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Industrial Technology, Planning, Productivity

Miscellaneous

UDC 621.923.4-422.13

Patent for Machine Tool To Manufacture Optical Components With Aspherical Surfaces

18610442b Moscow OTKRYTIYA, IZOBRETENIYE in Russian No 10, Mar 89 p 80

[Text] Author's certificate no.: 1465275

International Classification System for Inventions index no.: 4 B 24 B 13/00

Application registration no.: 4187470/25-08

Date application issued: 30 January 87

Authors of invention: Sh. Sh. Irtuganov, A. V. Platonov, and B. D. Gorelik

Name of invention: machine tool to manufacture optical components with aspherical surfaces

The machine tool to manufacture optical components with aspherical surfaces contains a product spindle, a tool spindle, a mechanism to move the spindles radially in relation to one another (with each of them being equipped with a controlled drive), a mechanism to create the working pressure in the machining zone, a sensor to indicate a defect in the surface being machined, a tool position sensor, three dynamic correction units, and a programmer. The programmer's first port is connected with the sensor to indicate defects in the surface being machined, and the second port is connected to the tool position sensor. The programmer's three outputs are respectively connected to the first, second, and third dynamic correction units, the second and third ports of which are connected with the tool position sensor. The outputs of the first and second dynamic correction units are connected to the first and second controlled drives, respectively. The machine tool is distinguished by the fact that, to increase its precision, it is additionally equipped with three angular velocity sensors, two velocity calculators, two integrators, a comparator, a multiplier, and a divider and adder. The outputs of the angular velocity sensors are connected to the three ports of the first velocity calculator, its fourth port is connected to the third output of the tool position sensor, and its output is connected to the port of the first integrator (whose output is connected to the first input of the comparator). The three ports of the second velocity calculator are connected to the outputs of the first, second, and third dynamic correction units, respectively, and the fourth port is connected with the fourth port of the first velocity calculator. The output of the second velocity calculator is connected to the port of the second integrator, the output of which is in turn connected with the second port of the comparator and the first port of the divider. The output of the comparator is connected to the port of the multiplier, the second port of which is connected to the first port of the adder and is connected to the output of the third dynamic correction unit. The output of the multiplier is connected to the second port of the divider, with the output of the divider in turn being connected with the second port of the adder, whose output is connected to the third controlled drive.

UDC 531.715.27

Patent for Scanning Device

18610442d OTKRYTIYA, IZOBRETENIYE in Russian No 10, Mar 89 p 210

[Text] Author's certificate no.: 1465858

International Classification System for Inventions index no.: 4 G 02 B 26/10

Application registration no.: 4243664/24-10

Date application issued: 12 May 87

Author of invention: Yu. A. Stepin

Name of invention: scanning device

1. The scanning device, which consists of a telescopic turning reflecting polyhedron, a lens, and a radiation detector, is distinguished by the fact that, in order to increase the signal-to-noise ratio, the telescopic system and lens are arranged such that their axes intersect the reflecting polyhedron's rotation axis in the center of the telescope system's exit pupil. The reflecting polyhedron consists of two-sided reflectors, the first face of which is perpendicular to its rotation axis. The rib of each two-sided reflector coincides with the line of the intersection of the first face with the plane passing through the center of the telescope system's exit pupil at an angle equal to half the sum of the angle formed by the first face and the telescope system's axis and the angle that is equal to the angular dimension of the radiation detector. The second face (the one sloped toward the rotation axis) of each reflector is combined with the bisecting plane of the angle between the first face and the plane passing through the center of the telescope system's exit pupil.

2. The device, which is in accordance with paragraph 1, is distinguished by the fact that, in order to reduce its overall dimensions, the angle between the telescope system's axis, the lens axis, and the axis of the reflecting polyhedron equals 90°.

3. The device, which is in accordance with paragraph 1, is distinguished by the fact that, in order to achieve the capability of scanning along a second coordinate, the faces of the adjacent two-sided reflectors that are sloped toward the rotation axis of the reflecting polyhedron are sloped toward it at angles that differ from one another by an amount equal to one-fourth the angular dimension of the radiation detector.

4. The device, which is in accordance with paragraph 1, is distinguished by the fact that, in order to simplify the design and increase its reliability, the faces of the two-sided reflectors that are perpendicular to the reflecting polyhedron's rotation axis are fastened to one another and designed in the form of a single unit.

5. The device, which is in accordance with paragraph 1, is distinguished by the fact that, in order to increase its reliability and simplify its design, the faces of the two-sided reflectors that are sloped toward the rotation axis are designed in the form of a pyramid.

UDC 621.373.826.621.396;535.813

Patents for Fiber-Optic Switch and Optical System

18610469b Moscow OTKRYTIYA, IZOBRETENIYE in Russian No 8, Jan 89 pp 193-194

[Text] Author's certificate no.: 1462223

International Classification System for Inventions index no.: 4 G 02 B 6/24

Application registration no.: 4129312/24-10

Date application issued: 8 October 86

Authors of invention: N. V. Okladnikov and L. Z. Pivovarov

Name of invention: fiber-optic switch

The fiber-optic switch contains an incoming and two outgoing fiber light pipes and an optical system consisting of axiosymmetrical collimating lenses and a rigid reflector that is mounted with the capability of moving between two extreme positions, at the first of which light passes from the incoming light pipe through the optical system to the first outgoing fiber light pipe and at the second of which the light passes into the second outgoing fiber light pipe. The fiber-optic switch is distinguished by the fact that, to reduce the switch's losses and simplify its design, two lenses are mounted on one optical axis and the reflector is in the form of a plane mirror and is mounted between the lenses in such a way that in the first position the light beam between the lenses is completely covered. In the second position it is open; the incoming and first outgoing fiber light pipes are mounted symmetrically in relation to the lens axis from the outer side of the first lens. The second outgoing fiber light pipe (whose axis coincides with that of the first outgoing fiber light pipe) is mounted from the outer side of the second lens.

Author's certificate no.: 1462226

International Classification System for Inventions index no.:4 G 02 B 27/00

Application registration no.: 4177588/24-10

Date application issued: 7 January 87

Applicant organization: Applied Geodesy Scientific Research Institute

Authors of invention: A. S. Pisarev, K. G. Shumilov, V. V. Skonodobov, and A. D. Sukhomlinov

Name of invention: optical system

The optical system includes a radiation source in the form of a laser and a means of equalizing the intensity that is implemented from at least one positive optical element. It is distinguished by the fact that, to increase the degree of equalization of the radiation intensity, the optical element is designed in the form of a cylindrical lens, with the focal distance F(r) being determined by the relationship

$$\frac{\int_0^r e^{-\frac{\sqrt{R^2-r^2}-\sqrt{r^2-y^2}}{\delta}} dy}{\cos\left[\operatorname{arctg}\frac{r}{F(r)}\right]\cdot\sin\left[\operatorname{arctg}\frac{r}{F(r)}\right]} = \text{const},$$

where r is the running coordinate calculated from the lens' optical axis in the main section, R is the aperture of the optical element, y is the coordinate calculated in a plane orthogonal to the main section, and δ is a coefficient allowing for the distribution of the laser radiation in the beam.

621.313.322-81-048-004.58

Diagnostic Testing of Stator Winding Insulation and Repair of Stator Windings of TGV-500-4 Turbogenerators in Novovoronezh Nuclear Power Plant

18610514 Moscow ELEKTRICHESKIYE STANTSII in Russian No 5, May 89 pp 32-36

[Article by I.D. Dronov, engineer; A.A. Pigarev, engineer; L.L. Khaymovich, engineer; and I.Ya. Cheremisov, candidate of technical sciences, Scientific Research Institute of Industrial Association 'Heavy Electrical Machines' and Novovoronezh Nuclear Power Plant]

[Abstract] Diagnostic insulation testing for repair of stator windings in the TGV-500-4 hydrogen-cooled turbogenerators in the Novovoronezh nuclear power plant is evaluated, considering three viable insulation systems for segmented slip rings: 1) high-voltage ground insulation and interphase insulation, 2) high-voltage ground insulation and low-voltage interphase insulation, 3) low-voltage ground insulation and interphase insulation. A typical situation in the second case is described, namely an unstable weak insulation spot to be located which causes periodic shutdown of a 20 kV turbogenerator by the protective relay preventing phase-to-ground fault. Proper diagnostic testing of the stator winding insulation is shown to improve the reliability of hydrogen-cooled turbogenerators. Tables 2; references 5: Russian.

