	3	5	4	6	8	6	11	3	2	2	1	4	7	67
FOREIGN CORP.		3	2	3	2	4	7	6	11	3	2	2	1	3	6	55
FOREIGN GOVT.				1												1
FOREIGN INDIV.	2		1	1	2	2	1							1	1	11

	PRE 66	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	TOTAL
UNITED STATES OF AMERICA, NATIONAL AERONAUTICS AND SPACE ADM																
PATENTS GRANTED					6	19	8	9	11	5	7	2	2	3	3	75
PATENTED APPLICATIONS	1	2	8	10	11	8	10	7	7	4	1	1	4	1		75
UNITED STATES OF AMERICA, NAVY																
PATENTS GRANTED					5	5	2	6	3	4	1			2	2	30
PATENTED APPLICATIONS	2		10		4	3	3	3	2				2	1		30
RCA CORPORATION																
PATENTS GRANTED					1		1	1	2	3	1	7	3	6	1	26
PATENTED APPLICATIONS		1	1			2	1	4	2	3	5	5	2			26
TRW INC.																
PATENTS GRANTED					6	6		2		4		1				19
PATENTED APPLICATIONS	1	2	6	3		3	2	1		1						19
HUGHES AIRCRAFT COMPANY																
PATENTS GRANTED					1	1			6	2	3	2	1	1		17
PATENTED APPLICATIONS	1	2			2	3	1	1	3	3	1					17
UNITED STATES OF AMERICA, AIR FORCE																
PATENTS GRANTED						2		1	3	2	1	2	1		2	14
PATENTED APPLICATIONS			2	2		2		2		3	3					14
GENERAL DYNAMICS CORPORATION																
PATENTS GRANTED						1	1		1				3	2	3	11
PATENTED APPLICATIONS	1			1	1							5	1	2		11
GENERAL ELECTRIC COMPANY																
PATENTS GRANTED					6	2		1								9
PATENTED APPLICATIONS	2	4	2	1												9
ROCKWELL INTERNATIONAL CORPORATION																
PATENTS GRANTED					3	1	3								1	8
PATENTED APPLICATIONS	1		4	2									1			8
MARTIN-MARIETTA CORPORATION																
PATENTS GRANTED					3	1	1			1			1		1	8
PATENTED APPLICATIONS	1	2		2			1				1		1			8
WESTINGHOUSE ELECTRIC CORP.																
PATENTS GRANTED					2		3		1				1			7
PATENTED APPLICATIONS	2		2	2								1				7
SOCIETE NATIONALE INDUSTRIELLE AEROSPATIALE																
PATENTS GRANTED									1			1		1	3	6
PATENTED APPLICATIONS								1			1		4			6
BRITISH AIRCRAFT CORPORATION LIMITED																
PATENTS GRANTED						1		2	1	1			1			6
PATENTED APPLICATIONS			1		1		2		1		1					6

	PRE 66	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	TOTAL
TOKYO SHIBAURA ELECTRIC CO., LTD.																
PATENTS GRANTED							2	1	2							5
PATENTED APPLICATIONS				1	1	2	1									5
LTV AEROSPACE CORPORATION																
PATENTS GRANTED							2		1	1						4
PATENTED APPLICATIONS				1	1		2									4
COMMUNICATIONS SATELLITE CORPORATION																
PATENTS GRANTED					1	1		1							1	4
PATENTED APPLICATIONS	1		1	1									1			4
UNITED STATES OF AMERICA, ARMY																
PATENTS GRANTED										2	1				1	4
PATENTED APPLICATIONS			1						2	1						4
MESSERSCHMITT-BOLKOW-BLOHM GMBH																
PATENTS GRANTED							1		1						1	3
PATENTED APPLICATIONS					1		1							1		3
AVCO CORPORATION																
PATENTS GRANTED					1					2						3
PATENTED APPLICATIONS	1					1		1								3
DORNIER SYSTEM GMBH																
PATENTS GRANTED						1		2								3
PATENTED APPLICATIONS			1			2										3
RAYTHEON CORPORATION																
PATENTS GRANTED					1	2										3
PATENTED APPLICATIONS	2		1													3
AKTIEBOLAGET BOFORS																
PATENTS GRANTED						1		1								2
PATENTED APPLICATIONS			1			1										2
SINGER COMPANY																
PATENTS GRANTED											1		1			2
PATENTED APPLICATIONS									1		1					2
BELL TELEPHONE LABORATORIES INCORPORATED																
PATENTS GRANTED						2										2
PATENTED APPLICATIONS		1	1													2
SPERRY RAND CORPORATION																
PATENTS GRANTED									1			1				2
PATENTED APPLICATIONS							1			1						2
BOEING COMPANY																
PATENTS GRANTED							1				1					2
PATENTED APPLICATIONS				1						1						2

APPENDIX III

OTAF SPECIAL REPORT
CLASSIFICATION PROFILE - PATENTS ASSIGNED TO BOEING CO.

CLASS 004 - BATHS, CLOSETS, SINKS AND SPITTOONS

SUBCLASS 300	TOTAL	1	(OR)	1	(	0	PCT OF TOTAL OR	.1	PCT OF ALL (OR+XR)	.1
SUBCLASS 316	TOTAL	2	(OR)	2			PCT OF TOTAL OR	.3	PCT OF ALL (OR+XR)	.3
SUBCLASS 317	TOTAL	1	(OR)	1	(XR)		PCT OF TOTAL OR	.1	PCT OF ALL (OR+XR)	.1
TOTAL CLASS 004	TOTAL	4	(OR)	4	(XR)		OF TOTAL OR	.6	PCT OF ALL (OR+XR)	.6

CLASS 016 - MISCELLANEOUS HARDWARE

SUBCLASS 45	TOTAL	1	(OR)	1	(XR)	0	AL OR	.1	PCT OF ALL (OR+XR)	.1
SUBCLASS 136	TOTAL	1	(OR)	1	(XR)	0		.1	PCT OF ALL (OR+XR)	.1
TOTAL CLASS 016	TOTAL	2	(OR)	2	(XR)	0	PCT O	.3	PCT OF ALL (OR+XR)	.3

CLASS 023 - CHEMISTRY

SUBCLASS 230 PC	TOTAL	1	(OR)	1	(XR)	0	PCT OF TOTAL	.1	PCT OF ALL (OR+XR)	.1
SUBCLASS 230 R	TOTAL	1	(OR)	1	(XR)	0	PCT OF TOTAL OR	.1	PCT OF ALL (OR+XR)	.1
TOTAL CLASS 023	TOTAL	2	(OR)	2	(XR)	0	PCT OF TOTAL OR	.3	PCT OF ALL (OR+XR)	.3

CLASS 024 - BUCKLES, BUTTONS, CLASPS, ETC.

SUBCLASS 68 R	TOTAL	1	(OR)	1	(XR)	0	PCT OF TOTAL OR	.1	PCT OF ALL (OR+XR)	.1
SUBCLASS 122.3	TOTAL	1	(OR)	1	(XR)	0	PCT OF TOTAL OR	.1	PCT OF ALL (OR+XR)	.1
TOTAL CLASS 024	TOTAL	2	(OR)	2	(XR)	0	PCT OF TOTAL OR	.3	PCT OF ALL (OR+XR)	.3

USAF SPECIAL REPORT
CLASSIFICATION PROFILE - PATENTS ASSIGNED TO BOEING CO.

CLASS 239 - FLUID SPRINKLING, SPRAYING AND DIFFUSING										
SUBCLASS 265.29	TOTAL	3	(OR)	3	(XR)	0	PCT OF TOTAL OR	.4	PCT OF ALL (OR+XR)	.4
SUBCLASS 265.37	TOTAL	1	(OR)	1	(XR)	0	PCT OF TOTAL OR	.1	PCT OF ALL (OR+XR)	.1
TOTAL CLASS 239	TOTAL	13	(OR)	13	(XR)	0	PCT OF TOTAL OR	1.8	PCT OF ALL (OR+XR)	1.8
CLASS 242 - WINDING AND REELING										
SUBCLASS 158 R	TOTAL	1	(OR)	1	(XR)	0	PCT OF TOTAL OR	.1	PCT OF ALL (OR+XR)	.1
TOTAL CLASS 242	TOTAL	1	(OR)	1	(XR)	0	PCT OF TOTAL OR	.1	PCT OF ALL (OR+XR)	.1
CLASS 244 - AERONAUTICS										
SUBCLASS 1 A	TOTAL	1	(OR)	1	(XR)	0	PCT OF TOTAL OR	.1	PCT OF ALL (OR+XR)	.1
SUBCLASS 3.1	TOTAL	1	(OR)	1	(XR)	0	PCT OF TOTAL OR	.1	PCT OF ALL (OR+XR)	.1
SUBCLASS 3.16	TOTAL	1	(OR)	1	(XR)	0	PCT OF TOTAL OR	.1	PCT OF ALL (OR+XR)	.1
SUBCLASS 7 A	TOTAL	1	(OR)	1	(XR)	0	PCT OF TOTAL OR	.1	PCT OF ALL (OR+XR)	.1
SUBCLASS 7 C	TOTAL	2	(OR)	2	(XR)	0	PCT OF TOTAL OR	.3	PCT OF ALL (OR+XR)	.3
SUBCLASS 12.4	TOTAL	1	(OR)	1	(XR)	0	PCT OF TOTAL OR	.1	PCT OF ALL (OR+XR)	.1
SUBCLASS 12.5	TOTAL	5	(OR)	5	(XR)	0	PCT OF TOTAL OR	.7	PCT OF ALL (OR+XR)	.7
SUBCLASS 15	TOTAL	1	(OR)	1	(XR)	0	PCT OF TOTAL OR	.1	PCT OF ALL (OR+XR)	.1
SUBCLASS 17.11	TOTAL	2	(OR)	2	(XR)	0	PCT OF TOTAL OR	.3	PCT OF ALL (OR+XR)	.3
SUBCLASS 17.13	TOTAL	2	(OR)	2	(XR)	0	PCT OF TOTAL OR	.3	PCT OF ALL (OR+XR)	.3

CLASS 244 - AERONAUTICS

SUBCLASS 137 R	TOTAL	8	(OR)	8	(XR)	0	PCT OF TOTAL OR	1.1	PCT OF ALL (OR+XR)	1.1
SUBCLASS 142	TOTAL	1	(OR)	1	(XR)	0	PCT OF TOTAL OR	.1	PCT OF ALL (OR+XR)	.1
SUBCLASS 175	TOTAL	1	(OR)	1	(XR)	0	PCT OF TOTAL OR	.1	PCT OF ALL (OR+XR)	.1
SUBCLASS 180	TOTAL	4	(OR)	4	(XR)	0	PCT OF TOTAL OR	.6	PCT OF ALL (OR+XR)	.6
SUBCLASS 181	TOTAL	1	(OR)	1	(XR)	0	PCT OF TOTAL OR	.1	PCT OF ALL (OR+XR)	.1
SUBCLASS 182	TOTAL	7	(OR)	7	(XR)	0	PCT OF TOTAL OR	1.0	PCT OF ALL (OR+XR)	1.0
SUBCLASS 183	TOTAL	3	(OR)	3	(XR)	0	PCT OF TOTAL OR	.4	PCT OF ALL (OR+XR)	.4
SUBCLASS 184	TOTAL	2	(OR)	2	(XR)	0	PCT OF TOTAL OR	.3	PCT OF ALL (OR+XR)	.3
SUBCLASS 186	TOTAL	5	(OR)	5	(XR)	0	PCT OF TOTAL OR	.7	PCT OF ALL (OR+XR)	.7
SUBCLASS 187	TOTAL	1	(OR)	1	(XR)	0	PCT OF TOTAL OR	.1	PCT OF ALL (OR+XR)	.1
SUBCLASS 191	TOTAL	1	(OR)	1	(XR)	0	PCT OF TOTAL OR	.1	PCT OF ALL (OR+XR)	.1
SUBCLASS 199	TOTAL	1	(OR)	1	(XR)	0	PCT OF TOTAL OR	.1	PCT OF ALL (OR+XR)	.1
SUBCLASS 207	TOTAL	7	(OR)	7	(XR)	0	PCT OF TOTAL OR	1.0	PCT OF ALL (OR+XR)	1.0
SUBCLASS 210	TOTAL	4	(OR)	4	(XR)	0	PCT OF TOTAL OR	.6	PCT OF ALL (OR+XR)	.6
SUBCLASS 212	TOTAL	1	(OR)	1	(XR)	0	PCT OF TOTAL OR	.1	PCT OF ALL (OR+XR)	.1
SUBCLASS 213	TOTAL	1	(OR)	1	(XR)	0	PCT OF TOTAL OR	.1	PCT OF ALL (OR+XR)	.1
SUBCLASS 214	TOTAL	8	(OR)	8	(XR)	0	PCT OF TOTAL OR	1.1	PCT OF ALL (OR+XR)	1.1

OTAF SPECIAL REPORT
CLASSIFICATION PROFILE - PATENTS ASSIGNED TO BOEING CO.

CLASS 280 - LAND VEHICLE									
SUBCLASS 43.23	TOTAL	1	(OR)	1	(XR)	0	PCT OF TOTAL OR	.1	PCT OF ALL (OR+XR) .1
SUBCLASS 166	TOTAL	1	(OR)	1	(XR)	0	PCT OF TOTAL OR	.1	PCT OF ALL (OR+XR) .1
TOTAL CLASS 280	TOTAL	3	(OR)	3	(XR)	0	PCT OF TOTAL OR	.4	PCT OF ALL (OR+XR) .4
CLASS 285 - PIPE JOINTS OR COUPLINGS									
SUBCLASS 334.5	TOTAL	1	(OR)	1	(XR)	0	PCT OF TOTAL OR	.1	PCT OF ALL (OR+XR) .1
SUBCLASS 341	TOTAL	1	(OR)	1	(XR)	0	PCT OF TOTAL OR	.1	PCT OF ALL (OR+XR) .1
SUBCLASS 343	TOTAL	1	(OR)	1	(XR)	0	PCT OF TOTAL OR	.1	PCT OF ALL (OR+XR) .1
SUBCLASS 382.2	TOTAL	1	(OR)	1	(XR)	0	PCT OF TOTAL OR	.1	PCT OF ALL (OR+XR) .1
SUBCLASS 382.4	TOTAL	1	(OR)	1	(XR)	0	PCT OF TOTAL OR	.1	PCT OF ALL (OR+XR) .1
TOTAL CLASS 285	TOTAL	5	(OR)	5	(XR)	0	PCT OF TOTAL OR	.7	PCT OF ALL (OR+XR) .7
CLASS 292 - CLOSURE FASTENERS									
SUBCLASS 341.19	TOTAL	1	(OR)	1	(XR)	0	PCT OF TOTAL OR	.1	PCT OF ALL (OR+XR) .1
TOTAL CLASS 292	TOTAL	1	(OR)	1	(XR)	0	PCT OF TOTAL OR	.1	PCT OF ALL (OR+XR) .1
CLASS 294 - HANDLING, HAND AND HOIST-LING IMPLEMENTS									
SUBCLASS 81 R	TOTAL	1	(OR)	1	(XR)	0	PCT OF TOTAL OR	.1	PCT OF ALL (OR+XR) .1
TOTAL CLASS 294	TOTAL	1	(OR)	1	(XR)	0	PCT OF TOTAL OR	.1	PCT OF ALL (OR+XR) .1
CLASS 297 - CHAIRS AND SEATS									
SUBCLASS 157	TOTAL	1	(OR)	1	(XR)	0	PCT OF TOTAL OR	.1	PCT OF ALL (OR+XR) .1

TECHNOLOGY TRANSFER: LICENSING GOVERNMENT INVENTIONS TO INDUSTRY

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U.S.A.

Invention technology constitutes a sizeable portion of the science and technology base in the United States. But invention technology in the public domain is underutilized. Only a small fraction of government inventions are licensed by industry. The reason for this state of affairs traces to the evolution of government patent policy in the United States. To stimulate greater utilization and licensing of government inventions, government agencies are becoming more disposed towards granting exclusive licenses under certain conditions. In order to develop better insight into government efforts to promote private-sector licensing of government inventions, the licensing activities of the Department of the Navy and the National Technical Information Service are highlighted. More licensing of government inventions by industry expedites the flow of technology from the public to private sector. And, close cooperation between the licensing and technology transfer communities is desired to help accelerate the rate of government inventions licensing and to improve the chances for technology transfer success.

Invention technology embodied in government-held patents constitute an underutilized resource in the United States. Government patents are the tangible, inventive output arising from the billions of dollars invested by the Federal Government in research and development (R&D). As such they represent a significant subset of technological resources in the public domain. Yet this resource is virtually ignored by U.S. industry despite slowing national investments in R&D. The transfer of government invention technology towards fuller commercial and industrial exploitation would help compensate for slower real growth in industrial R&D investments by drawing on the results of past federal investments in R&D.

The low utilization by industry of government-owned patents traces back to government policies developed over the years mainly concerning (1) assignment of title in the case of government-sponsored R&D performed by industrial contractors, and (2) questions of exclusivity in licensing of government patents. Patent policies evidently provide inadequate incentives to spur commercialization of government invention technology. Much of the difficulties arises from the absence of an overall national patent policy which has contributed to nonuniform interpretation and implementation of patent authority granted under the U.S. Constitution. Considerable attention is being given to determining the needed policy changes in attempting to encourage greater private-sector utilization of invention technology residing in the public domain.

At the same time that government patent policy deliberations are being pursued, there is increasing effort to promote the licensing of government-owned patents within the framework of existing patent policies. Because patent policies differ with the different federal mission agencies, examinations of current licensing policies and practices are best performed on an agency by agency basis. Attention therefore will be focused on the patent licensing activities of the Department of the Navy and the National Technical Information Service (NTIS) of the Department of Commerce. The Navy Department is the most active of the military services in patenting activity. The Department of Defense in turn is the most active among the federal mission agencies in patenting inventions arising from agency R&D programs. Although NTIS is primarily a technical information service and conducts no R&D, it nevertheless is heavily engaged in licensing and promotion activities on patents that other federal mission agencies have assigned to NTIS for this purpose. NTIS therefore serves as the licensing promotion arm for many federal agencies. Additionally, NTIS pursues an active foreign filing program where foreign patent protection is obtained for selected government-held patents.

This presentation will therefore briefly outline government patent policies and recent developments aimed at providing stronger incentives to attract more licensing of government inventions. We shall also focus on Navy and NTIS licensing activities and the recent progress reported from their efforts. Finally, we shall see that there are compelling reasons why a close working cooperation between the licensing and technology transfer communities is highly desirable.

DEVELOPMENTS IN GOVERNMENT PATENT POLICY

The U.S. Constitution empowers Congress to "promote the progress of science and useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries". Thus, the patent system is intended to

provide the incentive of legal protection to an inventor in order to encourage public disclosure of his invention to speed technological progress and the invention's adoption in commerce. In return for full public disclosure, the inventor receives a 17-year exclusive right to develop, use and sell his invention. But over the years Congress has acted in a fragmented, inconsistent fashion. As a result numerous policies have evolved that differ from agency to agency dealing with rights of the government and the inventor in cases where inventions are made as a result of federally-sponsored R&D. Furthermore, in those federal agencies where their statutory authority governing patent rights are unclear, they must rely on interpretations of the Presidential Memorandum on Government Patent Policy issued by President Kennedy in 1963 and subsequently revised by President Nixon in 1971. This has consequently led to nonuniform interpretations and determinations of inventor rights depending on the particular federal agency concerned. Nonuniformity of federal patent policies also extends to the domain of privately developed inventions and patents. Consequently, federal patent policy inconsistencies and issues pertaining to the equitable distribution of invention rights that would best serve the public interest act more as disincentives to inventors and is therefore contradictory to the original intent of the constitutional authority granted Congress.

A major issue since federal patent policy was first enunciated in 1943 has been whether title to inventions resulting from government-sponsored R&D should reside with the government or the inventor-contractor with government acquiring a royalty-free, nonexclusive license. Proponents for government title retention argue that because the invention was made with public funds, it should therefore remain in the public domain. Opponents on the other hand contend that government patent ownership defeats the original intent of patent policy which is to promote full disclosure and rapid utilization in the public interest. A government patent freely available to all offers no protection to the potential licensee who may have to devote large sums of money and considerable effort to commercialize the invention. It is argued that only when the title remains with the inventor-contractor with government retaining royalty-free, nonexclusive license will the necessary incentive exist for the contractor to pursue commercial exploitation of the invention.

The government over the years has by no means been of one mind on the title issue. While early government pronouncements provided for government retention of title, often referred to as the "title policy" concept, various federal agencies registered opposition to the policy and instead supported a "license policy" where government retains royalty-free, nonexclusive license and title remains with the contractor. This coupled with the notably different missions and statutory responsibilities of the various departments and agencies has contributed to the nonuniform patent policies presently in force. Although the title policy was in early favor with most agencies, the current trend is towards a more flexible government posture which embraces both title-policy and license-policy concepts.[1]

The Presidential Memorandum of 1963 as revised in 1971 enlarged the authority of agency heads to waive the government's title to inventions in favor of the contractor and to permit exclusive licensing of government patents. Exclusive licensing is permitted when, after publication for at least 6 months, use of the invention has not been achieved under a nonexclusive license. The public is protected by strong "march-in" rights under which the government may require licensing of the invention to a third party if it is deemed in the public interest or if the contractor has not made sufficient progress in commercializing the invention. The increased flexibility embracing the license-policy concept reflects the growing recognition that commercialization of inventions is more likely to occur when title resides with the contractor rather than with the government. This view has become more prominent amid mounting evidence that the government's title policy has not provided a sufficiently strong incentive for a respectable level of inventive activity stemming from government R&D sponsorship, nor has it served to encourage private-sector licensing of government-owned patents.

Though the government supports roughly half of all R&D in the United States, private-sector patents outnumber patents derived from government-supported R&D by a factor of better than 20 to 1. In addition, despite the fact that about two-thirds of government R&D is contracted to the private sector, contractor inventors account for only about 40 percent of government patent applications.[2] And, less than 5 percent of the government patents are licensed by industry. This low licensing rate is illustrated in Figure 1 for the 1963-1975 fiscal years. In 1978, the Industrial Research Institute, whose member companies perform some 84 percent of the industrially-funded research in the United States, conducted a survey of its members concerning sources of technology licensed into the company.[3] Whereas some 81 percent of respondents licensed technology from outside the United States, only 20 percent of the respondents licensed technology from the U.S. Government. The results, shown in Table 1, further indicate that government inventions are not widely exploited in the private sector.

Although many factors contribute to the low patenting activity from government R&D and the low licensing rate of government patents, a major factor undoubtedly is the small incentive provided by the government's title policy. As a result business and industry prefer to use their own resources in performing significant R&D that may lead to important inventions rather than rely on the vagaries of government R&D sponsorship and patent policies.

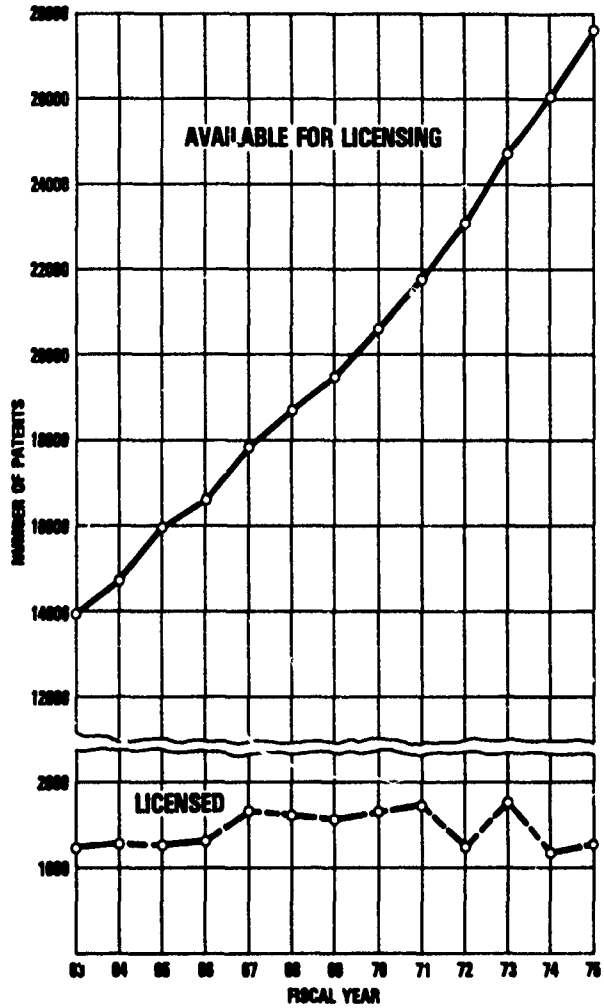

Figure 1. Government-owned Unexpired U.S. Patents Available for Licensing, and Number Licensed, at End of Fiscal Years 1963-75[2]

Sources of Outside Technology	Percent of Respondents
Foreign Countries	81
Private Individuals	80
Universities	40
U. S. Government	20

Table 1 Industrial Research Institute Survey Results[3]

Another circumstance that detracts from the desirability of government owned patents is the laxity of most federal agencies in obtaining foreign patent protection. With the exception of the Department of Defense, Department of Health/Education and Welfare, National Aeronautics and Space Administration, and the old Atomic Energy Commission, federal agencies have generally ignored the foreign commercial potential of their inventions which by nature should be readily suited to commercial applications (see Table 4). As a result foreign manufacturers are able to use U.S. patented technology abroad without paying royalties. Equally serious, domestic licensees of government patents are not provided with foreign patent protection which would be important if they wished

to exploit the government invention overseas. Generally, the federal government has 6 months after the U.S. filing to exercise its option to file patents in foreign countries on government-owned inventions. If the six-month period lapses without action by the government, foreign patent rights revert to the inventor. However, most foreign countries bar patent filings if the invention has been previously published, unless the U.S. patent application predates the publication in which case foreign filing can be made within one year of the U.S. filing date. Therefore, in order to preserve foreign filing rights, government inventors should see that the U.S. patent application predates any publication of their invention.

