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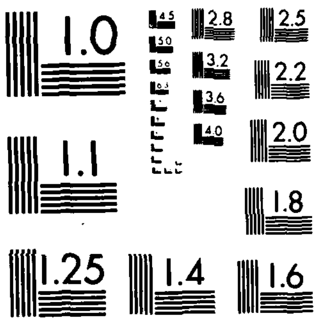

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NAVY

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Kenneth P. Lusk

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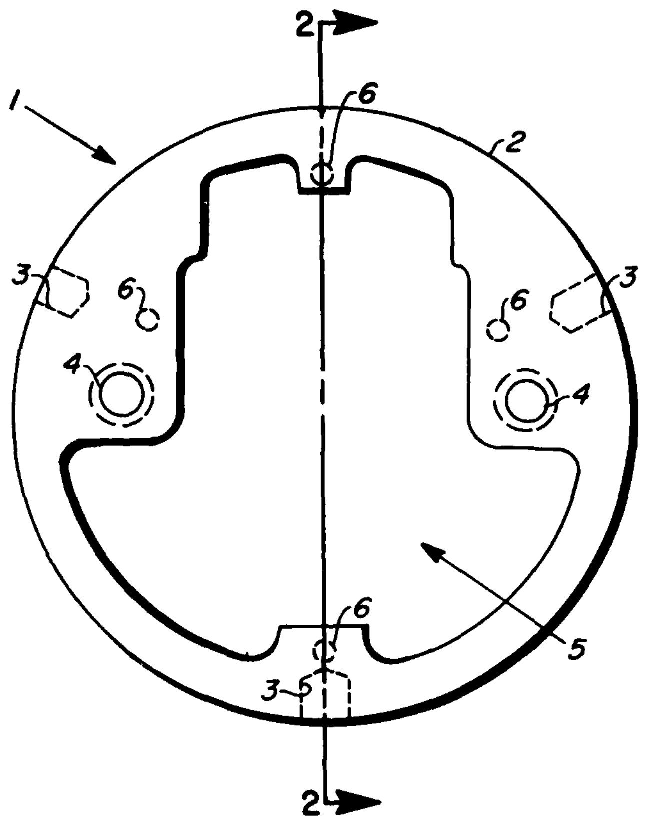
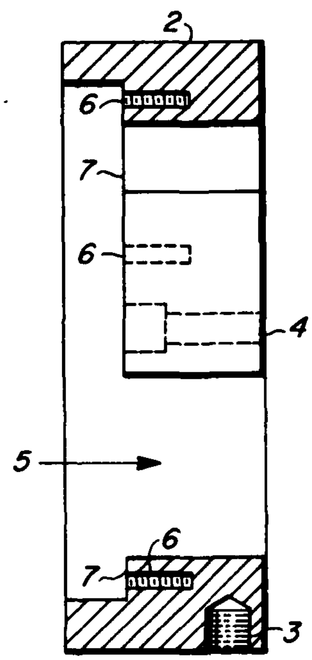


Fig. 1

Fig. 2



Navy Tech. Cat. No. 4124 ____ Navy Case No. 67691

ELECTRONICS MOUNTING FRAME AND STRUCTURAL MEMBER

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Abstract

A mounting member for modularized telemetry electronics components is demonstrated which further functions as a structural member within the frame of a guided missile. This packaging concept allows for the use of modularized telemetry components as opposed to a previously utilized, more expensive hybridized telemetry package.

Description

Air Force and Navy versions of an air-launched guided missile differ in the method of attaching discrete missile sections to one another. As a result, dissimilar internal volumes and geometries existed in the two versions of the missile within which telemetry system components could be accommodated. This result precluded the use of an existing telemetry package to accomplish missile testing in the Air Force version of the missile. Additionally, a solid bulkhead type structural member utilized a portion of the volume available within each telemetry section. The availability of telemetry electronics packaging space was particularly acute in the Air Force version of the missile which utilized a "dogging" scheme for missile section attachment. A need was identified to provide a telemetry

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section for the Air Force version of the missile with the goal of reducing expense in telemetry section procurement by the accommodation of modularized electronic components as opposed to the customized electronic microcircuits found in the previous telemetry sections.

The electronics module mounting frame and structural member described herein accommodates a particular Air Force missile section attachment scheme while providing increased electronics packaging volume within the telemetry section. Additionally, the frame facilitates the mounting of modularized electronic components. Mounting frame 1 is a machined disc shaped piece of material having sufficient dimension and thickness to allow it to be substituted for a solid bulkhead type structural member within the missile structure. The frame is hollowed to provide increased electronics mounting space. Circumferential face 2 of frame 1 includes threaded holes 3 utilized to incorporate frame 1 into the structural framework of the Air Force missile. Counterbored holes 4 are provided to accommodate the attachment and support of other structural or support members within the telemetry section of the missile. Void 5 generally represents electronics packaging space not available where a solid bulkhead type member was previously utilized. Threaded holes 6 and planar surfaces 7 represent features which accommodate the mounting of modular electronics components within void 5.

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Advantages and Features

An electronics mounting frame accommodating modularized telemetry electronics components is incorporated within an Air Force guided missile. The frame provides structural strength within the missile as well as increased electronics mounting space. The compatibility of the frame with the Air Force missile section attachment scheme, the provision of additional electronics packaging volume and the accommodation of modularized electronics components contribute to the realization of significant cost savings over previous telemetry sections.

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Navy Tech. Cat. No. 7740 Navy Case No. 68175

COMPACT TOWED SUBMERSIBLE

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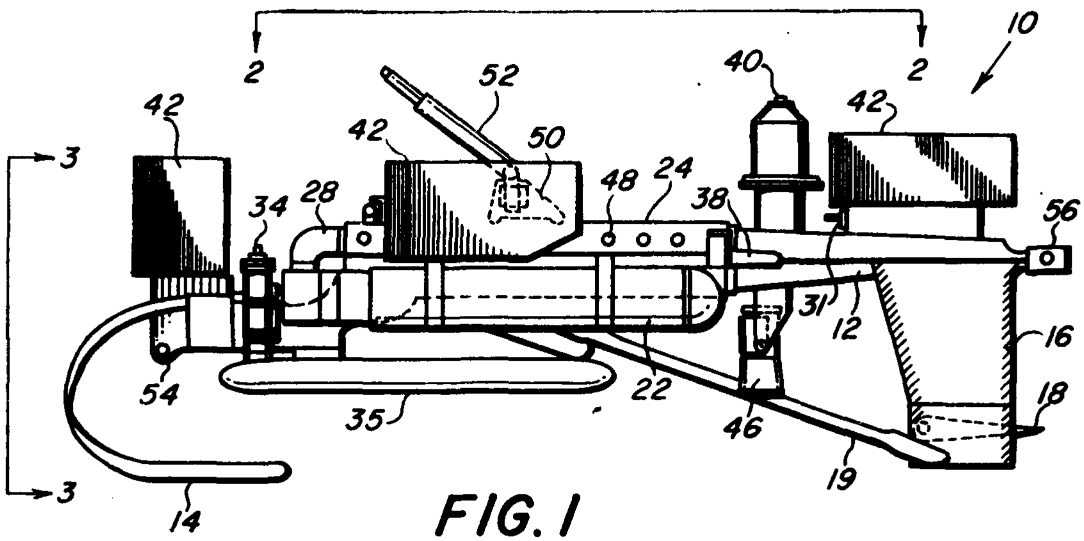

FIG. 1

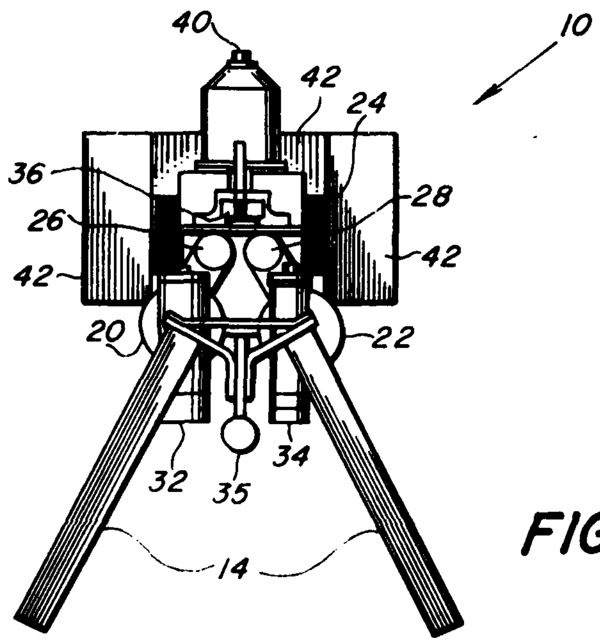

FIG. 3

COMPACT TOWED SUBMERSIBLE

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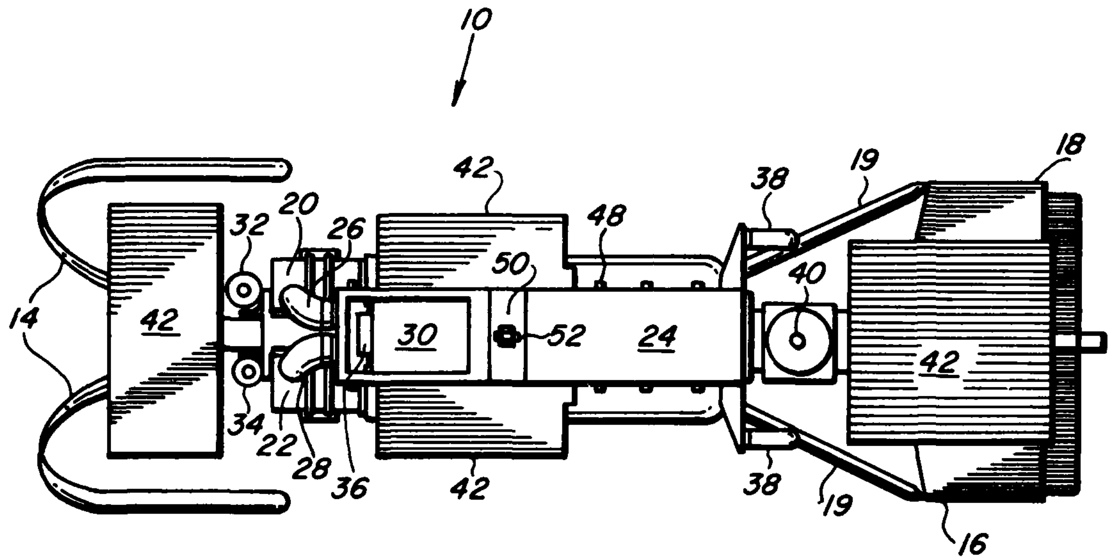

FIG. 2

COMPACT TOWED SUBMERSIBLE

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Abstract

A compact towed submersible of lightweight one-piece stabilized construction with minimal drag is generally made up of a longitudinally extending web-like center support. A pair of obstacle-avoiding flexible guard arms and a triangular-shaped stabilizer are affixed to the support. Also affixed to the support are a power source device, a data multiplexer/demultiplexer telemetric device along with various acoustic data gathering and orientation sensing devices. Electric interconnection between these devices is effected by a fluid-sealed conduit arrangement that minimizes electromagnetic interference. The support also includes flotation modules for controlling the buoyancy of the submersible. By reason of the submersible being both compact and stabilized even with its various devices thereon, it is capable of being precisely navigated and used during calm and heavy seas. At the same time the submersible is being navigated, it normally conducts deep sea-bottom surveys including the identification and location of submerged objects all without requiring the use of a large surface ship and without increasing the risk of submersible loss such as, e.g., due to cable breakage.

Description

Both governmental and commercial interests because of increased market demands are requiring that a submersible be capable of conducting marine surveys at greater depths with greater accuracy while at the same time providing improved inspection techniques at these depths. While there are presently numerous submersibles that are available for operating at greater than 4,000 feet sea depths, they are unable to provide, among other things, economy during use, minimal drag, and precision subsea navigation along with data gathering subject towed submersible, because of its compactness and one-piece lightweight balanced construction is capable of being used in sea state 5 conditions while at the same time being precisely navigable at depths greater than 4,000 ft. in gathering subsea data and inspection information.

A compact towed submersible 10 is generally comprised of a one-piece web-like center support 12 that extends longitudinally of the submersible as shown in Fig. 1. A pair of C-shaped arms 14 of flexible construction and suitable material, e.g., KEVLAR, are affixed to the forward end of support 12. A delta or triangular-shaped stabilizer 16 of one-piece construction is affixed at its upper apex to the trailing end of support 12. An adjustable fin 18 is interposed between and pivotally connected to opposed lower leg portions of the stabilizer. A reinforcing strut

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or stabilizer bar 19 extends between each side of stabilizer 16 and support 12 as best shown in Fig. 2.