UDC 669.841.002.5:(621.311.25:621.039)

Determination of Elasticity Characteristics of Enclosed Power Equipment for Evaluation of Earthquake Resistance

18610488a Moscow ENERGOMASHINOSTROYENIYE in Russian No 3, Mar 89 pp 26-28

[Article by G.A. Akopyan, engineer, V.I. Yesman, candidate of technical sciences, S.P. Kaznovskiy, doctor of technical sciences, and V.L. Mnatsakanyan, engineer]

[Abstract] Design of enclosed power equipment for earthquake resistance in accordance with 1981 Construction Norms and Regulations is considered, of particular concern being equipment of a vertical construction. For design analysis on the basis of experimental study, the AFI-1.0-1.0 filter in a vertical housing was selected for vibration tests on a shake table. Its horizontal linear displacements were measured with electrodynamic transducers and resistive strain gages mounted on the filter as well as on its skirt and lid. From the data, including oscillograms, the mode and parameters of free vibrations have been determined. Analogues to vibrations of a cantilever beam in shear rather than in flexure, their first natural frequency was found to be 15.9 Hz. The shear modulus of the filter structure was found to be 3500 kgf/cm2 average, not smaller than 3200 kgf/cm2 and to increase with decreasing deformation. Figures 6; tables 2.

UDC 621.039

Calculation of Basic Operating Parameters for Turbine-Generator Set in Nuclear Power Plant With Heat Storage

18610488b Moscow ENERGOMASHINOSTROYENIYE in Russian No 3, Mar 89 pp 28-30

[Article by R.Z. Aminov, doctor of technical sciences, professor, V.A. Khrustalev, engineer, and M.S. Doronin, engineer]

[Abstract] Operation of two turbine-generator sets in a nuclear power plant with heat storage is evaluated, for the purpose of technical and economic optimization. The four basis parameters are calculated which will minimize the total variable cost of base-load coverage and peak-load coverage, equal to the sum of the two respective variable costs, these four parameters being the pressures and the temperatures of steam entering the two turbines. A heat storing device of the phase-transition type with LiNO3 as working substance is selected in preference to feedwater heat storage of steam-water heat storage, heat being pumped to and from the storage under atmospheric pressure. The optimum initial pressure and temperature of steam entering the main turbine are found to depend, the pressure more so than the temperature, on the cost of nuclear fuel and on the are of the heat exchanging surface of the steam generator. Since the cost of peak-load coverage is determined principally by the cost of the heat storing device, which is high, an increase of the initial pressure for base-load coverage compensates the rise in cost of the steam generators by lowering the cost of the heat storing device on account of a smaller required heat exchanging surface. Figures 3; references 9: Russian.

UDC 531.71:519.6

Method of Calculating Shape Deviations of Housings for Nuclear Power Plant Equipment

18610488c Moscow ENERGOMASHINOSTROYENIYE in Russian No 3, Mar 89 pp 30-31

[Article by Yu. S. Sysoyev, candidate of physical and mathematical sciences, V.Sh. Magdeyev, engineer, and L.N. Stolyar, engineer]

[Abstract] A method of determining shape deviations is proposed for in-production and in-service quality control of housings for nuclear power plant equipment, particularly nominally circular cylindrical shells needing to be inspected for noncircularity and taper. The method, simpler and more accurate than existing ones,

does not require centering in a machine tool and relies on an analysis of gage readings. With the coordinates of N points of a profile already known and given in a Cartesian system, the coordinate of the center of the mean circle and then the radius of that circle are obtained by minimization of the eccentricity function. The algorithm is an iterative one, calculations begin from an arbitrary starting point most expediently selected on the basis of the known information and end when an arbitrarily selected accuracy criterion has been satisfied. The algorithm can be executed on a minicomputer or on an M-600 computer, calculations for an AST-500 housing with 18 points given requiring not more than 4 min of machine time. References 5: 4 Russian, 1 Western (in Russian translation).

UDC 621.311.2:621.039

Cost Effectiveness of Supplying Heat Electrically

18610489b Minsk IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ENERGETIKA in Russian No 4, Apr 89 (manuscript received 4 Dec 87) pp 113-116

[Article by M.N. Khodzhayev, doctor of economic sciences, All-Union Scientific Research Institute for Solving Complex Fuel and Energy Problems, USSR State Planning Committee]

[Abstract] The cost effectiveness of supplying hot water and steam with excess electric energy made available during nightlong load dips is evaluated in terms of fuel economy, considering that generation of pumped-storage hydroelectric power in the European part of the USSR is limited on account of the mostly flat terrain. Calculations, based on the premise that the cost of replacing fuel for the boiler furnace with electric energy already generated must not exceed the total cost of supplying fuel to the boiler furnace, take into account the cost of installing an electrode-type boiler and transmitting to it electric energy from the nearest substation as well as the cost of generating electric energy during nightly load dips. To this is added the effect of load curve equalization. The results indicate that such an operation of a thermal electric power plant is not economical because of the extra fuel consumption during load dips. In a nuclear power plant, on the other hand, operating an electric boiler during night hours is economical but only inasmuch as it prevents an excessive load dip. Figures 2.

UDC 621.311.25.621.039

Thermal Economics of Stagewise Supply-Water Heating With Steam From Unregulated Turbine Bleeders in Nuclear Power Plant

18610489a Minsk IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ENERGETIKA in Russian No 4, Apr 89 (manuscript received 5 Mar 87, after completion 12 Dec 88) pp 94-97

[Article by V.A. Ostapenko, candidate of technical sciences, docent, and S.A. Potekhin, engineer, 'Labor's Red Banner' Saratov Polytechnic Institute]

[Abstract] Considering that the growing demand for energy in the European part of the USSR will be met by construction of new nuclear power plants rather than power plants on fossil fuel, conservation of the latter will be maximized by providing heat release in a nuclear plant for purposes such as condensate and supply-water heating by steam from unregulated turbine bleeders. The thermal economy resulting from stagewise supply-water heating by this steam is analyzed and evaluated in terms of annual underproduction of electric energy owing to the heat load and its ratio to annual heat production by a turbine with generally N bleeder stages. Calculations based on the thermodynamics and the operating characteristics of a K-750-65 turbine with two or three bleeders have yielded a bleeder efficiency which monotonically increases and a specific annual electricity underproduction representing the thermal economy which first decreases and then increases as the saturated-steam temperature is raised, intermediate steam separation and overheating when the hot water temperature becomes equal to the saturated-steam temperature causing both the bleeder efficiency and the thermal economy index to jump upward at that temperature. An analysis of the results indicates that it is more economical to regulate the heat release from bled steam at a constant temperature than at a constant pressure. Figures 3; references 3: Russian.

UDC 621.165.004.67

Operation of K-200-130 LMZ (Leningrad Metal Works) Turbines Between Overhauls

18610486 Moscow TEPLOENERGETIKA in Russian No 5, May 89 pp 33-36

[Article by O.S. Naymanov, candidate of technical sciences, V.A. Bonesko, engineer, Yu.A. Averbakh, engineer, and V.Ye. Gelfer, engineer, Central Design Office, All-Union State Trust for Repairs of Power Equipment, Kharkov branch]

[Abstract] The operating characteristics of high-reliability K-200-130 Leningrad Metal Works turbines are analyzed for ways to lengthen the period of operation between overhauls. The analysis is based on service data covering the 1970-83 period and include the average overhaul time as well as the actual lengths of time between overhauls. These data indicate that, despite the efforts by planning and repair personnel, the time between overhauls has become not longer but shorter. In search of an answer to the problem, the analysis is refined by a classification of all replaceable or repairable turbine components into four groups: 1) those with a mean life not longer than 45,000 h (6 years), no component actually belonging in this group but the wear of seals reducing not so much the reliability as the cost effectiveness of turbine operation, 2) those with a mean life of 45-60,000 h (6-8 years), the obsolete diaphragm in the fourth low-pressure-stage cylinder being the only one, but the bands in this cylinder and in the 23rd intermediate-pressure-stage cylinder being marginal, 3) those with a mean life of 60-100,000 h (8-13 years), 4) those with a mean life longer than 100,000 h and thus having almost no role in limiting the mean time between overhauls. In order to lengthen the period of not only reliable but also economical operation of these 200 MW turbines to 8 or more years, it therefore is necessary to target the shorter-life components for preventive maintenance and redesign. Figures 2; references 3: Russian.