To provide stronger foreign patent protection for government inventions, the Secretary of Commerce in 1950 was granted authority by executive mandate to receive custody of foreign rights to government inventions from other federal agencies, to seek foreign patent protection and to license these inventions. Subsequently, as detailed later, the National Technical Information Service of the Department of Commerce has pursued an active foreign-filing program in order to provide foreign protection for U.S. licensees of government inventions and to obtain a return for the federal government on U.S. inventions used abroad.

Privately developed inventions and patents are also subject to various federal patent policies particularly when they are "background patents", that is, private-sector patents that form the basis for subsequent inventions made under government contracts. Although the policies of the federal agencies differ in this respect, many agencies and departments require the compulsory or mandatory licensing of background patents insofar as such licensing is necessary to carry out the government contract work. Not surprisingly, this mandatory licensing aspect is a serious concern to companies and serves as a disincentive to competition and private investment in R&D. Generally, however, the federal agencies have acted in good faith in recognizing the rights of the owner, requiring mandatory licensing only when in the public interest, and providing just compensation to the patent holder.

The situation with respect to the rights of government employee-inventors is decidedly less sanguine. Aside from professional pride and peer recognition, there is no tangible inducement for government employees to invent. In most cases the government retains the rights to the employee's invention. The only monetary award consists of $50 for filing a patent application and $100 for the patent award--hardly what one might consider a strong inducement to invent. Of course, foreign rights to the invention belong to the employee-inventor if the governments chooses not to exercise its option to file foreign patent applications within 6 months after the U.S. patent application is filed. However, in most cases the heavy filing fees in foreign countries act as a major deterrent to the employee-inventor who might otherwise pursue foreign filing on his own. Hence, there is very little incentive for the government employee to invent.

The situation in private industry is not much better. Generally, the employee as a condition of employment signs a release with the company conveying all rights to any job-related inventions to the company. Some companies go even further and require rights to inventions that are not job related. The amount of compensation awarded the employee for this invention varies by company. But in many cases the employee receives no compensation, or at most a nominal amount not related to the value of his invention.

In comparison with other countries, the United States is considered one of the more restrictive in relation to rights of the employee-inventor.[4] In many of the major industrial nations--Federal Republic of Germany, Japan, United Kingdom, and the Soviet Union--just compensation to the employee for his invention is common practice. In Germany, for example, the employee-inventor is entitled to compensation figured as a small percentage of product sales generated as a result of the invention.[5] Compensation for the employee-inventor that is commensurate with the value of his invention is important to provide adequate incentive for the employee-inventor to continue his creative pursuits. The more appealing compensation system in foreign countries may well be the reason for the rising foreign inventive activity as measured by the share of U.S. patents granted foreign citizens.[6,7] As illustrated in Figure 2, the share of the U.S patents awarded to foreign inventors has risen from 18 to 36 percent between 1963-1977.

Other patent issues exist such as reconciling with antitrust laws the limited monopoly conveyed by patents, and strengthening the patent search process[8] inasmuch as an estimated 80 percent of patents challenged in federal courts have been ruled invalid.[9] Efforts have been underway for several years to address these issues and to establish a uniform federal patent policy relating to inventions resulting from government-sponsored work. Provisions of a possible new federal patent policy would include the allocation of rights to inventions resulting from government programs, protection of these rights through patent filings in the United States and abroad, and licensing and commercialization of the invention technology. The trend is toward the license-policy concept provided there is strong intent to pursue commercial exploitation by the contractor, but the federal government would reserve strong march-in rights to protect the public interest if deemed necessary. Indicative of this trend is the Senate bill, "The University and Small Business Patent Procedures Act", which would allow universities, nonprofit organizations and small businesses to gain patent protection and marketing rights to inventions made under federal sponsorship, provided the necessary resources are expended to commercialize the inventions.[10] This bill has strong support in both the Congress and the White House.

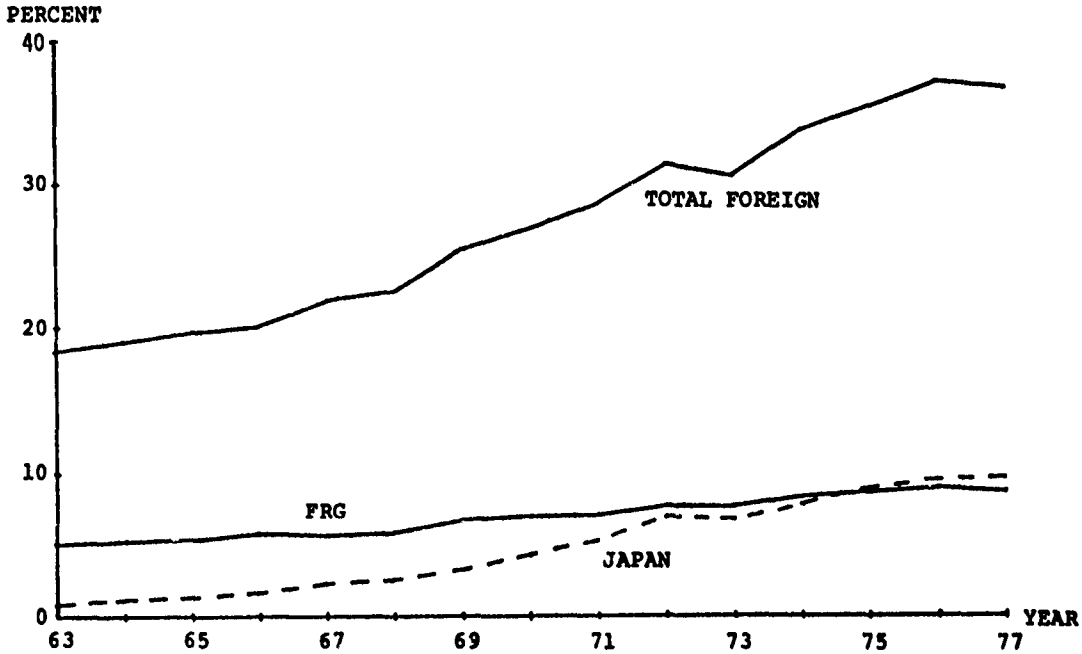

Figure 2. U.S. Patents Granted to Foreign Inventors

The government-wide General Service Administration licensing regulations issued in 1973 to implement President Nixon's 1971 directives on patent policy was intended to develop greater uniformity among federal agencies in promoting commercial use of government inventions. The regulations authorize limited exclusive licensing where there are no nonexclusive licensees, and they also permit licensing of government inventions when patent applications are still pending. The main thrust is to develop greater use of government inventions at the earliest date. Yet, licensing efforts among the different government agencies are decidedly dissimilar. In terms of patenting activity, more than 99 percent of government patents originate in the agencies shown in Table 2.[11] The number of unexpired patents available by agency and the number licensed as of the FY76 year end are also shown.[2]

Agency	No. Patents	Licensed
Department of the Navy	9521	81*
Department of the Army	5551	167
Department of Energy (ERDA)	4114	456
National Aeronautics and Space Administration	3056*	123
Department of the Air Force	2560	34
Department of Agriculture	1780	174
Department of Interior	675	90
Department of Health, Education and Welfare	325	75*
Department of Commerce	183	27
Tennessee Valley Authority	107	25
Department of Transportation	65	0
Environmental Protection Agency	42	0

*Includes patent applications

Table 2 Patenting and Licensing Activity of Federal Agencies Through FY 76

The Navy has the largest patent portfolio, while the Tennessee Valley Authority as of year-end FY76 has managed to license the largest share of its patents. But in order to obtain a better idea of government licensing activities, it is necessary to focus on specific agencies. For this reason, the licensing activities of the Department of the Navy and the National Technical Information Service (NTIS) of the Department of

Commerce will be considered in greater depth. Although the NTIS is not listed in Table 2, its activities are of interest because it engages in inventions licensing for a number of other government agencies.

NAVY LICENSING PROGRAM

The Navy licensing program was started in 1976 to implement government-wide licensing regulations issued by the General Services Administration (GSA) in 1973. The basic purpose of the program is to encourage the practical use of Navy inventions at the earliest possible time. Whereas previously the Navy policy was to grant licenses on a nonexclusive, revocable, royalty-free and nontransferable basis, limited exclusive royalty-bearing licenses are now authorized under certain conditions in line with the GSA regulations. The Office of Naval Research has prime responsibility for the licensing program. The program is being conducted in full cooperation with the Navy's technology transfer program, which is aimed at promoting the transfer of Navy technology to the civilian sector. In this respect Navy inventions are seen as a significant subset of the Navy's total science-technology base.

The Department of the Navy produces the most patents of all the federal agencies. Its active portfolio of patents number roughly 10,000, which accounts for about half of all patents within the Defense Department and more than a third of all patents held by the U.S. Government. Yet despite this large store of patented inventions, the pace of licensing activity has been slow. Typically, less than 1 percent of the patent portfolio is licensed annually. Moreover, only 109 nonexclusive, royalty-free licenses have been granted prior to 1975. Several reasons have been suggested for this low licensing rate:[12]

- A misconception persists in many that military technologies are not readily adaptable to civilian applications. But in reality most technologies underlying military weapon systems and equipment have nonmilitary applications. It has been estimated that better than 80 percent of the Navy patent portfolio falls into this dual-use category.

- There is a lack of knowledge by the general public about the availability of government invention technology for licensing. Even if potential users are aware of available Navy technology for licensing, they may not know how to gain access to the technology. Therefore information on availability and accessibility needs to be emphasized.

- The process of commercializing government-owned technology is generally a risky proposition that requires private investment capital that has not been freely available in recent years. Typically, the risk capital that is required for bringing a particular technology item to the commercial market is many times higher than the cost of developing the technology in the first place. Therefore, it is not surprising that considerations of financial risk often outweigh those relating to technical risk.

Effective licensing promotion therefore requires developing a strong public information program directed at dispelling the misconception concerning civilian applicability of military technology as well as informing the public about the availability and accessibility of Navy invention technology. In addition, greater incentives are needed to help overcome the high financial risks inherent in the technology commercialization process. In effect, these incentives are needed to develop increased demand in the private sector for publicly-held invention technology.

Greater incentives for licensing as a policy issue is being addressed at the highest levels of government. The movement towards the license-policy concept and greater disposition by the government to grant exclusive licenses are intended to provide the added incentives needed to stimulate industrial demand for government invention technology. Navy implementation of the GSA regulations therefore is consistent with government-wide efforts at strengthening incentives for licensing. Efforts to implement policy by making the vast store of government inventions more easily available and accessible to potential licensees is appropriately pursued at the mission-agency level. To this end the Navy licensing program has been closely linked with the Navy technology transfer program which has the mission of developing greater utilization of Navy technology in the civilian sector. Consequently, close cooperation has been established in these areas between the Office of Naval Research (ONR) which is responsible for Navy licensing activities, and the Naval Material Command (NMC), which has prime responsibility for the technology transfer program.

Of significance is the fact that both Navy organizations have a number of field personnel located throughout the United States. Navy patent field offices are organized into 13 Naval districts spanning the United States. A Navy patent counsel is also located at the ONR Branch Office in London. Among the duties of the field representatives is to promote and assist in the licensing of Navy inventions. Similarly, there are some 60 Navy technology transfer agents at field activities throughout the United States. Their responsibilities in technology transfer are to make Navy technology more accessible to potential users as well as to maintain an informal information network to facilitate person-to-person communications. What both groups of field personnel share in common, of course, is the establishment of direct contact with their respective constituency --inventors and potential licensees on the one hand, and potential users of Navy technology on the other.

Several methods are employed to promote the licensing of Navy inventions. Unclassified Navy inventions covered either by a U.S. patent or patent application are published in the Federal Register, and the Official Gazette of the U.S. Patent and Trademark Office. Additionally, Navy inventions are listed in the NTIS publications. In addition to these publications, the Navy also prepares and prints monthly the Navy Technical Disclosure Bulletin. This publication describes Navy inventions that are unpatented but yet are considered to have good promise for commercial or governmental exploitation. The document is distributed widely to domestic and foreign patent offices, American industry, major libraries, universities and government agencies at the federal, state and local levels.

Selected Navy inventions are also included in the Navy Technology Transfer Fact Sheet, a monthly publication put out by the Naval Material Command to highlight Navy technologies considered to have particularly high commercial potential. Each issue of this publication typically contains 6-8 different items of promising Navy technological developments that are concisely summarized in semi-technical language in order to be easily understandable to the layman. Photos or drawings of the items normally are included to facilitate reader comprehension. A reader reply card furnished with each issue allows the reader to request additional information on any particular item of interest. Additional documentation provided typically include more detailed technical reports and information releases. In the case of inventions, the supporting documentation could be a copy of the invention disclosure or the patent itself. The items in the Fact Sheet is mailed to over 3,000 individuals and organizations in both the public and private sectors.

Information on Navy inventions therefore is found in a number of publications. But reliance on publications for information dissemination represents only a passive approach. The wide distribution of printed matter is not necessarily an effective medium to stimulate individual awareness. A more active approach is generally desired to complement the distribution of printed material. Active person-to-person contact is widely considered to be the most effective medium for interpersonal communication. Though limited in scope, personal interaction nevertheless produces an impressionable stimulation of an individual's sensory perception. Person-to-person contact is also widely viewed to be indispensable to effective technology transfer. Much of the effort by the Navy technology transfer focal points at the field activities in fact have been directed towards personal interaction with technical personnel in the Navy R&D community as well as with potential technology users in the civilian community. Ascertaining technological needs of the civilian sector has been particulary stressed inasmuch as needs-oriented technology transfer appears to have a higher chance of achieving success than does recognition of technological opportunity.[13] In this context it is better to have identification of user needs trigger a search for the appropriate technology than it is to pursue a "technological solution looking for a problem".

Increased exposure of the civilian community to Navy technology nevertheless is desirable to help focus the attention of potential users on promising technologies. Navy participation in exhibits and seminars is designed to accomplish this purpose. Selected Navy inventions have been displayed at international exhibitions such as the World Fair for Technology Exchange, organized yearly by Dvorkovitz and Associates. Normally, 9 to 12 inventions are included in each exhibit, and Navy personnel are on hand to discuss with prospective licensees the details of each invention or to provide information on how to get more detailed information. Seminars are also employed to highlight Navy inventions. Seminars could also involve exhibits as well as presentations given normally by the Navy inventor to brief interested parties about his invention. A seminar could be organized for a single, particularly important invention, or it could involve several inventions in a specific field or industrial area. An outstanding example is the 1974 seminar organized by NTIS in cooperation with the Navy, highlighting the Navy's anti-fouling paint invention. The marine paint was developed by the Navy in 1971 to keep barnacles and other marine organisms off ship hulls. Obviously, this technology item has application to civilian as well as military watercraft. Over 100 representatives from the chemical, paint and marine supply industries attended the seminar. Many data packages on the paint were sold to participants, and to date 24 licenses have been granted as a result.

Although the Navy licensing program and revised directives authorizing the granting of limited exclusive licenses have been in effect only since 1976, it is not too early to attempt to discuss their impact on the licensing rate. Table 3 summarizes the results of the Navy licensing program for fiscal years 1978 and 1979. Two observations are immediately obvious. Despite increased emphasis on licensing promotion, the number of licensing inquiries dropped by about 25 percent. Yet it must be noted that the number of licensing inquiries in FY79 is still high compared to the 28 inquiries received in FY75. The other observation is that, despite the smaller number of inquiries in FY79 compared to FY78, the number of exclusive licenses applied for, and granted, has increased markedly. Some of the Navy inventions for which limited exclusive licenses were granted are 1) a portable constant-current power pack to aid bone healing, 2) an electromagnetic flowmeter, 3) an optical slip-ring arrangement, and 4) a low-flow gas or liquid calibrator. It should also be noted that no exclusive license had been granted by the Navy through FY76.

	FY78	FY79
Licensing Inquiries	85	63
Applications for Nonexclusive License	10	10
Nonexclusive Licenses Granted	8	9
Applications for Exclusive License	6	9
Exclusive Licensees Selected	3	4
Exclusive Licenses Granted	1	5
Requests for Technology	50	61

Table 3 Navy Licensing Summary, FY78 and FY79

The increase in exclusive licensing tends to substantiate that license exclusivity does offer a powerful incentive to potential licensees. Although the data for the two fiscal years is insufficient to provide definitive conclusions, there nevertheless appears to be substantially higher interest in exclusive licensing. At the same time the rate for nonexclusive licensing has remained stable. It can therefore be inferred that recent Navy efforts to promote licensing have produced added licensing activity mainly involving exclusive licenses. That is, parties encouraged to seek Navy licenses as a result of Navy licensing promotion have invariably sought limited exclusive licenses as opposed to nonexclusive licenses. Verification of this inference, however, will require more time to accumulate a sufficiently large data base, especially when it is realized that the time-span between initiation of a licensing inquiry and the granting of a license often exceeds a year's time. As an indication of the time-span involved, FY79 was the first year in which the Navy received a royalty payment as a result of the Navy licensing program which started in 1976.

In the past the Navy has generally ignored the foreign commercial potential of its invention technology. Foreign patents held by the Navy generally were filed by foreign governments in return for a nonexclusive license.[2] Patent applications filed by the Navy were traditionally confined to the United States. As a result foreign manufacturers have been able to exploit U.S. patented inventions abroad without obligation. In FY77, however, the Naval Material Command and the Office of Naval Research jointly initiated a modest experimental program to file patent applications in foreign countries on selected Navy inventions considered to possess high commercial potential. Funded by NMC and carried out by ONR, the program aims to protect Navy invention technology by generating royalty returns from Navy inventions practiced abroad, and at the same time enhance the licensing attraction of Navy inventions by providing world-wide patent coverage instead of only U.S. coverage. The thesis of course is that by offering Navy inventions with wider patent protection, more companies will be attracted towards licensing Navy inventions.

Because of the large expense associated with filing and maintaining patents in foreign countries, the appraisal and selection process of candidate inventions is quite stringent. In appraising a particular invention, a number of questions are posed to individuals knowledgeable in the appropriate technical field. Some of the questions asked are:

What is the principal advantage of the invention over the prior art?
Who are the potential users?
How large is the foreign market?
Is there a functionally comparable product on the market?
Who would be the potential licensees?
What is the estimated cost to commercialize the invention?
How should royalties be assessed?
Would the projected royalties be sufficient to offset foreign filing fees?
In what countries should patent applications be filed?

The purpose, of course, is to obtain informed opinions from knowledgeable respondents as to whether foreign patent protection is warranted, and if so, where. So far, 4 Navy inventions have been filed in a total of 9 countries. Inventions filed abroad include a multiple polarization switch having communications applications, and a crystal semiconductor device with applications in infrared detection. Licensing activity has not developed as yet, however. The degree of licensing activity generated will undoubtedly have a direct bearing on whether this experimental foreign-filing program will be expanded or curtailed in the future.

NTIS LICENSING PROGRAM

The National Technical Information Service of the Department of Commerce is the federal government's central repository for unclassified technical information developed under government sponsorship. As a technical information service, it does not engage in R&D activities. But NTIS is actively engaged in licensing activities for government inventions produced by other federal agencies and assigned to NTIS for this purpose. The NTIS licensing program provides the following services:

- centralized announcement of government-inventions
- license evaluation and promotion
- foreign patent filings
- government inventor's incentive award system

The program was intended to be eventually self-sustaining financially, in consonance with the NTIS charter. That is, income primarily from licensing royalties are to be used to absorb program costs. Beginning in 1978, however, royalty income has been returned to the U.S. Treasury as required by the Office of Management and Budget, and the licensing program is being supported with appropriated funds.

Government regulations require that titles of government inventions be announced in the Federal Register and the Official Gazette. Approximately 2400 government patents and patent applications are announced in this way annually. Additionally, information on government patents are available in NTIS publications such as the Government Inventions For Licensing and the Tech Notes. Government Inventions for Licensing is a weekly bulletin, a part of the Weekly Government Abstracts series, which provides brief abstracts of government patents and patent applications arranged by subject area. The Tech Notes is a central source of information on new, commercially promising technological developments originating from the different federal agencies. One-sheet semi-technical briefs are used to describe each technological item. Many of these items are government inventions where the information is excerpted from either the patent or patent application.

Although announcement of government inventions in publications is necessary to disseminate information to potential licensees, it is recognized that publications in themselves have limited value as a means of promoting the use of government invention technology. Consequently, NTIS also actively engages in licensing evaluation and promotion of commercially promising inventions for federal agencies that do not operate their own licensing and promotion programs. In addition to the Department of Commerce, NTIS has concluded agreements with the Departments of Agriculture, Interior, Army, Air Force, Health/Education and Welfare, the National Science Foundation, and the Veterans Administration to provide these services.

The inventions undergo a comprehensive evaluation process in order to determine their commercial market potential. NTIS does not rely solely on its own judgement in this regard but engages outside contractors to assist in invention evaluation. In addition, NTIS requests knowledgeable persons in appropriate industry sectors to render opinions on the market potential of specitic inventions. The promising inventions that received high evaluations are identified, and NTIS proceeds to seek foreign filing rights for them. In some cases, domestic rights are also included. After NTIS acquires custody of an invention from the orginating agency and has filed the appropriate patent applications, an active effort to promote licensing of the invention is undertaken. This activity may include participating in international technology exhibitions and organizing invention seminars such as was done in the case of the Navy's antifouling paint. Direct contact is also made with potential licensees in American industry to advise them of the availability for licensing of a government invention that is closely related to their product line or business area.

NTIS initially offers licenses on a nonexclusive, revocable basis in accordance with GSA licensing regulations issued in 1973. If after 6 months no suitable applications for nonexclusive licenses have been received, then exclusive licenses may then be offered. But before an exclusive license can be issued to an applicant a notice of intent to grant an exclusive license must be published in the Federal Register for 60 days. The exclusive license may then be granted if no other applicant appears during the 60-day period. If, however, other companies apply for a license within this time period, then a nonexclusive license may be granted to each applicant.

The duration of a nonexclusive license is negotiable between NTIS and the licensee, and may extend over the life of the patent. Exclusive licenses, however, do not normally extend past 5 years. In exceptional cases where NTIS determines that a longer period is necessary for the licensee to market the invention and to recover costs, an exclusive license may be granted for more than 5 years. In all instances, however, the duration of an exclusive license will be less than the life of the patent.

Similarly, the terms of royalty payments are negotiated between NTIS and the licensee. Typically, a minimum annual payment is agreed upon from the date of license issuance. Additionally, a royalty fee as a percentage of net sales (gross sales less certain taxes, credits and discounts) is established. Royalty payments from net sales are credited towards the minimum annual payment. Royalty fees negotiated for exclusive licenses generally are higher than for nonexclusive licenses. The licensee futhermore is obligated to make semiannual reports to NTIS concerning the progress of net sales and the corresponding royalty payments.

In FY79, NTIS granted 8 royalty-bearing licenses. Of this total, 7 were nonexclusive licenses and one was an exclusive license. The exclusive license was granted for a cancer chemotherapy drug, which will require additional development and testing by the licensee before it can be submitted to the Food and Drug Administration for approval. The small number of licenses concluded is attributed to the lengthy time-span required to progress from the first announcement of a government invention to arriving at a licensing agreement. The negotiation process itself could be quite extensive and time-consuming. Examples of inventions that NTIS expects to reach licensing agreements in the near future are a fiber optic pH probe, a chemotherapy drug, a low pH preparation of starches and flours, and highly absorbent polymeric compositions derived from flour.

Disputes that arise between the licensee and NTIS may be brought before the Appeals Board of the Department of Commence by the licensee. The Appeals Board is the duly appointed agent for the Secretary of Commerce on these matters. Licensing problems between NTIS and the licensee must be appealed to the Board prior to resorting to legal action.

A major part of the NTIS licensing program is to acquire foreign patent protection for government inventions. NTIS has long recognized the need for devoting greater attention to acquiring foreign patent protection. Most federal agencies, however, have generally ignored the foreign commercial potential of inventions made under their sponsorship.[14] Through FY76, only the 5 federal agencies shown in Table 4 had patent applications filed in foreign countries.[2] By far, the Department of Energy has the most patents filed and licensed abroad, whereas the Navy and Army had no foreign licensees as of FY76 despite the fact that substantially all of their foreign patents were filed by the foreign governments. Besides these 5 agencies with foreign patent portfolios, the majority of federal agencies, that is, the civilian nonaerospace agencies whose inventions might generally be expected to be especially suited to commercial applications, did virtually no foreign filing during the period. As a result, foreign manufacturers are able to exploit many government inventions overseas without paying royalties, thereby putting domestic licensees in a decidedly unfavorable competitive position. In many instances, government agencies fail to exercise their 6-month option on foreign filing after the U.S. patent application has been filed on a government invention. In this case foreign patent rights then revert to the government employee who seldom pursues foreign filing because of the high attendant costs. Consequently, many government patents fail in this way to acquire the proper foreign patent protection.

Agency	Inventions	Numbers of Patents	Licensed
Department of the Navy	199	199[a]	0
Department of the Army	18	18[a]	0
Department of Energy (ERDA)	150[b]	2300[b]	688
National Aeronautics and Space Administration	129	648	52[c]
Department of Health, Education and Welfare[c]	31	161	2

[a]Virtually all filed by foreign governments

[b]Estimated

[c]Includes patent applications

Table 4 Foreign Filing and Licensing Activity by Agency as of Year-End FY76

NTIS acted to strengthen the U.S. patent position overseas by establishing a foreign patent filing program in the mid 1970's. Under this program NTIS works with other federal agencies to acquire foreign rights to selected government inventions. Those considered to have strong commercial and technical merit are consequently filed in selected foreign countries. After foreign patents are filed, NTIS then undertakes to license them to American companies desiring to practice the invention abroad or to foreign enterprises in the absence of an American licensee. In this way, valuable foreign markets will be protected for American industry. Additionally, unrestricted and uncompensated use of government invention-technology by foreign companies would generally be prevented. Licenses negotiated by NTIS typically are royalty-bearing. So far, NTIS has filed a total of about 65 government inventions in an average of 6 foreign countries each. In about 25 percent of the cases, domestic rights have also been assigned to NTIS. In these cases, world-wide licenses may therefore be negotiated.