As illustrated in Fig. 3, a power source device is disposed within a bottle 20 suspended from and affixed to the left hand side of support 12. Similarly, a multiplexer/demultiplexer data telemetric device is confined within another bottle 22 affixed to the right hand side of the support.

An electric junction box 24 is affixed to the top of support 12 between its ends as depicted in Fig. 1. Conduits 26 and 28 sealably and electrically connect bottles 20 and 22 to the junction box as illustrated in Fig. 2. The box includes a three-axis accelerometer for indicating the orientation of the submersible about the pitch, roll, and yaw axes. The box is also filled with a dielectric fluid material, preferably oil, that is pressurizable by a bladder device 30 affixed to the top of the junction box at its forward end. An inlet 31 for filling or replenishing the oil in the junction box is provided at its trailing end as viewed in Fig. 1. By virtue of the bladder device being pressurized by the sea water at different depths of the submersible, the oil in box 24 is normally sufficiently pressurized to prevent water seepage into the electric system of the submersible.

A 35 millimeter (M) still camera 32 and TV camera 34 are affixed to the forward end of the support as viewed in Fig. 2. A housing 35 incorporating a side looking Sonar of 100 kilo Hertz (kH) and an altimeter is located beneath junction box 24. A digital compass 36 is mounted on top of the junction box and forward of bladder device 30. A pair of laterally spaced mercury vap r TV lamps 38 are affixed to opposed sides of the junction box at its trailing end. An acoustic responder 40 is mounted on top of support 12 and interposed between stabilizer 16 and junction box 24. A series of four flotation modules 42 of appropriate plastic foamed material and generally box-shaped construction are affixed to the submersible. One of the modules of the series is affixed to the top of support 12 at its forward end; and another to the top of the junction box at its trailing end. The remaining two modules of the series are connected to opposite sides of junction box 24. By reason of the series of four flotation modules enabling controlled buoyancy of the submersible, it is readily deployed, steered and maneuvered during towing and use at all operable depths.

As illustrated in Fig. 1, a strobe light 46 is suspended by a bracket affixed to the trailing end of support 12 adjacent stabilizer 16. The purpose of the strobe light is to illuminate a given subsea area prior to operation of camera 32. Junction box 24 is provided with a series of fluid-tight electric sockets 48 for effecting connection of electric conduit (not shown) that are associated with the aforediscussed devices 32, 34, 35, 38, 40 and 46.

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A bracket 50 affixed to the top of junction box 24 intermediate its ends provides attachment of a pivotally mounted coupler 52 for effecting combined electric and tow cable connection to the lower coupling end of a tow cable (not shown) deployed from a surface ship (not shown) during use of the submersible. A depressor (not shown) is attached to the cable adjacent the submersible so as to isolate the submersible as much as possible from the surface action of the ship. Opposite ends of support 12 are provided with apertured brackets 54 and 56 that facilitate suspending the submersible in a work cradle (not shown) when the submersible is being handled prior to use, e.g., dockside or on a surface ship. The arrangement of the apertured brackets allows the submersible to be rotated in the work cradle such as, e.g., during maintenance of the device.

Prior to an operating mode of submerisble 10, a surface ship initially defines a grid area on the sea surface to be surveyed by the submersible by precisely locating and anchoring a series of submergible and anchorable acoustic transponders at selected points of the grid, normally at four corners thereof. To assist in precisely locating each acoustic transponder, the ship is normally provided with LORAN and satellite navigation equipment. Prior to the ship deploying the submersible, the grid area is divided into a predetermined number of ship surface paths or lanes so that the submersible, with its various devices, can conduct an effective survey at depths greater than 4,000 feet. The submersible, by use of the side looking Sonar and altimeter of housing 35, has been able to acquire sufficient data for bathymetric mapping when the surface ship lanes or paths are no more than about 250 meters apart. At the same time the three-axis accelerometer provides sufficient data to accurately maintain the submersible in its proper orientation as the suface ship tows the submersible and follows each predetermined path within the grid. Also, because of compass 36, submersible 10 can be maintained on its desired underwater course during use by a surface ship. By virtue of lamps 38, the area beneath the submersible can be sufficiently illuminated to enable continued remote monitoring and inspection by the ship crew of subsea areas by way of TV camera 34. Depending on the objects or terrain uncovered by the TV camera, still camera 32 together with light 46 can be remotely operated by the ship crew to take selective pictures. It has been found that the submersible can be towed up to speeds of about ten (1) knots without affecting its stability or data gathering ability of the various devices mounted thereon.

Advantages and Features

An improved compact towed submersible having a predetermined buoyancy is capable of operating at depths greater than 4,000 feet and of being towed and maintained on an underwater course by a compass at speeds up to 10 knots without affecting its stability. By reason of this stability, the data gathering capability of the side scan Sonar, the altimeter, and the accelerometer all cooperate to provide an accurate subsea survey while at the same time the TV camera and 35 M camera cooperate to provide a continued remote inspection of subsea conditions, including subsurface terrain and objects.

DIRECT CONTROL OF EXTERNAL HARDWARE BY PROCESSOR MICROCODE

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IBM Corporation, Manassas, VA

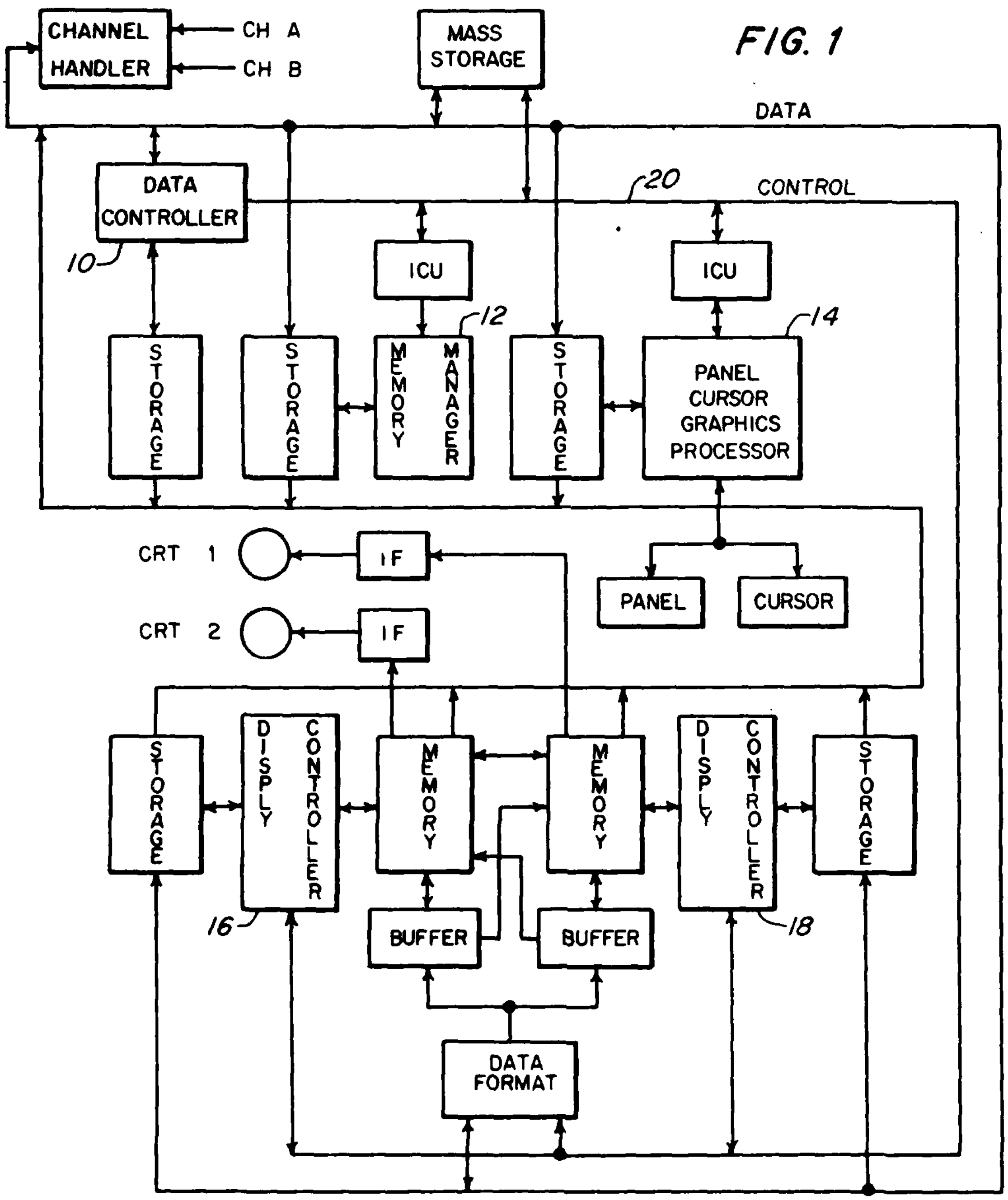

FIG. 1

Navy Tech. Cat. No. 1201 Navy Case No. 67139

DIRECT CONTROL OF EXTERNAL HARDWARE BY PROCESSOR MICROCODE

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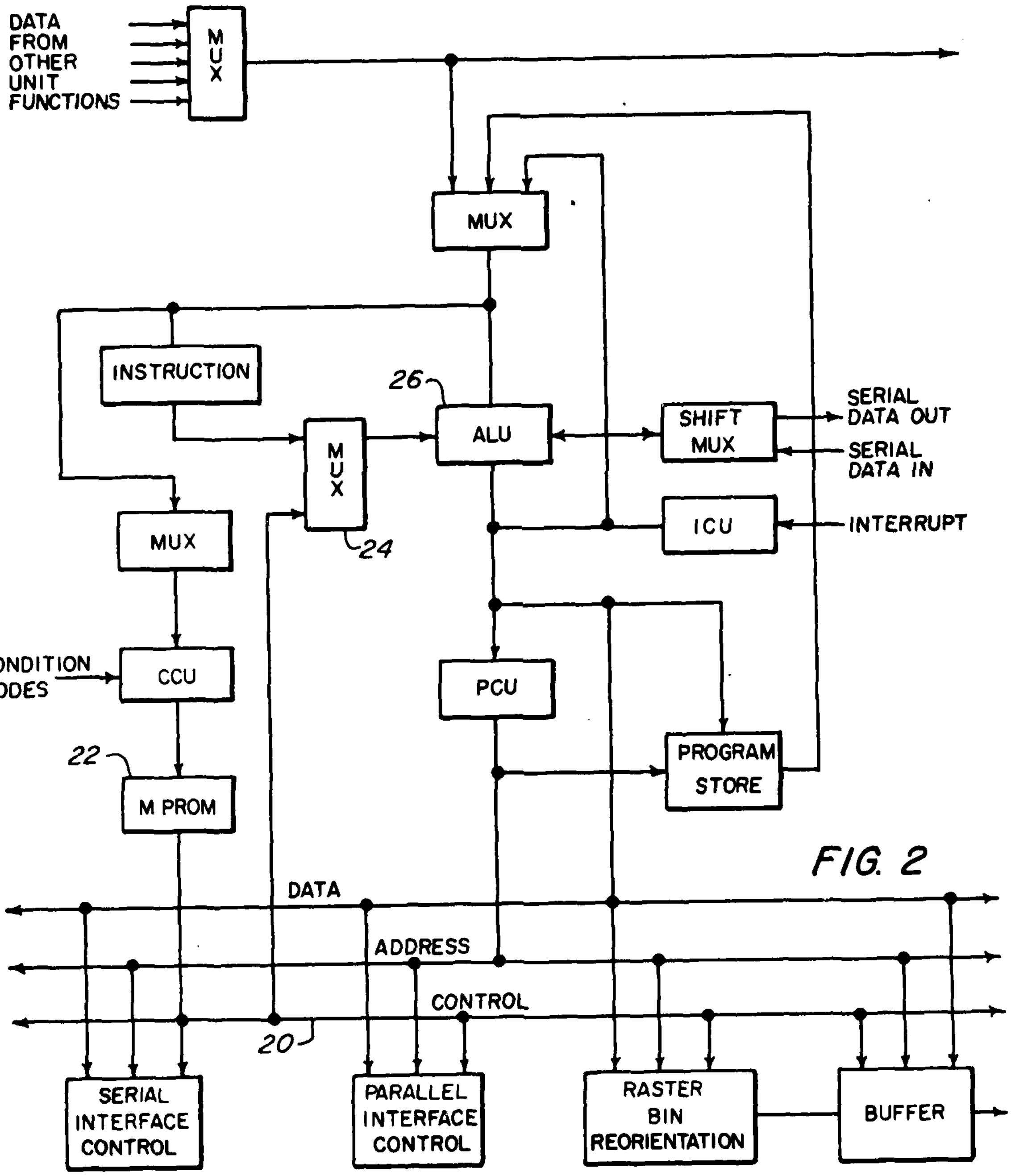

FIG. 2

Navy Tech. Cat. No. 1201 Navy Case No. 67,139

DIRECT CONTROL OF EXTERNAL HARDWARE BY PROCESSOR MICROCODE

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Abstract

Direct control of external hardware from a control display console is accomplished via a data controller which carries out the overall control of the system including other microprocessors. The data controller is a 16-bit microprocessor which carries out the major functions of microprocessor control, the external processes of interprocessor data transfers, and the control of external functions of display data generation or formatting.