UDC 621.311

Main Trends in Development of Unified USSR Electric Power System and Principles of Designing Its Electric Network

18610502a Moscow IZVESTIYA AKADEMII NAUK SSSR: ENERGETIKA I TRANSPORT in Russian No 1, Jan-Feb 89 (manuscript received 14 Jun 88) pp 8-15

[Article by V. A. Khanayev, Irkutsk]

[Abstract] Further development of the Unified USSR Electric Power system over the next 30-40 years and thus far beyond the year 2000, till the demand for electric energy will have doubled, is examined on the basis of current and anticipated future tends. These trends are indicated by an increasing role of electric energy in the national economy generally and in the industrial growth particularly, by continuing improvements in generation and transmission of electric energy with emphasis on overall energy and fuel conservation, and by improvements and innovations in power equipment design and manufacture with due emphasis not only on efficiency and economy but also on protection of the environment. These trends are evident in construction of pumped-storage hydroelectric and wind electric power plants, in the addition of heat storage plants to nuclear power plants, in increasingly higher voltage ratings of overhead a.c. transmission lines, in a shift from high-voltage a.c. to high-voltage d.c. overhead transmission lines, and in introduction of superconducting underground cables. The conditions determining both design and layout of the electric network for this unified power system are also changing, in terms of demand for more electric energy and better service including automation, in terms of increasing load concentration and increasing need for more installed power with a higher degree of maneuverability, and in terms of new power distribution schemes. A possible variant of the future electric network for the Unified Electric Power System covering both European and Asian parts of the USSR would include 500 kV, 750 kV, 1150 kV a.c. and 600 kV, 800 kV, 1500 kV d.c. long-distance transmission lines with hookup to the electric power systems in countries east and south of the border. Figures 1; references 9: Russian.

UDC 621.311

Guidelines for Long-Term Planning Construction of Main Electric Network for Unified USSR Electric Power System

18610502b Moscow IZVESTIYA AKADEMII NAUK SSSR: ENERGETIKA I TRANSPORT in Russian No 1, Jan-Feb 89 (manuscript received 14 Jun 88) pp 26-30

[Article by A. N. Zeyliger, L. A. Koshcheyev, and N. N. Tikhodeyev, Leningrad]

[Abstract] Construction of the main electric network for the Unified USSR Electric Power System is examined on the basis of projections of current trends to the 2010-20 period. Guidelines are proposed assuming a moderate annual increment of generated power within the 20-25 pct range over any five-year period and a more even territorial distribution of industry so that the load concentration will increase but slower than the demand for electric energy. One must also assume that there will be a need for installing additional generators in the electric power plants so as to ensure self-balancing of integrated power grids, that there will be a need for higher power ratings of generating units in nuclear power plants as well as in steam electric power plants, that selection of plant sites will be based on ecological constraints as well as on viability and reliability criteria, and that there will be more emphasis on hydroelectric and pumped-storage hydroelectric power for coverage of the variable load. One can envision electric power plants with up to 12 GW capacity and power transfers in blocks of up to 10 GW along the periphery of the European part of the USSR

and of up to 25 GW along the East-West link, power being transmitted over 500-650-1150 kV a.c. lines or 1150 kV d.c. lines. References 4: Russian.

UDC 621.311

Principles of Designing and Researching Main Electric Network for Unified USSR Electric Power System

18610502c Moscow IZVESTIYA AKADEMII NAUK SSSR: ENERGETIKA I TRANSPORT in Russian No 1, Jan-Feb 89 (manuscript received 14 Jun 88) pp 30-37

[Article by Yu. N. Kucherov and M. N. Rozanov, Irkutsk]

[Abstract] Adaptation of the main electric network for the Unified USSR Electric Power system to long-range requirements it will have to meet during the first two decades beyond the year 2000 is examined, a design and research strategy being proposed that takes into account established trends such as a shift toward use of direct current for power transmission, new development, and anticipated future conditions. A computer-aided thorough engineering study is outlined, the four basic tasks being reliability analysis by the applicable variant of Newton's method or by applying the compensation theorem, this analysis being most important and also most difficult, then stability analysis on the basis of the "slow" dynamics model, viability analysis, and economic analysis. References 9: Russian.

UDC 621.311

Problems in Long-Range Development of Main Electric Network for Unified USSR Electric Power System

18610502d Moscow IZVESTIYA AKADEMII NAUK SSSR: ENERGETIKA I TRANSPORT in Russian No 1, Jan-Feb 89 (manuscript received 14 Jun 88) pp 38-44

[Article by V. V. Bushuyev and G. I. Samorodov, Novosibirsk]

[Abstract] Long-range development of the main electric network for the Unified USSR Electric Power System for the year 2000 and two decades beyond is overviewed, essential concepts and problems being identified from the perspective of growing demand for electric power. Transmission of up to 50 GW power blocks from nuclear power plants and hydroelectric or steam electric power plants over 1150 kV a.c. or d.c. lines is envisioned, with the recommendation that the voltage will have to be raised to 1800 kV a.c. and 1500 kV d.c. respectively. The attendant problem will be to raise the power carrying capacity of transmission lines. As to maneuverability of generated electric power for coverage of the variable load, particularly in the European part of the USSR, two possible alternatives are combining a nuclear power plant which covers the base load with a pumped-storage hydroelectric power plant or drawing the extra power from the Angaro-Yenisey hydroelectric power plant.

UDC 621.311

Using a.c. Transmission Lines of Higher Than 1150 kV Voltage Classes and New Transmission Lines for Unified USSR Electric Power System

18610502e Moscow IZVESTIYA AKADEMII NAUK SSSR: ENERGETIKA I TRANSPORT in Russian No 1, Jan-Feb 89 (manuscript received 14 Jun 88) pp 44-54

[Article by G. N. Aleksandrov, Leningrad]

[Abstract] Design of new high-voltage a.c. transmission lines for transfer of electric power over up to 5000 km long distances in the Unified USSR Electric Power System is analyzed, performance characteristics of existing transmission lines of up to 1150 kV voltage classes serving as reference basis. The design is then optimized with respect to efficiency and economy. Calculations yield the dependence of the optimum nominal transmission line voltage on the transmission line length. Assuming a minimum required efficiency of 90 pct, the optimum nominal voltage and correspondingly the minimum power making transmission over 1000, 2000, 3000, 4000, 5000 km long distances most expedient are found to be 500, 1200, 1800, 2600, 3200 kV and 1, 5, 10, 20, 30 GW respectively. Figures 3; tables 2; references 4: Russian.

UDC 621.3.051.025

Technical Characteristics of Controlled Self-Compensating Electric Transmission Lines and Expediency of Their Use in Network for Unified USSR Electric Power System

18610502f Moscow IZVESTIYA AKADEMII NAUK SSSR: ENERGETIKA I TRANSPORT in Russian No 1, Jan-Feb 89 (manuscript received 14 Jun 88) pp 54-65

[Article by V. M. Postolatiy]

[Abstract] Following a design analysis of controlled self-compensating high-voltage a.c. transmission lines and their support structures, the performance of such a line with power flow regulation is evaluated from the standpoint of network forming for the Unified USSR Electric Power System. Theoretical calculations as well as test and cost data pertaining to such transmission lines of 500-750-1150 kV voltage classes indicate that such lines with phase regulators excel conventional lines of the same voltage classes at any power level. They do not, as a rule, add any constraints on plant site selection for energy producers and energy users. Figures 5; tables 1; references 8: 7 Russian, 1 East German.

UDC 621.311.1

Including Viability as Factor in Design of Main Electric Network for Unified USSR Electric Power System

18610502g Moscow IZVESTIYA AKADEMII NAUK SSSR: ENERGETIKA I TRANSPORT in Russian No 1, Jan-Feb 89 (manuscript received 14 Jun 88) pp 65-70

[Article by N. I. Voropay]

[Abstract] Viability of an electric power system, namely its ability to withstand perturbations and to inhibit their buildup resulting in failure, is discussed and closely associated with reliability of an electric power system. Its importance and thus the necessity of including it as a factor in the design of such a system is demonstrated on several possible situations likely to occur in very large electric power generating plants, in electric networks, and in control equipment. It therefore needs to be included as a design criterion in planning the main electric network for the Unified USSR Electric Power System. References 15: 13 Russian, 2 Western (1 in Russian translation).