An important factor in preserving the government's foreign filing rights is to avoid premature publication of an inventor's works. Typically, scientists, engineers and inventors seek to publish the results of their work at the earliest date. In the United States, patents may be filed within one year of open publication of an invention. But in most foreign countries, prior publication of an invention before a U.S. patent application is filed may bar the subsequent filing of a foreign patent application. Therefore, in order to preserve the government's foreign filing rights, NTIS must seek to advise government inventors not to disclose publicly their invention until after a U.S. patent application

has been filed. Once the U.S. patent application has been filed, subsequent publication of the invention will not preclude the filing of foreign applications as long as it occurs within one year of the filing date of the U.S. application. In the case of the Navy's antifouling paint, the invention was published in the American Paint Journal 6 months prior to the filing date of the U.S. patent application. As a result, foreign filing rights were lost in all but 2 foreign countries.

Because many federal agencies generally do not pursue foreign patent protection, foreign filing rights on government inventions invariably revert to the employee-inventor. In these cases and for those inventions appraised to have high commercial potential, NTIS in order to receive assignment of foreign rights must therefore contact directly the employee-inventor. Previously, there existed no tangible incentive for the inventor to assign foreign rights to his invention to NTIS, even though the inventor had no intention of acquiring foreign patent protection on his own. But an inventor's incentive award system was recently introduced by NTIS whereby the employee-inventor is entitled to a small percentage of annual royalties generated by his licensed invention. Consequently, the inventor is more disposed to assigning to NTIS the foreign rights to his invention. Furthermore, the NTIS program of assuming the costs for patent application filing and licensing promotion offers an attractive alternative to personal expenditures by the employee-inventor.

The inventor's incentive award system is applicable only to those federal agencies which have concluded agreements with NTIS to participate. Awards may be granted for both domestic and foreign licenses. Under the award system, government employee-inventors whose invention has been licensed on a royalty bearing basis by NTIS is given a minimum award of $300. In addition, under agency-head authority, the inventor is entitled to a percentage (typically 15 percent) of royalties up to a maximum of $5000. Awards in excess of $5000 may be granted upon the approval of higher authority. Hence, the monetary return to the government inventor can be substantial. More importantly, it provides the needed incentive by which government employee-inventors will become more attentive to protecting foreign filing rights on their inventions.

The NTIS licensing program has been in existence barely 5 years. Because of the long lead-time between patent application and flow of royalty-income, it is still too early to assess the real cost-benefits of the program. Costs for sustaining the program are approximately $600,000 annually. Royalty income has not risen to cover program costs as yet. However, with a portfolio of about 65 inventions having been filed abroad, and the expectation that royalties on some of these inventions could reach $1 million annually by the mid-1980's, it is widely anticipated that eventual royalty income will soon more than balance out total program costs to date. Only a few big "winners" are needed to underwrite program costs.

LICENSING FOR TECHNOLOGY TRANSFER

The Navy and NTIS licensing programs by no means span the breadth of government licensing activities. Other agencies such as the National Aeronautics and Space Administration (NASA) and the Department of Energy (DoE) also have sizeable licensing programs. The enabling legislation for both agencies contain special authority to grant exclusive licenses to inventions made under their sponsorship. As a result a number of exclusive licenses have been granted under existing agency authority. NASA patent policy was recently changed to permit the granting of exclusive licenses in a shorter time period --in some cases as early as 9 months after the filing date of the U.S. patent application.[15] This change was enacted in order to accelerate the commercial use of NASA inventions. Although no restrictions exist concerning the size of licensee firms, approximately 90 percent of NASA patent licenses have been awarded to small businesses. DoE grants exclusive licenses when it determines that nonexclusive licenses will not provide the necessary incentive to generate the required risk capital to commercialize an invention. Exclusive licenses granted by DoE have mainly involved inventions covered by foreign patents. Furthermore, patent applications on energy-related inventions are given special attention by the U.S. Patent and Trademark Office in order to speed their processing as a direct consequence of the world energy situation.

Other federal agencies have implemented statutory authority for exclusive licensing. However, their authority for granting exclusive licenses generally predates the GSA regulations of 1973. It is therefore not surprising that licensing policies are generally different among the different federal agencies. This nonuniformity undoubtedly contributes in large part to the low licensing rate of government-owned inventions by industry, and it serves to impede the transfer of government technology to the private sector.

A similar situation is found on the international scene. The nonuniformity in national laws and regulations governing patents and patent licensing constitute significant impediments to the international transfer of technology.[16] It is especially critical in the case of small businesses and individual entrepreneurs where the high costs of international patenting and licensing constitute serious disincentives to technology transfer and innovation. Simply exporting technical data and invention technology in itself encounters many legal restrictions in the United States and elsewhere.[17] In the United States, potential technological export items including technical data undergo close scrutiny by the Departments of Commerce and State, and in many cases the Department of Defense also. The process could involve months of delay before export licenses are granted.

There has been progress made, however, in developing closer international cooperation on patent matters. A case in point is the establishment of the European Patent Office in 1978. Instead of filing patent applications in each country separately, filing patent applications at the European Patent Office in Munich will enable multiple-country coverage from a single patent filing. The first European patents were granted by the European Patent Office in January 1980, and projections are that there will eventually be 30,000 patent applications annually. However, the filing fee is high (~DM 4500), and for this reason the majority of the patent applications are filed by the large multinational corporations.

Additionally, many of the legal restrictions impeding the flow of technical data and technology among NATO member nations have been waived by the United States in the interest of furthering NATO rationalization, standardization and interoperability. Numerous bilateral and multilateral data exchange agreements are in place covering the mutual exchange of technical information on specific technical topics. Bilateral memoranda of understanding are being concluded between the United States and NATO allies intended to facilitate transatlantic cooperation, reciprocal access to national defense markets, and establishment of cooperative development and production projects. Although the scope of these international agreements is much broader than patents and invention technology, they nevertheless provide the basis for a freer flow of invention technology within the NATO Alliance.

A not insignificant factor also is the rapid pace of industrialization taking place in the developing nations of the world. Part of this process involves the transfer of technology from the industrial nations. Among the various modes of technology transfer, licensing has emerged as a popular avenue for the developing nations principally because it affords access to the desired technological know-how at low cost. Licensing technology from the industrial nation also provides a quick and effective method to acquire the needed technology for rapid industrial development without sacrificing national control over the development project. As a result demand for licensed technology is high. Potential licensors furthermore are invariably glad to find licensees for its proprietary assets if for no other reason than to take advantage of an opportunity to generate royalty income. That both industrial and developing nations are willing to enter into licensing agreements presages growing prospects for the international flow of licensed technology.

Licensing therefore offers an attractive avenue for technology transfer both from a national and international perspective in spite of the many diverse national laws and regulations in existence governing the flow of invention technology. Licensable technologies moreover form a sizeable subset of a nation's science and technology base. From both these standpoints, licensing constitutes an important aspect of technology transfer.

Increased licensing of government inventions by industry accelerates the transfer of government technology to the private sector. The trend in government patent policy in the United States is towards developing greater incentives to make licensing of government inventions more attractive to industry. But the public informational and promotional aspects of licensing must not be neglected to inform potential licensees and to make licensable technologies more accessible to them. In this respect close cooperation with the technology transfer community is desired inasmuch as much of the government's technology transfer activities is in promoting the use of government technologies in the private sector. In addition, technology transfer agents also seek out user problems or needs and attempts to match them with available technologies. Consequently, they are to some extent knowledgeable about the "market" for licensable technologies. Hence, a high degree of cooperation should necessarily be maintained between the licensing and the technology transfer communities.

The close relationship between invention licensing and technology transfer is evidenced by the cooperation between the Naval Material Command and the Office of Naval Research in connection with the Navy licensing program. The NMC is responsible for Navy technology transfer, whereas the ONR has responsibility for Navy patents and licensing activities. Numerous cooperative projects in technology transfer have been conducted between the two organizations. But in addition to organizational cooperation, there must also be close interaction between technology transfer agents and licensing personnel in order to increase the likelihood that a successful problem-solution match can be achieved. That is, technology transfer representatives generally encounter problems that are seeking solutions, while their licensing counterparts are typically faced with invented solutions seeking a market. Continuing close interaction between the two groups therefore should help increase licensing activity and at the same time enhance the chances that successful problem-solution matches can be found--which is the essence of successful technology transfer.

The NTIS has also recognized the need to integrate licensing activities with technology transfer. As part of this effort NTIS attempted to determine how its principal function of technical information dissemination might be complemented with an active technology transfer effort. To assist in this effort, a Navy technology transfer officer was temporarily assigned to NTIS in 1976 from the Naval Surface Weapons Center, Silver Spring, Maryland. A major result was the development of a conceptual plan for a more active technology transfer role for NTIS aimed at expediting the flow of technology from government sources to the private sector, especially the small business sector. NTIS, in cooperation with the Economic Development Administration (EDA) of the Department of Commerce, attempted to link problems and needs of the private sector, focusing on small and medium-sized

firms, with technological resources in the federal R&D centers. The plan builds upon the EDA university-center program, an EDA-sponsored outreach activity by state universities to provide technical assistance to companies in their respective regions.

Figure 3 illustrates the basic concept. Private-sector problems and needs (solid lines) are referred to NTIS and the EDA university centers. The federal R&D centers and laboratories provide the necessary technical support for many of the technical problems identified. Answers or solutions transmitted in response to user requests are shown by the dashed lines. In general, technological assistance and information products are supplied by the federal labs and NTIS respectively, while a broader range of management, market and technical assistance is provided by the university centers. The plan therefore combines the "passive" NTIS data banks with the "active" person-to-person efforts of the university-center staffs and the technology transfer focal points in the federal laboratories. Furthermore, as part of this effort, NTIS started a personal referral service whereby telephoned inquiries from potential users or university-center personnel seeking federal expertise on specific problems or needs may be referred to appropriate sources in the federal government.

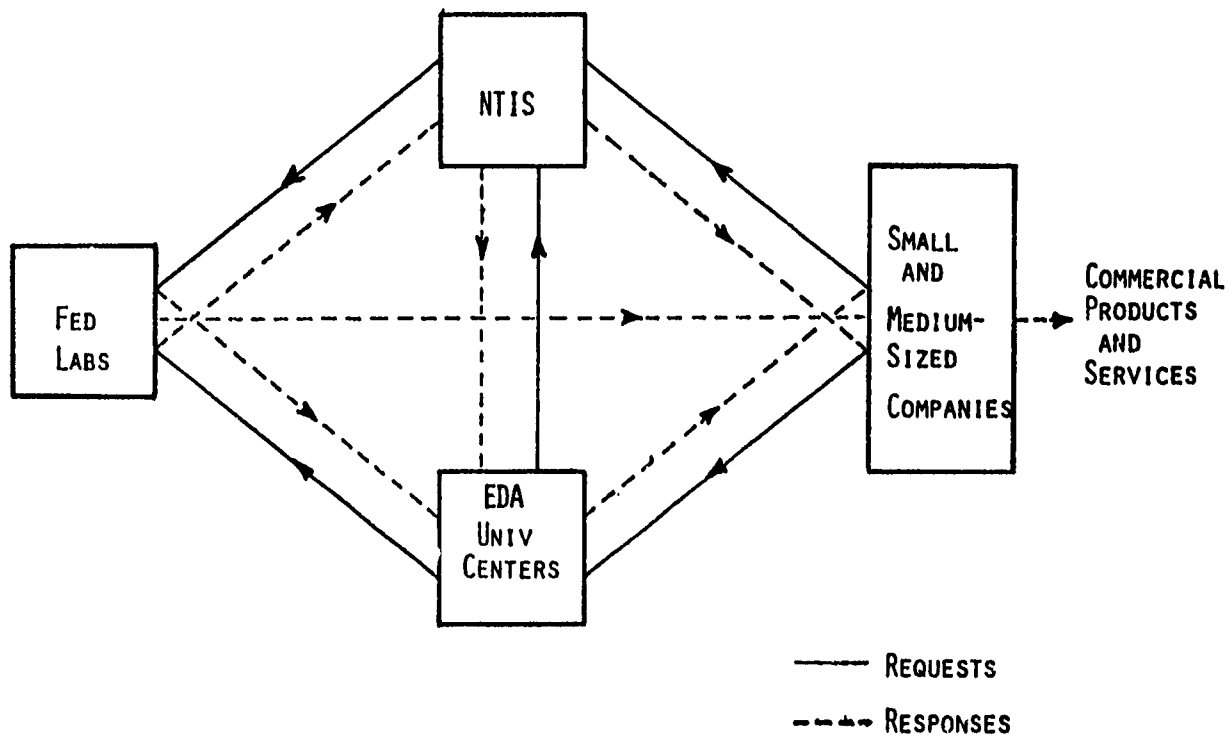

Figure 3. Major Informational Flow Lines for Expanded University-Center Operation

The plan was subsequently tested during 1977-1978 in the southeastern part of the United States.[18] The demonstration project involved 8 state universities and 6 federal laboratories. Lessons learned from the demonstration project are being weighed for possible expansion into a nationwide network. In this way NTIS in a modest demonstration project was able to test out a more active technology transfer role for itself. Although the effort was not restricted to licensed technology, it is significant that the personal referral service initiated by NTIS was collaterally assigned to the staff member responsible for the NTIS licensing program.

Generally, in the federal agencies and R&D centers, licensing and technology transfer are separate and distinct functions. Although it is not necessary nor perhaps desirable for the two functions to be merged, there nevertheless is good reason why close working relationships should be established between staff personnel working in the two fields. Close cooperation between the licensing and technology transfer communities facilitates the technical data exchange necessary for the identification of potential problem-solution matches. Thus, inventions available for licensing might be more likely matched against "market" needs identified by the technology transfer personnel. In this way a closer working interaction among licensing and technology transfer personnel promises to improve measurably the chances for technology transfer success and at the same time can lead to a higher utilization of government-owned invention technology.

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Library Networks in Western Europe and North America

A comparison of the availability of patent documentation centres

M W Hill

In most, if not all, the member countries of NATO, the national Patent Office is the most obvious place to go to when wishing to use patent documents for information purposes. In the Search Room, or the Library, or in a combination of the two - arrangements vary from one country to another - facilities are provided for members of the public (meaning anyone other than a Patent Office Official) to conduct searches for themselves. In several countries, however, there are also in some major towns and cities libraries which hold collections of patent literature and which also are open to anyone who cares to use them.

Only in France and Germany do any of these libraries belong to the Patent Office and even in those countries the majority do not. Nevertheless, there are usually links with the Patent Office - it is normally at least the supplier of the patent literature - and hence the libraries can be regarded as forming together with the Patent Office a sort of network. Generally this is a radial one but there are in some cases organised contacts between the libraries, even if only an annual exchange of experience, which may develop into a distributed network. Certainly modern technology, especially copying machines, makes it profitable for the libraries to help one another as well as being channels of communication to the Patent Office.

In the countries which belong to NATO, I have been able to identify major networks of patent libraries in Denmark, France, Germany, the United Kingdom and the United States. Similar networks exist in Eastern bloc countries; that in the DDR may be a relic of one set up well before 1939. In Canada some 166 libraries are sent free of charge a copy of the Patent Office Record: of these libraries 5 also hold either abstracts of patents or claims and drawings on microfilm.

The libraries of which the networks are comprised fall into one of the following broad categories:-

(i) public libraries or regional archives

(ii) academic libraries which allow public access

(iii) libraries of branches of the national Patent Office

(iv) libraries of chambers of commerce

(v) libraries of research institutes.

The libraries can also be categorised from a user's point of view into:-

(a) libraries holding collections of patent documents from several countries

(b) libraries holding a collection of national patent documents only

(c) libraries holding no patent specifications but an extensive collection of indexes, abstracts and other search tools.

It is also worth noting, since it affects the value to a user of a particular library, that:-

- some libraries limit their collections to those subject fields of interest to their parent organisation

- some libraries hold the documents only in serial number order, some only in classified order, some in both orders.

Thus when planning to use one of these libraries for the first time, it may be advisable to check in advance not only that it will be open but also what material and facilities are available.

Denmark

Denmark has, in addition to the documentation services at the Patent Office in Copenhagen, no fewer than 15 libraries which hold copies of Danish patent specifications plus three more which hold only the official gazette (Dansk Patenttidende).

From the information searching point of view, the most important library by far is the Danmarks Tekniske Bibliotek in Lyngby, not far from Copenhagen. This library has very extensive holdings of other scientific and technical literature, and a wide range of abstracting and indexing services both printed and computer based. It is therefore very well able to provide searchers with the choice of patent or non-patent literature or both according to their need. Two of the other technical libraries share with Lyngby the feature that standards specifications and abstracting journals are to be found.

The other libraries are, as one would expect, distributed so as to provide reasonable access in any part of Denmark from the Island of Bornholk (Bønne) in the east to Esbjerg (two libraries here) in the west, from Alborg in the north to Sønderborg in the south. The Odense Tekniske Bibliotek is noteworthy in having a classified collection of Danish patent specifications.

A list of the libraries is appended.

France

The situation in France is particularly interesting because not only are there three distinctly different types of provincial centre but new centres have been recently created: the only other country where new patent document centres have come recently into existence is the United States.

At one time France had only a large number of what they call archival centres. It would appear that the collections of patent documents in these were, with one or two exceptions, not used very much. They were there for consultation, were produced on demand but little was done to promote their exploitation. Today there are fewer archival collections and exploitation is stimulated by two new types of centre.

1. Regional documentation centres of INPI (the French Patent Office)

2. Active documentation centres based on chambers of commerce, universities or agences regionales, usually under the aegis of the Bureau Nationale d'Information Scientifique et Technique (BNIST) now called Mission Interministerielle de l'Information Scientifique et Technique (MIDIST) or even certain active archive centres.

1. INPI centres

In addition to the Patent Office in Paris, with its extensive facilities, there are four regional centres (sometimes called "antennes") which provide the same search tools as in Paris, the full range of French industrial property publications and substantial stocks of foreign patents as well. The Centres are in Bordeaux, Lyon, Marseille and Strasbourg, the oldest being Marseille (1963) and the newest Bordeaux (1979).

Being extensions of the Patent Office, these centres - unlike those in any of the other countries, with the exception of the one in Berlin - are closely involved with industrial property matters and the legal side of patenting. They are, for example, authorised to receive applications for the PCT and the European Patent on behalf of the Paris Office.

Stock will vary as far as ancilliary literature is concerned. Marseille has not only French, German, UK, US, European and PCT documents and other official publications but also 150 technical journals and a full set of the Bulletin Signalétique. Lyon by comparison has the same patents coverage but less non-patent literature.

These centres are often closely associated with several other official services so that together they form a Regional Centre for Innovation (CERDI). For example the Strasbourg INPI centre is closely linked with:-

l'Agence Régionale d'Information Scientifique et Technique (ARIST)

l'Agence Nationale de Valorisation de la Recherche (ANVAR)

la Délégation Générale à la Recherche Scientifique et Technique (DGRST)

le Centre National de la Recherche Scientifique (CNRS)

le Délégué aux Relations Industrielles

2. Active documentation centres

These are much more general commercial and technical information centres than the INPI ones. They use patents as one of several sources of information and tend to contain only French patent documents, possibly with European and PCT documents as well.

The centres are in Besancon, Dijon, Lille, Montpellier, Nancy, Nantes, Nice, Rouen and Toulouse. That at Besancon is in the Chambre de commerce et d'Industrie du Doubs, that at Nantes in the Service d'Information pour le Developpement Technologique (SIDETEC), that at Nice in the Bibliothèque de l'Université, that at Rouen in the Agences Regionales d'Information Scientifique et Technique (ARIST). One may, therefore, expect a considerable degree of variation in the extent and nature of the supporting non-patent documentation.

3. Some archive centre still exist at Belfort, Caen, Clermont-Ferrand, Grenoble, Rennes and Tarbes.

A full list is appended.

Of particular interest in the French INPI and Active Centres are the sets of duplicates of the Patent Office search cards. These contain abstracts of the patents and two sets are maintained, one arranged by applicant and one by subject (IPC).

Germany

Germany is unique in that the national Patent Office is not in or near the administrative capital of the country but is in Minich. There is also a second office in Berlin which has very extensive document facilities, far greater than the INPI antennes. It contains the patent documents of about 16 countries, including those of Germany in classified arrangement, and a substantial collection of books and journals.

In addition, according to a recent issue of the Blatt fur Patent -, Muster- und Zeichenwesen (6) there are 14 libraries containing publicly accessible collections of patents throughout the Federal Republic. These Patentauslegestellen (PAS), as they are known, exist in (going from north to south) Hamburg; Bremen; Hannover; Bielefeld; a little group all very close together at Dortmund, Bochum, Dusseldorf (2) and Remscheid; Aachen; Darmstadt; Kaiserslautern; Nurnberg; and Stuttgart. Of these one (Bielefeld) is in the Central library (Stadtsbibliotek), six are in academic or research institutes and seven in chambers of commerce trade institutes or other environments. Wild and Wittmann (ref 4), however, list 15 Auslegestellen, including one at Kiel. The EEC publication (3) lists 17 such libraries so presumably some have recently been closed.

Some of the libraries (for example Aachen, Hamburg and Nurnberg) charge entrance fees. The libraries vary in resources. Those in Aachen, Bochum, Darmstadt, Dortmund, Hamburg, Hannover, Kaiserlautern, Nurnberg and Stuttgart have substantially complete collection of German patent documents. The libraries in Bielefeld, Bremen, Dusseldorf (both libraries), and Remscheid hold only material in limited subject fields.

All the libraries keep their set of German documents in classified order. Many of the libraries keep only microform copies of the recent material.

Only Nurnberg (Austrian, Swiss and American) and Stuttgart (Austrian and American) hold any foreign patents (Hannover has disposed of the set of UK patents it once held). These same two hold UK Abridgments (ie official abstracts) and the Official Gazette of the USA which nowadays gives Main Claims, not abstracts. Nurnberg also holds abstracts of French patents.

Judged by the number of user visits (ref 5), Nurnberg is more heavily used than any Community patent library other than those in Munich, London and Paris, a fact which no doubt reflects both the excellent service and the very close relations it has with a small number of firms who depend entirely on it.

United Kingdom

Until recently the UK had, in addition to the Science Reference Library in London, which contains the national intellectual property library, fourteen other libraries which hold sets of UK patents. These are, from north to south, in Glasgow (Scotland), Belfast (Northern Ireland), Newcaslte, Bradford, Leeds, Hull, Sheffield, Manchester, Liverpool, Nottingham, Leicester, Birmingham, Bristol and London (Science Museum). From April 1980, only those in Glasgow, Newcastle, Belfast, Leeds, Manchester, Liverpool, Birmingham and London (Science Museum) will continue to receive officially funded sets. These libraries,except the Science Museum, also hold EPO, PCT and US patent documents either in hard copy or in microform. The library at Liverpool holds a very extensive collection of foreign patent documents (13 countries). Several of the others hold some foreign material and most have some of the foreign gazettes.

All these libraries are public libraries and the patents collections are housed in the technical and commercial reference sections, where there is always a substantial collection of other reference material. Indeed, several would classify as major research libraries.

It is expected that the libraries which no longer will receive sets of patents, will continue to receive the gazettes, indexes, abstracts and other search material and thus provide an access point to patent information. This service is already provided to a certain extent at twelve other public libraries: Aberdeen, Cardiff, Coventry, Edinburgh, Huddersfield, Middlesborough, Norwich, Plymouth, Portsmouth, Preston, Swindon, and Wolverhampton plus the National Library of Wales at Aberystwyth.

Basically, the UK plan is to provide an extensive network of access points where researchers can identify patents that may be worth studying, backed by a fast copy supply service and a small number of centres, if necessary with facilities enhanced over those currently available) where sets of patent documents can be searched. Although each of the libraries concerned is funded (except for the supply of patent documents) by its own area public authority, it is planned to achieve an interactive network, with the libraries calling on one another for appropriate assistance as well as turning to the Science Reference Library and Patent Office.

United States of America

In the United States the number of libraries holding sets of patent documents has recently started to increase. Basically there are two types of library: two-thirds are public libraries and one-third academic libraries but, even more than in the UK, several of the public libraries are major research libraries: New York Public Library, Boston Public Library and Chicago Public Library for example.

Roughly in regions from east to west the libraries that have been holding patents for some time are:-

Boston PL, Province PL (Rhode Island); Albany (NY), New York PL, Newark PL (New Jersey), Franklin Institute Library Philadelphia; Buffalo and Eric County Library, Carnegie Library of Pittsburgh, Cleveland PL, Toledo/Lucas County PL, Ohio State University Columbus, Cincinnati PL, Detroit PL; Georgia Institute of Technology Atlanta; Chicago PL, Milwaukee PL, University of Wisconsin Madison; St Louis PL, Linda Hall Library Kansas; Oklahoma State University Stillwater; Sunnyvale Patent Library (California).

All these hold sets of US patents, recent ones sometimes on microfilm. In all except Sunnyvale the sets are in numerical order. Fifteen of the libraries hold sets UK and Canadian patent specifications. Ten hold German patent documents. Sets of Australian (6 locations), USSR (6), French (5), Belgian (4), Japanese, Netherlands, Cuban, New Zealand (2each), Italian, Danish, Swedish, Irish and South African patent literature (one location only) are to be found.

With 1700 clients per month, Sunnyvale is easily the most heavily used. To what extent this is due to its lack of competition (until recently it was the only patent library west of the central American plains), to its location in an exceptionally innovative area or to its specialised service to the patents profession it would be interesting to discover.

Services from the others vary significantly. In many there has been, until recently, little more than a standard reference service though at Madison, for example, patents form a well integrated part of a general industrial information service rather like that in the French SIDETEC and ARIST centres. All the libraries can now provide, through close collaboration with the US Patent and Trademark Office, an expert service of identifying classes to search and lists of documents in those classes. Through annual seminars at the US Patent and Trademark Office, many of the libraries have acquired a considerable knowledge of how to use the published indexes and Definitions and know how to acquire quickly copies of any required document.