Description

Referring now to Fig. 1 an overall functional block diagram of a control display console is shown which includes a data controller 10. The data controller 10 carries out the overall control of the balance of the system, including four other microprocessors -- a memory manager 12, a panel cursor graphics processor 14 and display controller 10 communicates over a control line 20 with each of the controlled microprocessors 12, 14, 16, 18.

The functional block diagram of the data controller 10 is shown in Fig. 2. The data controller 10 is a 16-bit microprocessor which carries out the major functions of microprocessor control including start, stop, and resume commands, initial program load, and blanking and unblanking of displays. The data controller 10 also carries out the external processes of interprocessor data transfers and controls the external functions of display generation or formatting for raster lines, scans or vectors, and characters, symbols and symbol side marks.

The internal operation of the data controller 10 is carried out under microinstruction control with microinstructions which are stored in a microinstruction read-only memory 22. Microinstructions from the PROM 22 are transferred via the control line 20 through a multiplexer 24 for execution in an arithmetic logic unit (ALU) 26.

There are many operations in the system of Fig. 1 which are external to the data controller 10, such as display data update, blanking and unblanking the display, testing the display, starting and stopping the other microprocessors 12, 14, 16, 18 etc. To carry out these operations in as fast a manner as possible, the PROM 22 is directly connected to the control line 20 so that microinstructions from the PROM can be directly transferred out of the control line to the remote microprocessors 12, 14, 16, 18 and to other hardware in the system. Thus, there are no delays in order to decode a microinstruction and output a control instruction from the data controller 10 over the control line 20 to the remote hardware which must be controlled.

Advantages and Features

Direct control of external hardware by processor microcode is accomplished by connecting the data controller microinstruction read-only memory directly to the control line to which the external hardware is connected. This eliminates the need for microinstruction decoders, and thus the delay associated with such decoders.

Navy Tech. Cat. No. 1470 Navy Case No. 67423

HEAD AIMED PROJECTED AREA OF INTEREST

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Archer M. Spooner

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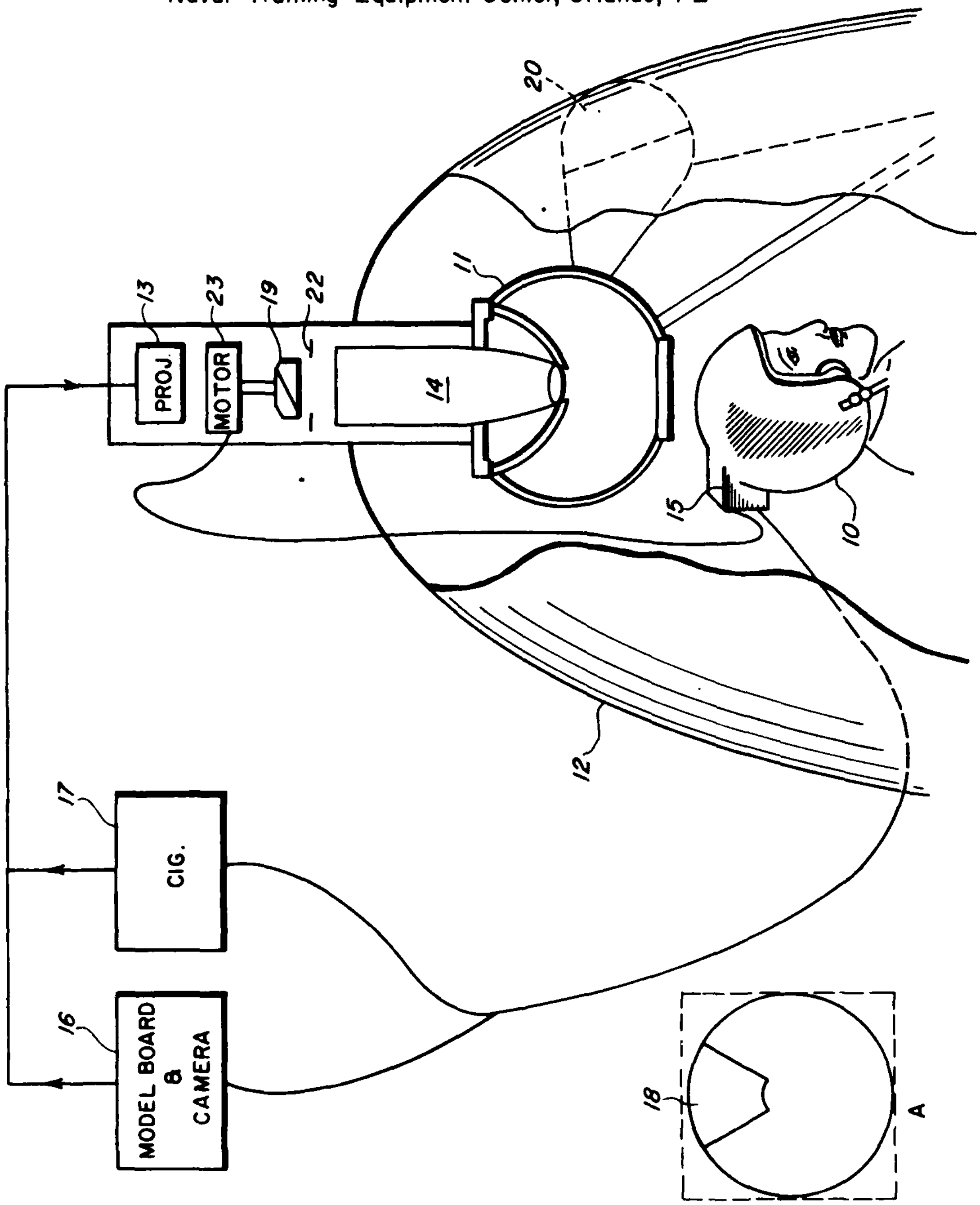

Navy Tech. Cat. No. 1470 Navy Case No. 67,423

HEAD AIMED PROJECTED AREA OF INTEREST

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Abstract

A non-programmed visual display that is capable of providing high detail over wide fields of view by utilizing area of interest imagery together with an annular off-the-head projector is disclosed which takes advantage of the limitations of the human eye and presents a visual image only in the direction in which the trainee is facing. The mechanization is facilitated by a 360° lens projection system having a means therein for rotating the image thus projected to correlate with the line of sight of the user.

Description

As is well known, the human eye has an instantaneous field of view which is less than 360°, thus if provision is made for rotating the imagery to be viewed by a trainee in accordance with the trainee's look direction, only that portion of the imagery which would fall within the instantaneous field of view of the trainee needs to be presented. The instant device accomplishes this coordination of image presentation with trainee look direction through the use of a 360° annular projection lens such as the Surnot lens developed for the Naval Training Equipment Center. In the accompanying Figure, a trainee 10 is

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positioned within such a projector where lens 11 projects the image to be viewed onto a spherical screen 12. The imagery is provided via a light valve projector 13, such as the SODERN titus light valve projector, and projection optics 14 intermediate light valve projector 13 and lens 11. The imagery may be derived from either a modelboard and camera 16 and/or a CIG 17, with either choice of image source having an output in the format shown in inset A. The information to be displayed would be in an annular format and would be contained within wedge 18 of inset A. When projected, the information contained in wedge 18 would correspond to the instantaneous field of view displayed on screen 12 at 20 indicated by the dashed lines in the accompanying Figure. Inasmuch as display 20 is required to maintain alignment with observer 10's line of sight, wedge 18 must be correspondingly displaced. This is accomplished through the use of a Pechan or dove prism 19 which is driven by a servo motor 23 to rotate the formatted wedge 18 at image plane 22 of the projection optics 14. Servo motor 23 is made responsive to head movements of trainee 10 by head tracker 15 which may be such as a Polhimus head tracker. Head tracker 15 also has an output to CIG 17 or modelboard camera 16, thereby controlling their output such that the images generated correspond to the look direction of trainee 10.

Advantages and Features

This type of simulation could provide near real time simulation for such tasks as air to ground combat, low level flying, nap of the earth flying, surface navigation, harbor navigation, and other close approach type simulation. Furthermore, by limiting the imagery to the instantaneous field of view, realistic high resolution display can be provided.

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Navy Tech. Cat. No. 6680 Navy Case No. 67792

ULTRASONIC DESORPTION SPECTROMETER

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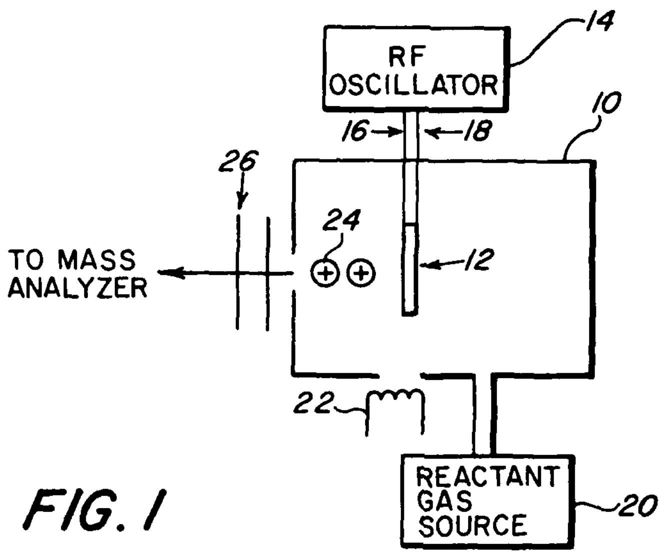

FIG. 1

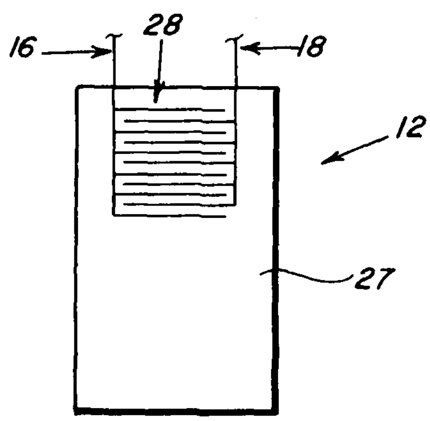

FIG. 2

Navy Tech. Cat. No. 6680 ____ Navy Case No. 67792

ULTRASONIC DESORPTION SPECTROMETER

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Abstract

An ultrasonic desorption spectrometer is described wherein thermally labile nongaseous samples to be analyzed may be transformed into the gas phase for subsequent ionization. The spectrometer includes a surface acoustic wave device mounted in an ionization chamber in which gas-phase sample molecules are ionized. The surface acoustic wave device comprises a piezoelectric crystal substrate having interdigital electrodes which are driven with a radio-frequency voltage. In operation, a nongaseous sample placed on the substrate is desorbed off of the substrate surface in the gas phase.

Description

In analyzing a nongaseous sample with a spectrometer, the sample must first be transformed to the gas phase so that the sample molecules may be conveniently ionized. In the past, this transformation of the sample to the gas phase has been accomplished primarily by heating the sample on some sort of probe until vaporization results. One significant disadvantage of this technique, however, is that certain samples, which are thermally labile decompose upon heating, making analysis of the sample impossible. In addition, some involatile compounds cannot be analyzed with prior spectrometers because these compounds are difficult to vaporize by heating. Examples of the above mentioned thermally labile or involatile compounds are quaternary ammonium salts, various biological molecules, porphyrins, and inorganic complexes.

In Figure 1 is shown one embodiment, employing chemical ionization, which can successfully analyze thermally labile and involatile samples by utilizing a surface acoustic wave device. The device shown in Figure 1 includes an ionization chamber 10 having a surface acoustic wave (SAW) device, shown generally at 12, mounted therein. Various supporting structures for SAW device 12 are omitted for clarity of illustration. The SAW device 12 is supplied with a pulsed input from an RF oscillator 14 via leads 16 and 18. As a consequence of the RF input to SAW device 12, a nongaseous sample placed on SAW device 12 is caused to be transformed to the gas phase. The structural details and operation of SAW device 12 will be discussed in datail below.