UDC 621.311

Development of Main Electric Network for Unified USSR Electric Power System for Years 2010-20

18610502h Moscow IZVESTIYA AKADEMII NAUK SSSR: ENERGETIKA I TRANSPORT in Russian No 1, Jan-Feb 89 (manuscript received 14 Jun 88) pp 71-81

[Article by Yu. N. Kucherov and Yu. N. Rudenko]

[Abstract] Development of the main electric network for the Unified USSR (Southern European - Central European - Urals - Siberia) Electric Power System to meet the requirements in the years 2010-20 is overviewed, on the basis of current trends and conditions as basis for anticipating future loads and energy demand. First is considered the overall distribution of installed power, nuclear power plants being increasingly clustered in Northern region and steam electric power plants running on coal as well as hydroelectric plants being increasingly clustered in Eastern regions including Siberia. Next is considered design of the main electric network for that power system, the foremost problem being selection of transmission lines. Use of existing 1150 kV a.c. lines, construction of new 1800-2000 kV a.c. lines, and construction of 1500 kV d.c. lines are analyzed for a comparative evaluation. Inasmuch as d.c. operation not only contributes to higher system stability and viability but also simplifies controls, d.c. inserts are shown to play an important role where a.c. lines are retained primarily for economic reasons. Transmission of heavy power over long distances will require higher voltages, stepwise transition from one to the next higher voltage class being as usually effected after the lower-voltage transmission network has already been constructed. There follow problems of network operation and power flow management, including fault control. Other items of interest are sectionalization of the main electric network and paralleling this network with those of other European countries, particularly with those of CMEA member countries. References 3: Russian.

UDC 621.311:510.67

New Matrix Structural-Flow Scheme of Autonomous Power Integration

18610504 Riga IZVESTIYA AKADEMII NAUK LATVIYSKOY SSR: SERIYA FIZICHESKIKH I TEKHNICHESKISN NAUK in Russian No 2, 1989 pp 115-119

[Article by M. Kuznun, submitted 27 Apr 88]

[Summary] Autonomous power integration is the complex of interconnected elements perfornung purposeful production, conversion and distribution of energy-mass flows for electrical supply, cryogenics and thermal control of consumers. A new method of mathematical simulation of power integration work, which has no limitations concerning dimensions of sets of large system elements, flows and operating conditions is presented.

The traditional structural-flow scheme of autonomous power integration in the form of graph (or suitable adjacent and incidence matrices) is criticized. A new matrix of structural-flow scheme (the so-called generalized structure) of power integration is proposed.

It is demonstrated that generalized structure of multimode power integration can be presented as three-dimensional array.

The article gives rigorous definition of generalized structure.

Database Management for a Computer-Aided Mining Industry Planning System

18610453 Moscow GORNYY ZHURNAL in Russian
No 3, Mar 89 pp 24-27

[Article by A. S. Tanayno, candidate of technical sciences, Institute of Mining, Siberian Division, USSR Academy of Sciences]

[Text] In the field of scientific support for surface mining work, the USSR is on a par with the world state of the art in most areas. However, in the area of development and adoption of the theory of automated mine planning, it is quite backward.[1]

Analysis of the state of development of a system of automated planning of surface mining enterprises as compared to the Soviet machine building and the Western mining and extraction sectors reveals that one of the reasons for the backwardness in this region lies in the unsystematic approach to the development of CAD. The creation of CAD systems continues to be dominated by a unit item approach, in which each task is handled with its own set of data, regardless of the fact that the individual design tasks for surface mining enterprises are interrelated and form a single whole.

A CAD for surface mining enterprises is characterized by rather complicated internal relations between the tasks, the outcome being that the results from the solving of certain problems are used as the starting data for others. Many problems are solved by the iteration procedure. For example, it is not possible to solve the problem of stripping of a site without knowing the values of the parameters of the development systems. In turn, the parameters of the system cannot be determined without knowing the parameters of the stripping. Consequently, the problems should be handled by consecutive approximation and by changing the role of the data, which sometimes appear as initial data, at other times as the resultant data.

Solving the problem involves creating an extensive database management system, consisting of computerized systems for entry, checking, storage, output, and updating of data on the environment and the objects under design. Certain specialists call this an automated data bank, presuming that it consists of individual databases which are specialized in the objects under design.

The data bank for the CAD of surface mining enterprises (and also in large measure for subsurface ones) should be divided into external and internal databases, vis-a-vis the system (see table). The external databases (DB) contain information that supports the design process in general. The internal DB contain information that is formulated during the design of a specific object. The external bases are divided, in turn, into invariant and sector-specific.

Composition of the Data Bank of a CAD System of Surface Mining Enterprises

Groups of database relative to the system

External		Internal	
Invariant	Sector	Objective	Design
"Standards" DB	"Sector Norms" DB	"Geology" DB	"Design" DB
"STP" DB	"Typified Technological Layouts" DB	"Mine" DB	
"Machinery" DB	"Typified Designs (Analogues)" DB		
	"Materials and Equipment" DB		

The main attribute by which data are grouped into bases is the logical relationship of the data which describe homogeneous real-world objects.

In this respect, the invariant bases contain a group of bases with the identical type of information needed to carry out design projects in almost any given mining sector. This includes, first and foremost, information on the state standards used in the mining sector, the standards, the norms, and the practices ("Standards" DB). This same group contains the bases of information on the results of scientific research, patents, inventor's certificates, i. e., data on the scientific and technical progress ("STP" DB).

In the traditional sense, the "Standards" DB and the "STP" DB perform the role of a reference information fund. But while the methods of representation of information in automated information retrieval systems (IRS) are somewhat adequate to the general information needs of the users, automated use of information from the IRS in the CAD is virtually impossible.

The group of sector-specific databases, in contrast with the invariant ones, contain information pertinent only to a specific mining sector, i. e., sector norms, typified technological solutions, materials and equipment. The problem of development of information structure is acute for the sector databases. The difficulty of this problem consists in the fact that the traditional form of representation of data (such as normative data) is accompanied by textual information. While a textual description is acceptable in IRS, in CAD systems the purpose is to employ the data as a kind of constraint or input parameter for solving the problem. What is needed is to develop a formalized representation of verbal-numerical information for normative documents.

The internal groups of databases contain information on the object being designed and the design that is being developed. The information on the object of design contains a quantitative and three-dimensional description of the geological conditions of the deposits, as well

as data on the situation of mine workings, galleries, and equipment arrangements. Since this group of databases essentially contains quantitative characteristics, a number of successful projects have already been accomplished in this area. During the course of construction of the design, a database of the object being designed ("Design" DB) is formulated, which performs a dual function. First, in the course of working out the design, this database exchanges information between the individual problems and decision making alternatives for the sections of the design. Second, information about the design as a whole ultimately results, which can be put out in the form of appropriate text notes and graphics documents.

The Database Structure.[1] The "Machinery" DB for surface working of deposits should contain information on the kinds and types of mine transport equipment with an indication of their characteristics, to be used in the various computations during the design process, and also for issuing of reference information outside the system (Fig. 1).

The information model of the base includes the following concepts:

1. The "kind of machine"—a general usage term. Machines are grouped by functional purpose: drilling, extraction and loading, extraction and delivery, hydraulic mechanized machines, and so on.

2. The "type of machine"—a concept which means that any given kind of machine can be represented by several types. For example, to formulate information on drilling machinery, the data are organized in terms of impact, impact-rotational, rotational, and combination types of machines for drilling.

3. The "machine model" is a specific abbreviated designation of the given type of machine (such as EKG-8, 2SBSh-2ON, and so on).

4. The data on the specific model present all essential information about the machine. Some of the data will be set apart: the standard government machine codes (GOST, UK, OKP—at least one of these); one of the principal characteristics of the machine (such as the bucket capacity of single-bucket excavators, the theoretical output of multiple-bucket types, and so on); the possibility of using several machines in different technological processes and the restrictions on their application.

In using a database, it is rather simple to select information on a particular subject, unlike the case of mere storage of data in a computer. For example, it is possible to ask for a printout of all equipment used in a particular technological process.

It has been possible to create a rather simple structure of information model for machinery data, thanks to the presence in the specialized literature of well developed classifications of machines for the mining sector. Unfortunately, there is no acceptable systematization of knowledge for the other databases. Not only is the information [not?] systematized, but on occasion it is contradictory, and many terms contain different connotations. All of this necessitated special studies to work out conceptual and generalized models for the databases given below.