All the libraries have very extensive collections of other technical and often commercial literature as well. Many have appropriate abstracting journals on site or in nearby libraries. An increasing number now make use of on-line access to bibliographic data-bases.

Services from the libraries

It will be obvious from the foregoing descriptions, incomplete though they are, of the patent library resources in each country, that the type of service that one can expect and the type of search that one can undertake will differ widely. Each country seems to have evolved or be still evolving a set of arrangements suited to its particular needs. Whether the UK is right, or premature, in believing that information technology has reached the stage that having complete sets of specifications in a large number of depository centres is no longer necessary time and experience alone will tell. The French experiment of associating the patent document sets with either Patent Office outposts or with active industrial information services certainly merits close attention. So too does the US expansion of the number of its depository libraries allied with a steady increase in local interaction with the Patent Office to raise the level of service available. We should also examine critically whether the classified collections approach of the German libraries and of Sunnyvale in the US is cost-effective now and will continue to be so in the near future.

Current awareness scanning of recently issued national patents should be possible at all the centres, though obviously pan discipline scanning will be less easy if classified collections only are provided. Scanning by patentee's name can be done from the gazettes.

Retrospective searching techniques will vary from one centre to another according to the facilities. Where one's field of interest matches the classification, the availability of classified sets obviously has much to commend it but the UK and French systems of sets of classified Abridgements/abstracts can prove effective and economic of space but depends on informative abstracts. The availability of other abstracting services, especially Chemical Abstracts or the Derwent publications, and of on-line services will also be significant for many information searches. In most countries, perhaps all, the Patent Office will advise which classes to search for a topic.

Virtually all libraries can supply, or allow the visitor to take for himself, copies of the patent documents held. Many will obtain copies of any not held from another source.

Virtually all libraries can find out status information for an enquirer but many will commend direct contact with the Patent Office.

Conclusion

If one cannot readily visit the national patents library, there may well be, if one is in Denmark, France, Germany, the UK or the US, a library close at hand which holds patent literature. If one's interest is in industrial property rights matters, only the four French INPI centres are likely to be able to give highly expert help. For technical and commercial information, however, the regional libraries can be invaluable, particularly if the staff are as familiar with the use of patent literature as they are with technical journals, reports, standards and so on. It is certainly worth noting whether such a library is near at hand and, if there is, getting to know what resources it has and what services it can supply.

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Appendix. Patent libraries containing patent specifications.

1. Denmark

Danmarks tekniske Bibliotek, Anker Engelundsvej 1. Lyngby
Stratsbiblioteket i Arhus
Centralbiblioteket for Sydvestjylland, Esbjerg
Bornholms Centralbibliotek, Rønne
Biblioteket i Thorshavn
Esbjerg Tekniske Bibliotek
Centralbiblioteket, Holstebro
Naestved, Centralbiblioteket
Odense, Teknisk Bibliotek
Randers Centralbibliotek
Sønderborg Tekniske Bibliotek
Vejle, Biblioteket for Vejle By og Amt
Abenra, Det Sønderjyske Landsbibliotek
Alborg, Biblioteket, Grønlands Tory
Arbor, Ingeniørakademiets Bibliotek
Arhus, Teknisk Bibliotek

2. France

A. INPI Regional Documentation Centres:-

Bordeaux	3, place Gabriel, 33075
Lyon	43, rue Raulin, 69007
Marseille	32, Cours Pierre Puget, 13006
Strasbourg	2, rue Brulee, 67000.

B. Active documentation centres:-

Besancon	Chambre de Commerce et d'Industrie du Doubs
Dijon	Archives du Département de la Côte d'Or
Lille	ARIST Nord Pas-de-Calais
Montpellier	ARIST Languedoc Roussillon, Ecole Nationale Supérieure de Chimie
Nancy	Archives du Département de la Meurthe et Moselle
Nantes	SIDETEC-INNOVATION
Nice	Bibliothèque de l'Université, Section Sciences
Rouen	Archives du Departement de la Seine-Maritime
Toulouse	ARIST (Chambre Régionale de Commerce et d'Industrie Midi-Pyrenees).

C. Other collections:-

Calvados	61, rue de Lion sur mer, Caen
Ille et Vilaine	20, avenue Jules Ferry, Rennes
Isère	2, Boulevard des Adieux, Grenoble
Puy de Dôme	18, Boulevard Desaix, Clermont-Ferrand
Hautes-Pyrénées	Rue des Ursulines, Tarbes
Belfort	2, rue de l'Ancien Theatre.

Germany

Aachen	Bibliothek der Technischen Hochschule
Bielefeld	Stadtbibliothek Bielefeld
Bochum	Bibliothek der Westfalischen Berggewerkschuftskasse
Bremen	Handelskammer
Darmstadt	Hessische Landes- und Hochschulbibliothek
Dortmund	Universitatsbibliothek
Dusseldorf (1)	Verein Deutscher Eisenhuttenleute
and (2)	Zentralstelle fur Textildokumentation und -information beim Verein Deutscher Ingenieure
Hamburg	Handelskammer
Hannover	Universitatsbibliothek der Technischen Universitat Hannover und Technische Informationsbibliothek
Kaiserlautern	Universitatsbibliothek
Nurnberg	Landesgewerbeanstalt Bayern
Remscheid	Fachverband Werkzeugindustrie e.V.
Stuttgart	Landesgewerbeamt Baden-Wurttemberg.

United Kingdom

Belfast	Central Library
Birmingham	Central Library
Glasgow	Public Library, Royal Exchange Square
Leeds	Central Library
Liverpool	Central Library
London	Science Museum Library
Manchester	Central Library
Newcastle	Central Library.

United States

A list is appended to Mr Chasen's paper.

Dissemination of patent information through official services and corresponding resources in Europe (seen through the eyes of a patent office official)

Member of the German Patent Office, Dipl.Ing. Rudolf Schiffels , Isartalstr. 79
D 8000 München 70

CONTENTS :

1 - What are the reasons for dissemination needs of patent information ?

The word "patent" has to be derived from the latin word "patere", that means as to be allowed to become known to everybody. A patent therefore is a document to be known and to be accessible by the public, which opens technical knowledge. It seems that technical knowledge would only be allowed to become krown to erverybody, if this knowledge is protected against unlawfull ursurping by other persons. That is the reason that a patent as well is open technical information alike protective right. Now I wont to explane this twice function of patents by a very simple example (figure 1) :

In a living room a great bookshelf should be brought in. But the entrance is lead through a small floor with two corners. At this point at the latest you can recogneize that there is no chance to get to the living room with such a great bookshelf. What is to do ? You have probably to ask the experts of furniture and transport. Supposing the experts have to offer two solutions: The first solution should cost 50 dollar. The second solution should cost 5 dollar. - After questioning again the experts of furniture and transport pointed out, that they only could disclose their solutions if they had received their costs. But the buyer of one of these solutions wants to assess the utility of the solution to himself before buying the solution. The seller on the other hand only wants the solution to become known to the buyer after completion of a purchase. Because there is no protection by a patent upon these solutions. The buyer of course wants to buy always the best solution. This seems to be the most expensive solution with the price of 50 dollar.

The solution is : "The bookshelf has to be sawn in two pieces". - But such a solution has been already known to the buyer and doesn't come up to the buyers expectations. Therefore the buyer also buys the second solution with the price of 5 dollar. The second solution is: "The bookshelf has to be brought in from outside through the window". This solution is in concordance to the expectations of the buyer. If the competitors of the two solutions would have had a protective right (e.g. a patent) upon their technical solutions, the buyer would have been able to select his adequate solution before buying. He would have saved 50 dollar. The consequence of this example leads to the importance of knowledge of technical information contained in patent documents to people asking for technical solutions. In a short word: The importance of patent information for such people.

In spite of the age of computerized bases and the on line retrieval facilities many people are living scattered over the whole world with no possibilities to an on line access to computerized data bases containing patent information. Therefore it is very important to facilitate the access to patent information to all searchers. This aim only can be reached by a wide dissemination of patent documentation. Of course this is not only valid to those people searching for the solution of a technical problem, but it is also important to researching people, technical developing people, inventing people, patent attorneys, engineers, etc. as will be illustrated more detailed in chapter 3.

2 - Different kinds of disseminating patent information

2.1 - by making available a patent documentation

I am sure the most direct and the best kind of patent information has to be seen in the original patent document (figure 2). It contains as you probably know a title page including the bibliographic datas and in some times additionally an abstract. Further a description of the technical matter, of the purpose, of the description of examples, of the drawings. And of a set of claims defining the scope of the protective right

sought for or granted. Obviously the patent document is highly appropriated to set up a patent information system. The only question is, how gets the user of patent information access to those patent documents especially interesting him. Concerning this we have to distinguish between two possibilities. the first one: The user is visiting a governmental or semi-governmental institution presenting for the public a collection of patent documents arranged according to a patent classification. Usually such a collection covers the whole field of technic and also covers the patent documents of the own country and several important countries. The Federal Republic of Germany may serve as an example for such public reading rooms presenting patent documents as technical information (figure 3). In about 12 large towns disseminated over the area of the Federal Republic of Germany such public reading rooms are existing with collections of patent documents. Additionally there are two very well equipped public reading rooms at the residences of the German Patent Office at Munich and Berlin.

As second possibility the user receives periodically patent documents of a certain technical field. Such a technical profile of patent documents from several important countries only can be held, evaluated, set up to an own patent collection by big enterprises, but not by small establishments or by single inventors etc. In the first case of the public reading room the user on the one hand has to travell a more or less long distance to the next public patent reading room with a complete collection. The search must be done very carefully and entirely in order to avoid twice or multiple journeys to the public patent reading room. On the other hand the user save trouble with narrow profiles of subscripted patent documents. That is trouble with setting up, adapting those profiles with respect to technical progress, changing of profiles in correspondence to changing technical activities of the user.

In the second case concerning small own collections the user of course saves travelling long distances . Beyond that the search can be renewed or evaluated at any time the searcher is feeling necessity. But the user is never quite sure, if the selected technical profile really covers the problem he is searching for. Perhaps there are also some technical functions, objects or substances belongimg to quite another not covered technical field (e.g.chemistry, physics, electronics, etc.).

2.2 - Different kinds of disseminating patent information by additionally consulting services for searching people

As above mentioned neither the complete public patent reading room nor the private, selected, small patent collection of a certain technical profile is satisfying all wishes of users and searchers. This rises deliberations about consulting services for searchers of patent information which would be able to compensate the shortcommings of the above mentioned search possibilities. Such services may comprehend consulting about the technical fields to be selected for searches, consulting about the search means available in a special case, carrying out technical and bibligraphic data searches by order of the user and last not least surveillance services with respect to the legal status of the protective right rised by a patent application. Services like these are offered by governmental institutions as well as by private establishments.

Within the governmental institutions particulary the services of the Swedish Patent Office, the Danish Patent Office, the Austrian Patent Office, the European Patent Office have to be pointed out. Private patent information consulting services often use the accessibility of big public patent documentation systems. Their advantage has to be seen by the user in quick searches and high quality searches by very skilled searching experts. Concerning to the carried out searches costs have to be paid in both cases, to public institutions as well as to private searching establishments. But on the other hand there is the advantage of combined search aids, of special search strategies and technics, which are not reachable to a single user even after years of searching experience.

As indication of authorities used may mentioned the book "Patent Information and Patent Documentation" edited by the Commission of the European Communities, Munich, 1976 , Verlag Dokumentation. This book contains a well prepared list of public and private patent information services with open access to everybody.

2.3 - Different kinds of disseminating patent information by additionally search aids.

Besides the above mentioned governmental and private patent information consulting services there are additionally search aids which can give an indirect access to the technical information contained in patent documents. In particular these are services setting up and selling abstracts of the technical contents of patent documents. Beyond these are also computerized data bases offering on line searches for patent information using keyword systems etc. A special kind of such an indirect computerized search aid is the search for bibliographic datas belonging to patent documents, for instance for applicants, inventors, patent classification symbols, equivalent patent patent documents from other countries (patent families) and publication datas belonging to them. Of course all search aid systems today use modern technics of information transfer as microfiches, microfilm, computerized searches with batch or on line facilities, data teleconnection with terminals linked to host computer having patent information data bases available. Among these facilities the the on line searching by terminal is chiefly advantageous, because a real dialogue between searcher and computer is possible and allows immediatly the evaluation of a search result. On the

other hand you have be aware such kind of search aids are only a first step to a complete patent search . Namely in any case it is necessary to find the original patent document or a copy of it , to read the original patent documents in order to evaluate the search result and to reconsider the relevance of the patent information found by the search. Obviously to the list of patent information search aids are belonging the editions of the International Patent Classification, containing about 55 000 items and the several catch- or key-word indexes to the International Patent Classification.

Furthermore have to be mentioned as search aids several official patent gazettes edited pericdically by patent offices and containing the complete set of bibliographic datas belonging to a patent document, and partly containing an abstract of the patent document too. Last not least I want to refer to the patent registers, set up by several patent offices. Besides the bibliographic data the patent registers can give information about the legal status of a patent application or a granted patent at any time.

3 - Different kinds of users of disseminated patent information

3.1 - Analysis of users existing

Firstly existing users of patent information can be arranged in persons generally and very often concerned with the matter of patents and patent information. Let us call them "patent insiders". Further the users existing can be arranged in persons coming occasionally or very seldom in connection with matters of patents and technical patent information contained in patent documents. I want to call them "patent outsiders". The patent outsiders are represented by the overwhelming majority of persons concerned with matters of technic and technical science. The patent insiders furthermore can be arranged in persons professionally concerned with patent application and granting procedure of protective rights. These are patent attorneys and members of patent divisions of big enterprises. But patent insiders are also persons professionally concerned with setting up and superintendence of patent documentation systems. These are librarians and documentalists of public institutions or industrial enterprises.

to add
Last not least we have to the list of patent insiders a number of professional patent searchers, of searchers from industrial enterprises and a small minority of the primary producers of patent information, namely the inventors. The needs of patent information of patent insiders essentially can be divided in two categories : first the information about the legeal status; that is the patent examining and granting procedure, the priority of inventions, the datas of applicants and inventors, the licencing possibilities. Such information especiallly is needed by patent attorneys and members of patert divisions of enterprises.

Secondly the information about technical content of a patent document; that means the technical problem, the technical task, the solution, the advantages of an invention, the scope of the protective right, laid down in the patent claims, the description of the examples and the drawings, the symbols of the patent classification. Such information especially is needed by professional patent searchers etc. So far as concerning patent insiders.

The special attention of this course of lectures and of course of similar meetings should be drawn to the patent information needs of the patent outsiders, There are engineers, for instance research or developing engineers, inventors and so on, who want to know at the beginning of a technical development or research program how far the technical task is already solved or known, respectivsly what part of known state of the art is still include in a protective right. Even in the case of long range researches and developments the management of an enterprise occasionally wants to know, if in the meantime technical solutions had become state of the art by a published patent document. perhaps in such a case the cancelling of the whole research project could be a economical cosequence.

Lastly, if a technical task or development is finished, the engineer or the management wants to appreciate the facilities for filing a patent application with respect to the state of the art given by patent information. there is also a vital interest on the research results of the competitive industrial enterprises documentated by patent documents. urthermore the management of an enterprise gets information from patent documents, if buying in a certain case is cheaper than starting an own research and developing program.

Patent information also can stimulate further progress on new inventive ideas while at the same time avioding waste time and money repeating already patented work. The double work in this frame generally is estimated as about 30%. Members in the list of patent outsiders are also documentalists and librarians dealing with technical and scientific literature, because as matter of fact less than 10% of the information given by patents is published elswhere as well. Therefore they are usually not skilled in searching for patent information or supplying a collection of patent documents.

3.2 - Analysis of potential users

Of course potential users have to be added to list of patent outsiders. Especially those persons looking still today for technical information only by using articles from scientific and technical books, journals, standards, reports etc. are potential users, because as above mentioned F.Liebesny in "The Information Scientist", December

1974, pages 165 to 176, pointed out that only 5 to 10 % of the technical information given by patents is published elswhere as well. For this reason especially small and medium sized industrial establishments as well as research institutions, technical colleges, trade divisions, marketing divisions, management are belonging to potential users of patent information. There are existing some inquiries about users of patent information, giving knowledge about the frequency of users existing. But numbers of potential users can't be found out by these inquiries. Even to estimate numbers of potential users is very dangereous, because the number of potential users depends highly on the attractivness of futural patent information institutions and facilities to an unexperienced user. Last but not least the number of potential users depends on the information marketing as described in the next chapter.

4 - "Information marketing" (i.e. to give information about the necessity of patent information)

The first proolem arises, how to reach a person, who don't know patent information as an object worth to him to know about it and totake adventage of it. But after having reached such a person the second problem arises, how making him interested in patent information and how getting him to a sufficient user. The latter is spoken out very quickly, but it is very difficult carrying it out, for this is a problem of human communication.I want to illustrate the difficulties by the following communication procedure. Certainly many of you are wondering why many orders especially spoken to children but alos to adults often and often are not carried out or the use is not continued. See the evidence in the following words:

" Spoken doesn't mean heard,
heard doesn't mean understood,
understood doesn't mean agreed,
agreed doesn't mean made use of,
made use of for one time is far, far away from continuing in use."

In order to get from a word spoken to continuing in use is as you could see not only a problem of reaching a person not knowing the importance of patent information for himself but also a difficult problem of communication with the aim of making a person continuing in doing a thing you spoke about. Referring to the latter case only can help good and extensive training courses, frequently consulting and superintending facilities as necessary as the attractivness of the futural patent information institutions. Finally not to forget the motivation for continuing in patent information use rised by the amplifying event of a successfull search result with the aid of patent information. Therefore it is necessary to discuss and if it is possible to make a search on the own problems of the participants of training courses.

5 - Existing official services concerning dissemination of patent information

A nearly complete list of existing official services concerning dissemination of patent information is given by the above mentioned book edited by the European Communities. From among the great number of services I only want to point out some important ones. Concerning bibliographic datas of patent documerts there are the services of INPADOC at Vienna a foundation of the Austrian Government and the World Intellectual Property Organization. As regarding the active search aids by order of the user there are well running services at the Danish Patent Office, the Swedish Patent Office,the Austrian Patent Office (This only for residents of Austria), the European Patent Office, the Patent information system of the Soviet Union. Also at the German Patent Office such an active search service is being at the first step of its realization.

Besides these active search services of course there is a lot of voluminous public collections of patent documents arranged in a classified order, which covers the whole field of technic. You can find such collections of course at the residence of national patent offices. Apart from this in many large cities of the most countries of central Europe you can find such collections of patent documents with open access to the public. So usually a user has to travel less than 100 kilometers to patent information. The towns and the complete addresses are contained the above mentioned book of the European Communities.

6 - Provided official services concerning dissemination of patent information

Referring to provided official services I only want to talk as example from my own country the Federal Republic of Germany. Although a subcommittee of the German Society for Documentation since more than 20 years was struggling for setting up and disseminating patent information and documentation, only since the last 5 years we reached successfully parts of the public far away from the patent insiders and could convince them of the economical necessity of dissemination and more intensively using patent information. This broadly rising interest in the Federal Republic of Germany seems partly to be initiated by the typical activities of some neighbour countries.

The Federal Republic of Germany namely gave in its "Information and Documentation Program of 1974/75 only space for some scanty words about the need of patent information. Firstly it was tried to divide all fields of knowledge, the technical fields included, in 16 sectors (like a tart). each sector was representing a so called "Fachinformationszentrum" (abbreviated "FIZ"). Within these FIZ the patent documents were included only [illegible] incomplete. After having spent two years for planning the authorities got aware that it is necessary for a special kind of technical-scientific literature, namely the patent documents, to plan and build up a own center, that is

a Patent Information Center (abbreviated: IZ Patente). This Center is overlapping five sectorial Centers (FIZ) as far as patent literature is concerned. Three years later, the planning period has come to an end and, beginning in 1981, the erection of a patent information center "IZ Patente" in Munich at the German Patent Office will be realized step by step. The scope of the provide arrangment reaches from better availability of the 12 public patent reading rooms spread over the area of the Federal Republic of Germany, including consulting services for users concerning search, making available on line patent search systems as bibliographic data information, patent legal status information, searches for the technical contents of patent documents. Also searches by order of the user shall be possible, which would be done by the examiners or mechanized retrieval systems of the German Patent Office without any patent examining or granting procedure. Therefore the user will have to pay a adequate fee.

Furthermore services are provided as setting up technical profiles according to the International Patent Classification for subscribers of limited collections of patent documents, also for subscribers of search file list (these are inventories of a very big classified collection of the examiners of the German Patent Office, including about 20 million patent documnets). Last not least the patent information center shall take over the instruction and technical training of the consulting personnel in the public patent reading rooms and the disseminating of information <u>about</u> patent information by training courses, lectures etc.

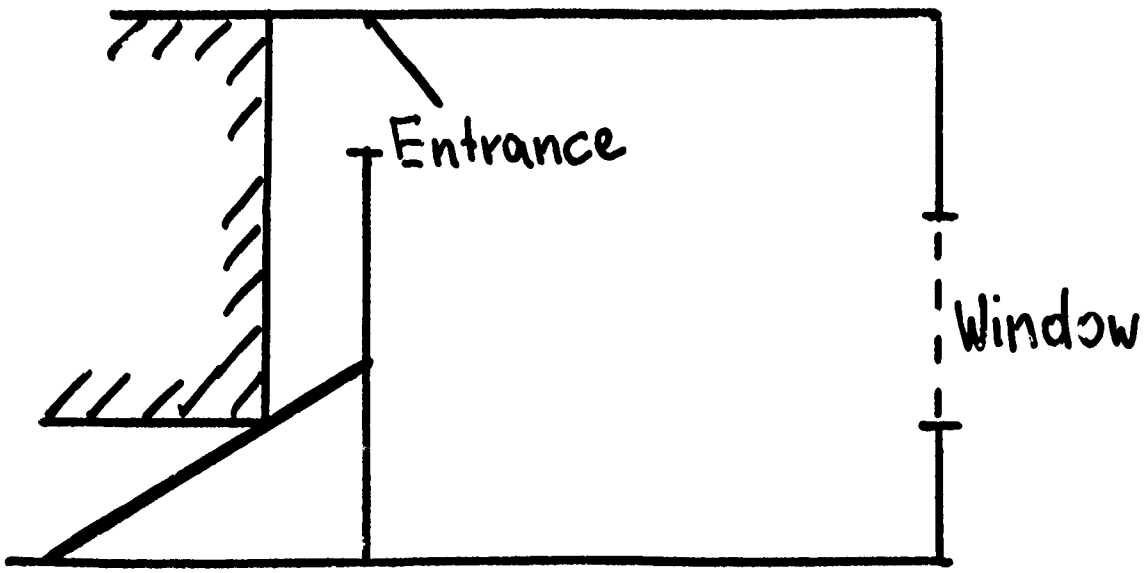
7 - Desirable activities of official services in future concerning dissemination of patent information

Already in the preceeding chapter many services possible were cited but they are not yet realized in many countries. Therefore the list of possible or planned services in chapter 6 includes also desirable activities of official services. It is not necessary to repeat the list.

But in future, when all these services shall be introduced, we must be aware, that existing important private institutions, dealing with patent information can survive against the competition of the official services. In the past those private services as for example DERWENT Ltd., INPADOC, International Documentation Chemistry (IDC) and lot of smaller patent report services have done an excellent service to the dissemination of patent information, whilst the official authorities are still trying to overcome their omissions concerning public patent information. Not at least with respect to the excellent patent information know how and the data bases of these private establishments, it would be best, the official instututions could give participation or incorporation or cooperation facilities to the private establishments .

Coming to the end of my speech I wish my lecture would have a little bit contributed to the big task of promotion of the dissemination needs of patent information.

-.-



Solution I :

$ 50

The boockshelf has to be sawn to two pieces

Solution II :

$ 5

The boockshelf has to be brought in from outside through the window

Figure 1

PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification: C03B 19/00 C03C 3/00, 11/00	A1	(11) International Publication Number: WO 78/00001 (43) International Publication Date: 19 October 1978(19.10.78)

(21) International Application Number: PCT/US78/00002

(22) International Filing Date: 1 June 1978 (01.06.78)

(31) Priority Application Numbers: 827,725
894,188

(32) Priority Dates: 25August 1977 (25.08.77)
6 April 1978 (06.04.78)

(33) Priority Country: US

(71) Applicant: SAMANTA, Mrinmay; Post Office Box 2322, Washington D.C. 20013, United States of America.

(72) Inventor: Applicant is also the inventor.

(81) Designated States: BR, CH, CH (regional patent), DE, DE (regional patent), FR (regional patent), GB, GB (regional patent), LU (regional patent), SE, SE (regional patent), SU.

Published before the expiration of the time limit referred to in Article 21(2)(a) on the request of the applicant, with: *International search report.*

The applicant has declared that he does not wish to amend the claims of his international application under Article 19.

(54) Title: LOW TEMPERATURE SYNTHESIS OF VITREOUS BODIES AND THEIR INTERMEDIATES

(57) Abstract

A method of making glass of high purity and in virtually u[illegible]dted shapes via solution deposition on a porous self-supporting body by reaction between a first solution and a second solution; and a product made thereby. The first solution containing at least one basic glass forming solute is confined within a porous container, the walls of which are substantially impermeable to the basic solute. The second solution containing at least one acidic solute is diffused into the porous container through its walls which are substantially permeable to the said acidic solute. The reaction between the first solution and the second solution takes place within the porous container leading to the deposition of a self-supporting porous body on the inside walls of the container. The porous body which is crys[illegible], vitreous or intermediate between the two, is purified by leaching and/or washing, dried and thermally consolidated, to a tr[illegible]ent non-porous glass.