Ionization chamber 10 is supplied with a reactant gas, such as CH_4, by reactant gas source 20. Electrons are injected into chamber 10 by a heated filament 22 which is heated by a current source (not shown). These electrons ionize reactant gas molecules, which in turn react with sample gas molecules to yield sample ions, as shown at 24, by the well known process of chemical ionization. Sample ions are then directed by focusing plates 26 to a mass analyzer for mass analysis. The mass analyzer used may be of any type, such as magnetic, quadrupole, etc.

Referring now to Figure 2, there is shown a plan enlarged view of SAW device 12. SAW device 12 includes a piezoelectric substrate 27 made of, for example, quartz. Mounted on the surface of substrate 27 are interdigital electrodes 28, which alternately extend from leads 16 and 18. Electrodes 28 may be made by, for example, vapor depositing gold or aluminum on the substrate surface, or by conventional photoetching techniques. As discussed above, RF oscillator 14 is connected to leads 16 and 18, and therefore supplies an RF input to electrodes 28. The RF signal from electrodes 28 causes the crystal substrate 27 to oscillate at the same frequency as that of the RF signal. Thus, a surface acoustic wave is generated across the substrate surface.

The operation of the apparatus described above will now be discussed in regard to the analysis of a liquid sample. First, the liquid sample is placed on the substrate 27 in a homogeneous fashion in order to avoid perturbing or destroying the surface acoustic wave set up across the substrate surface. Such a homogeneous application of the sample can be easily accomplished by electrospraying the sample on the substrate surface. To apply the sample to

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the substrate 27, the apparatus can be adapted so that the SAW device 12 could be removed from chamber 10 in order to apply the sample thereto. Additionally, it is preferable that the sample be placed on a portion of substrate 27 away from electrodes 28 to avoid possible detrimental heating of the sample.

When an RF signal is applied to electrodes 28 from oscillator 14, the substrate 27 is caused to vibrate, as discussed above. This vibration causes the sample to be desorbed off the substrate surface in a gaseous phase. Sample gas molecules are then available for chemical ionization and subsequent mass analysis as already noted.

In order to analyze a solid sample with the described apparatus, the solid sample can be placed in solution with a solvent, such as ethanol or water. The solution may then be applied to the substrate surface by electrospraying.

Frequently, it is desirable that a spectrometer have the capability of selectively ionizing certain molecules of a sample. This could be done with the present device by simply varying the amplitude of the RF signal applied to electrodes 28 so as to desorb selectively only certain molecules from the substrate surface. The amplitude required for desorption should be proportional to the absorption energy of the molecule on the substrate.

There are many alternatives to the embodiment discussed in reference to Figure 1. For example, a SAW device could be employed in an optical probe spectrometer in which the absorption by the sample of a laser beam directed over the SAW device surface is monitored to determine sample constituents. In another alternate embodiment, the SAW device could be utilized in a spectrometer which employs electron ionization.

Advantages and Features

The ultrasonic desorption spectrometer employs a SAW device to transform a sample to the gas phase without heating the sample. Thus, there is provided by the spectrometer a means to analyze thermally labile and involatile nongaseous samples.

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Navy Tech. Cat. No. 1201 Navy Case No. 66559

A FOUR-TRACK PARALLEL CARTRIDGE FORMATTER

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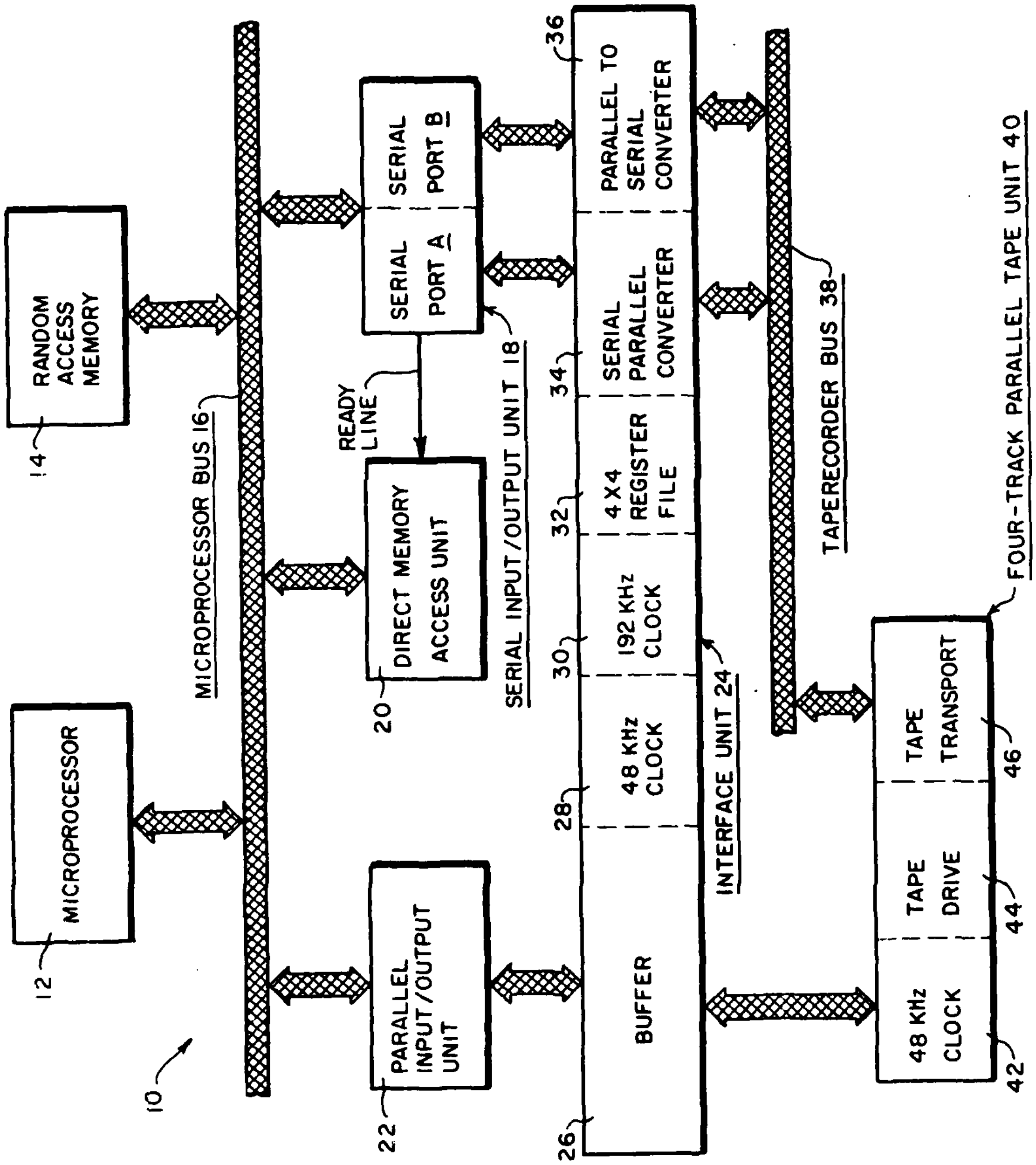

Navy Tech. Cat. No. 1201 ____ Navy Case No. 66,559

A FOUR-TRACK PARALLEL CARTRIDGE FORMATTER

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Abstract

A four-track parallel cartridge formatter generates the proper tape formats for recording data on a four-track parallel tape unit (of the cartridge type) portion thereof. The four-track parallel tape unit, which includes a 48KHz clock, a tape drive and a tape transport is operatively connected to microprocessor and random access memory portions of the formatter by, inter alia, an interface unit portion. Conversion of data to the proper format and such functions as forward, reverse and stop for control of the four-track parallel tape unit are furnished.

Description

Referring to the Figure, a four-track parallel cartridge formatter 10 for accomplishing the foregoing comprises a microprocessor 12, a random access memory (RAM) 14, a microprocessor bus 16, a serial input/output unit 18 including a serial A and a serial B port, a direct memory access unit 20, a parallel input/output unit 22 and an interface unit 24. The interface unit includes a buffer 26, a 48KHz clock 28, a 192KHz clock 30, a 4X4 register file 32, a serial to parallel converter 34 and a parallel to serial converter 36. The four-track parallel cartridge formatter 10 further comprises a tape recorder bus 38 and a four-track parallel tape unit (of the cartridge type) 40. The four-track parallel tape unit 40 includes a 48KHz clock 42, a tape drive 44 and a tape transport 46.

The four-track parallel tape unit 40 is configured to write in nibbles. The tape format consists of a preamble, a data block, a cyclic redundancy check character (CRCC) and a postamble. The microprocessor 12 has access to data via the microprocessor bus 16. The microprocessor 12 also has access to the four-track parallel tape unit 40 via the serial input/output unit 18, the direct memory access unit 20 and the parallel input/output unit 22 in cooperation with the interface unit 24 and the tape recorder bus 38. The serial input/output unit 18 is programmed to generated data blocks in the proper format for serial transmission. To format data in a parallel form, the serial input/output unit 18 is programmed for bisync serial transmission. An interrupt is generated each time a transmit buffer portion (not shown) of the serial input/output unit 18 becomes empty. In this interrupt routine, control over the modes and data of the serial input/output unit 18 is exercised. The serial input/output unit 18 is also configured to transmit two sync characters before each data transmission. By loading the sync characters with the first two bytes of the preamble and transmitting the balance of the preamble as data, a properly formatted preamble is generated. Once the preamble is transmitted, a CRCC generator portion (not shown) of the serial input/output unit 18 is reset to prevent CRCC calculation on the preamble. The data block is subsequently transmitted without disturbing control registers (not shown) of the serial input/output unit 18. On the interrupt generated by the last data transmission, the control registers generate an External Status Interrupt on an empty transmit buffer, aforementioned. The sync characters are made to match the first two postamble characters. In this routine, no new data is loaded into the transmit buffer. This forces the serial input/output unit 18 to transmit the CRCC and the sync. The interrupt caused by the empty transmit buffer is used to begin loading of the balance of the postamble. Once the postamble is transmitted, the control registers, aforementioned, are set to terminate all transmissions of the serial input/output unit 18.

To continue, data is transmitted by the serial input/output unit 18 in response to clock pulses generated by the 192KHz clock 30 of the interface unit 24. Data is transmitted by the four-track parallel tape unit 40 in response to clock pulses generated by the 48KHz clock 42 portion thereof. The aforementioned two clocks 30 and 42 are synchronized using the 4X4 register file 32 of the interface unit 24. Data in a serial format from the serial port A of the serial input/output unit 18 is loaded into the serial to parallel converter 34 of the interface unit 24. On every fourth clock of the 192KHz clock 30, as determined by the 48KHz clock 28, data is written in a parallel format into the 4X4 register file 32 of the interface unit 24. After two entries are made, the Write Data Enable of the four-track parallel tape unit 40 is dropped thereby starting the writing cycle. An address counter (not shown) keeps the 4X4 register file accessible to the four-track parallel tape unit 40 in the same counting sequence as that used to write the data from the serial input/output unit 18.

Data is repeated by the four-track parallel tape unit 40 and sent to the serial input/output unit 18 via the interface unit 24 for recording verification. The data is accompanied by a Nibble Ready flag and a Data

Detect flag from the four-track parallel tape unit 40. Each nibble of data is loaded into the parallel to serial converter 36 of the interface unit 24. A counting sequence is begun on every nibble to generate the proper shift sequence to reconstruct the serial data from the parallel to serial converter 36.

Read-after-write verification is done by software comparison of a saved copy of the transmitted data block and the received data. The direct access memory unit 20 is used to acquire the data without interference with the software controlled writing sequence. Each direct access memory unit 20 write operation is triggered by a Ready strobe from the serial input/output unit 18 on the Ready Line. The direct access memory unit 20 is programmed to generate an interrupt after the proper number of data transfers. The interrupt routine of the direct access memory unit 20 tests the two data blocks and signals the system's background task of the test results.

Advantages and Features

Use of an apparatus like the four-track parallel cartridge formatter 10 to generate the proper tape formats for recording data on a four-track parallel tape unit 40 portion thereof greatly simplifies the hardware (system size) and complexity required to control a tape drive 44 portion of the aforementioned four-track parallel tape unit 40 portion. The four-track parallel cartridge formatter 10, and, in particular, the serial input/output unit 18 portion thereof eliminates the need to generate the CRCC in hardware or calculate it in software.

SELF-SHORING EPOXY ADHESIVE FOR RUBBER-METAL BONDING

R. J. Dick
E. C. Hobaica

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Abstract

A self-shoring epoxy adhesive which is used to bond rubber to steel in a marine environment.

Description

The novelty of the present adhesives lies in the formulation of low molecular weight epoxy resin compositions to obtain self-shoring properties which exceed those of contact adhesives and which are equal to those obtained by use of vacuum and various mechanical means.