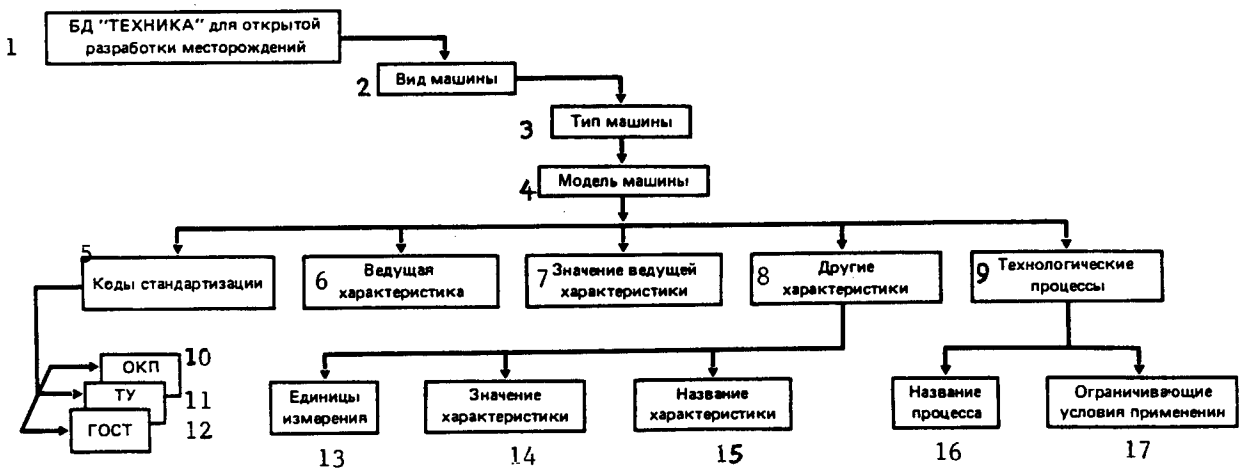

Figure 1. Generalized Scheme of a Database for Mining Transport Machinery

Key: 1. DB "Machinery" for opencut working of deposits 2. Kind of machine 3. Type of machine 4. Model of machine 5. Standardization codes 6. Principal characteristic 7. Value of principal characteristic 8. Other characteristics 9. Technological processes 10. OKP[All-Union Product Classification System] 11. TU [specification] 12. GOST [State Standard] 13. Units of measurement 14. Value of characteristic 15. Title of characteristic 16. Title of process 17. Limiting conditions for application

The "Geology" DB contains all necessary geological information for planning the working of the deposit by the surface method, as well as the planning of modifications and the long range calendar planning at operating enterprises.

In this case, one of the most crucial concepts comes under consideration: a database formulated from cartographic information. Information of two fundamentally different kinds is portrayed: graphical and alphanumeric.

The graphical information in the database is the numerical analogue of any given graphical forms represented in the cartographical documentation. The alphanumeric and symbolical information accompanying the graphical forms determines the various characteristics on the qualitative and quantitative levels.

Of the methods developed for representation of graphical information, the vector and the scan are well known. This dictates the hardware for automation of the entry and storage of graphical data. The conceptual premises of the "Geology" DB are founded on the vector method, the essence of which is that any given graphical form can be represented by a vector of coordinates traced along its boundaries or as a set of points with their respective characteristics. To each vector we may assign a list of qualitative indicators and, if necessary, the quantitative values thereof.

The "Geology" DB as a whole contains numerical analogues of complicated graphical arrays: vertical and horizontal profiles, maps, counting plans (Fig. 2), i. e., any given graphical document concerning the deposit. In order to display the information in the database, a glossary of geological and technological concepts is formulated to describe the characteristics of the particular deposit. Each of the complex graphical arrays contains all the essential graphical and textual information individually for all graphical forms.

To formulate the "Geology" DB, an automated graphics information entry and output system was developed, along with a group of software, including interactive software.[2-3]

The information kept in the database can be used to construct models of the deposits in order to work on the most diverse of planning problems: calculation of the reserves at any given section of the deposit, calendar planning, verification of the parameters of the development systems, the operating capacity, and so forth. Graphics compilation of maps and sections of varying complexity becomes possible. It is important that all problems are worked out on a uniform information basis. Duplication of information and an arduous setup for each problem are entirely eliminated.

The "Mine" DB should contain information on the current status of mining work at the mine, as well as data

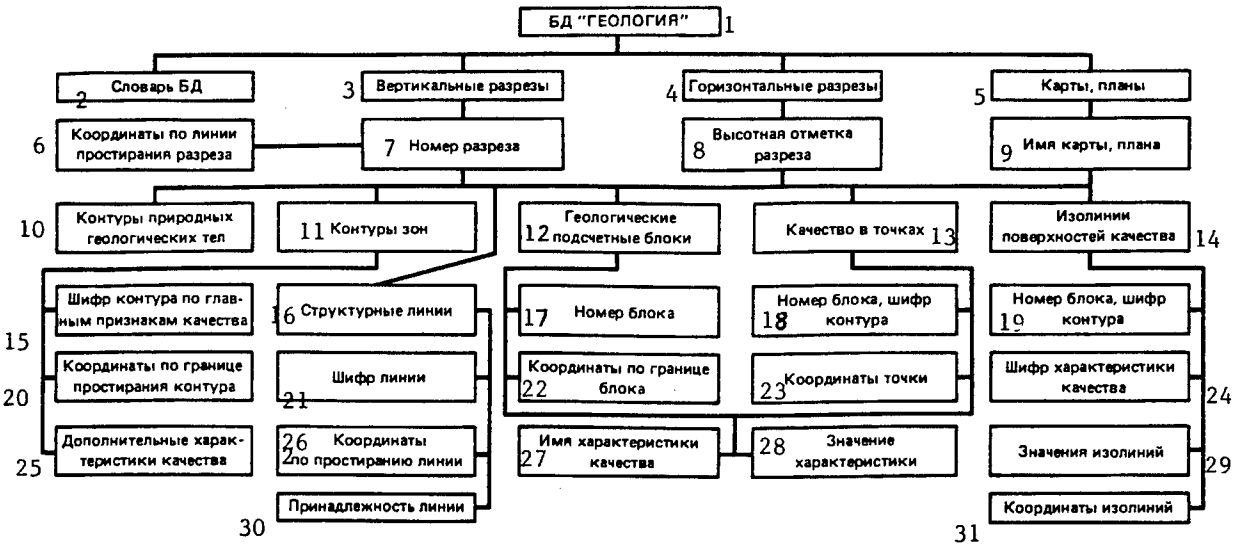

Figure 2. Generalized Scheme of a Database for Mining Geological Conditions Formed From Cartographical Information

Key: 1. "Geology" DB 2. DB glossary 3. Vertical profiles 4. Horizontal profiles 5. Maps, plans 6. Coordinates along line of strike of profile 7. Number of profile 8. Elevation mark of profile 9. Name of map, plan 10. Contours of natural geological bodies 11. Contours of zones 12. Geological counting blocks 13. Quality at points 14. Isolines of surfaces of quality 15. Code of contour in terms of primary quality indexes 16. Structure lines 17. Number of block 18. Number of block, code of contour 19. Number of block, code of contour 20. Coordinates along boundary of contour 21. Code of line 22. Coordinates along boundary of block 23. Coordinates of point 24. Code of quality characteristic 25. Supplementary quality characteristics 26. Coordinates along strike of line 27. Name of quality characteristic 28. Value of characteristic 29. Values of isolines 30. Category of line 31. Coordinates of isolines

Figure 3. Generalized Scheme of a Database for the Current Status of Mine workings

Key: 1. DB "Mine" 2. DB glossary 3. Mine workings 4. Transport lines 5. Primary equipment 6. General characteristics of mine 7. Mine workings in plan view 8. Mine workings in cross sections 9. Coordinates of stations 10. Title of equipment 11. Basic data about mine (passport) 12. Sectors and coordinates of their contours 13. Plan of disposition of section lines 14. Plan and profile of permanent lines of communication 15. Functions in the process 16. Boundaries of mine (contours) 17. Technological zones and coordinates of their contours 18. Number of section 19. Plan and profile of lines of communication in mine 20. Coordinates of location 21. Boundaries of outside dumpsites 22. Escarpments and coordinates of their contours 23. Coordinates of contours of sectors 24. Coordinates of station distances 25. Primary characteristics 26. Primary indexes by year 27. Levels of escarpments and coordinates of their contours 28. Coordinates of rim of mine quarry 29. Coordinates of contours of technological zones 30. Structural characteristics of track, road, etc. 31. Year of startup, output by year, repair chart

on the equipment with a characterization of its status as of a particular time. In view of the purpose of the CAD systems, this information should be available as of the commencement of work on modification, equipment replacement, expansion, and other projects. It is evident from the detailed layout of the database (Fig. 3) that the information on the current status of the work is represented by graphics and symbolic-numerical data. As for the latter kind of information, its organization and entry into the database do not present special difficulty, in view of the available experience with the management of such databases, particularly in automated control systems. The techniques of management of a graphics information base are of interest. All graphics information at present is plotted by the surveying service on plans, profiles, and sketches. In the past 10-15 years, however, intense work has been done on automation of the office work of the surveying service at the mines. In the techniques under development (aerial survey, photogrammetry), an information flow is formed which, with the necessary processing, can be organized in the form of a digital model of the mine, i. e., information as to the position of the mine workings in plan view can be represented in the database (see Fig. 3). One version of such system has been presented in the literature.[4] The information as to the digital model of the mine, stored as a set of system files, can be entered into the database and used either in the making of designs or in the system for routine scheduling of mining work.