Figure 2

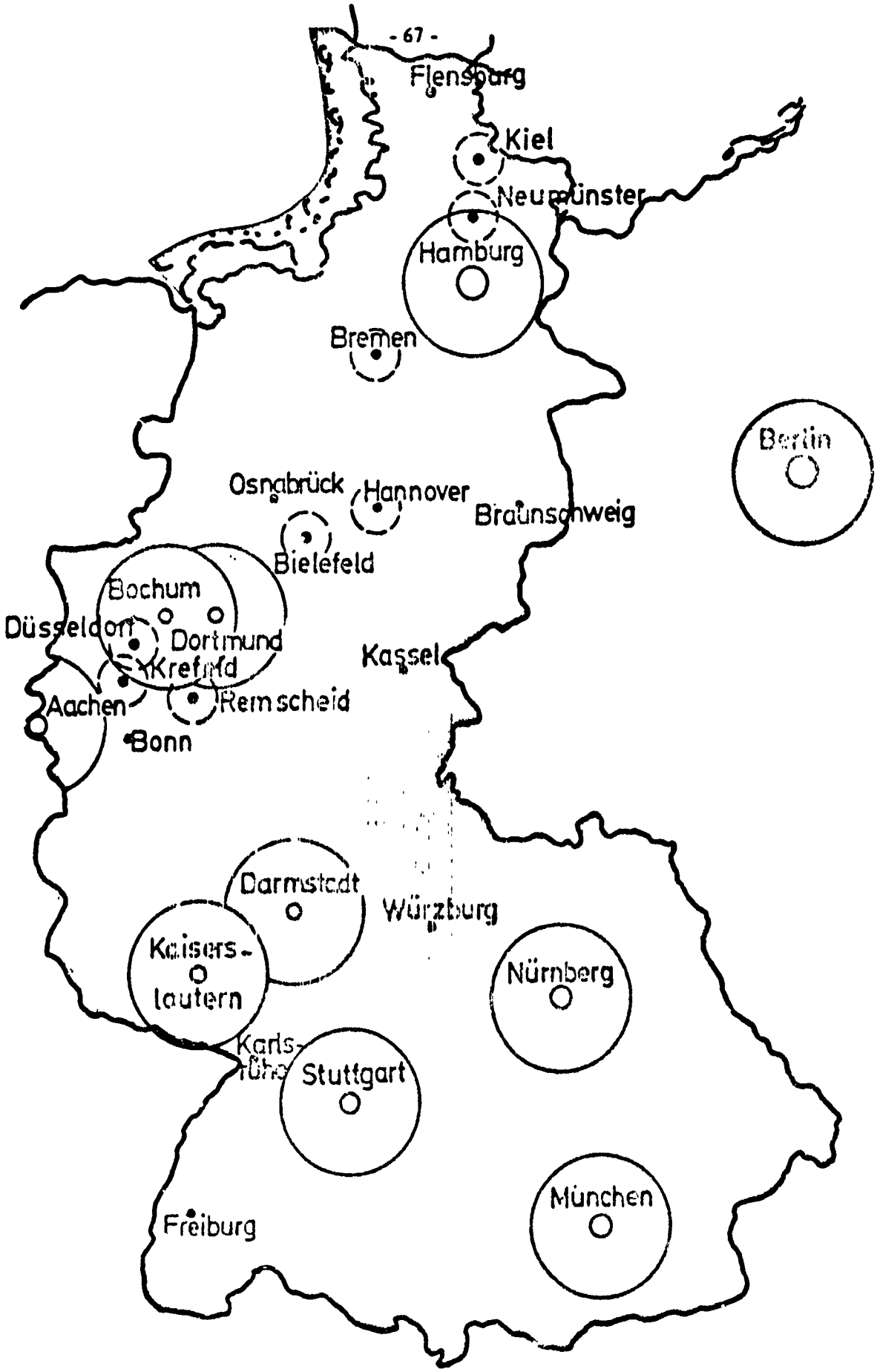

- 67 -
Flensburg
Kiel
Neumünster
Hamburg
Bremen
Berlin
Osnabrück
Hannover
Braunschweig
Bielefeld
Bochum
Düsseldorf
Dortmund
Krefeld
Kassel
Aachen
Remscheid
Bonn
Darmstadt
Würzburg
Kaisers-
lautern
Nürnberg
Karls-
ruhe
Stuttgart
München
Freiburg

Figure 3

THE ROLE AND POSSIBLE ROLE OF OFFICIAL SERVICES IN THE DISSEMINATION OF PATENT INFORMATION

J.W. Plevier, Centre for Technical and Scientific Information and Documentation TNO, Delft, The Netherlands

Summary

Patent offices are considered as organisations which have available a source of well organized information and a large staff of highly specialized technical people with a high level of experience in dealing with information and information and retrieval systems.

Taking these human and material resources as a starting point a number of new activities are discussed which might meet some of the information needs of society at large and industry in particular. Some of the items discussed are: study of the performance of retrieval systems, patent statistics and trend analysis, scouting activities, making available patent information in a for non-patent specialist comprehensible form.

In my presentation I will be looking upon patent offices from a rather limited angle. In the presentation I will look upon patent offices as organisations with a tremendous information potential, consisting of a hugh collection of well classified technical literature covering the entire technical field and a staff of well educated, highly specialised employees with a high level of experience in dealing with information and information systems.

In this paper I shall refrain from reporting on the state of the art of the activities of the various patent offices in the field of information dissemination. This was already presented in an excellent way by various preceedings speakers.

It is also not my intention to give you a lot of factual information. I should like to present to you some views and ideas obtained from various sources and a few of my own with respect to the kind of activities patent offices could undertake given the material and human resources at their disposal.

The main purpose of my presentation is to stimulate you to look at patent offices as public organisations which have the potential to render many services to the public by making use of the facilities at hand.

The specialisation of the human resources may be illustrated by the following data referring to the European Patent Office (EPO). The Principal Directorate for Searching of the EPO employs about 470 staff members. In addition more than 100 staff members are working in the Principle Directorate Classification Documentation Statistics. So almost 600 employees are involved directly in classification and searching activities. The total number of employees, including the Directorate General and the Directorate Administration is about 700.

The EPO uses for internal purposes a classification scheme based on the IPC which has about 55,500 subclasses. The present International Patent Classification (IPC) has about 51,500 subclasses.

I do not think it will be easy to find an organisation in another field with a comparable total effort in making information accessible and in retrieving information. Of course the big publishers of secundary information like Chemical Abstracts Service employ even more personnel for abstracting and indexing, but in general their retrieving efforts are negligable.

To give you an idea of the degree of specialisation of the examiners it may be illustrative to give you a few examples of the number of examiners that are involved in a particular technical field.

Seven examiners deal with searches in the area:

- Treatment or chemical modification of rubbers
- Macromolecular compounds (partially)
- Compositions of macromolecular compounds (partially).

Eleven examiners cover the area:

- Paper making, production of cellulose
- Drying solid materials
- Printing, bookbinding
- Containers for packaging
- Hoisting lifting, hauling
- Mechanical treatment and processing of skins, hides and leather.

As I mentioned earlier the examiners are assisted by their colleagues of the Directorate Classification, Documentation, Statistics, so the total human effort, apart from administrative work is about 1/5 higher.

The average search time at the EPO is about 11 hours. Depending on the technical area the time needed varies from 3-4 hours up to 30 or 40 hours.

Given this potential and refraining from taking into account political and financial constraints which may impede the exploitation to the fullest possible extend of the available facilities we may arrive at some rather unexpected opportunities which might fulfill some of the information needs of society at large and government and industry in particular.

As I said before I will not take into consideration the many obstacles which exist or will be invented as soon as organisations are confronted with proposals for changes and new activities.

I will discuss some activities patent offices might embark on along the lines of so called idealized design. This is a design process which is subject to only two constraints:

1. The design may not involve any technology that is not now known to be feasible.

2. The system designed must be operationally viable. It must be capable of operating if it did come into existence.

The product of an idealized design is not a design of an ideal system, rather it is an ideal-seeking system. Idealization invites and facilitates participation of all the stakeholders in the system.

The main purpose of my presentation is to stimulate you to look at your patent office as a public organisation which in general is financed fully or to a large extend by those who file patent applications and pay fees to keep the granted patents in force. So the offices are mainly financed by industry and thus ultimately by consumers like you and me. These public organisations in using the available facilities financed by the public have the potential to render a number of services which might be quite useful.

Some of the activities which in my view fall within the scope of a patent office as far as its human and material resources are:

1. Study of the performance of retrieval systems and data bases

2. Study of the cost-effectiveness of various information systems

3. Analysis of trends of technological development

4. Scouting activities on behalf of the national industry and the national government

5. Facilitating the use of information contained in patent specifications by those outside the patent profession

6. Making the examiners files accessible to the public

7. Providing access to patent information from various viewpoints.

I know that some of these activities are already contained in the program of some patent offices and that some patent offices envisage to undertake one or more of the activities mentioned. I will come back to this later on without aiming at completeness.

1. <u>Study of the performance of retrieval systems and data bases</u>

Obviously patent offices have to examine thousands of patent applications a year for novelty. As you know this is mainly done by manually searching the appropriate collection of documents. Some patent offices also use mechanised systems. The European Patent Office for example uses the facilities of on-line services like the Information Retrieval Service of the European Space Agency, Lockheed Information Systems etc. to perform novelty searches. As a matter of fact they carry out about 1125 on-line searches per month. I bet it is very difficult to find an organisation which does a similar amount of on-line searches and which, moreover, has to control all those on-line searches manually which do not produce a 100% anticipation for the patent application concerned. The control searches are performed as usual in the search files classified according to the (modified) International Patent Classification.

Any patent office working along these lines is in a position which enables it to obtain an insight into the merits and deficiencies of the various information systems, in the scope and coverage of data bases as well as in the performance of information systems using free text or thesaurus terms compared with manual systems using a hierarchical classification. Those offices can also inform the data base owners of misindexed items, items not covered which are in the scope of the data-base etc. Apart from patent offices no institution is in a position to perform a 1000 searches per year on-line and check them manually.

In my view the development on improvement of systems and retrieval methods could be enhanced considerably through the cooperation of on-line vendors and data base owners and patent offices like the European Patent Office.

2. Studying the cost-effectiveness of various information systems

Such a study is more or less comprised in the study mentioned under 1. It is quite clear that it will be relatively simple to conclude under what circumstances the one or the other method for retrieving information is more cost effective.

3. Analysis of trends in technological development

The subject has been covered in all its aspects by Mr. Marmor. I hope you will agree that patent statistics can be a powerful tool in making visible trends in the technological development.

The work of the Office of Technological Accessment of the U.S.-Patent Office has as far as I know not yet stimulated other patent offices to start similar activiteis. Some scattered Russian efforts are reported in the literature whereas in the annual 1979 report of the Dutch Patent Office there is mentioned that a trial study will be undertaken.

I do think that particularly in the actual period of quick transition all efforts which might enable industry to accommodate in the right moment to changes should be stimulated and supported.

4. Scouting acitivities for the national government and industry

As we have seen earlier an examiner is a highly specialised profession who, in many cases, for a rather long period handles patent applications within a rather restricted area of technology. In the course of the years the examiner will obtain a thorough knowledge of the body of literature within his search files. In this way he, more than anybody else is in a position to distinguish new developments in a technical field in a fairly early stage. For that reason an examiner could be a valuable consultant for the branch of industry in his field He will beable to control and stimulate the technical development in his patent area. The advantage for the examiner and thus for the patent office concerned lies at hand. In the patent office there will arise a growing understanding for the information needs of industry. Furthermore the examiners may welcome contacts of this kind with their industrial colleagues and will in my view certainly consider this an enrichment of their job.

As far as I know there have been started developments at the Swedish and Danish Office in this direction, probably some other offices are planning similar facilities.

The examiner could also report to the appropriate government body on developments which in his view might have an impact on an important national industry.

If the patent office, the ministry for industrial affairs, industry associations and other appropriate bodies could come to a cooperation in this field it might be feasible to establish an early warning system aiming at timely actions for the adaptation of industry and government to possible future developments.

5. Facilitating the use of information contained in patent specifications by those outside the patent profession

As you know patents are in fact legal documents describing an exclusive right for the owner of the patent.

From the very beginning the granting of patents had a dual purpose, that is granting an exclusive right and making available information on the newest technology to further the development of the national industry.

The presentation of Beier and Straus at the International Symposium "Patent information and documentation" in Munich in 1977 gives an overview of the development of both functions.

In the 14th century Kind Edward III furthered the immigration of craftsman from Flanders, France and Italy and gave them the privilege to prosecute for a defined period their trade exclusively under the obligation however to instruct the local population. Until the second half of the 19th century the main objective of the legislators in various countries for granting privileges to inventors was to make information on technological developments available to the public.

If you look at patent specifications of the 19th century you will see that the inventions are described in such a way that in a few pages a specialist easily could apply the invention. In our century the development of the patent system tended in the direction wherein more and more weight was put on the legal protection side of a patent while the information side of it was more and more neglected. The actual situation is that patent publications are almost incomprehensible for non-patent experts even if they are experts in the technical field concerned.

Kronz in "Mitteilungen der Deutschen Patentanwälte" 66 (2), Februar 1975, p. 21-23, states:

> That the language of patent specifications is eccentric and incomprehensible and the reliability and completeness are doubtful".

Liebesny in "Mainly on Patents" 1972, Butterworths, London formulated it as follows:

> "The strangeness of the language referred to is due to the prevalence of so-called 'patentese', i.e. a system of word selection and sentence construction which is frequently found in other types of legal writing. This is a aggravated in the case of patents by being combined with highly specialized technical terminology. ...Further more, there are also some grammatical atrocities commonly used in this form of literature... These peculiatrities of the patent language certainly do not add to the attractiveness of patent literature as a source of technical information and it requires considerable skill and expertise to translate this queer jargon into more common acceptable everyday language."

From various sides suggestions have been made to improve the information function of patents.

A subcommittee on patent and information policy of the US Advisory Committee on Industrial Innovation formulated in its report of 1978 the recommendation:

> The Patent Office should develop and require the submission with the patent application of an additional body of information to help provide easier accessing of the patent and more information concerning its use and potential application.

The recognition that a patent is a legal document which must be written to provide protection to the inventor and to define the scope of the invention suggests that major changes in the content of the patent specification would not be practical. However, a patent office can require that an additional information sheet should be furnished. This sheet which must not become part of the legal document itself should furnish according to the subcommittee:

- A more descriptive title
- Descriptive terms which are provided for in the search and retrieval system
- A statement of what need is met or what problem is solved including a description of what is useful and in what product or problem areas it might apply
- An improved summary which provides adequate disclosure of the generic basis of the invention and a clearer description of what the new invention is about.

Similar recommendations have been formulated by a Dutch advisory committee in 1978.

In the publication of Kronz, I mentioned before, a new type of invention description is proposed. The state of the art should not form part of it neither claims and criteria for patentability. It should not contain legal phrasiology but possibly economic data.

Since it is claimed that information contained in patent publications is of great value and for instance can play an important role in innovation processes and moreover as most of the information can be found only in patents and nowhere else, only about 20% of the patent information is also published in another medium, action whould be taken to make available in a suitable form the information contained in patents.

In my opion patent offices and legislators in cooperation with the patent profession and information end users, non patent-specialists, should try to re-establish the information function of patent publications, so as to further the technical development and to prevent unwanted duplication of efforts due to lack of timely information in a suitable form. Information geared to the needs of industry as well as appropriate communication channels might create a substantial market for patent information.

6. Making the examiners files accessible to the public

As mentioned before a patent office has available a large collection of documents. In 1975 the German Patent Office's collection contained 17 million documents, the one of the U.S. patent office even 21 million documents. The annual growth of the collection is about 500,000 documents.

The documents are classified, in most countries by means of the International Patent Classification (IPC) the latest edition of which having more than 50,000 subdivisions.

It will be clear that such an information system represents a considerable value. In most countries the system is used exclusively for internal purposes. The means available to the public are mostly limited to a classified collection of national publications only and numerical collections of foreign patent publications. Up till recently it was hardly possible to give the public access to the classified collection of a patent office. The patent office could not take the risk of the loss of publications and thus incomplete files, furthermore such a public service may obstruct the smooth operation within the patent office. Duplication of the files is financially not feasible.

The technological development of on-line facilities and transmission networks has opened the possibility of the shared use of a database by a great number of users. So the patent office's files which are in a machine readable form can now easily be made available, in Europe for instance via Euronet.

The Directorate Documentation of the European Patent Office has submitted a proposal to the board of the EPO to allow them to make their systematic documentation available to the public via Euronet. As a matter of fact it is already on-line searchable internally.

Search possibilities will be restricted to the internal EPO classification which as I told you before, is based on the IPC. The search result is a list of patents in numerical order per country of the publications classified into the IPC class asked for. It is selfevident that the public would benefit considerable if these facilities became available. Searching would be less time consuming, more complete and thus less expensive. It would probably result in better patent applications and extension of the use of patent information e.g. in research and development.

7. Providing access to patent information from various viewpoints

The collection of patent documents of a patent office is classified with the sole purpose of enabling the examiners to perform novelty searches as efficient as possible. Classification schemes used by patent offices, such as the IPC, are devised solely for that purpose. As a consequence informative searches having nothing to do with a patent application and its novelty cannot always be carried out succesfully in a collection classified according to e.g. the IPC.

If you ask for instance for patents on chemical processes with an energy-saving aspect you will not get an answer out of an IPC-file.

There are a number of aspects according to which government and industry might wish to access a patent collection. For instance aspects like:

- energy saving
- optimal use of raw materials
- what products can be made with defined available human resources, production facilities and marketing conditions
- non-polluting technology.

Some experts have formulated this more fundamentaly in suggesting that a patent file should be organised in such a way that the problems defined in a patent and the solution worked out should be the access points of the collection. A study of Battelle on behalf of the European Commission describes a system for indexing the content of the patent literature according to which the problem and the solution of each invention are characterised.

Patent Offices with a great experience in understanding and classifying patent publications seem to be the appropriate bodies to be entrusted with the task of creating instruments of this type which will enable the community at large to exploit the tremendous expensive body of patent information in which has been invested a considerable amount of money to the fullest possible extend.

I do hope that I have given you a few starting points for further thoughts on tasks which may be entrusted to your patent office. Hopefully you will come to additional activities which may be even more important than the ones I presented.

I can assure you from experience that the climate for making proposals to patent offices is much milder than it used to be. This does not mean however that the many financial and political constraints are easy to overcome.

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Commercial abstracting and indexing services, printed and on-line

D Greenwood and M W Hill

Until now we have been concentrating primarily on the official publications, those produced by WIPO, by the patent offices and by INPADOC, which is a government funded body. We must not, however, overlook the other information accessing services that are available, some only in printed form, some only on-line and some in both forms.

Possibly the best known and certainly extensively used is the very wide range of indexing and abstracting services of Derwent Publications Limited. They form a special category, being used by those concerned with industrial property rights possibly even more than by those merely seeking technical information. Leaving aside Derwent's special services for the chemical, pharmaceutical, agricultural and pesticide areas, they publish patent data covering 23 countries. Abstracting journals cover all patents issued by Belgium, Federal Germany, the UK, the US and the USSR. Further abstracting journals deal (one journal for each) with Human Necessities, Performing Operations, Transport and Construction, Mechnical Engineering, Instrumentation, Electrical Engineering.

A very special service is the World Patent Index. This consists of four, weekly gazettes (General, Mechnical, Electrical and Chemical) which list newly received patents by Patentee, IPC, Derwent accession number and Patent document number. Also there is the separately published Priority concordance which lists all the Family members under the priority application number. The index provides a series of routes to identifying patents.

Earlier this year, Derwent announced that it would be starting an Electrical and Electronic Patent Index, presumably on the lines of its Central Patent Index (which covers chemistry).

Then there is a number of publications and data-bases, produced by other organisations designed, it would appear, for general use but which are devoted exclusively to patents. These include the American Petroleum Institute's APIPAT data-base (which is available to only a limited number of users); the IFI/Plenum data-bases Claims/Chem and Claims/Gen which cover United States patents; and the four journals published by R H Chandler Limited including Paint and Resin Patents. The one abstracting journal devoted to patents in the aerospace field, the Airplane Patent Digest, seems to have ceased publication a few years ago.

Worth hunting out are many of the one off bibliographies of patents on a specified topic; many are of a review nature. The major publisher in this field is Noyes Data Corporation. Their books are derived solely from US patents but now cover an immense number of topics. For example Pressure sensitive adhensives is one; Powder Coatings Technology is another. Chandler lists twelve bibliographies; most of them are drived from UK patents only. National technical or patent libraries should be able to advise enquirers whether there is a specialised patents bibliography on the subject the enquirer is researching.

Finally there is a group of services which abstract technical literature in general, normally in a particular subject field, and include patents in their coverage. Sometimes, as in the Chemical Abstracts service, special attention is paid to patents by, for example, publishing a special index or a concordance of equivalent ones. In other services only a few patents seem to be included, perhaps only a selection from those on one country, and in these cases the value depends on the care in selection or the language of publication. The Bulletin Signaletique may be of special help to Frenchmen and Technische Zentralblatt similarly to those of German origin. A list of some services which may have a relevance to the present audience is attached.

Perhaps the most important role of these abstracting services which are not devoted to patents is that of alerting users to the possibilities of patents as a source of information, a source which might otherwise be overlooked. Many chemists, for exampe, use nothing but Chemical Abstracts as an access tool, relying on it completely to reveal sources of information in their field (except for the few journals they scan). Fortunately, Chemical Abstracts covers patent literature reasonably thoroughly (though, according to some studies, not thoroughly enough for a prior art search). Other services are less thorough; Inspec's coverage has, for a major service, been distinctly patchy. One wishes that those services which do include patents would do so thoroughly within their own field even if, to restrict the cost, they have to limit coverage to the patents of one major country only.

Engineering disciplines are very badly served. The major abstracting service, Engineering Index (and hence the computerised database Compendex) does not include patents at all. There is, however, some coverage by the peripheral, but important, services such as Corrosion Central Abstracts, Metal Finishing Abstracts and RAPRA Abstracts (Rubber and Plastics). A most important journal is, of course, the WILA fur Wirtschaftswerbung publication Auszuge aus den Offenlegungsschriften of which part 3 covers machinery and vehicles but which is almost an official journal though published commercially.

Abstracts should, of course, be used only as an indication of the topic or topics contained in a document. The old warning of "check your references" applies to abstracts with as much force as to citations. Even leaving aside the subjective question of the quality of one set of abstracts versus another, or whether there are errors, one can expect the way the abstract is written to be slanted to the interests of the intended reader. The extreme illustration of this can be found in the former British Abridgments. When the subject matter of a patent fell into two different Divisions of the classification scheme, it was normal to write a separate abridgment for each Division, highlighting in each the feature of the invention relevant to that Division. Abstracts serve really as an expansion of the index term under which you found the abstracts and as a clarification of the title of the document.

For some information purposes this may be quite sufficient. It will not be enough if one is concerned with the details of a manufacturing process, but if one is simply reviewing the different directions in which solutions to a problem have been sought or deciding on material for inclusion in an SDI bulletin it may well be all that is needed.

On-line information services

For the remainder of this paper we shall concentrate on the use of on-line systems with, of course, particular reference to those of value for patent information. We must say at the outset that this is based entirely on experience of using the systems in the Science Reference Library in London but we believe most of it has general relevance. It must also be emphasised that the information is correct (to the best of our ability) only at the time of writing (May 1980). On-line systems, unlike printed materials, tend to change both in the content and organisation of the data-base and in the modus operandi of the host system. It may well be, therefore, that some of the finer details concerning a particular database or host are no longer quite correct by the time the paper is presented.

We earlier mentioned that some abstracting journals covered only patents and others both patents and more conventional technical literature. The point has repeatedly been made earlier in the Lecture Series that patent information should, anyway, be regarded as one component of the total technological information spectrum. This we have found particularly true in on-line work. It is sometimes very difficult to split off the patent field from the information field as a whole, since in many cases the kind of work carried out in patents enquiries is identical with that in other information fields. Of necessity, therefore, this paper discusses the use of on-line in general and follows this with a particular discussion of areas peculiar to the patents field.

In the appendix are listed and described the on-line files that have proved useful to the patent community. If, therefore, you find any names that are unfamiliar in the paper itself, you should be able to find something about them in the appendix.

What is on-line?

It is assumed that most people reading this paper will be familiar with the use of on-line computer systems for information retrieval. However, for any who are not, the following is a brief description of the process.

Basically with most systems used today a central computer is made available to a large number of users through a telecommunications network. This allows the user to link up a computer terminal in, say, his or her office with the main or 'host' computer by means of the telephone system. Loaded on to the computer are files or databases each of which can be separately accessed by the user. The individual files normally correspond to a printed indexing or abstracting journal and in fact computerised information searching is analogous to searching a typical indexing journal, eg the computer holds a keyword index in its memory which can be used when doing a subject search. The only difference from a printed indexing journal with its attendant indexes is that storage is in the computer memory rather than on paper. A typical file that might be searched is the WPI file which corresponds to Derwent Publications Limited Central Patents Index/World Patents Index.

For example, a user with a computer terminal in France can link up his or her terminal with the INFOLINE computer in Britain via a telephone link through a communications network such as EURONET, or he can use a Tymshare network to link to the SDC computer in the United States. Once the link has been established the terminal can be employed to search any of the particular files available on INFOLINE or on SDC, not just the Derwent file. Figure 1 illustrates the physical set-up involved. Typically if some kind of patents enquiry is being answered the file in use will be the WPI file. Suppose for example that we wish to locate recent patents on hang gliders, it would be a simple matter to link up with the WPI file and produce a list of relevant patents. The example in figure 2 shows how this might be undertaken on the WPI file. Even simpler would be a search to find equivalents to a given patent as is shown in Figure 3.