Increasing the thixotropy of the epoxy resin composition is not an acceptable solution to obtaining self-shoring properties because thixotropy is lost during upheat (exotherm) of cure. In the developed formulations, the rheology of the compositions has been adjusted to eliminate sagging of the rubber and still allow for viscosity reduction arising from the exotherm produced during the chemical cure of the DGEBA epoxy resin.

Self-shoring advantage can be gained by adding an aliphatic polyamine such as TETA (triethylenetetramine) to the portion of the black pigment ground into the polyamide resin and thereby neutralizing the surface reactivity of the pigment and blocking out the effect of filler surface on cure. Further advantage in self-shoring properties can be obtained by use of a hydrophobic fumed silica since epoxy resins posses bonding sites for both hydrophobic and hydrophilic materials.

Improved self-shoring properties are also obtained by vacuum treatment (1 day at 40 C) of paint-milled master batches of resin component/carbon black/and or fumed silica to remove absorbed water.

Use of aliphatic ether-based epoxy resins (ex. Epon 871, "Shell") as internal wetting agents and flexibilizing modifiers to help control adhesion to rubber positively affects the resultant rubber-to-metal bond strength of the composition.

The developed compositions are mixed mechanically and prepared as two-part formulations according to the general proportions listed below.

Ingredient	Parts by Weight No. 42-1	Parts by Weight No. R-31
Epoxy resin ("Epon 828" Shell)	101.8	97.2
Polyamide resin("Versamid 140" General Mills)	81.4	77.7
Carbon black("Conductex SC", Columbian)	46.4	53.5
Colloidal silica ("CAB-O-Sil M5" Cabot)	3.7	4.9
Total Parts by Weight	233.3	233.3

Advantages and Features

Prior to these epoxy adhesive composites, it was necessary to shore individual rubber tiles during cure by vacuum or other physical means. These adhesive compositions are capable of holding the rubber tile in any geometry until cured without perceptable slippage or sag.

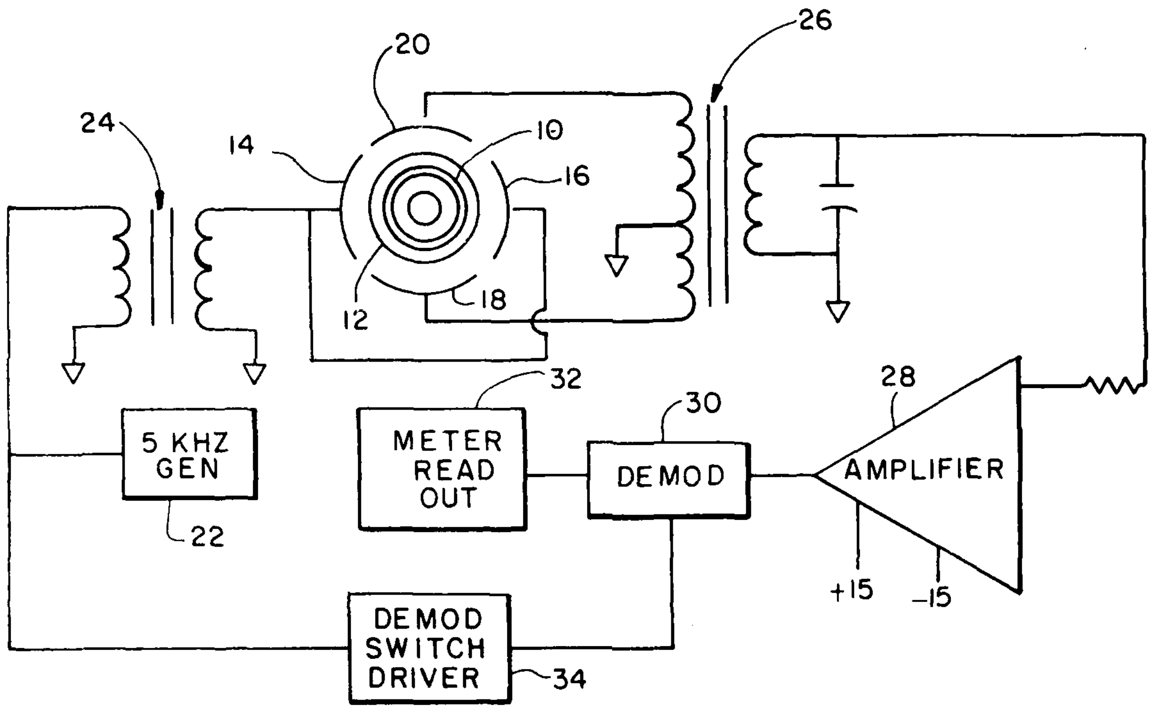
The composites also produce strong bonds having excellent physical properties.

Navy Tech. Cat. No. 3801 Navy Case No. 67666

TRANSFORMER CORE MOVEMENT DETECTOR

Merritt J. Vincent

Rockwell International Corporation, Anaheim, California



Navy Tech. Cat. No. 3801 Navy Case No. 67,666

TRANSFORMER CORE MOVEMENT DETECTOR

Merritt J. Vincent

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Abstract

The testing for transformer core movement by symmetrically surrounding the transformer core with four capacitor plates. Two of the plates are excited from a power source. The other two plates are connected to a sensing transformer. Any movement of the core causes an unbalance in the capacitance and causes a change in output that can be detected as to magnitude and direction of movement.

Description

Pick-off transformer cores are encased in a core box (usually fiberglass) to prevent movement of the core. Occasionally there may be a core that has movement beyond the allowable limit for instrument manufacturing, such as gyros.

Core 10 is encased in the core box 12. Symmetrically surrounding core box 12 are four curved capacitor plates 14, 16, 18 and 20. Capacitor plates 14 and 16 are excited by a 5 KH_z generator 22 driving transformer 24. Capacitor plates 18 and 20 are connected to the primary winding of sensing transformer 26. Any movement of core 10 will cause an unbalance in capacitance and change the output voltage to sensing transformer 26. The output of transformer 26 is amplified in amplifier 28 and the modulation caused by the change in capacitance is demodulated in demodulator 30 to provide a signal to meter 32 proportional to the magnitude and direction of the movement of core 10. Demodulator 30 is kept in sync with the excitation source through switch driver 34. Amplifier 28 is provided with a + 15v and - 15v power supply to provide an output signal that represents the direction of movement of core 10.

Advantages and Features

Testing for transformer core instability before the transformer is constructed and installed in the instrument can be done using this testing device.

The testing for mechanical stability of transformer cores before the transformer is constructed and installed results in the prevention of production down time.

Navy Tech. Cat. No. 653!

Navy Case No. 67604

PROGRAMMABLE TELEMETRY TEST SYSTEM

Juan M. Guadiana

Naval Ship Weapon Systems Engineering Station, Port Hueneme, CA

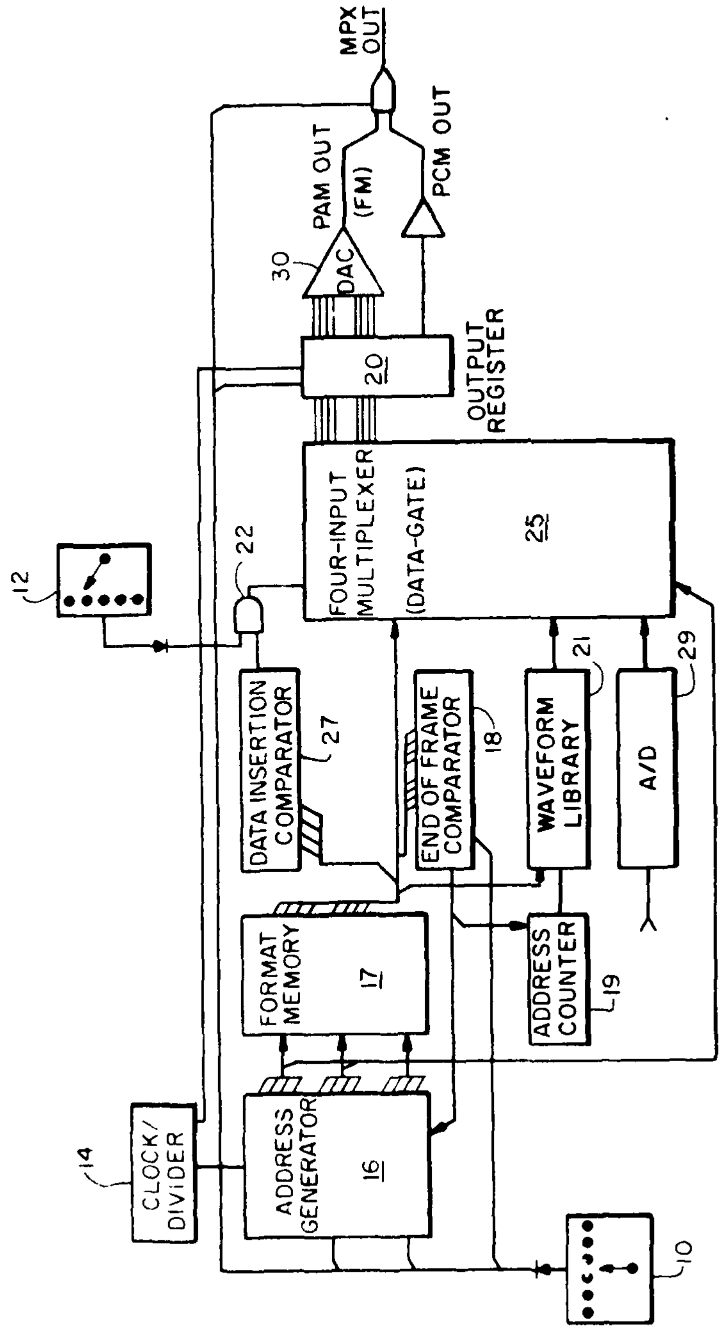

FIG. I

Navy Tech. Cat. No. 6531 Navy Case No. 67604

PROGRAMMABLE TELEMETRY TEST SYSTEM

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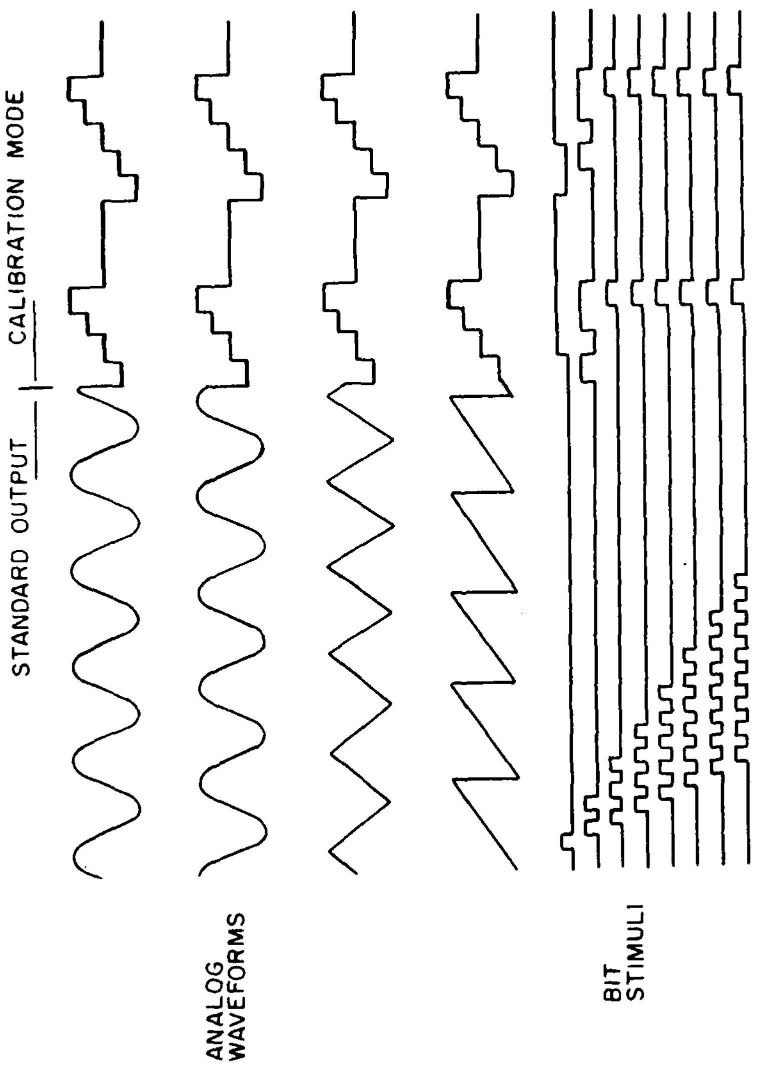

FIG. 2

Navy Tech. Cat. No. 6531 ____ Navy Case No. 67,604

PROGRAMMABLE TELEMETRY TEST SYSTEM

Juan M. Guadiana

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Abstract

A portable programmable telemetry test system based on a two comparator processor for generating realistic looking PAM and PCM signals. The simulated telemetry signal is not static but dynamic. Wave-forms, such as sine-waves, ramps and bit stimuli (or events) are retrieved from a look up table and inserted into the data stream under the selected format control. The system stores six telemetry formats which may be FM, PAM or PCM. Thus, six very different missiles may be simulated by simply changing a switch setting.