The *database management system (DMS)* is a critical element of the CAD system. The DMS accomplishes centralized data management, which offers a number of advantages. Most of the experience in the use of a DMS has been gathered in commercial systems. As for CAD systems, especially those of the mining sectors of Soviet industry, the use of DMS is just beginning here.

Study of this issue in respect of the CAD-coal[2] reveals that, of the Soviet DMS, the best suited to the needs of CAD systems of the coal enterprises is the INES system.[5]

At present, the following databases are being implemented for opencut coal mine CAD systems on the basis of the INES DMS: "Geology," "Typified Technological Layouts," "Machinery," and "Mine."

Choice of the DMS is determined by the following criteria:

the data should be easily represented by hierarchical (tree-shape) and network models, as well as combinations thereof;

the problem solving methodology used and the interaction of the problems with the databases should be primarily static in nature. In the updating of data, the main procedure should be addition, with much less use of deletion or changing of data;

the DMS should have a high level of flexibility, since the CAD system is under continual evolution, and therefore new demands are presented by the users of the system;

the DMS must have a sophisticated language for interaction with the base, since the user of the CAD system is a mining engineer/designer;

the software service of the DMS should include means of reducing the labor in the programming of applied problems, as well as the cost of updating the databases;

the DMS should be independent with respect to the programming languages in which the application programs are written.

The approaches explained for development of the database of CAD systems are still far from perfection. However, the creation of a sophisticated database for the CAD systems of the mining industry must be viewed as the cornerstone of the intellectual activity of the designer.

The only way to produce a CAD system for opencut mines is by developing a new information technology of the design process, entailing an active interaction between the designer and the computer, where the database can no longer be treated as simply the resources for storage of data in the traditional understanding. It is necessary to create textual, graphics, and combination databases. Therefore, the issue of the database management must be examined in the broad sense, including the aspect of creation of knowledge bases for solving the design chores of opencut mine workings.

Footnotes

1. Conceptual models are presented only for those databases that have been verified or worked out on the level of requests for proposal.

2. The work was carried out at the Tsentrogiproshakhta with the participation of the author.

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UDC 621.867

Patent for Robotic Production-Process System, 29 May

18610442b Moscow OTKRYTIYA, IZOBRETENIYE in Russian No 10, Mar 89 p 106

[Text] Author's certificate no.: 1465390

International Classification System for Inventions index no.: 4 B 65 G 47/10

Application registration no.: 4251859/27-03

Date application issued: 29 May 87

Applicant organization: Automotive Industry Technology Scientific Production Association

Authors of invention: Yu. F. Chechekin, B. N. Stepanov, B. V. Gusakov, V. M. Arkhipkin, and P. L. Mariyev

Name of invention: robotic production-process system

1. The robotic production-process system includes a walking-beam conveyer, a transfer robot, a device to discharge productions, a storage unit for machined products, transport holders, and production equipment. The system is distinguished by the fact that, in order to increase its productivity, the device to issue products consists of several sections, with one located behind the other and evenly spaced along the width of the walking-beam conveyer. Each of the sections is equipped with a hoist with a V-shaped cradle to hold products and with a travel regulator. The holder consists of several equilength sections that are lengthwise relative to the axis of the walking-beam conveyer. It is designed with openings in the lower part that are commensurate with the hoist cradles and has several transverse sections based on the number of sections in the product discharge device. The sections are furnished with split vee blocks

that are evenly spaced in a transverse direction at a spacing equal to that of the sections of the device to discharge products.

2. The system, which is in accordance with paragraph 1, is distinguished by the fact that the longitudinal sections of the transport holders are arranged with a spacing equal to the spacing of the walking-beam conveyer.

3. The system, which is in accordance with paragraph 1, is distinguished by the fact that the hoist is equipped with a bar with a stop (that is controlled along its height) that is mounted on the bar by a quick-acting clamp.

UDC 62-229.6

Patent for Robotic Production-Process System, 21 July

18610442a Moscow OTKRYTIYA, IZOBRETENIYE in Russian No 10, Mar 89 p 77

[Text] Author's certificate no.: 1465264

International Classification System for Inventions index no.: 4 B 23 Q 41/02

Application registration no.: 4287656/25-08

Date application issued: 21 July 87

Authors of invention: Yu. N. Chugonov and V. A. Obukhov

Name of invention: Robotic production-process system

The robotic production-process system contains a machine tool with an attachment (that rotates around a horizontal axis) for mounting the workpieces undergoing machining, a gantry manipulator with a carriage (that contains an arm with grippers for the blank and machined workpiece) that moves along a gantry, and a storage unit for blanks and machined workpieces. The robotic production-process system is distinguished by the fact that, to increase its productivity and simplify its design, the attachment for fixing a workpiece during machining is designed in the form of a right polyhedron with sockets for the workpieces. Each socket is located on one face and is equipped with angle vee blocks that are located opposite one another in the plane of the polyhedron. One is movable. One of the base surfaces of each vee block is parallel to the plane of the face, with a dog/rod mounted on the face from the side of the movable vee block. The dog/rod is sloped to the face and has been designed so as to permit the exit of a workpiece when it is unloaded from the fixed vee block. The manipulator's arm is mounted on the carriage by means of an axis that is parallel to the turning axis of the polyhedron, and the gripper for workpieces that have been machined is equipped with an arm-trap that is located in such a way as to be capable of interacting with the socket's dog/rod.

2. The robotic production-process system, which is in accordance with paragraph 1, is distinguished by the fact that the fixed vee block of each socket is located behind a vee block that can move along the polyhedron's turning path and is equipped with a descending guide chamfer.

UDC 621.791.039

Patents of New Industrial Robots Published

18610469a Moscow OTKRYTIYA, IZOBRETENIYE in Russian No 8, Feb 89 p 52

[Text] Author's certificate no.: 1461614

International Classification System for Inventions index no.: 4 B 23 K 37/04, B 21 D 43/00

Application registration no.: 4223741/25-27

Date application issued: 8 April 87

Applicant organization: Forging and Pressing Robot Building Planning, Design, and Technological Institute

Authors of invention: V. V. Goshtalek, B. I. Vatolin, and V. G. Prutskov

Name of invention: industrial robot

1. The industrial robot contains a table with magazines for stacks of blanks that is mounted on its bed, a mechanism to raise a stack of blanks with a sensor to indicate the top level to which the stack of blanks is lifted, an intermediate table, a mechanical arm with grippers to grip the blanks, and drives to move the mechanical arm horizontally and vertically. The robot is distinguished by the fact that, in order to increase its reliability by monitoring the thickness of the blanks and to raise its productivity, the intermediate table has been designed in the form of a platform that is hinged to the bed. The platform is equipped with a drive to turn it and with a sensor to monitor the thickness of the blanks. The mechanism for lifting the stack of blanks is equipped with a sensor to indicate the bottom level to which the blanks are lifted. The sensor is connected to the drive that lifts the stack of blanks.

2. The robot, which is in accordance with on paragraph 1, is distinguished by the fact that its table containing the magazines is designed in the form of a turntable and the magazines are arranged evenly around the table in a circle.