Fig 1 TYPICAL ON-LINE SYSTEM

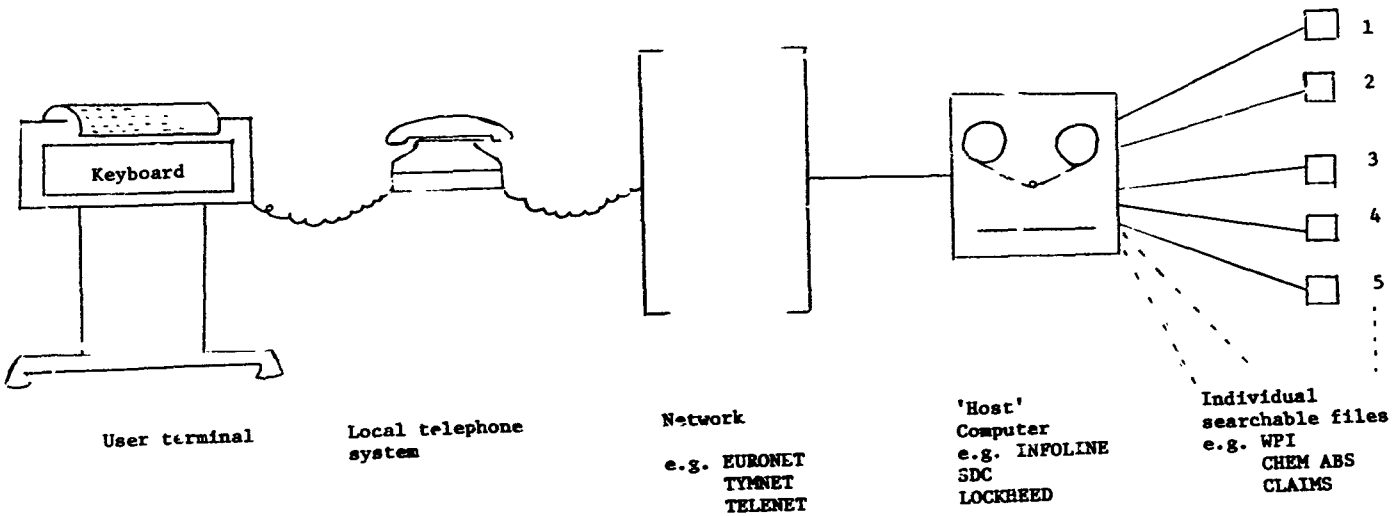

FIG 2 SEARCH FOR PATENTS ON HANG GLIDERS

```
INFOLINE
15/04/80  15:59
 LINE 31/07
LOGIN: 110051,

RUN NUMBER  276

LAST RUN AT: 041580 121901
///

   INFOLINE  VERSION 1.
 ENTER FILE NAME
/FILE WPI
 WPI VERSION 1 - (UP=8002)
 FOR FILE UPDATE STATUS ENTER  ?UPDATE

 UPDATE CODE FOR EQUIVALENTS (UE=8002) NOW AVAILABLE
/sSeETTT
 ERROR
/SELECT HANG
 SET    1: 823      HANG
/SELECT GLIDE
 SET    2: 339      GLIDE
/COMBINE 1 AND 2
 SET    3: 59       1 AND 2
/D UTI,PN/1-5
 D UTI,PN/1-5
 D UTI,PN/1-5
   *
 /D TI,PN/1-5

 ITEM 1
 TI:   FORESAIL IN HANG GLIDER- MOVES ALONG MAST, IS FIXABLE IN VARYING
       POSITIONS, AND ATTACHED PARTIALLY OR WHOLLY TO KEEL
       NL7808243-C09
 PN:   NL7808243-C09

 ITEM 2
 TI:   SAIL ASSEMBLY FOR SKATE SAILING OR HANG GLIDING- HAS CRUCIFORM
       FRAME AND TWO HAND HOLDS STITCHED INTO SAIL FOR MANIPULATION OF
       MAST US4186680-C07
 PN:   US4186680-C07

 ITEM 3
 TI:   HOLLOW MAST FOR SURF BOARD SAILS, HANG GLIDERS AND SIMILAR
       SPORTS GEAR- COMPRISES ALUMINIUM TUBE WOUND ABOUT WITH RESIN
       IMPREGNATED GLASS-FIBRE WEB DT2728583-B03
 PN:   DT2728583-B03

 ITEM 4
 TI:   HANG-GLIDER WITH TWO PROPELLER MOTORS- HAS MAIN CRUCIFORM
       TUBULAR FRAME WITH ADDITIONAL STRUTS FOR PROPULSION UNIT,
       TENSION WIRES AND WHEELS EP---4965-B44
 PN:   EP---4965-B44

 ITEM 5
 TI:   TOY HANG GLIDER KITE FOR TETHERED OR FREE FLIGHT- HAS TRIANGULAR
       FOIL COVER PIERCED AT REAR ENDS BY STRENGTHENED RIBS HELD IN
       FITMENTS FASTENED TO TOP SIDE OF COVER DT2815516-B43
 PN:   DT2815516-B43
```

FIG 3 EQUIVALENTS OR FAMILY SEARCH

```
 SELECT PN=FR2298616
 ERROR
/SELECT PN=FR2298616
 SET    4: 1        PN=FR2298616
/DISPLAY PN

 ITEM 1
 PN:   DT2503215-X32 BE-837924-X33 NL7600812-X33 J51099674-X42
       BR7600450-X44 FR2298616-X48 US4045325-Y36 GB1520362-A32
       CS7600437-A50
/LE-GOFF
 ERROR
/LOGOFF


++++++++++++++++++++ INFOLINE SESSION SUMMARY ++++++++++++++++++++++++++++++

   USER: 110051                                          DATE: 15 APR 1980

                SESSION STARTED 15.59 (LONDON TIME)

   FILE      CONNECT                PRINTS                  DOCUMENTS
             TIME (HRS)     ORDER NO  FORMAT  RECS      SOURCE  ORDER NO

   ENTRY       0.0186

   WPI         0.1222
```

The advantages of on-line in the patents field are basically the same as in any other information field in that on-line allows rapid, simple and as thorough access as the indexing will allow to published information in almost every field of human endeavour. Obviously, in the patents field it is of crucial importance to know what has gone before or whether a patent for a certain invention exists in a given country. Very often non-patent literature as well as patents material needs to be searched and this can be done very simply with a suitable on-line system.

In brief then the use of on-line is:

Time-saving	Searching manually through printed sources can be very time consuming. A search which would take several hours of searching through abstracting journals may be completed within a few minutes on on-line time.
Thorough	Because the computer can often search sections of an on-line file that are not available in the printed equivalent, it may be possible to get information on-line that could not be obtained from a manual search.
Flexible	The computer allows complex combinations of concepts in a search and moreover these can be modified if necessary as the search progresses
Cost effective	The time-saving capabilities of an on-line system ensure that this method of searching is cost effective.

Patents information in on-line systems

So far the discussion has been about on-line in general and has not covered patents in any great detail. This is largely because a lot of information required in patents work will be drawn from general literature anyway so that what is of relevance to on-line in general is also of relevance in a patents context. For example, a search for novelty or prior use may well cover all sorts of non-patents type literature. However, there are specific types of searches, eg to find whether something has been patented before or to find out whether a patent is held in a particular country, which do require specialised patents files.

The appendix at the end of the paper contains a description of all the files used at the SRL which either contain patents information or have been used in patents related searches. However, the following provides a breakdown of the various types of usage to which the files have been put.

Equivalents or family searches

In on-line terms these are the simplest type of search that can be carried out. The normal procedure is to enter a known family member or priority. The computer will then retrieve and print out the complete family corresponding to the entered number. Various files provide family searching but within the SRL the WPI file is normally used as it has up to now provided the broadest coverage and the easiest access. The other major file becoming now more widely available is the INPADOC Patent Family and system choice between the two is likely to be determined by available local access arrangements.

Name search

Again this is fairly simple, the procedure being to enter either the actual name of an applicant or inventor, or a code to represent that name. The computer will then gather all entries listed under that name either for printing out or further processing. Very often this facility is used in conjunction with some other kind of search, eg with a very common applicant such as SIEMENS an initial name search will produce many thousands of patents and a further subject search as described below may well have to be carried out to reduce the original search to a more meaningful set.

Subject matter search

This is the most complicated type of on-line searching, but it is perhaps the one that shows most advantage over the equivalent manual search. The major problem involved is that very often the data-base being searched only goes back a few years: for instance WPI in the non-chemical area contains records only as far back as 1974. However, in searches where date is not a limitation on-line methods can be extremely useful and cost effective. For example, with a very fast moving area such as electronics generally only the last four or five years literature need to be searched in any case to establish novelty. Even in cases where a search has to be taken much further back than the on-line file goes, it can still be useful to do a computer search first, since this search will throw up papers that may cite the earliest bibliography on the subject. Another type of subject search we are asked for is the 'quick and dirty' type search where we go into a data-base and get out half a dozen say useful references to provide a customer with background information. There is no expectation of comprehensive coverage in this case but again this kind of search can be carried out very quickly. Sometimes a customer will ask us to do a search just to find how much has been written on a particular subject.

In this case no records are printed out but the customer will have some idea of the size of the new project he or she is undertaking.

In practice so far, the finding equivalents is far and away the most heavily used type of on-line patents search and it is the one which has introduced most patents searchers to the other possibilities available through on-line systems. In most cases people are asking just for one or two families, but sometimes they may have anything up to a couple of hundred numbers to check. One can cope most easily with very large types of search by using a cassette machine to record the search strategy before going on-line. Once on-line it is merely a matter of feeding in the tape as fast as the system can handle it. Equivalents or family searching is in general very simple, each family normally taking a minute or less to check. One can, therefore, provide a rapid and very cost effective service in this area and although the same thing can be done manually, it is time consuming and not as convenient as a computer search.

Also very simple is name searching. However, the computer search may not have significant advantage over manual searching if one has access to the range of printed indexes. If one has not, it can be very useful and, therefore, is likely to find most use outside patent libraries.

Subject searching is not as frequently asked for as family searching, but the searches are much more involved and, therefore, cost much more. Retrieval is certainly not perfect, so in cases where a searcher has to be as sure of his facts as possible a supplementary manual search will also be conducted to complete retrieval, but this is usually greatly simplified by having the results of the computer search to start from.

In terms of cost a family search can in many cases be carried out for as little as £1 to £2 per family, but at the other end of the scale a complicated subject search involving a large number of search terms might cost £50 to £100.

The Science Reference Library has had on-line information facilities since 1973 and specialised patents data-bases since 1976. However, if our experience is typical, it was not until the advent of the Derwents WPI file in late 1977 that patents users started to take any real interest and only in the last year or so has the use of on-line systems for patent searching started to grow rapidly.

The future

The way now seems clear for continued growth in the use of on-line systems and this increasing growth is bound to affect the patent community. New files or file improvements are being introduced all the time (the Inpadoc file is an example) and there is no reason to suppose this trend will reverse. It also appears that on-line will spread to areas not yet covered. For instance, a data-base called LEXIS has just been announced which deals among other topics with patents law. It must be probable that the availability of full text patents on magnetic tape (the US is now selling such tapes) will eventually lead to total on-line searching but this may be a few years away yet.

Conclusion

On-line computer systems provide a simple and versatile method for fulfilling the needs of people working in the patent information field. Access to commercial files held in various computers in the US and Europe can now be obtained relatively easily through international communications networks, and there is no doubt that the number of available files will increase. There has been a general rapid growth in use to which has in recent years been added interest shown within the patent community. Information workers are nowadays quite used to this technology: it has become a common-place and those who wish to search for patents information can find a number of data-bases designed to meet their needs.

The main growth in on-line searching is surely to be by those who use terminals at their place of work. For them, ready access to the documents revealed as potentially relevant is likely to be of increasing importance. When only a few patents are needed swift photocopy supply systems will usually suffice, though larger organisations may choose to buy in microfilm of patents. For the user who has no in-house sets of patents and for whom the search has created a need to look at a large number of patent specifications, a visit to a library will still be necessary but he has the advantage of being well prepared so that his time at the library can be used most effectively.

APPENDIX 1

On-line files of interest in the patents field

Listed and described below are the following types of files:-

1. Specialised patents files
2. General on-line files which cover patents as part of the overall literature in a particular subject

1. Specialised patents files

WPI 1963

This corresponds to the Central Patents Index/World Patents Index printed services of Derwent Publications Limited.

It provides complete coverage of patents in all major countries and all subject areas from 1974 onwards, but also includes coverage of various areas of chemistry to well before that date. At present the file contains approximately 1.7 million patent records currently. Each record contains full bibliographic details including: patent number, equivalent patents, Derwent assigned title, inventor(s), applicant(s) and priority information.

Coverage by subject and by country is indicated in the following tables:

Patents coverage by subject

Pharmaceuticals	from 1963-
Agricultural Chemicals	from 1965-
Polymers and plastics	from 1966-
All other chemical subjects	from 1970-
All non-chemical subjects	from 1974-

Patents coverage by country

1963-

Belgium, Canada, France, Germany (West), Germany (East), Japan* Netherlands, South Africa, Soviet Union, Switzerland, United States.

1975-**

Austria, Czechoslovakia, Denmark, Finland, Hungary, Israel, Norway, Portugal, Romania, Sweden, (also Argentina 1975-1976).

1976-**

Brazil

1978-**

Italy

* For Japan, chemical patents only are being added to the database; there is no non-chemical coverage for Japanese patents.

** Patents from these countries are included only when a related patent appears in one of the 'major' countries.

Chemical Abstracts 1970-

Chemical Abstracts is the prime source of chemical information ans as such its aims is to record all patents that contain new chemical information. As a result about 20% of Chemical Abstracts entries are patents. At present around 4 million references in total are held in the on-line file from 1967 onwards. There are no abstracts as such in the computer-readable file but both the controlled and free-language descriptive phrases used in the Chemical Abstracts subject indexes are included in each reference. Equivalent patents are not listed in Chemical Abstracts, but can be traced, eg in the Derwent's WPI file. Searchable areas of the file are:

Chemical Abstracts search fields

Subject retrieval

1. Words from the title, from free-language identifying phrases and from controlled-language terms used in the indexes to the Chemical Abstracts printed edition.
2. Registry numbers (for searching on particular chemicals).
3. Patent classification (normally International Classification, but there are exceptions, eg Canada).

Bibliographic retrieval

4. Assignee (name)
5. Inventor
6. Patent number and country
7. Patent country
8. Priority country

This file is available through LOCKHEED, INFOLINE, SDC and the EUROPEAN SPACE AGENCY.

European Patent Office Register 1978-

This has only recently been made available. It is provided by the European Patent Office and provides register details of European applications and patents. At the moment there are only some 7000 entries on the register but this is expected to grow rapidly. Searching can only be carried out by application or publication number.

This file is available direct from the EPO.

INPADOC Family Service and Patent Gazette

At the time of writing we have no experience of these data-bases. The major use of the INPADOC service is expected to be in the checking of equivalents.

The family service will be available direct from INPADOC and a German service, whilst the Gazette is to be offered through LOCKHEED.

2. Other files containing patent information

Many of the other files available cover patents as a part of the overall literature in a particular subject area. However, coverage may not be exhaustive. The following list indicates files which fall into this category.

INSPEC 1969-

Covers physics, electro-technology, computers and control.

METADEX (Metals Abstracts and Alloys Index) 1966-

Covers metallurgy and related areas.

Information can be retrieved from the Derwent file by the methods tabulated below; either alone or in combination:

WPI searchable fields

1. Words from the Derwent assigned title (and descriptors)
2. International patent class
3. Derwent class
4. Derwent codings

Bibliographic retrieval

Assignee (code)
Inventor (1978-)
Patent number
Patent country
Priority number
Priority country
Year of basic publication
Derwent accession number

This file is available through SDC and INFOLINE

Claims 1950-

A series of files which resulted initially from a merger of Dupont and IFI/Plenum patents data-bases and which do not have a printed equivalent. They contain records of about 0.9 million US patents. Coverage is as follows:

Chemical patents	back to 1950
Non-chemical patents (general, electrical and mechanical)	back to 1971

Currently, each record contains the patent number, inventor(s), applicant(s), patent title, US classification details and a full abstract of the first claim as listed in the US Official Gazette. With chemical patents, equivalents in the major European countries are also listed. It has recently been announced that the chemical patents records will also soon have UNITERM subject index terms available to improve subject searching.

Information can be retrieved from the CLAIMS file by the following methods either alone or in combination.

CLAIM/CHEM and CLAIMS/GEN search fields

Subject retrieval

1. Words from the expanded patent title*
2. Original US Patent Office class code
3. Cross-reference US Patent Office class code
4. US Patent Office classification group
5. UNITERM subject index terms (chemical patents - available by summer 1980)

Bibliographic retrieval

Assignee (name)
Assignee (code)
Patnet number
'Foreign' patent number (chemical patents only)

* IFI/Plenum have been expanding the patent title to make it more informative from 1972-

This file is available through LOCKHEED

PAPERCHEM 1969-

Includes patents selected from the gazettes of six major countries in all areas of pulp, paper and board manufacture and utilisation.

RAPRA 1972-

Covers the areas of plastics and rubber technology.

APTIC

Covers air pollution control and related areas.

WORLD TEXTILES 1970-

Covers textiles and related materials and includes US and UK patents.

WAA (World Aluminium Abstracts) 1968-

Covers aluminium processing and utilisation.

Patent information : looking ahead

M W Hill

The written version of this concluding paper will be brief. Its purpose is to review some of the long term trends and try to judge where they are leading us. The shorter term aspects, covering the next year or so, I shall try to cover during the oral presentation by drawing upon the various discussions of the two days of this meeting. Let us start, however, by briefly looking at what has been achieved in recent years.

One might say that each problem has its information sources and that each information source has its problems. If books and journals seem to pose few problems to those who use them, it is because they have always been familiar to them. The problems with patents probably are those of unfamiliarity. An effort has to be made to learn how to assess what you want. At the risk of being a lone voice crying in a wilderness - a wilderness present composed of some hundred million sheets of paper gradually being overlayed with a rather thick veneer of microfilm - I would say that the most serious problem is that of finding with reasonable ease, the information one wants. Familiarising one's self with strange classification systems, coping with the peculiarities of the legal language and so on, are problems which pale almost into insignificance beside that fact that a search of the patent literature may involve scanning up to a thousand documents at a time to find whether or not what one wishes to learn is actually present.

We have talked during these two days quite a lot about the resources which are now available, their merits and their disadvantages. We may still feel, as I have indicated in the last paragraph that there are serious problems still in searching patents but I think that we must recognise that there have been huge advances in the last 2 decades. There have also been one or two steps backwards but in general, the directions in which there has been progress far outweigh the others. Great deal of this progress has been due to the work of ICIREPAT and more recently WIPO. But some of the commercial services have also made immense steps forward. We now have more or less standardized documents with clearly identified bibliographic items on the front pages and we know which series of publications each document belongs to. We have an abstract on the front page usually with a diagram to help us see quickly whether the document is in the field in which we are interested. We even have substantially improved titles, though there is a long way to go before these alone will be suitable for keyword indexing. In many countries the introduction of early publication enables the dissemination of information about the invention to start as early as possible though some may feel that this has in fact put the inventors' interests at some disadvantage.

We now have the international classification applied to virtually all patent documents and in the case of several English speaking countries, a national classification as well, which means that there is a two pronged approach possible to finding information in these countries. We have the various indexing services available from INPADOC which, being based on the official data, must be assumed to be, if not perfect, at least up to official standards of reliability. And most recently perhaps we now have at least one patent office register available on line, namely that of the European Patent Office. The same office plans, I understand, soon to have the IPC on-line.

Among commercial operations those of Derwent Publications Limited must surely take pride of place with both their wealth of detailed abstracting services covering most of the important subject areas and of language groupings plus their indexing services. Chemical Abstracts Service has greatly strengthened its methods of dealing with patent information and we also have a number of other on-line and printed services available.

So what else is left? Must we assume that the era of improvements in usability and access to printed documents is now over and that the situation can be taken to be more or less static for a while? I think the probable answer to that limited question is yes, even though I realise, with certain humility, that a definite forecast of that type is likely to be disproved in a very short period of time perhaps by someone who rose to the challenge of making sure he could disprove it. Future progress will, I feel, be more radical in nature than improving the presentation of paper documents, of microforms and of abstracts.

Of course there is still room for improvement in existing operations. One would like to see coverage by conventional abstracting journals improved to the same level as that achieved in Chemical Abstracts. One would like to see official abstracts available on line from the patent offices or through some international service. One would like to be able to undertake free text searching of abstracts as an alternative or as a supplement to using the classification approach. If this does catch on, it will be necessary to improve the quality of the official abstracts probably to something like the level of the now abandoned Abridgements.

Obviously, what is going to happen as far as the management and exploitation of patent information is concerned must depend on what happens in three major sectors : changes in industrial property practice; developments in information handling; and in what happens to the social/economic climate of our countries. Forecasting is notoriously unreliable. Admittedly, some forecasts aim to be doomed because they are made in order to initiate action to ensure that the future they predict does not come about, but our efforts here do not have that objective. Lewis (ref 1) forecasting the demise of much of the present style of documentation work, of information work and of information scientists as mere intermediaries, relies largely on the analysis of long term trends of social behaviour and short term trends in specific activities. Summit (ref 2) prefers to match a solution of current problems to newly developing technologies. Yet few in the 1940's would have realised just how the transistor would transform our way of living even though Summit's approach would have made us realise that perhaps atomic energy was not the most important step forward.

In his very perceptive paper, Summit indicates that progress has depended on identifying problems which were being encountered and then finding solutions for those problems in very much more sophisticated versions of technologies which were, in their infant stages, already available. As illustration he showed that a whole series of problems listed by Helen Brownson of the National Science Foundation has since been solved by computerised systems and by on-line services. Such solutions could, at the time the problems were listed, be seen only in their primitive forms in peek-a-boo systems, in CRAM the NCR mass, random access storage device and in the IBM RAMAC high speed disc. Of course, as he readily admits, blind alleys have been tried and unprofitable developments pursued : perhaps the outcome in principle is easier to forecast than the means of achieving it. Nevertheless, listing the features that we feel need to be available in a manner which expresses the real need rather than in one which implies a particular solution, it may be that one can hopefully, get some idea of what might be in store in the future.

Perhaps we could usefully adopt both techniques. Let us look first at the information technologies which are around and then at the communications field, on which so much information work depends. Progress on publishing patent information has parallelled (albeit a few centuries in arrears of other fields of publishing) the usual trend from oral transmission, to manuscript record, to printed record. We may now have caught up in that we are exploring microprint and near-print systems (e.g. off-set litho reproduction of typescripts) but it is too early to tell whether these are blind alleys or not. In the publishing world generally interest is currently focussed on the possibilities of electronic publishing and viewdata, on synopsis journals and on computer printing.

The publishing problem of the patents field is that each searching/examining office prints a large number of individual documents in very small quantities mainly for free distribution : few copies are sold of each.

On-line services, which we have discussed, are still relatively new and must be regarded as still in their early stages. A trend towards replacing data bases of mere indexes and abstracts by data banks of information for the end user is already becoming visible. After all, as I have said at another meeting, abstracting services are really a nineteenth century solution to an eighteenth century problem. How many senior decision makers today have time to read a full report on a topic? They need concise synopses of the salient features of each matter they have to decide. The same is true of news for the lay public. None of them look for brief accounts which simply indicate whether or not the original full account is worth reading. The two minute piece of TV news is not given as a guide to whether to watch a later programme. Reviews of progress in various fields are invaluable to scientists and often call for no further reading of the full papers. Despite all that we have heard about the work of OTAF, and despite the efforts of the Noyes Publishing Corporation, similar reviews of progress in technological fields which draw extensively on patents are not yet common.

Lewis sees as inevitable a trend towards replacing the intermediary who is currently a feature of bibliographic on-line systems, though less commonly so of those concerned solely with a limited range of data. I'm sure he is right though, even with a common command language for most systems, sophisticated on-line operation will for a long time demand a reasonable level of intelligence and training. The fact that on-line may cost rather more than other methods of searching is likely to be irrelevant as long as it is within the user's means. A car is much dearer than a motorcycle, yet most prefer to buy the car. A washing machine is much more expensive than washing clothes by hand, yet few housewives who can afford it would be without one.

Mini computers and microprocessors already have sufficient storage capacity at a reasonable cost to make it feasible for even medium sized companies to store substantial amounts of information and to code and index it for retrieval according to their own interests as long as complex programming which is expensive, can be avoided. At present, however, these small computers cannot, as far as I know, handle the diagrammatic data which is necessary in so many patent documents. However, viewdata systems already provide illustrations and the technology to manage linear diagrams by computer does exist; so it may only be a question of time - or of demand for such systems - before acceptably low priced packages suitable for patents become available. The videodisc system is very promising but as yet is still quite expensive for information work. If it is to be used for patents, however, there may have to be changes in the way specifications are written: diagrams will have to become self explanatory.

Communications technology is obviously developing rapidly. For example, computers and microprocessors can now be linked to the telex system. The cost of accessing remote computers can be kept down by working up one's search on an intelligent terminal and then when it is ready feeding it as quickly as the telephone lines will allow to the computer. I am sure that many in this audience will know of, perhaps already be familiar with, far more advanced communication technologies than are, for various reasons, yet available over or as the PTT systems.

Facsimile transmission has been around for some time and is used on some scale for newspaper work. It is also useful for message transmission where diagrams are involved. But it has not yet made much impact on document supply because machines suitable for use over telephone lines have drawbacks of low speed and difficulty with small typefaces and low contrast paper. Satellite rather than land line links might produce a breakthrough.

Electronic mail and intelligent copiers are developments which could well influence the patents information world. Already, of course, on-line systems are building in an automatic document copy ordering system.

Inevitably one has a feeling of being overwhelmed by far too much new technology. How can one hope to pick out the winners. As Summit suggests, we can look at the problems we need to solve but we must, I suggest, go one step further. If technology is to solve our problems, there must be an adequately large market for the machinery which is developed. This means almost inevitably, a certain standardisation of our requirements and a willingness to accept a slightly less than perfect solution. It may be that because developments in the patents field have up till now been constrained by the needs of the legal field, where mistakes can prove expensive, progress has inevitably been slow. But now that we can get the whole of patent information, full text as well as bibliographic data and abstracts, in machine readable form, the possibilities of paperless information storage, retrieval and dissemination operations cannot be far away. Diagrams remain a problem but videosystems ought to be able to cope. So perhaps we shall eventually see during our lifetime the future that Derek de Solla Price forecast at EURIM IV, namely whole text, self indexed with selective sections displayed on screens in response to natural language requests. Our fundamental problem, you remember, is too much paper to be searched for any information need.