Description

The entire simulator is controlled by two switches, modulation format select switch 10 and calibration mode select switch 12. By means of Diode Matricis (not shown) the switches select binary codes to control the simulator. Switch 10 is used to set; the frequency of clock 14, the word rate, the start address of address generator 16, frame comparator 18, codes output register 20 for parallel or serial output, and selects the appropriate signal to be fed to the monitor or transmit. Switch 12 controls data insertion at gate 25.

Clock 14 is a voltage controlled oscillator and is divided by a selectable down counter to generate the word rate pulse. The word rate pulse is sent to a 12 bit counter 16 that generates the address for format memory 17. Counter 16 is preset with the start address for a particular format by end of frame comparator 18.

End of frame (EOF) comparator 18 is enabled only when it finds the eight bit representation of the last channel in a PAM frame or the last eight bits of a PCM synchronization pattern. At the time the last word of the frame appears, EOF comparator 18 goes high, enabling address generator 16 to preset to the beginning address. The EOF pulse also advances address counter 19 for wave-form library 21.

The outputs of format memory 17 and wave-form library 21 are routed to multiplexer (data gate) 25. Gate 25 is controlled by data insertion comparator 27 through gate 22. If format memory one of the sixteen codes, comparator 27 enables gate 22 and multiplexer 25 is switched from format memory 17 input to either the wave-form library 21 input or to analog to digital converter 29 input. The input to AID converter 29 is from an external source.

The output of multiplexer 25 is fed to an eight bit register 20 that parallel loads the data with the word rate pulse. This data is fed to digital to analog converter 30 and provides the PAM signal. If the main program memory 17 holds FM data, it circulates continuously and generates the desired subcarrier channels. Memory 17 must also hold the Inverse Fourier Transform of the desired subcarrier frequencies. If output 20 is set to operate in serial mode the clock shifts the register serially and generates NRZL PCM.

When the simulator is operating in the calibration mode, the first function in wave-form library 21 is a five-step staircase occupying the first 256 lines of memory. Each function occupies a consecutive 256 line segment. The lower eight bits of address generate the consecutive approximation of each function and the upper four bits select the function of interest. By disabling the upper four bits by appropriate setting of switch 12, only the staircase function may exit from format memory 17 and all dynamic channels are modulated simultaneously by the staircase function as shown in Fig. 2. Otherwise up to 16 unique wave forms exit the multiplexer.

Advantages and Features

A programmable test apparatus that is portable, simple to operate, yet provides the complex signals for rapid testing of shipboard telemetry systems, including complex characteristics such as sub commutated, sub-sub commutated and super comutated data streams. The field engineer has the ability to test totally from the antenna to the last bit display.

Navy Tech. Cat. No. 5440

Navy Case No. 67506

ELECTRICAL LOCKING BOLT SYSTEM

Sergio G. Cortez and Gene G. McMahan

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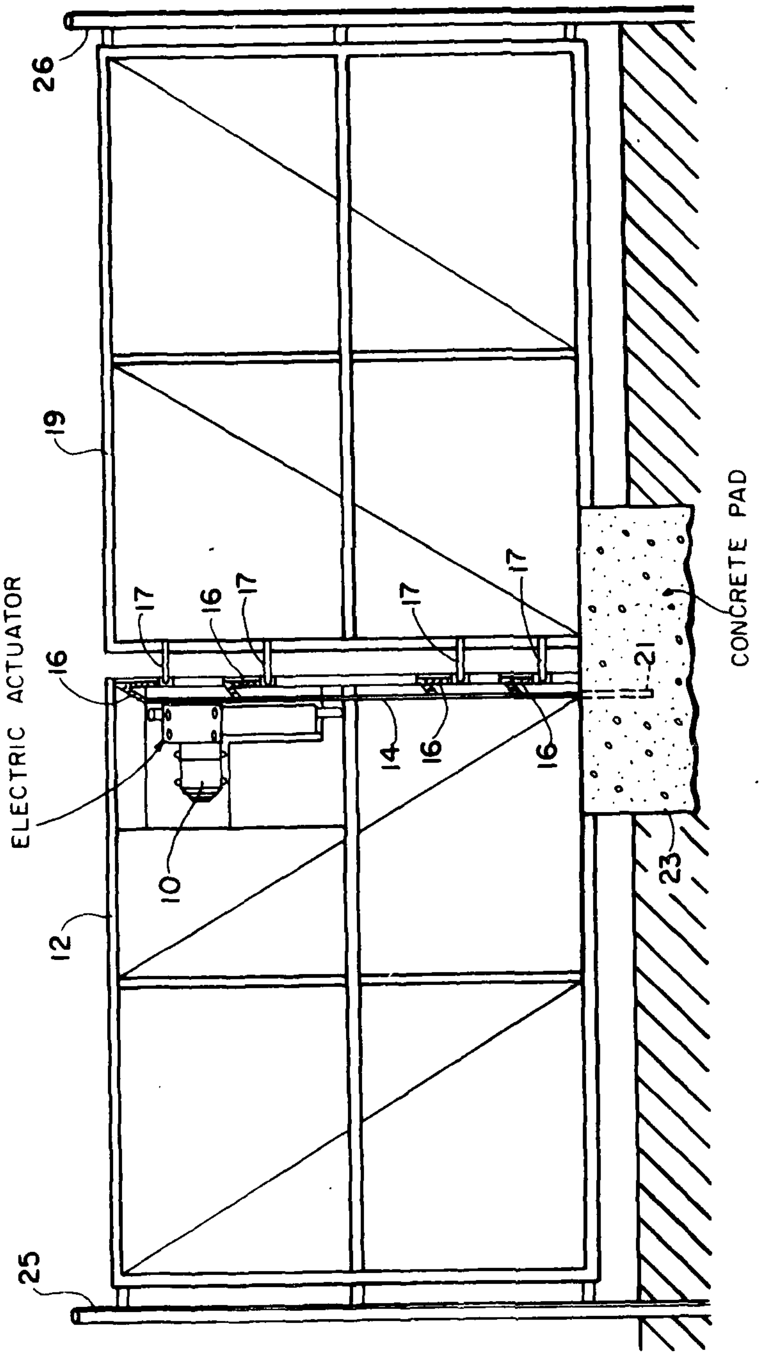

Navy Tech. Cat. No. 5440 Navy Case No. 67,506

ELECTRICAL LOCKING BOLT SYSTEM

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Gene G. McMahan

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Abstract

This device is an electrical locking system which operates with a high cycle rate and is generally used on double or single chain link fence gates. An electric linear actuator is mounted to one of a pair of gates which swing together to close at a center. The actuator lifts or drops a vertical rod with multiple downwardly depending bolts affixed to the rod to engage receptacles in the other of the pair of gates on the downward stroke and to disengage from the receptacles on the upstroke. The bottom of the rod also engages a groundhole on the downstroke to further secure the gates.

Description

Double gates for chain link fences commonly use fork type latches with a center gravity drop rod or plunger bar of full gate height arranged to engage a gate stop in a concrete pad at the road pavement. The locking device is constructed so that the plunger bar cannot be raised when locked and secured with a padlock. Neither the bar nor lock of this prior system, however, has been found to provide significant resistance against ramming with an automobile or other vehicle, and consumes time to open and close.

The Figure of drawing shows the rear view of a typical gate. The electrical locking bolt system, shown in the drawing, includes an electric linear actuator 10 mounted on gate leaf 12 of the dual gates. Linear actuator 10 is commercially available and operates at either 12 v d.c. or 115 v a.c. In this application the electrical linear actuator 10 is mounted on a central metal rod 14 with four L-shaped bolts 16 welded at select spacings on the active gate leaf 12 and arranged to engage in matching receptacles 17 welded on the inactive leaf 19 of the gate. The locking device is constructed such that the lower end of the central metal rod 14 drops into a hole 21 in concrete pad 23. Until energized to open, linear actuator 10 operates to prevent central metal rod 14 from being raised to the point where the gate can be unlocked. When energized, the linear actuator automatically raises metal rod 14 and disengages the L-shaped bolts from receptacles 17 leaving the gate leaves 12 and 19 free to open. The gate leaves 12 and 19 are generally reinforced with cross bracing, and gate posts 25 and 26 can be reinforced with sections of wire ropes from anchors at either side to transfer any loads placed on the gate to the anchors. The electric bolt locking system can also be used to lock sliding gates.

Advantages and Features

This electrical locking bolt system for chain link fence gates and the like provides substantial resistance against ramming with standard vehicles. The system eliminates the use of chain and padlock; operates with a high cycle rate; is easy to open and close; can be actuated with a remote on-off switch; and consumes less time to operate. In case of power failure the system can be operated manually.

INTERACTIVE BUILT IN TEST (BIT)

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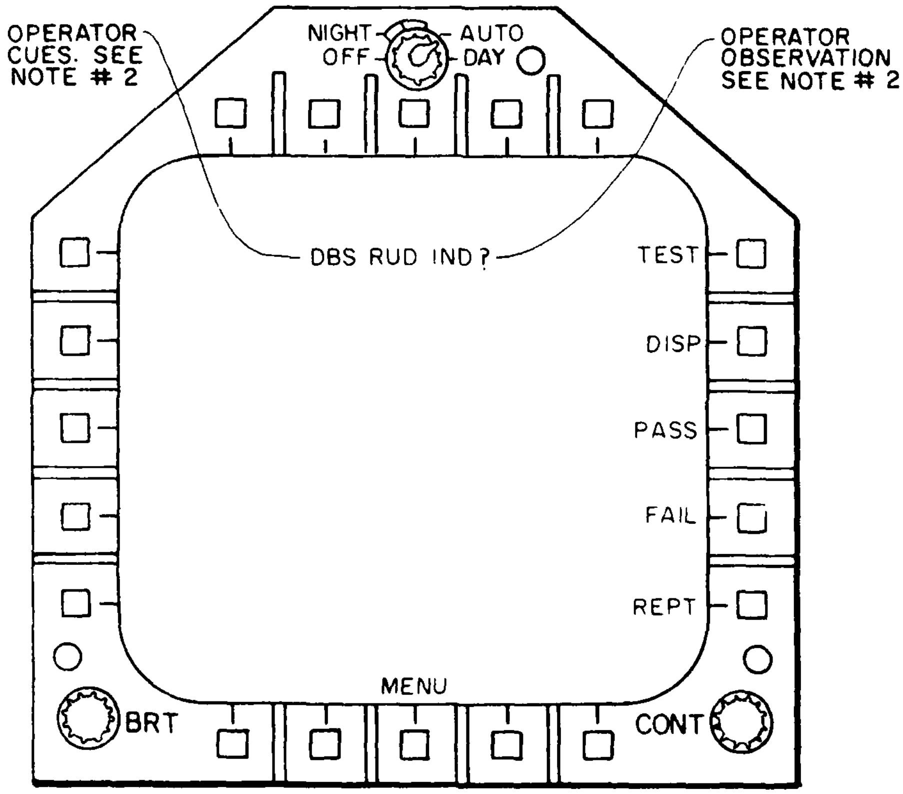

NOTES:

1. OPERATOR COMMAND CUES ARE DISPLAYED FOR EACH AVAILABLE TEST IN THIS MODE.
2. "?" INDICATES A REQUIRED OPERATOR OBSERVATION FOLLOWED BY A PASS OR FAIL SELECTION. IF "?" NOT DEPLOYED, AN OPERATOR PARTICIPATION TEST WILL BE PERFORMED AND AUTOMATICALLY INITIATES DISPLAY TO PROCEED TO NEXT TEST.
3. "PASS" IS SELECTED AFTER EQUIP. HAS SATISFACTORILY PERFORMED THE OPERATOR CUED TEST AND INITIATES DISPLAY TO NEXT TEST.
4. "FAIL" IS SELECTED IF EQUIP. HAS UNSATISFACTORILY PERFORMED THE OPERATOR CUED TEST AND INITIATES DISPLAY TO NEXT TEST.
5. SELECTION OF "REPT" WILL CAUSE CURRENTLY DISPLAYED TEST TO REPEAT.