Author's certificate no.: 1461615

International Classification System for Inventions index no.:4 B 23 K 37/04, B 21 D 43/00

Application registration no.: 4230070/25-27

Date application issued: 14 April 87

Authors of invention: L. A. Petrusenko, A. I. Gulak, V. N. Lagutin, and I. D. Telyavskiy

Name of invention: industrial robot

1. The industrial robot contains a bed with guides that are located in guides that have the capability of moving a cross-piece with grippers in a reciprocating motion, a cross-piece drive in the form of a power cylinder, a drive to move the grippers, and a control system. The robot is distinguished by the fact that, to simplify its design and increase its reliability, the cross-piece is mounted coaxially to the power cylinder and is equipped with a plunger fastened to it. The rod of the power cylinder of the drive responsible for moving the cross-piece is designed with a through opening. The plunger is mounted with the capability of moving in the aforementioned rod opening. The cross-sectional area of the rod of the cross-piece's power cylinder is larger than the cross-sectional area of the plunger and less than the cross-sectional area of the ram of the power cylinder of the drive responsible for moving the cross-piece.

2. The robot, which is based on paragraph 1, is distinguished by the fact that each gripper is equipped with a spring-loaded roller and the drive that moves the grippers is equipped with master cams for the spring-loaded rollers.

Installation for Comprehensive Automatic Monitoring of Product Quality

18610468 Moscow OTKRYTIYA, IZOBRETENIYA in Russian No 11, Mar 89 pp 158-159

[Article from the Official Bulletin of the State Committee on Inventions and Discoveries at the State Committee of the USSR Soviet of Ministers on Science and Engineering]

[Text] (11) 1467393 (51) 4 G 01 B 21/00 (21) 4236918/24-28 (22) 29.04.87 (71) Kiev Polytechnical Institute imeni 50th Anniversary of the Great October Socialist Revolution (72). V. V. Tatarinov (53) 531.7.717 (54) (57) Installation for comprehensive automatic monitoring of product quality containing photoelectric, ultrasonic and TV monitoring devices, a unit of primary rejection, a first memory device, a first mechanism for moving the product and an indicator distinguished by the fact that in order to expand the operating possibilities and increase monitoring productivity it is furnished with second and third memory devices; by a second mechanism for moving the product; a sensor of the rotation angle of the product connected in series with a computer unit and orientation mechanism with a unit to determine the geometrical characteristics of defects and a unit to determine fitness, a defect marker whose output is connected to the first input of the unit for primary rejection; a scaling unit whose output is connected to the input of the TV monitoring device; a unit to determine the number of accumulated scans the input and output of which are connected respectively with the output and the first input of the third memory device; a recorder whose input is connected to the second input of the third memory device an to the input of the unit for determining the geometrical characteristics of defects; the first and second inputs of the first memory device connected respectively to the outputs of the first mechanism for moving the produce and to the first input of the second memory device, while the output is connected to the second input of the first rejection unit whose input of the second memory unit is connected to the output of the angle rotation sensor, while the first and second outputs are connected respectively to the inputs of the first mechanism for moving and the rotation angle sensor; the input of the second mechanism for moving the product is connected to the output of the computer unit; the output of the orientation mechanism is connected to the second input of the TV monitoring device whose output is connected to the third input of the third memory device to whose input is connected an indicator, while the TV monitoring device is made in the form of a TV camera.

UDC 531.717.5;621.9.08

An Alternative to Imported Devices for Active Monitoring

18610493 Moscow MASHINOSTROITEL in Russian No 4, Apr 89 pp 21-22

[Article by V. A. Faynman and Yu. P. Yazenok: "Instead of Imported Devices for Active Monitoring"]

[Text] In the shops of Production Association "ChTZ [Chelyabinsk Tractor Plant] imeni V. I. Lenin" the complex of imported active devices has been replaced by domestic analogs in the set of procured equipment.

In selecting analogs, besides conformity of functional purpose, it was necessary to insure the correspondence of the devices with respect to a number of indicators, namely:

—uniformity in the relationship between the device and the machine tool—in the arrangement of the measuring components on the machine tool and the switching between the electronic unit and the electrical automatic circuits of the machine tool. In preserving the invariability of the ties, changes are minimal in the

design of the machine tool, in the operating arrangement of the automatic electrical circuit and the method of mounting the part;

—correspondence of the part to the control cycle. The continuity of the implementation of technological transitions in the processing cycle and their number are determined by technical requirements of the processed surface and cannot be changed. Therefore, the analog must reproduce fully the required processing control cycle. In particular, when replacing positioners of the "Marposs" Firm (Italy), in view of the lack of domestic analogs capable of producing the required control cycle for the machine too, our own design of the positioner was developed and introduced;

—correspondence of the analog to the class of precision. Stability of dimensions in the machining process depends on many factors related to the designs and rigidity of the machine tool, modes and conditions of machining, stability of preliminary operations and the limit of allowable errors in the device. The share of the latter in the total error of machining is insignificant. Therefore, meteorological parameters correlate little with the dispersion in the dimensions of parts machined on a machine tool using a certified device.

Of decisive importance is not the absolute difference between the meteorological characteristics of the imported device of active monitoring and its domestic analog, but the stability of the adjustment level of the device during operation. Practice indicates that this indicator which determines the number of readjustments during the working shift is the most difficult to achieve.

In the final account, the solution to these problems determines the volume of necessary modernization of domestic analogs. At the same time, the large list of domestic devices for active monitoring manufactured by the ChZIP and the "Pribor" NPO [Scientific Association] (in Aprelevka, Moscow Oblast), makes it possible to produce direct analogs to any imported device.

The Table shows data on replacing imported active monitoring devices implemented in the shops of the association. The results of long operation indicate that most of the analogs operate more than three years and domestic devices meet technical requirements of operations no less stably than imported ones; there are no questions of providing spare parts, while the spending of no foreign currency for their acquisition had a positive economic effect of 137,000 rubles.

Special equipment	Model of device, manufacturing firm (country)	Domestic analog			Modernization content
		Reading-instruction device (manufacturer)	Converter (manufacturer)	Measuring device	
Tool and cutter grinding machine tool model 250PL "Agaton" Firm (Switzerland)	8032102750 "Marposs" (Italy)	BV-4100-70 (ChZIP)	BV-6067 (ChZIP)	-	Modernization of OKU [Optimal Quantum Amplifier) by input of automatic memory device
Internal grinding tool model Sip 315x500 (GDR)	B-IV-S4 "Aeropan" (GDR)	BV-6119 (ChZIP)	KV-71 (ChZIP)	-	Without modernization
Circular grinding semiautomatic machine model AFTs-630 "Kikinda" (Yugoslavia)	8061703431, "Marposs" (Italy)	Positioner (a.c. 1144847)	B-120 (NPO "Pribor")	-	Circuit modernization of electrical automatic control machine tool
	BV-6134 (ChZIP)	B1.02.000 (NPO "Pribor")	BV-3153—80 (ChZIP)		
Circular grinding semiautomatic machine model K630/1500 of "Nakses-Union" Firm (FRG)	ZE3K919W—"Marposs" (Italy)	Positioner (a. c. 1144847)	B-120 NPO "Pribor"	-	Circuit modernization of electrical automatic control machine tool

Special equipment	Model of device, manufacturing firm (country)	Domestic analog			Modernization content
		Reading-instruction device (manufacturer)	Converter (manufacturer)	Measuring device	
Circular grinding semiautomatic machine of "Fritz-Shtuder" Firm (Switzerland)	D13NZU "Movolimit" (Switzerland)	B-2 (Scientific Production Association "Pribor")	B-1.02.000 (NPO "Pribor")	BV-3153-80 (ChZIP)	Modernization of the time relay unit and the relay block
Circular grinding semiautomatic machine model EA 300NP of "Fritz-Shtuder" firm (Switzerland)	D13NZU, "Tesa" (Switzerland)	BV-6119 (ChZIP)	BV-6067 (ChZIP)	Circuit modernization of electrical automatic control machine tool	
Semiautomatic circular grinding machine model GOR 30x50 of "Toyota" Firm (Japan)	Ataka Co. Ltd (Japan)	B-2 (Scientific Production Association "Pribor"	B-1.02.000 NPO "Pribor"	BV-3153-80 (ChZIP)	Circuit modernization of electrical automatic control machine tool
Circular grinding semiautomatic machine model GMA 20x50 of "Toyota" firm (Japan)	ZE3K919W, "Marposs" (Italy)	Positioner (a.c. 1144847)	B-120 NPO "Pribor"	-	Circuit modernization of electrical automatic control machine tool
	ZE4W, "Marposs" (Italy)	BV-4257 (ChZIP)	-	-	Modernization of measuring OKU channel
Circular grinding machine tool model 5R14x72 of Lendis-Lund Firm (England)	ZE4W, "Marposs" (Italy)	BV-6119 (ChZIP)	B1.02.000 NPO "Pribor"	B2.02.000 NPD "Pribor"	Modernization of measuring OKU channel
				BV—3153-80 (ChZIP)	

UDC 62-229.2/3

Characteristics of Automatic Tool Accessories Designed, Built, and Operated for Production of Turboblades

18610488d Moscow
ENERGOMASHINOSTROYENIYE in Russian No 3, Mar 89 pp 39-40

[Article by I.S. Bolshakov, candidate of technical sciences, D.I. Petrov, engineer, and L.M. Vaynshteyn, engineer]

[Abstract] Automatic production of up to 1,600 mm long turboblades is considered, many diverse operations on many different surfaces being required and a special automatic rig with an electrohydromechanical control system having been designed and built at the Leningrad Turbine Blade Manufacturing Plant. It is adequately versatile with a minimum number of interchangeable components, is highly sensitive to change of tolerances, and is guarded against intrusion of chips or lubricant-coolant fluid. Figures 3.