After that brief gallop through the forest of our technology and information management let us now turn to the patents world itself. Although there are anxieties about its future it may be the easier sector to forecast. True, companies in the western world are wondering whether patenting is worthwhile, whether too much is disclosed with too little protection. The change in the last few years to early publication, to more stringent searching of prior publications and the as yet largely untested European court naturally make companies cautious, particularly when some countries outside the NATO membership are imposing there severe limitations on the monopoly. Shall we find that companies cease to patent processes which they can hope to keep secret and patent only artefacts which can be bought on the open market and their novel secrets analysed. I hope not for the world will be the poorer. Progress is speeded by the ready interchange of ideas, by building upon the discoveries of others even if it remains those with properly prepared minds who benefit most.

However, it must be unlikely that in the next few years any fundamental change will occur. The European patent will, by about five years time, be well established and the Community patent operation will be coming into effect. It is at that time that we may well be learning whether or not the national patent systems of Western Europe will continue as separate entities, and if so, to what extent. The Patent Co-operation Treaty will have been in operation for the same number of years, sufficiently long to enable us to say that either it is on the way up or that it is on the way out. It is certainly unlikely that the present uncertainty will fail to have been resolved by then. Across the Atlantic I think we may expect with reasonable certainty that the United States patent system will still be operating in very much the same way as it does at present though, from this distance, the future of the Canadian one seems less certain. That is not to suggest, of course, that there will not have been any improvements or developments in the US system, (I am sure there will have been many) but it is evident that one can expect their patent system as such to continue on lines similar to if not identical with the present patent law.

One would like to hope that guidelines for resolving patentability questions for novel developments (i.e. questions of the type raised by computer programs and by biotechnology) will have been produced but it may not be so. So we must, I suggest, assume that inventors and industrial companies will continue to seek patent protection for their ideas much as they do at present but there may be some changes of emphasis in the route which is chosen for applying for patents, especially those which are sufficiently significant to be worth protecting in several countries. We can also expect the flow of patent information to continue even if the balance of the fields of coverage changes. However, even if men remain as inventive as ever, it may be that, despite Government exhortations, we in the industrialised West have passed our peak of innovative activity (ref de Solla Price Eurim 4). This is because innovation in many fields is impeded by innumerable social pressures - environmental lobbies, health danger lobbies, unions fearful of job losses and so on. Other countries are untrammelled so far by such considerations and may, therefore, prove more fertile fields for new manufacturing plant.

Even if the output of patents from the industrialised west remains constant or, as is more likely, declines slightly, that from the emerging countries, Brazil and Korea for instance, can be expected to grow. If so, the language problem, already acute because of the huge number of Japanese patents, can be expected to intensify and equivalents in the documents of the EPO or other western countries or the US will be sought more intensively, as will PCT abstracts in English.

So we have an increase in social-environmental constraints which may make even longer the lead time which must elapse before a new invention is being sold in the market place. What other general long term trends are there which may help to forecast where we are heading?

Evans (ref 3) sees not only a trend to the replacement of the intermediary or dispenser of services - eg the ticket clerk and bank clerk - by machines but also the gradual replacement, also by machines, of certain areas of professional mystique. Certainly one can see associated with the gradual elimination of labour intensive operations - and both patent examining and information searching fall, at present, into the category of labour intensive - an increasing willingness to accept lower standards of choice or service or even of performance.

I am well aware that many efforts have been made under the ICIREPAT programme since the 1950's to find ways of computerising the search process without achieving any notable success. It may be that for granting industrial property rights the stringent requirements of searching will continue to make progress in this field impracticable but where searching for information from patents or other purpose is concerned, I am sure that - as indeed we can already see - the normal patterns of progress will be followed. Every school child today uses calculating machines and on-line terminals. The travel agent in the village where I live no longer looks up the cost and other data in brochures but has a Prestel terminal for this purpose. Social pressures will demand that searching vast files of paper documents is replaced by simpler systems so that the information worker can devote his time and skill to interpreting information rather than just retrieving it.

One last thought, what about the huge mass of paper and microform which already exists and must be searched? There seem to me to be two options, both perhaps unthinkable. The technological one is to put all this information into machine-readable form (machines already exist which would do this). The second, which is the one I back, is to get the patents system to forget it and to search only the last twenty years so that by the year 2000 we could, except for archival purposes and historical research, throw away all the stuff we now have. As we know, we keep reinventing the wheel: would it really matter if we could also repatent it?

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1. Lewis, D. A. — Today's challenge - Tomorrow's choice: change or the changed. Paper presented to the Institute of Information Scientists Annual Conference 1980.

2. Summit, R. K. — Problems and challenges in the information society - the next twenty years. Journal of information science, principles and practice. 1(4), 223, Oct 1979.

3. Evans, C. — The mighty micro. London. Gollancz. 1979.

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Chancery Lane, London, WC2A 1AW

PART A: GENERAL TEXTBOOKS

A1. Konold, W.G. et al
WHAT EVERY ENGINEER SHOULD KNOW ABOUT PATENTS.
New York. Marcel Dekker Inc. 1979.
A useful guide.

A2. Maynard J.T.
UNDERSTANDING CHEMICAL PATENTS: A GUIDE FOR THE INVENTOR
Washington DC. American Chemical Society 1978.
This 150 page book gives, according to one reviewer, "lucid information on the US patent system". Inter alia, the book aims to answer immediate and practical questions about how to use patents as a source of information. It also deals with other aspects of the patenting process.

A3. WIPO
INDUSTRIAL PROPERTY GLOSSARY. ENGLISH/FRENCH/SPANISH/ARABIC.
Geneva. WIPO. 1979.
350 main terms, many subdivided, which are listed have been taken from the various treaties administered by WIPO.

A4. Wittmann, A., Schiffels, R. and Hill M.W.
PATENT DOCUMENTATION.
London. Sweet and Maxwell. 1979.
A thorough survey of the scene written at the end of 1978.

PART B: MAJOR CONFERENCE PROCEEDINGS

B1. Derwent 78.
INTERNATIONAL PATENTS CONFERENCE. PROCEEDINGS
London. Derwent Publications Ltd. 1978.
A set of 54 papers on topics ranging from Patent Office procedures via in-house patents management and in-line searching to chemical and polymer coding. Despite the expected emphasis in Derwent services a broad approach is taken.

B2. DGD/WIPO
INTERNATIONAL SYMPOSIUM: PATENT DOCUMENTATION AND INFORMATION. MUNICH 1977.
K.G. Saur Munich 1978.
A more helpful set of papers for those interested in the use of patents than those of the Moscow conference.

B3. WIPO
INTERNATIONAL SYMPOSIUM ON THE ROLE OF PATENT INFORMATION IN THE TRANSFER OF TECHNOLOGY.
VARNA 1980.
For those concerned with practical aspects of the use of patent information, this set of papers contains but a few crumbs of information. These papers are of more interest to students of the politics of the patents world.

B4. WIPO
THE ROLE OF PATENT INFORMATION IN RESEARCH AND DEVELOPMENT. MOSCOW 1974
WIPO Geneva 1975.
Although many papers are mere position statements among them are a number giving useful information. Many are individually listed in the following sections.

PART C: SPECIALIST JOURNALS

C1. WORLD PATENT INFORMATION
Quarterly. Luxemburg
Published by the Commission of the European Communities in collaboration with WIPO.
This journal is the only one uniquely devoted to the field.

C2. A NUMBER OF OTHER JOURNALS FROM TIME TO TIME CONTAIN INFORMATION OF VALUE TO THOSE WORKING WITH PATENT INFORMATION. EXAMPLES ARE:-

1. Intellectual property. WIPO. Geneva
2. Industrial property news. Science Reference Library. London.
3. Nachrichten für Dokumentation.
4. Journal of Chemical Information and Computer Science.

PART D: PATENT INFORMATION GENERAL

D1. Appleyard, R.K.
PATENT INFORMATION AND THE COMMISSION OF THE EUROPEAN COMMUNITIES
"International symposium: Patent information and documentation. Munich 1977
Munich K G Saur 1978."
Author's Summary

The legal and organizational framework for information and documentation on patents at the Commission of the European Communities is constituted partially by the Treaties of the European Communities (ECSC, EEC and EURATOM), and principally by the Resolution of the Council of Ministers of June 24th, 1971 on the coordination of the activities of the

member states in the field of scientific and technical information and documentation (STID). Based on this resolution a working-group "Patents documentation" has been set up, which will submit its final recommendations to the STID-Committee during this year. One of its major proposals will aim at giving public access to patent information bases through the European On-line Information Network EURONET. An important result of its work was the preparation and publication of an inventory of patent information and documentation services available to the public in the European Community. As to the Commission's own work, the patent-statistical study on the impact of patents in the various technical sectors within the EEC (Report No. 5530) should be mentioned.

D2. ARTEMIEV. E.I.
PATENT INFORMATION- AN IMPORTANT FACTOR OF TECHNOLOGICAL PROGRESS IN THE SOCIALIST COUNTRIES. p60-69. INTERNATIONAL SYMPOSIUM: PATENT INFORMATION AND DOCUMENTATION. MUNICH. MAY 16-18. 1977. K.G.SAUR. Munich 1978.

The paper discusses the social and economic function of patent information under conditions of the socialist state and analyzes the state mechanism for controlling patent information activity.
The principles of organization and structure of the patent information system in the USSR are described and the relation of the system with the state system of scientific and Technological information is discussed.
Possibilities for further improvement of information retrieval systems, operativeness and efficiency of alert information and abstract information are discussed alongside with the improvement of the quality of periodicals containing information on domestic and foreign inventions; possibilities for the utilization of new advanced carriers for patent information are considered.
The state and future of cooperation between the CMEA member-countries in the field of patent information are discussed.

D3. Selmo, S.
THE TECHNICAL INFORMATION PROVIDED BY THE EUROPEAN PATENT OFFICE
World Patent Information, 2(2), 53, 1980
An account of the searches undertaken.

D4. Beier, F.K. and Straus, J.
THE ROLE OF INFORMATION IN PATENT SYSTEMS
p.34-50. International Symposium: Patent Information and Documentation. Munich, May 16-18, 1977. K.G. Saur, Munich. 1978.

Importance of the patent system for the production, transfer and dissemination of new technological knowledge - historical survey. The disclosure and information functions of the patent system in the light of the patent theories. Origins and further development of patent documentation. Legal and technological aspects of the disclosure. Changed function and present significance of patent information as part of the general information system.

D5. Borggord, G.
PATENT INFORMATION IN MARKET ECONOMY COUNTRIES
International Symposium in the role of patent information in the transfer of technology Varna 1980.
A paper with some interesting case studies.

D6. Grewen, J.
THE PROBLEM ORIENTED INFORMATION AGENCY FOR PATENTS AND THE PROGRAM OF THE FEDERAL GOVERNMENT FOR THE PROMOTION OF INFORMATION AND DOCUMENTATION.
"International Symposium: Patent information and documentation. Munich 1977
Munich K G Saur 1978."
A brief account of the relationship of the Fach Informatsion Zentrum network, set up under the IVD program and the field of patent information.

D7. Harman M.G.
PATENTS AND INFORMATION. CIPA. THE JOURNAL OF THE CHARTERED INSTITUTE OF PATENT AGENTS AUGUST/SEPTEMBER 1976

D8. Hausser, E.
PATENT INFORMATION - AN IMPORTANT FACTOR IN INDUSTRIAL DEVELOPMENT OF MARKET ECONOMY COUNTRIES.
International Symposium in the role of patent information in the transfer of technology Varna. 1980.
The views of the Head of the German Patent Office.

D9. Host-Madson, K.
IMPROVEMENT OF PATENT OFFICE INFORMATION SERVICES
"WIPO Symposium: The role of patent information in research and development. Moscow 1974
Geneva WIPO 1975."

D10 Joenk R.J.
PATENTS: INCENTIVE TO INNOVATE AND COMMUNICATE AN INTRODUCTION
IEEE Translations on Professional Communication PC22(2) 46-59, 1979
A very brief and simple introduction to patenting and to information retrieval from patents. Its main value is an extensive bibliography on invention and patenting.

D11. Kunz, M.
TIME DISTRIBUTION OF PATENT INFORMATION
Scientometrics 1(3) 275-285. 1979
Studies the distribution of patents in time; for the experiment a list of patent fees paid for 5 European countries (Belguim, Britain, France, Holland, and Austria) between 1971 and 1973 is used. The time distribution of British patents can be described by a truncated Gauss'i distribution, for Belgian patents there is a Poisson distribution. Discusses appropriate models derived on the base of the octagonal and cubic linerar vector space norms.

D12. Leberl O.
ACCESS TO PATENT DOCUMENTATION FOR USERS IN DEVELOPING COUNTRIES
p 174-179 International Symposium: Patent Information and Documentation
Munich, May 16-18 1977. K.G. Saur, Munich 1978

For the promotion of technology transfer within the frame-work of the Austrian development aid activities a program is being implemented by the Austrian Patent Office, the objective of which is to provide more effective access to patent documentation for users in developing countries. The program executed in collaboration with WIPO is focussed on the provision of technological information from patent literature (searches of the state of the art in specific technical fields), training of experts in the use of patent documentation and promotion of the establishment of documentation centers in developing countries through contribution to the implementation of the CAPRI project.

D13. Lenoir, M:
PROMOTION OF PATENT LITERATURE
World Patent Information, Vol. 1 (1979), No. 2. p.84-87
In its report EUR 5952 of 1978 the Commission of the European Communities published the results of an enquiry into the use of patent documentation which revealed that a mere 5% of potential users availed themselves of the opportunity. The aim of this article is to lay bare the causes, psychological and material, of this disturbing state of affairs. The publicity adopted for the promotion of this type of documentation seems ill-suited to the purposes envisaged, and there is a need for training schemes for the three main types of potential user.

D14. Marmor. A.C.
CHARACTERISTICS AND VOLUME OF PATENT INFORMATION
International Symposium: Patent Information and Documentation.
Munich, May 16-18, 197[illegible].
K.G. Saur, Munich. 1978
A general survey but gives [illegible] emphasis to the United States scene.

D15. Charles Oppenheim.
THE INFORMATION IN FUNCTION OF PATENTS
European Intellectual Property Review. December 1979. p 344-349
A short description of the types of searches (patentability, infringement, technical information, commercial information) and a general description of features of patent documents which effect searching. A few of the major sources of information about patents documents (Derwent, Inpulse, Claims) are discussed. A brief interview with some interesting side lights.

D16. C. Oppenheim.
INFORMATION AVAILABLE
Paper to CIPA/ESC Conference. " Practice under the Patents Acts 1977". London 1977

D17. de Passemar, B.
LA DOCUMENTATION BREVETS - UN FACTEUR IMPORTANT DE PROGRES TECHNIQUE DANS LES PAYS A ECONOMIE DE MARCHE.
p.51-59. International Symposium: Patent Information and Documentation.
Munich, May 16-18, 1977. K.G. Saur, Munich, 1978.

D18. Saunderson K.M.
PATENTS AS A SOURCE OF TECHNICAL INFORMATION
ASLIB Proceeding April 1972

D19. Schweikhardt, F.
USERS' ASPECTS AND WISHES
"International Symposium: Patent information and documentation
Munich 1977. Munich K G Saur 1978" p 376
An account of user problems and the resources provided to meet their needs. Regrettably the argument in the English version is not very clear, having suffered in translation.

D20 Seibert, R.
PATENT INFORMATION IN A LARGE INDUSTRIAL ENTERPRISE
"WIPO Symposium: The role of patent information in research and development. Moscow 1974 Geneva WIPO 1975."
The author works with patents in a large German firm and is a recognised authority

D21. Sviridor, F.A.
PATENT INFORMATION ACTIVITIES OF WIPO
P.113-126. International Symposium (---- As A)

D22. Terapane J.F.
A UNIQUE SOURCE OF INFORMATION
Chemtech 8 (5) 272 1978

D23. Terragno P.J.
PATENTS AS TECHNICAL LITERATURE
IEEE Transactions in Professional Communication
PC 22 (2) 101-104. 1979
Patents are an important technological information resource. They are different from journal literature in that they are stand-alone documents and have a uniformity of presentation. Studies show that eight out of ten U.S. patents contain technology not disclosed elsewhere in the scientific and technical literature. However, there is evidence to suggest that, outside of the chemical field, patents are not utilized as a major source of technological information. Currently, some of the more significant efforts concerning patent information dissemination are those involving 30 Patent Depository Libraries in the United States which maintain patent collections and serve the public in the use of these collections. The Patent and Trademark Office distributes some ten million copies of patents annually as well as some 5,000 copies weekly of its Official Gazette which contains a summary of the approximately 1,500 patents issued each week.

D24. Tribus Myron.
THE PATENT OFFICE IN THE AGE OF INFORMATION. UNITED STATES DEPARTMENT OF COMMERCE NEWS
12 August 1969

D25. USPTMO
PATENTS AS A TECHNOLOGICAL RESOURCE
8th Report of the Office of Technology Assessment and Forecast 23-27. 1977
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D26. USPTMO.
THE PATENT FILES AS A TECHNOLOGICAL RESOURCE
8th Report of the Office of Technology Assessment and Forecast. 38-43. 1977
NTIS. Report No. PB276375

D27 Weber, F.
FUNDAMENTAL AND ACTUAL PROBLEMS OF PATENT INFORMATION
"International symposium: Patent information and documentation. Munich 1977. Munich K G Saur 1978."
Organisational aspects are discussed

D28. White G R.
MANAGEMENT INTERIA FOR EFFECTIVE INNOVATION
IEEE Translations on Professional Communication. PC - 22(2) 77-82 1979

PART E: USE OF PATENT INFORMATION FOR SPECIAL PURPOSES

E1 Allcock, H.M. and Latz, J.W.
PATENT INTELLIGENCE AND TECHNOLOGY - GLEANING PSEUDO PROPRIETARY INFORMATION FROM PUBLICLY AVAILABLE DATA.
Journal of Chemical Information & Computer Science 18 (2) p65 (1978)
An illustration of the use of patent documents for commercial intelligence purposes.

E2. Balent, M.Z. and Latz, J.W.
POLYMERS AND PATENTS DON'T MIX. - EASILY
Journal of Chemical Information and Computer Sciences, 19(2) p.70-83, 1979
Polymer references in the patent literature pose a unique challenge to the indexing-retrieval process. Of the several forces working together to compound the problem, four appear to be significant: (1) the wide range in specificity and format of the references. (2) the wide range in user requirements, (3) the sheer volume, and (4) the indexing cost/search cost relationship. A polymer indexing/retrieval system designed to meet the challenge and including an optimizing combination of generic, specific, and monomer/role indexing techniques to produce a favourable indexing cost/search cost relationship is discussed.

E3. Bowman, W.H.
IMPORTANCE OF PATENTS AND INFORMATION SERVICES TO RESEARCH WORKERS
Journal of Chemical Information and Computer Services. 18(2) 81 1978
A very short, meaty paper

E4. Diamond, S.A.
USE OF PATENT INFORMATION FOR TECHNOLOGY ASSESSMENT AND FORECASTING IN THE USA
International symposium in the role of patent information in the transfer of technology Varna 1980.
A description of an intelligence use of patent information. Refers to the new review publications "Patent Profiles".

E5. Ellis P. Hepburn G. Oppenheim C.
PATENT CITATION NETWORKS
pp 269-276 International Symposium: Patent Information and Documentation Munich. May 16-18 1977. K G Saur. Munich 1978.

Work is described on patent citation networks, a novel technique for displaying the history of technological subjects and their key turning points. The method accurately identifies the key patents in a subject field, and if a subject does not have a definite starting point, this is reflected in the patent citation network. Subjects studied were: semi-synthetic penicillins, tobacco substitutes, electro-photography and Ziegler-Natta catalysis. Possible users of the technique are examined.

E6. Giragosian, N.H.
PATENT INFORMATION NEEDS FROM A MARKETING MANAGER'S POINT OF VIEW
Journal of Chemical Information and Computer Science. 18(3) 121 1978
The paper lists what might be done with patent information but gives no examples of what has been done.

E7. Guzy, V.
USE OF PATENT INFORMATION IN THE UKRANIAN RESEARCH AND DEVELOPMENT INSTITUTE OF CHEMICAL ENGINEERING
"WIPO Symposium: The role of patent information in research and development. Moscow 1974. Geneva WIPO 1975."

E8. Hausser, E.
THE USE OF PATENT INFORMATION FOR THE IDENTIFICATION OF DEVELOPMENT TRENDS
World Patent Information. Vol. 1 (1979) No. 2, p. 73-76
The publications on a specific technical field issued by the patent offices within a certain period of time do not only reflect the inventive activities and the "production" of new technical knowledge in a country, but also signalize forthcoming industrial activities and therefore indicate new technological trends. The focal points of these inventive activities may e.g. be ascertained from the bibliographical data on published patent applications compiled according to the International Patent Classification. These data also provide information on the granting of existing and imminent patents in the different industrial countries.

E9. Horvath, G.
USEFULNESS OF PATENT DOCUMENTS OTHERS FOR ONE'S OWN RESEARCH
"WIPO Symposium: The role of patent information in research and development. Moscow 1974 Geneva WIPO 1975."

E10. Ivanor, I.
USE OF PATENT INFORMATION IN TECHNOLOGY FORECASTS
"WIPO Symposium: The role of patent information in research and development. Moscow 1974 Geneva WIPO 1975."
An East European view; very similar in many respects to that of the US.

E11. Kronz, H. and Grevink, H.
PATENT STATISTICS AS INDICATORS OF TECHNOLOGICAL AND COMMERCIAL TRENDS IN MEMBER STATES OF THE EUROPEAN COMMUNITIES (EEC)
World Patent Information 2 (1) p4-12, 1980
A review of the principal results of a statistical analysis of the published patent applications filled in six of the member states of the EEC between 1969 and 1975, and a comparison with similar data for the USA and Japan. It highlights subject fields of major patenting intensity and those showing significant growth or decline in the numbers of patents applied for.

E12. Maksarer, Y.
THE ROLE OF PATENT INFORMATION IN RESEARCH AND DEVELOPMENT
"WIPO Symposium: The role of patent information in research and development. Moscow 1974. WIPO Geneva 1975."

E13. Mlodzik, H.:
PATENT LITERATURE - A TOOL FOR FORECASTING IN THE PHARMACEUTICAL INDUSTRY
World Patent Information. Vol. 1 (1979) No. 2, p. 81-83
Technological forecasting based on patents in the pharmaceutical field appears to be feasible by correlating the respective basic patents with the market shares of the applicants, and thereafter by taking the more important patent family cases as indicators for the future new products to appear on the market.

E14. Munn, H and Oppenheim C.
A PATENT-JOURNAL CITATION NETWORK ON PROSTAGLANDINS
World Patent Information 2 (2) 7, 1980

E15. De Passemar, B.
PATENT INFORMATION AS A MANAGEMENT TOOL
World Patent Information 2 (2) 67 1980

E16. PATENT INTELLIGENCE AND TECHNOLOGY REPORT 1978
New York: IFI/Plenum Data Co. 1979
Data taken from US Official Gazette and includes all assignees receiving 10 or more patents during the year. There are four sections:-
1. Alphabetical history of companies and number of patents granted.
2. Same list in ranking order.
3. Distribution of patents by company within each US class.
4. Patent acting profile.

PART F: PATENT INFORMATION AND TECHNOLOGY TRANSFER

F1. Armitage, E.
PATENT DOCUMENTS AS A SOURCE OF INFORMATION FOR THE TRANSFER OF TECHNOLOGY
World Patent Information 2 (1) p.23-26. 1980
The American spelling may disguise the fact that the author was Comptroller-General of the UK Patent Office. The merits of patent specifications as information carriers, and their disadvantages, are described. The consequences for use are analysed and the use of patents in the technology transfer process described.

F2. Gee, S.
TECHNOLOGY TRANSFER IN INDUSTRIALISED COUNTRIES
Sythoff and Noordhoff, Netherlands, 1979
Proceedings of a conference held in 1979. Several of the papers refer to patents and to licensing and get their value in technology transfer properly into perspective. That by Albert Brown, "Impact of patents and licenses on the transfer of technology" is particularly noteworthy.

F3. Rimmer B.M.
PATENT LICENSING OPPORTUNITIES. A GUIDE TO THE LITERATURE
London. Science Reference Library. 1979
ISBN. 0 90291449 9.

PART G: PATENT DOCUMENTATION. GENERAL

G1. Bank, H.
SURVEY OF READERSHIP IN PUBLIC PATENT LIBRARIES
Commission of the European Communities. Report EUR5831e. Luxemburg 1977
Surveys the use of patent collections in the Patent Office libraries and a selection of other 'public' libraries in the European Community.

G2. Hill M.W.
ACCESS OF LIBRARY USERS TO PATENT DOCUMENTATION AND ASSOCIATED LITERATURE
p. 180-192 International Symposium: Patent Information and Documentation.
Munich, May 16-18 1977 K.G. Saur, Munich 1978.
This paper reviews some of the aspects which determine the nature of the library service which should be provided by publicly accessible patent libraries. Categories of users, the types of information required and the constraints under which they operate are related to the nature and form of provisions made. Some problem areas are highlighted and suggestions for collaborative action made.

G3. Johnstone, D et al
MICROFORM USAGE IN THE CANADIAN PATENT OFFICE
World Patent Information, 2(1) p21-22. 1980
A comparison of different ways of putting the search files on microform concludes that Chip coded roll film is to be preferred.