Navy Tech. Cat. No. 0968 Navy Case No. 67580

INTERACTIVE BUILT-IN TEST (BIT)

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Abstract

A method has been devised to isolate failures of input and receiving devices in a digital computer based system. The operational readiness or trouble-shooting of any particular avionics subsystem is evaluated without peripherial test equipment. A built-in test (BIT) routine is stored as part of the program of the digital computer. Upon command, the digital computer conducts an automatic test on the system by use of a preprogrammed set of commands or stimuli to associated peripherial equipment and evaluation of responses received from the peripherials.

Description

The availability and rate of develcpment of digital computers has resulted in wide spread application of digital computer based systems. Usually a software operational program is installed in memory and the programmed function is provided by the computer. Inputs from controllers and or sensors typically call for the computer to provide outputs for controls or displays. It has become apparent that the reliability or trouble shooting of the system could be enhanced by having a bit routine as part of the program of the digital computer so that an automatic test of the system can be made. One advantage of such a routine is that the system has a self-test capability and requires no special diagnostic equipment. Some digital systems do not lend themselves to the BIT technique because, for example, the expected response provided a visual cue which was impractical to interpret automatically or the test routine required manual stimuli which were impractical to automate.

This approach lends itself to a wide variety of digital computers having visual monitors which provide an indication of a particular sequence of events. Referring to FIG. 1, a typical computer control display device indicates to the operation what action is required. Any number of operator instructions called cue's are displayed and the operator takes the proper action. The computer senses the result of the operator's action and a new cue is displayed. If the action is not sensed within a specified time, the computer concludes that there is a failure and gives the next cue. The operator does not have to wait the specified time if the indicated action has been completed. The fail switch can be activated so that when the cue is followed by a question mark the operator must make an observation and select pass or fail. When it is desired to subject the associated digital system to trouble shooting, the operator depresses the REPT switch and causes the system to repeat a test. This will cause the holding of a test condition so that voltages etc. can be measured.

Depressing a control to initiate the pass or fail of the system causes the next cue to be displayed on the screen.

Upon completion of the test in which all of the tests pass, a go signal is displayed on the screen but if the tests have indicated a failure this is indicated as well as the number of recorded failures.

The BIT routine initiates what failures have occurred when the display button is actuated. The appropriate code for a certain portion of the associated digital system is displayed, for example, the initials FCC would be shown if there has been an improper response from the flight control computer. This alerts the operator of the possibility of failure in this unit. In addition to the BIT technique the computer controlled display also is used to display failures which are detected during flight by preprogrammed diagnostic routines executed in real time as part of the operational flight program. The in-flight diagnostic routines are referred to as periodic BIT or in-flight monitor (IFM). Failures identified by IFM are automatically stored in a nonvolatile memory to enable subsequent retrieval and the performance of proper maintenance.

Advantages and Features

Diagnostic testing of digital computer based systems can be programmed to eliminate the need for special test equipment. The diagnostic routines are preprogrammed

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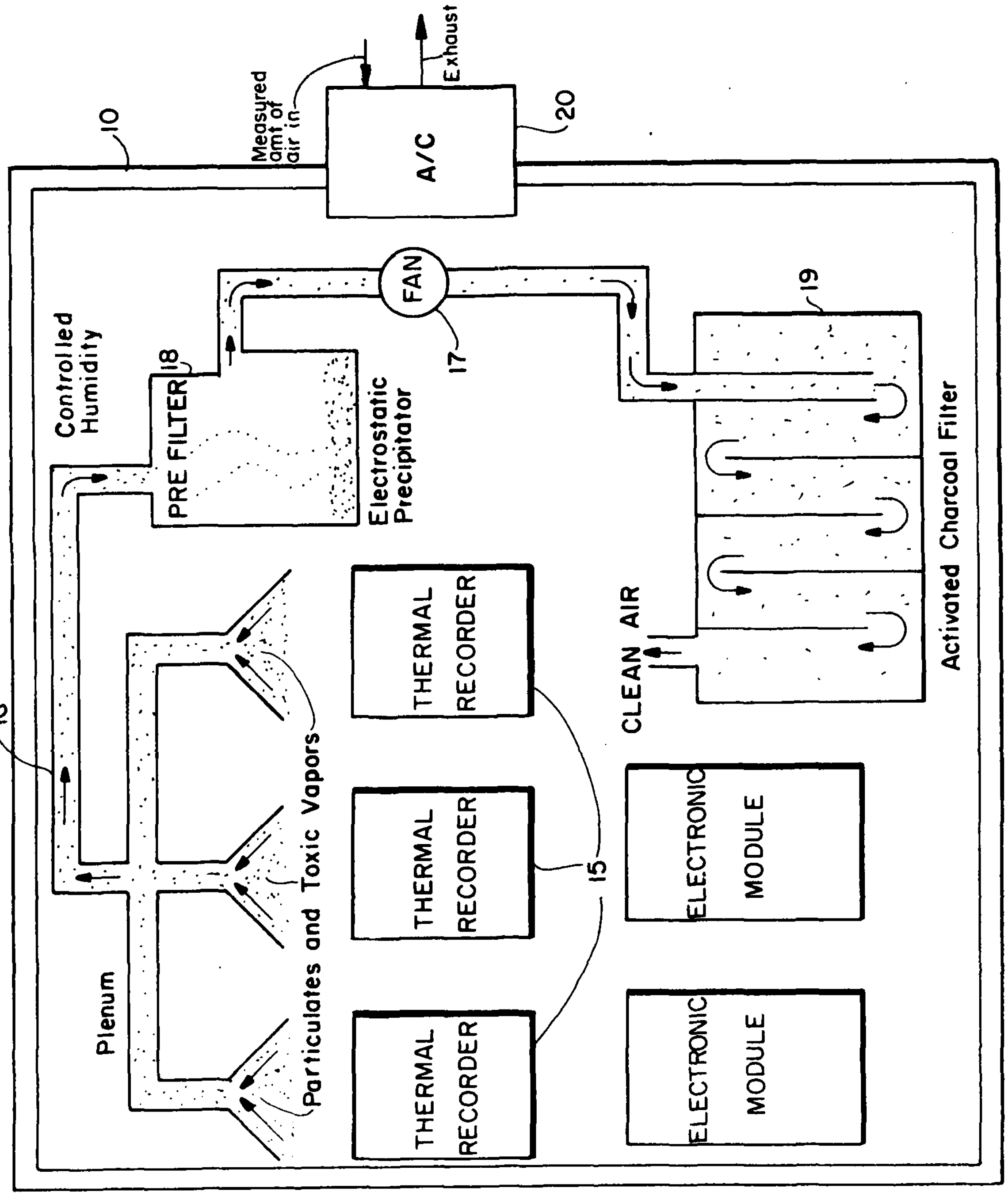
to provide instructions and cue's via a cathode ray tube display which makes the diagnostic routine self-teaching. The test results are displayed in a clear, unambigious manner via a digital computer controlled cathode ray tube display. The interactive BIT diagnostic routines are incorporated as part of the operational program of a digital computer system. The use of a nonvolatile memory records discrepancies detected by the diagnostic routines which later can be used during maintenance.

GPO 875 423

RECORDER EFFLUENT PURIFICATION

Charles E. Hansen

Naval Ocean Systems Center, San Diego, CA



Navy Tech. Cat. No. 0130 ____ Navy Case No. 67,679

RECORDER EFFLUENT PURIFICATION

Charles E. Hansen

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Abstract

This method removes particulate matter and gaseous by-products of combustion from air circulating through recorders which use a burn trace on electro sensitive paper. A buildup of particulate matter and gaseous by-products can be hazardous when a number of recorders are utilized in confined spaces. Electrostatic precipitators and activated charcoal filters are located in ducts that draw the by-products. After passing through the precipitator and filters, the air is recirculated to reduce air conditioning demands and to allow introduction of small amounts of fresh air.

Description

An enclosure room 10 houses a number of thermal recorders 15 as well as their associated electronics (not shown). The recorders and electronics frequently are packed in small enclosure spaces such that the by-products of recording can pose a health hazard to operating personnel as well as having an objectionable odor.

The recorders and their associated electronics usually are mounted in racks configured as plenums having interconnected ducts 16 which draw off the particulate and toxic vapors from the recorders. The drawing action is initiated by a fan 17 that is located downstream from an electrostatic precipitator 18. The large high volume fan 17 places a suction on the duct/plenum system that causes the particulate and toxic vapor contaminated air to be pulled through electrostatic precipitator 18 and on through an activated charcoal filter 19. The air is stripped of particulate matter in the electrostatic precipitator and next the activated charcoal filters absorb the gaseous components of combustion.

The resulting cleaned air is recycled. The recycling decreases the load on an interconnected air conditioning system 20 so that the air conditioning system can bring in fresh air at greatly reduced rates.

Advantages and Features

Cleaning particulate matter and absorbing the gaseous components of combustion from enclosed spaces such as seagoing display installations reduces headaches and tends to prevent seasickness of operators. Since measured amounts, if any, of outside air are introduced, the humidity within the enclosure can be more precisely managed. Managing the humidity within the enclosure prevents curling of the electro sensitive paper used in the thermal recorder. Controlling humidity also prevents damage to the electronics which might otherwise be the consequence of introducing quantities of salt air. Controlling the air in the enclosure also contributes to a feeling of well being by operator personnel since there is freedom from the pungent odors otherwise

GPO 875 423

emitted from the recorders.

GPO 875 423

Navy Tech. Cat. No. 1542 Navy Case No. 67531

ROLLER BEARING DISASSEMBLY PRESS

Gary R. Toomer

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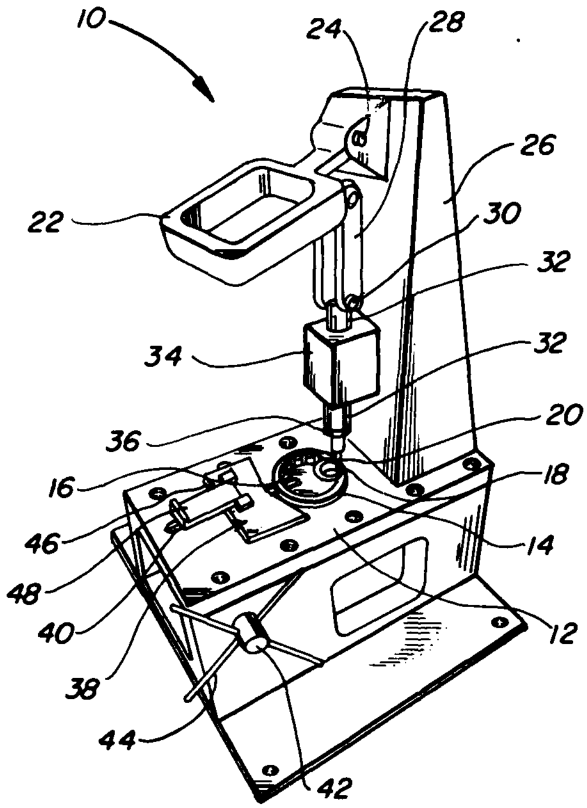

FIG. 1

Navy Tech. Cat. No. 1542 Navy Case No. 67531

ROLLER BEARING DISASSEMBLY PRESS

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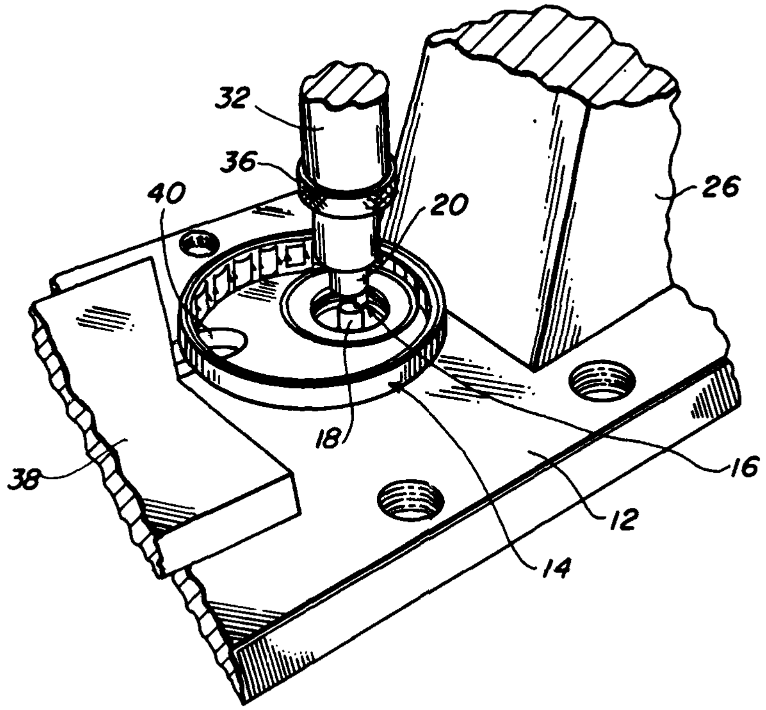