Is Protection Against Elemental Threat Effective?

18610495 Moscow STROITELNAYA GAZETA in Russian 28 Apr 89 p 4

[Article by V. Polyakov : "Until the Mud Slide Bursts ... Is Protection Against Elemental Threat Effective?" (Alma-Ata)]

[Text] I witnessed a unique experiment on an artificial reproduction of a mud slide at the headwaters of the Chemolgan River which is about 50 kilometers from Alma-Ata.

Time has smoothed out the impressions, yet the notes in my old notebook remind me: "A wave of moist air driven out of the stone gorge... mountains roar and groan... rocks shudder where we stand... boulders sounding various tones rattle as they flow into the black mash... fragments of age-old evergreens are shredded as though by a millstone... a black swell cuts deeply into the picturesque valley... the sound of a helicopter is drowned out by the noise of the mud slide...

People did not run away from the mud slide... because people cause it. The fact is that the direct damage from mud slides in Kazakhstan in some years reaches many tens of millions of rubles. In the mountains and foothills of the republic subject to earthquakes and seismogenic mud slides there are located Alma-Ata, Taldy-Kurgan, Dzhambul, Chimkent, Panfilov, Tekeli and other populated points. Are they prepared to meet the possible attacks of the elements? This is not an idle question, especially after the bitter lessons of recent tragedies.

The Usek River in the Panfilovskiy Rayon of the Taldy-Kurgansk Oblast is very restless. The foothills contain dangerous lakes whose waters are held back by not very reliable dams. Below—there is a large populated area. New buildings have been built without consulting with the mud slide protection service. In this same oblast, in dangerous proximity to the Karatal and Kora rivers, microrayons have been erected which may find themselves in the zone of mud slide disaster. City and oblast authorities are aware of this, but measures taken are ineffective and powerful protective structures can be built only with the participation of all interested departments...

For many years, the Badam River in Chimkent Oblast was not considered in danger from mud slides. Until 1987 a flood hadn't occurred there more frequently than half a century apart. Caution was forgotten during that time and housing and enterprises were built on bottom lands again without proper consultation with mud slide protection specialists. As a result of floods entire streets were wiped out and buildings destroyed. Luckily people were saved...

Until now construction has proceeded in river beds of three rivers intersecting Alma-Ata. The system for torrential run-offs is the least reliable exactly where flood waters are at the highest level. Many times the problem has been posed before the city authorities about the necessity of completing the construction of mud slide transit canals through the northern part of the city, but to solve it now was found to be no simple matter: it will be necessary, at great cost, to move buildings and structures and to resettle masses of people because of a poorly thought-out developed zone.

There are many problems also in the southern part of the republic. One hundred years after a destructive earthquake whose epicenter was near the mountainous Big Alma-Ata lake, its water volume of 14 million cubic meters conceals a serious danger. However, departmental interests of the hydraulic power people and the highway people have so far been found to be stronger than the appeals of the "Kazselzashchita" [Kazakhstan Mud Slide Protection] to move a part of the dwellings the automobile highway, electrical transmission, water and communications lines to the sides of the mountains. Instead of a cardinal solution to the problem, huge sums of money are being spent regularly on removing the consequences of the frequent mud slides here.

Near the city of Issyk which, 25 years ago, had already experienced the terrible shock of a mud slide, every two-three years highly expensive restoration work is being done instead of moving the road, the electrical power line poles and hydraulic structures from clearly dangerous mud slide areas. Is it possible that it is necessary to wait for a repetition of a catastrophe with a number of destructions and human sacrifices?...

Here is another example. Having soberly evaluated the danger of the region where the "Yuzhnaya" tourist base was located, the Chimkent Oblast Soviet of Trade Unions accepted a recommendation of the mud slide protection service and moved a number of tourist buildings from the dangerous mud slide bed of the Badam River.

The mud slide protection service has its own troubles, by the way; the reorganized "Kazselezashchita" was transferred to the Ministry of Automobile Highways of the republic. Although the department is substantial, it has limited rights and possibilities compared to the Council of Ministers which originated and strengthened a specialized organization for mud slide protection, the only one in the republic. But most important is the fact that its workers do not have construction norms and rules by which to calculate protection for structures against mud slides and there are no reliable norms for calculating mud slide flows. The Mud Slide Commission of the USSR Academy of Sciences still has not spoken its weighty words... It takes too long for all the possible coordination to release ground for building mud slide protection structures and, at present, there is no foreign currency available for business contracts with colleagues abroad who have rich experience in fighting mud slides.

The lessons of recent mud slide disasters require urgently more serious attitudes than present ones to antimud slide measures than now exist in dangerous regions of Kazakhstan. Their depths, as warned by seismologists, are still not "cleared of mines."

UDC 550.34+551.241

Focal Zones of Earthquakes in Western Turkmen SSR

18610484 Ashkhabad IZVESTIYA AKADEMII NAUK TURKMENSKOY SSR: SERIYA FIZIKO-TEKHNICHESKIKH, KHIMICHESKIKH I GEOLOGICHESKIKH NAUK in Russian No 2, Mar-Apr 89 (manuscript received 25 Apr 88) pp 72-78

[Article by T. A. Annaorazova, S. F. Izyumov, Yu. O. Kuzmin, and N. V. Petrova, Institute of Seismology, TuSSR Academy of Sciences]

[Abstract] A seismological and geodetical study of earthquakes which have occurred during the 1980-85 period in Western Turkmen SSR was made, of specific concern being the Nebit-Dag region extending from 38.5 deg to 39.5 deg latitude and from 53.5 deg to 55.5 deg longitude within which both Kum-Dag and Burun earthquake foci are located. The data include exact dates and durations of earthquakes which activated the Pribalkhano-Apsheron fault, their seismic characteristics as well as those of foreshocks and aftershocks including repeatability curves and pulse-frequency spectra. An analysis of these data indicates a consistency between the mechanisms of earthquake focus formation and geodynamic anomalies characterizing the tectonophysical state of the earth crust in Western Turkmen SSR. Figures 4; tables 2; references 7: 5 Russian, 2 Western (1 in Russian translation).

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Measurement of Slope of Earth Surface Near Earthquake Epicenter

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[Article by V. M. Grayzer, O. P. Kuznetsov, N. I. Nedoshivin, and D. D. Sultanov, Institute of Earth Physics imeni O. Yu. Shmidt, USSR Academy of Sciences, Moscow]

[Abstract] A method of recording linear and angular seismic vibrations near the earthquake epicenter is proposed, an improvement over the conventional use of two vertical pendulums pivoted to the same axis of rotation on opposite sides of it. Addition of a third one, preferably an astatic one, pivoted to the same axis and sensitive to horizontal vibrations improves the accuracy. The readings of such an accelerograph, when inserted into the solution to the corresponding system of three differential equations of motion with constant coefficients, yield separately the two displacement components and the slope of the earth surface. A prototype of such an accelerograph with direct optical recording was built and tested, the natural frequencies of the pendulums falling within the 20-30 Hz range. The sensitivity of the vertical pendulums was 100 mm/g and that of the horizontal one was 25 mm/g. Measurements were made at referred distances of 14.0 and 18.6 $m/kg^{1/3}$ from the hypocenters of equally intense first and second earthquakes. The profiles of horizontal displacements and surface slopes were found to be similar after both earthquakes. The results are fairly consistent with available data. Article was presented by Academician M. A. Sadovskiy on 8 December 1987. Figures 3; references 11: 6 Russian, 5 Western.