G4. Kratochvil, E.
COOPERATION ON PATENT DOCUMENTATION BETWEEN INDUSTRIAL FIRMS
World Patent Information 2(1) p29-31 1980
Discusses the conditions necessary and problems to be overcome if two or more documentation services of industrial firms wish to collaborate on patent documentation. No case studies are quoted nor is there any indication that the views are based on experience of such collaboration.

G5. Maynard, J.T.
HOW TO READ A PATENT
Chemical technology 8(2) p91-95. 1978
and in IEEE Transactions on Professional Communication PC22(2) 112-8 1979
Understanding how patents are structured and the reasons for the way they are written can make this important source of information effective and accessible. In contrast to a scientific paper in a journal, which presumes background knowledge by the reader, a patent must stand on its own; the reader's prior knowledge is not assumed. Each patent is a "complete" exposition of the problem addressed, the solution to the problem, and of the many opportunities seen by the inventor for elaboration and practical use of his findings. Thus, a patent typically includes both factual and speculative information. The reader, by experience, can learn to sort out and evaluate information in patent disclosures, but patent must necessarily be approached in a different way from scientific papers.

G6. Meyer, R.J.
MICROFORMS AND PATENT DOCUMENTATION:THE PROBLEM IS TOO MANY SOLUTIONS
WIPO Symposium: The role of patent information in research and development:
Moscow 1974 WIPO Geneva 1975

G7. Schweikhardt, F.
CLARITY OF PRESENTATION AND OF THE CONTENT OF PATENT SPECIFICATIONS
World Patent Information 2(2) 77 1980
Contains some suggestions from an experienced user

G8. Vincent.N.
LES BREVETS COMME SOURCE DOCUMENTAIRE ET LES MOYENS DE LES RETROUVER
Documentaliste 16(2), 62, 1979
The author gives a succinct account of the contents of patent documents from the technological information point of view. She discusses what one can find in patent documents and goes on to describe the full range of services available to assist their retrieval, with particular reference to those services available via l'INPI, Institut National de la Propriete Intellectuelle

PART H: PATENTS IN RELATION TO OTHER TECHNICAL LITERATURE

H1. Allen, J. and Oppenheim C.
THE OVERLAP OF U.S. AND CANADIAN PATENT LITERATURE WITH JOURNAL LITERATURE
World Patent Information. Vol 1 (1979) No. 2. pp. 77-80
The paper describes a study of the overlap of Canadian and U.S. patent literature and journal literature. A random sample of 300 S. and 1000 Canadian patents published in 1968 were examined. 6.0% of the U.S. patents and 11.0% of the Canadian patents also appeared in the journal literature. 6.1% of the chemical patents, 6.3% of the mechanical patents and 11.3% of the electrical patents also appeared in the journal literature. The results confirm the need to search both the journal and the patent literature for comprehensive literature coverage.

H2. Delorme, J.
LITTERATURE DE BREVET SECONDAIRE ET LITERATURE VOISINE A CELLE DES BREVETS
p 104-112. International Symposium: Patent Information and Documentation.
Munich. May 16-18 1977 K.G. Saur. Munich 1978
Non-patent literature is a complementary service to the Technical information contained at any given time in patent or like publications. It plays an important part in the fields of electrical engineering and physics and may sometimes provide the only relevant publications available in the most innovative technologies. It is standard practice for examiners to select and classify articles in technical periodicals for inclusion in the search files. This task can be at least partially centralised, as is the case with the PAL service. Secondary patent literature includes abstract collections which, among other uses, enables examiners to search literature published in an otherwise inaccessible language. In addition to the services already available from publishing companies, such as "Chemical Abstracts" and "Derwent Publications," other appropriate means will have to be found in order to include in the search documentation the whole of the relevant literature defined in the PCT regulations.

H3. Liebesny, F. et al
THE SCIENTIFIC AND TECHNICAL INFORMATION CONTAINED IN PATENT SPECIFICATIONS, THE EXTENT AND TIME FACTORS OF ITS PUBLICATION IN OTHER FORMS OF LITERATURE
Information Scientist. 8 165 1974

PART I: GUIDES TO PATENT DOCUMENTS

I1. Drazil, J.V.
GUIDE TO THE JAPANESE AND KOREAN PATENTS AND UTILITY MODELS
London. Science Reference Library 1976

I2. Finlay, I.F.
GUIDE TO FOREIGN-LANGUAGE PRINTED PATENTS AND APPLICATIONS
London: ASLIB 1969

I3. Kase F.J.
FOREIGN PATENTS: A GUIDE TO OFFICIAL PATENT LITERATURE
New York: Oceana: Leiden: Sijthoff 1972

I4. Rimmer, B.M.
GUIDE TO GERMAN PATENT AND TRADE MARK PUBLICATIONS
London. Science Reference Library 1979

I5. Rimmer, B.M.
GUIDE TO UNITED STATES PATENT AND TRADEMARK LITERATURE
London. Science Reference Library 1979

PART J: NATIONAL AND REGIONAL DOCUMENTATION SERVICES

J1. Aftemier, E.
THE USSR SYSTEM OF PATENT INFORMATION AND THE PROGRAM FOR ITS DEVELOPMENT
WIPO Symposium: The role of patent information in research and documentation
Moscow 1974. WIPO Geneva. 1975

J2. COMMISSION OF THE EUROPEAN COMMUNITIES
Patent information and documentation. An inventory of services available to the public in 'The European Communities'.
Verley Dokumentation. Munich 1976

J3. INPI, Paris
L'INFORMATION ET LA DOCUMENTATION JUNDIGNES EN MATIERE DE BREVETS
p277-283, International Symposium. (A)
An account of the various publications concerned with industrial property rights, patent law, court cases etc which those applying for patents in France, particularly foreigners, may have to consult for information on the patention/process.

J4. Padilla, J.R.
PATENT INFORMATION IN DEVELOPING COUNTRIES
p.70-72. International Symposium: Patent Information and Documentation.
Munich, May 16-18, 1977. K.G. Saur, Munich. 1978

J5. Vianes, G
LE ROLE DES OFFICES DE BREVETS DANS L'ARENIR EN CE QUI CONCERNE LA DIFFUSION DES INFORMATIONS CONTENUES DANS LES DOCUMENTS DE BREVETS
International Symposium: Patent information and documentation.
Munich 1977. K.G. Saur. Munich 1978 p336-349
An authoritative account of the activities of the French Patent Office in Paris and in the regions of France to make patent information readily available and used alongside other technological information.

J6. Vida. A.
SOME ASPECTS OF THE PATENT INFORMATION ACTIVITY OF THE HUNGARIAN STATE
p. 64-68. International Symposium: Patent information and documentation.
Munich, May 16-18, 1977. K.G. Saur, Munich 1978
A brief outline of the roles of the National Office for Inventions (OTH), the Hungarian Central Technical Library and Documentation Centre (OMKDK) and other bodies.

J7. Sumarokor, L.N.
MAIN ASPECTS OF THE DEVELOPMENT OF THE INTERNATIONAL SYSTEM OF SCIENTIFIC AND TECHNICAL INFORMATION OF CMEA COUNTRIES AND PATENT INFORMATION
International Symposium: Patent information and documentation.
Munich 1977. K G Saur. Munich 1978 p356
An account of the responsibilities in Eastern Europe of various bodies in the STI field and how they interest

PART K, ABSTRACTING AND INDEXING

K1. Barlow. D.H.
NON-PATENT LITERATURE: CENTRALIZED ABSTRACTING AND INDEXING FOR USERS OF PATENT DOCUMENTATION.
WIPO Symposium: The role of patent information in research and development
Moscow 1974. WIPO. Geneva 1975

K2. BOIS, R and Chattmier, J.
COMPARATIVE ANALYSIS OF THE DARC SYSTEM AND THE INFORMATION AND DOCUMENTATION SYSTEM OF THE IDC
World Patent Information 2(2) 61 1980
Two systems, DARC and GREMAS, for London/Chemical structures are compared. Some ground for cooperation is described though the two systems have different objectives.

K3. Gehring, G.
THEORETICAL KNOWLEDGE AND PRACTICAL CONDITIONS FOR A UNIVERSALLY APPLICABLE TERM ORIENTED DOCUMENTATION SYSTEM
International Symposium: Patent information and documentation.
Munich 1977. K G Saur. Munich 1978 p393
Describes some of the problems to be encountered if natural language indexing is used for patents.

K4. Hering, H.
AN EDP-ASSISTED INFORMATION SYSTEM BASED ON THE I.P.C.
International Symposium: Munich 1978. p434
A very brief account of the system in the German Patent Office

K5. Hollaender, R and Pieper G.
NACHRICHTUNG FUR DOKUMENTATION 30(2) p.75-80 1979
Erfahrungen mit der elektronischen Datenverarbeitung bei der Aufbereitung des Inhalts hochmolekularer chemischer Patente. 1. Mitt. Uber die Verwendung Ligischer Verknüpfungsmerkmale (Indizierung).

The Bayer company have used the Arbeitsgemeinschaft für makromolekulare Dokumentation (AMD) code, described in detail, for computerised documentation of patents on plastics since 1963. The code works satisfactorily if only one plastic is discussed in the document coded and if the auxiliary materials cited have only one function. Sources of error in output, resulting in the production of noise, can be removed by the addition of indices to the 3-digit code: tests showed that about 60% of documents from about 50,000 patent abstracts have had wrong code combination excluded by this method. Terms compatible with the indices can be identified in the stored documents.

K6. Hyams, M.
ABSTRACTING INDEXING AND RETRIEVAL OF THE INFORMATION CONTENT IN PATENT DOCUMENTS
WIPO Symposium: The role of patent information in research and development
Moscow, 1974. WIPO. Geneva 1975

K7. De Laet F.
COMPLEMENTARY INFORMATION SYSTEM (CIS)
pp 223-229. International Symposium: Patent Information and Documentation.
Munich, May 16-18 1977. K G Saur. Munich 1978.
The CIS system uses Int.Cl. symbols to indicate not only the classification of a document but also other information considered useful for retrospective novelty or inventivity searches. This information is represented by the subordinate information concerning secondary aspects (eg. applications, methods or means used) and complementary information showing the individual constituents of an entity classified as such (eg. the radicals of a compound, the constituents of a mixture, the component parts of an apparatus). Searches are carried out by combining a manual search with the up to date possibilities offered by computer data processing.

K8. Oppenheim C
THE PATENTS COVERAGE OF CHEMICAL ABSTRACTS
The Information Scientist, September 1974.

K9. Oppenheim, C and Sutherland, E.A.
STUDIES ON THE METALLURGICAL PATENT LITERATURE. 1. THE AVERAGE OF PATENTS OF ABSTRACTING JOURNALS IN METALLURGY
Journal of Chemical Information and Computer Science. 18(3) 122 1978

K10. Rimmer, B.M.
NAME INDEXES TO PATENT SPECIFICATIONS
World Patent Information, Vol. 1 (1979) No. 2, p.69-72
The lack of an internationally accepted standard for the alphabetical arrangement of names in patent indexes causes serious difficulties for searcher. Some examples are given of the variation in filing rules between patenting countries and of the solutions adopted in two computer based search systems. Interim proposals offered include international cooperation in the notification of errors and the mandatory indication by the patent agent of the significant element of the client's name. It is hoped that WIPO, already experienced in the provision of aids to patent searching, might be willing to undertake the solution of this long standing problem.

K11. Schramm, R
ABSTRACTS FOR INVENTION SPECIFICATIONS
International Symposium: Patent information and documentation.
Munich. 1977 K.G. Saur. Munich 1978 p424.
An examination of the indexing and abstracting operation with suggestions on how to achieve an effective result. A practical paper.

K12. Weiss, W.
MECHANIZED DEEP-INDEXING SEARCH SYSTEM AT THE GERMAN PATENT OFFICE AND THEIR TESTS BY THE PUBLIC.
pp. 237- 43. International Symposium: Patent Information and Documentation.
Munich, May 16-18 1977. K.G. Saur. Munich 1978.
From 1973 to 1976 fifteen mechanized, deep-indexing patent search systems, formerly developed, have been brought to an operational stage in the German Patent Office. This was achieved within the framework of the project "Utilization of developed patent search-systems" which was financed jointly by the German Patent Office and the Institut fur Dokumentationswesen (IDW) in Frankfurt/Main. The results obtained so far as a result of national and international cooperation in developing information retrieval systems were intended to be placed also at the public's disposal for searches to be carried out outside the official examination procedure. Within the framework of a Test program more than 500 searches were carried out free of charge by the German Patent Office for the public in 1975 and 1976. The large scale test has shown that mechanized patent searches can be carried out with satisfactory results for the users. The response by the public was positive and reflects a real need for such a service. The recently amended Patent Law will enable the German Patent Office to offer this service.

K13. WIPO
KEYWORD SYSTEMS FOR PATENT OFFICE SEARCH
Report No. Ec/TCSS/28 (73) 1973

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SYSTEMATIC DOCUMENTATION. CLASSIFICATION, AND DEEP INDEXING
p.97-103. International Symposium: Patent Information and Documentation
Munich. May 16-18, 1977 K.E. Saur. Munich. 1978

PART L: CLASSIFICATION

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PATENT OFFICE CLASSIFICATION: ITS WHATS AND WHYS
Journal American Society Information Service 25 308-11 1974

L2. Claus, P. and Hansson, B.
THE INTERNATIONAL PATENT CLASSIFICATION
World Patent Information, 2(1). p13-20. 1980
A readable account of the principles of the IPC published at the same time as the 3rd edition comes into force.

L3. Herbig E. and Ullmer K.H.
INTRODUCTION AND APPLICATION OF THE INTERNATIONAL PATENT CLASSIFICATION (IPC) AT THE GERMAN PATENT OFFICE
p.193-201. International Symposium: Patent Information and Documentation.
Munich, May 16-18 1977. K.G. Saur. Munich 1978
The gradual changeover from the national German Classification System (DPK) to the International Patent Classification System (IPC) by means of supplements and through the application of the IPC first as a second classification and finally a sole classification is described.
The rules of procedure and the institutions for the classification in cases at issue as well as the basis for decisions in controversial cases at issue as well as the basis for decisions in controversial cases including presidential discussions are reported on.

L4. Gehring. G.
THE KEY-WORD AND CATCHWORD INDEX FOR THE 2ND GERMAN EDITION OF THE INTERNATIONAL CLASSIFICATION OF PATENTS (1974)
p 202-208 International Symposium: Patent Information and Documentation
Munich. May 16-18 1977. K.G. Saur. Munich 1978.
A useful short guide to the philosophy of the register, its organisation, the electronic processing of the data and the necessary additions and revisions.

L5. Dood, K.G.
THE US PATENT CLASSIFICATION SYSTEM
IEEE Transactions on Professional Communication PC-2 2(2) 95-100 1979
A USPTMO Classifier's account of their system for the storage and retrieval of technical information. The hierarchical scheme for the classification of patents based on the technical subject matter disclosed in them. Multiple copies of patents are stored in the system according to their classifications and technical information is retrieved from the system by delineating fields of search in terms of classifications most apt to include all disclosures relevant to the subject matter to be retrieved.

L6. Dr. C. Oppenheim
THE PATENT OFFICE CLASSIFICATION SCHEME
CIPA 9 (2) 1979
Some practical criticisms from a searcher's point of view of the way UK patents are classified. The paper also suggests that Keywood indexing and the allocation of Standard Industrial Classification (SIC) terms would help searching.

L7. R.M.C. Arnot
THE FUTURE OF THE BRITISH CLASSIFICATION
CIPA 8, 287-291, 1979
First of two articles indicating features of the scheme which need to be maintained.

L8. R.M.C. Arnot
BRITISH PATENT CLASSIFICATION
CIPA 8 381-86 1979

L9. A. Shipley
PROBLEMS IN CLASSIFYING THE INVENTIVE STEP AND THE NEED TO PRESERVE THE BRITISH PATENT CLASSIFICATION SYSTEM
European Intellectual Property Revi . 203-4. Aug 1979.

L10. The Patent Office
STRUCTURE OF THE CLASSIFICATION KEY
HMSO
A description of the British system.

L11. Carpenter A.M. et al
CONSISTENCY OF USE OF THE IPC
International classification. 5 30-32 1978

L12. Eisenschitz T.S. and Oppenheim C.
REASONS FOR INCONSISTENCIES IN THE USE OF THE IPC
International Classification 6 26-28 1979
A study was carried out on the consistency of International Patent Classification indexing on 150 families of patents in the field of laser technology.
Patents emanating from eight countries (Belguim, Switzerland, East Germany, West Germany, France, UK, Netherlands and USA) were studied. Mean consistency ranged from 0.45 to 0.76 and it was found that countries for whom the IPC is a secondary classification are not significantly less consistent in their IPC assignments than those countries for whom IPC is the national patent classification.
IPC consistency was only 0.77 between 15 West German early published applications and the equivalent final granted patents. Reasons for IPC inconsistencies are suggested; the main reason seems to be that patents are being over-classified.

L13. Oppenheim C ..... et al
CONSISTENCY OF USE OF THE INTERNATIONAL PATENT CLASSIFICATION; STUDIES ON PATENT CLASSIFICATION SYSTEMS 1. INTERNATIONAL CLASSIFICATION 1978
The authors show that the same patent does not always receive the same classification at the hands of different classifiers.

L14. Ullmer K.H
IPC CONSISTENCY-TESTS ON THE CONSISTENCY OF APPLICATIONS AND HANDLING OF THE IPC
p 209-222 International Symposium: Patent Information and Documentation
Munich, May 16-18 1977. K.G.Saur. Munich 1978.
A basic requirement for uniform classification in the usability of the classification system and binding rules for its handling such as the demand for complete classifying down to the relevant sub-group as well as the number of subject matters to be classified, namely the invention and information units.
Reasons for lack of consistency within the classification as well as requirements for the evaluation of different consistency tests on the group and sub-class level are listed in detail.
The test results on the group and sub-class level with patent documents of various languages as well as with patent documents from the whole field of Technology and with patent families are represented in tables.
The results of these tests lead to conclusions and prompt proposals for the improvement of the handling of the International Classification.

L15. Ullmer K.H.
X-NOTATIONS AS PRELIMINARY CLASSIFICATION UNITS OF THE INTERNATIONAL PATENT CLASSIFICATION
International Symposium: Patent Information and Documentation.
Munich 1977. K.G.Saur. Munich 1978
The draft of the International Classification provides for a continuous revision by improvement and/or extension of the system within the revision periods of five years.
Missing classification units may be replaced by X-notations on a national basis.
Experiences concerning the fixation of X-notations in the German Patent Office show that the scope of the technical content of an X-notation up to the corresponding revision of the International Classification is a preliminary one which is based on existing subject matter only.
The X-notation has its effect both with regard to allocation of business in the German Patent Office and to the revision work of the IPC-Union. X-notations are transmitted by the German Patent Office to WIPO. The X-notation may result in the revision of the International Classification or may be withdrawn or cancelled. According to the hierarchy of the International Classification patent documents are published under the X-notation in the Official Gazette.
Two tables show the requests for X-notations as well as assignment or refusal thereof and the distribution of X-notations to technical fields. Statistics provide references for improvements. An X-notation represents a classification unit and is also meant to be used as such during the search.

PART M: SEARCHING: SERVICES AND SYSTEMS

M1. Auracher, O.
INPADOC AND ITS SERVICES
p.127-136. International Symposium: Patent Information and Documentation
Munich, May 16-18, 1977. K.G. Saur, Munich, 1978

M2. Donovan, K.M. and Wilhide, B.B.
A USER'S EXPERIENCE WITH SEARCHING THE IFI COMPREHENSIVE DATABASE TO US CHEMICAL PATENTS
Journal of Chemical Information and Computer Sciences 17 (3), 139, 1977

M3. Hyams, M.
DERWENT ACTIVITIES IN THE FIELD OF PATENT INFORMATION AND RETRIEVAL
International Symposium in the role of patent information in the transfer of technology
Varna 1980

M4. Hyams M.
DERWENT PATENTS SERVICES-SOME PROBLEMS AND SPECIAL FEATURES
p 137-154. International Symposium: Patent Information and Documentation
Munich, May 16-18, 1977 K.G.Saur, Munich 1978
An outline is given of some of the problems encountered by Derwent in dealing with the patent specifications acquired from different countries, and recommendations are put forward for improvement. Steps taken by Derwent to achieve standardisation of patentee names, classification and priority information are given, once again with recommendations for improvement on the part of the issuing patent offices. The value of informative abstracts is stressed and particularly the need for English language abstracts of non-chemical Japanese patents, and of more detailed coverage of electrical and mechanical specifications. Following a description of the retrieval of chemical and polymeric structures, the problem of text searching is dealt with, including proposals for a world patent on-line search file using full text searching of a 120 word abstract.
The various Derwent patents information and retrieval services are well known to most of the delegates, and are fully described in our various brochures and Instruction Manuals. Since, in any case, the keynote of the Munich Symposium is discussion rather than presentation, I have confirmed my remarks to the high-lighting of important problems of production and interpretation, as well as special features of the services, so as to stimulate as much useful argument as possible. Throughout, I have tried to stress the special problems of documentation presented by the patent literature, in the hope that the legally oriented patent office administrators, by hearing of our difficulties, will be encouraged to take appropriate measures to alleviate them.

M5. Kaback, S.M.
A USER'S EXPERIENCE WITH THE DERWENT PATENT FILES
Journal of Chemical Information an Computer Sciences. 17(3), 143, 1977

M6. Kolb. A.
ACTIVITIES AND SERVICES OF THE IDC
p 155-173 International Symposium: Patent Information and Documentation
Munich, May 16-18, 1977. K.G. Saur, Munich 1978
The author describes the approach taken by IDC in preparing a complementary suite of search files in the area of chemical information, with special emphasis on the patent literature of chemistry. Great advantage is taken of the strengths of other secondary services including those of CAS, Derwent, and INPADOC, by selecting and utilizing the most relevant and reliable information from each. The blending and coupling of this information with IDC's own input, the employment of rigorous intellectual and computer edits of the combined data, verification and/or correction of data by the users, use of the sophisticated GREMAS and TOSAR techniques for encoding and decoding the chemical content, use of a well developed thesaurus system, and other techniques result in a highly searchable and reliable set of files in the field of chemical information.

M7. McDonnell, P.M.
ICIREPAT AND INTERNATIONAL DEVELOPMENTS IN PATENT INFORMATION RETRIEVAL
Special libraries March 1975

M8. McDonnell, P.M.
SEARCHING FOR CHEMICAL LITERATURE IN THE PATENT AND TRADEMARK OFFICE
Journal of Chemical Information and Computer Sciences 1977

M9. Maynard, J.T.
CHEMICAL ABSTRACTS AS A PATENT REFERENCE TOOL
Journal of Chemical Information and Computer Sciences 17(3), 136, 1977

M10. O'Leary, P.T.
PATENT INFORMATION ACTIVITY OF THE TECHNICAL INFORMATION RETRIEVAL COMMITTEE OF THE MANUFACTURING CHEMISTS'S ASSOCIATION
Journal of Chemical Information and Computer Science, 18(2), p63. 1978
An account of how the TIRC has helped improve information services and training for on-line searching.

M11. Oppenheim, C. and Sutherland, E.A.
STUDIES ON THE METALLURGICAL PATENT LITERATURE. 2. CASE STUDY ON GALVALUME
Journal of Chemical Information and Computer Science 18(3) 126 1978

M12 Rogalski, L.
ON-LINE SEARCHING OF THE AMERICAN PETROLEUM INSTITUTE'S DATABASES
Journal of Chemical Information and Computer Sciences. 18(1), 9, 1978

M13. Smith, R.G. Anderson, L.P. and Jaskin, S.K.
ON-LINE RETRIEVAL OF CHEMICAL PATENT INFORMATION. AN OVERVIEW AND A BRIEF COMPARISON OF THREE MAJOR FILES
Journal of Chemical Information and Computer Sciences. 17(3), 148, 1977

M14. Vandecasteele, A.J.
THE SEARCH DOCUMENTATION OF THE EUROPEAN PATENT OFFICE
World Patent Information, Vol, 1 (1979) No. 2, p.60-68
The EPO has two classified search documentations available, one in the Hague and one in Berlin. The documentation is mainly organized according to the IPC with a large number of additional internal sub-divisions. Use is also made of deep indexing systems, hybrid systems and the topological DARC system. On-line searching of external data bases has recently been introduced. The use of on-line search services and the increased use of JP and SU patent documents will increase the need for rapid consultation of documents, and give a new impetus to the use of computers and of modern data carriers.

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14. Abstract

Patents, an important part of the total spectrum of scientific and technical information, are often overlooked by the information community and the scientific and technical community. The purpose of this Lecture Series is to make these communities more aware of the importance of patents to the research, development and engineering efforts in each country. The focus of the lecture series will be first on the wide range of applications for information from patents and second on the methods that can be used for acquiring that information. Methods used for indexing and classifying will be discussed, the various available abstracting services will be compared and techniques for searching, including automated systems, will be described. Participants, thus having a better understanding and appreciation of the bibliographic methods that are used for the control of patent literature, will be in a better position to use this valuable information resource.

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AGARD Lecture Series No.112 Advisory Group for Aerospace Research and Development, NATO PATENTS AN INFORMATION RESOURCE Published September 1980 148 pages Patents, an important part of the total spectrum of scientific and technical information, are often overlooked by the information community and the scientific and technical community. The purpose of this Lecture Series is to make these communities more aware of the importance of patents to the research, development and engineering efforts in each country. The focus of the lecture series will be first on the wide range of applications for information from patents and second on the P.T.O	AGARD-LS-112 Patents Subject indexing Abstracting Search structuring Information retrieval	AGARD Lecture Series No.112 Advisory Group for Aerospace Research and Development, NATO PATENTS – AN INFORMATION RESOURCE Published September 1980 148 pages Patents, an important part of the total spectrum of scientific and technical information, are often overlooked by the information community and the scientific and technical community. The purpose of this Lecture Series is to make these communities more aware of the importance of patents to the research, development and engineering efforts in each country. The focus of the lecture series will be first on the wide range of applications for information from patents and second on the P.T.O	AGARD-LS-112 Patents Subject indexing Abstracting Search structuring Information retrieval
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