FIG. 2

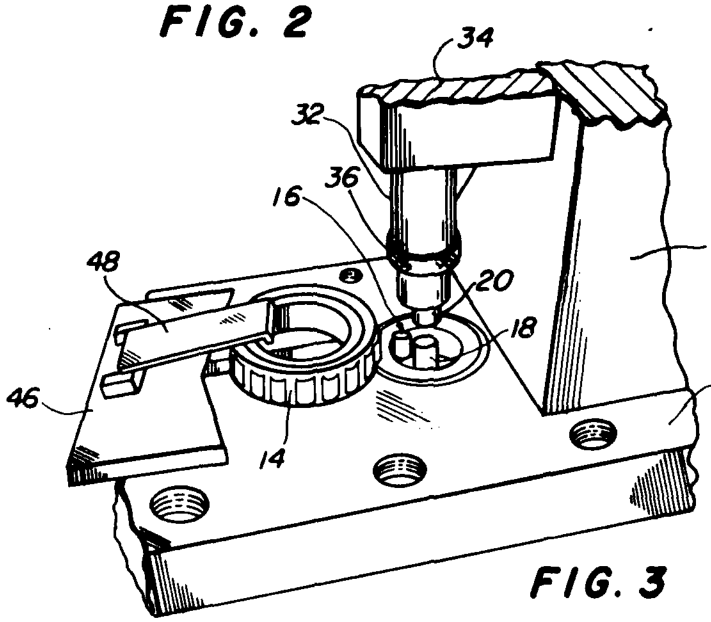

FIG. 3

Navy Tech. Cat. No. 1542 ____ Navy Case No. 67531

ROLLER BEARING DISASSEMBLY PRESS

Gary R. Toomer

Naval Air Rework Facility, San Diego, California

Abstract

A roller bearing disassembly apparatus is provided which will remove cylindrical rollers from inner or outer ring retained roller bearings. The apparatus selectively clamps the cylindrical roller at the available top and bottom surfaces of its end faces, and then the roller bearing is pushed to remove an inner cylindrical roller or pulled to remove an outer cylindrical roller. With this apparatus the retainer cage and tangs remain undamaged.

Description

There is shown in FIGS. 1 and 2 a roller bearing disassembly apparatus 10 which has a platform 12 for supporting a roller bearing 14 in a flat position. The apparatus 10 is capable of removing the cylindrical rollers 16 from the inner side of the roller bearing 14. The apparatus is also capable of removing cylindrical rollers from the outer surface of an inner ring retained roller bearing, as shown in FIG. 3.

The roller bearing disassembly apparatus 10 has a cylindrically shaped pedestal 18 which is mounted through an opening in the platform 12, and which is adjustable in up and down directions by a screw assembly (not shown) under the platform. A cylindrically shaped block 20, which is about the same size as the pedestal 18, is mounted above the pedestal and is selectively adjustable in up and down directions by a handle 22 for clamping and releasing a cylindrical roller between it and the pedestal. The handle 22 is pivoted at 24 to a stand 26, which in turn is fixedly mounted to the platform 12, The handle 22 has a bell crank (not shown) which is pivoted to a top end of a link 28. The link 28 is in turn pivoted at 30 to a plunger 32 which is slidably reciprocable in a bearing 34 which is fixedly mounted to the stand 26. The cylindrically shaped block 20 is fixed to the bottom of the plunger 32 by a screw and nut arrangement 36.

A push-pull device 38, which is slidably mounted on the platform 12, is capable of sliding toward or away from the roller bearing 14 above a slot 40 in the platform. The push-pull device 38 is slid back and forth on the platform 12 by a rack and pinion arrangement (not shown) below the platform 12, the rack being connected to the bottom of the push-pull device 38 and the pinion being mounted on the inner end of a shaft 42. The outer end of the shaft 42 is provided with handles 44 for operating the rack and pinion arrangement to selectively move the push-pull device 38 toward or away from the roller bearing 14. The push-pull device 38 includes a V-shaped block 46 which engages the outside perimeter of the roller bearing 14 for pushing the roller bearing to disengage a cylindrical roller which is clamped between the pedestal 18 and block 20. As shown in FIG. 3 when cylindrical rollers are to be disengaged from the outer surface of an inner ring retained roller bearing, a puller arm 48, which is pivoted to the top of the V-shaped block 46, is utilized. When this puller arm is utilized the arm is swung over into the inside of the roller bearing and the roller bearing is pulled by turning the handle 44 while the cylindrical roller in the outer surface of the roller bearing is clamped between the pedestal 18 and the block 20.

Advantages and Features

The roller bearing disassembly apparatus enables the removal of cylindrical rollers from a roller bearing without damage to the retainer cage or the tangs. Prior to the present apparatus pliers and screwdrivers were utilized for removing the rollers which often resulted in damage to the cage and/or the tangs. The present apparatus is capable of removing cylindrical rollers from either the inner or outer surfaces of outer or inner ring retained roller bearings. Roller bearings, which can cost as much as $4,000 each, can now be refurbished for a fraction of their original cost.

Navy Tech. Cat. No. 1020

Navy Case No. 67533

ROLLER-DROP GAGING FIXTURE

Gary R. Toomer

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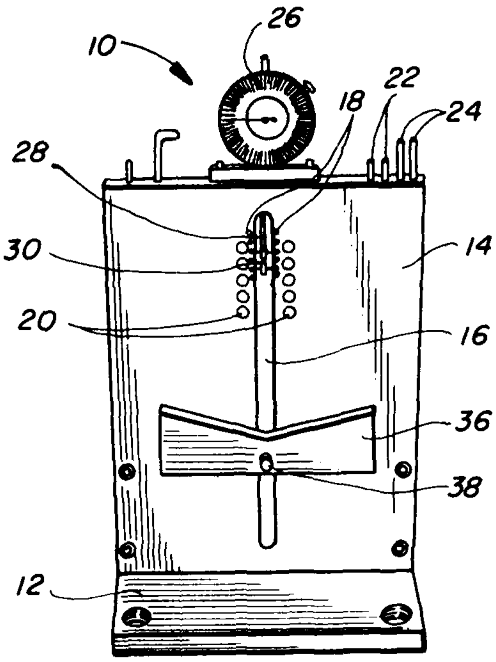

FIG. 1

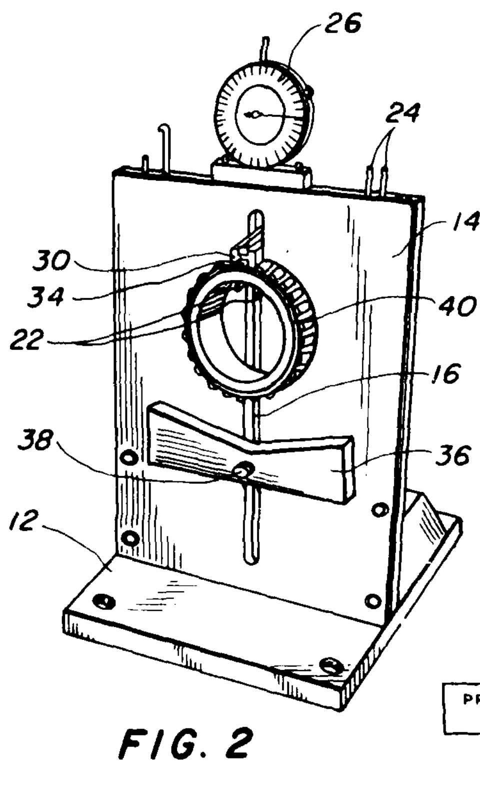

FIG. 2

ROLLER DROP GAGING FIXTURE

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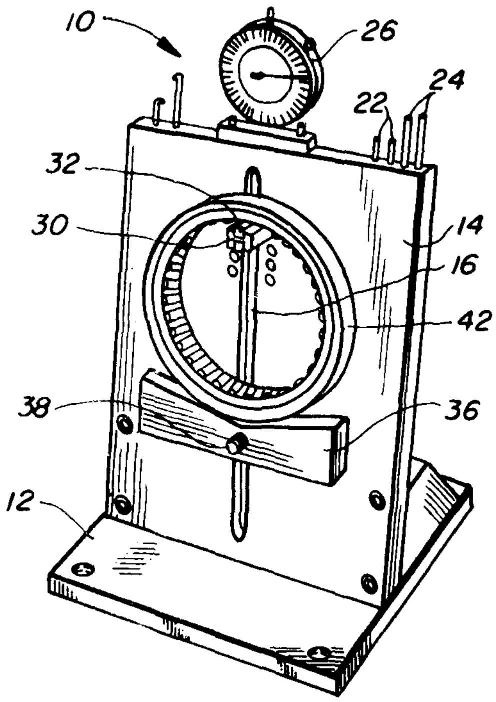

FIG. 3

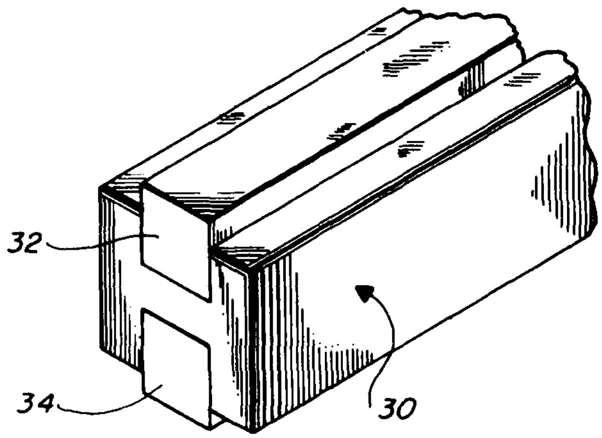

FIG. 4

Navy Tech. Cat. No. 1020 Navy Case No. 67533

ROLLER-DROP GAGING FIXTURE

Gary R. Toomer

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Abstract

An apparatus is provided for measuring the roller drop (amount of radial movement) of a roller within the cage assembly of a roller bearing. The apparatus includes a push rod type indicator which is mounted at the top of an upright plate. The push rod of the indicator extends through a slot in the plate and has an arm which extends outwardly from the plate. The arm has top and bottom means for engaging the inner or outer rollers of a roller bearing. Various devices are utilized on the upright plate to support the roller bearing under test. The arm is [illegible] from the rod of the indicator and brought into engagement with a roller at either its top or bottom extremity within the cage. The arm is then moved to its opposite extremity to indicate roller drop. .

Description

FIG. 1 is a front view of the roller drop gage apparatus, FIG. 2 is a front view of the roller drop gage apparatus with an inner-ring retained type roller bearing mounted thereon for measurement of roller drop, FIG. 3 is a front view of the apparatus with an outer ring retained type roller bearing mounted thereon for measurement of roller drop, and FIG. 4 is a perspective view of the magnetic arm for engaging rollers of a roller bearing.

In FIG. 1 there is shown the roller drop engaging apparatus 10 which has a platform 12 and a plate 14 which is slightly inclined backwards from a vertical so as to support roller bearings. The inclined plate 14 has a substantially vertical slot 16 with inner and outer sets of apertures 18 and 20, respectively, on opposite sides of the slot. Pairs of pins 22 and 24 may be selectively placed within the apertures 18 or 20 at selected locations for supporting the inner side of an inner ring retained type of roller bearing. The smaller pins 22 are used for smaller roller bearings and the larger pins 24 are used for larger roller bearings.

A dial indicator 26 with a push rod 28 is mounted through the top of the inclined plate 14 with the push rod 28 extending downwardly within the slot 16. An outwardly extending arm 30 is releasably attached to the rod 28 by a set screw. As shown in FIG. 4 the arm has top and bottom magnets 32 and 34 for engagement with rollers of roller bearings. A V-shaped plate 36 bridges the slot 16 and is adjustable there along by a bolt 38 which is threaded into a plate (not shown) on the opposite side of the slot. The V-portion of this plate is capable of supporting an outer ring retained of roller bearing.

FIG. 2 illustrates the measurement of roller drop of an inner ring retained type of roller bearing 40.

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With this type of roller bearing the pins 22 or 24 may be utilized in the apertures 18 or 20, respectively, for supporting the roller bearing on the inclined plate 14. The set screw of the arm 30 is loosened and the bottom magnet 34 of the arm is brought into engagement with a roller of the roller bearing, the roller being in its downward position within the tangs of the roller bearing. The set screw is then tightened and the arm is raised until the magnet 34 is just pulling away from the roller. At this point the indicator 26 is read to indicate the amount of roller drop. If the roller drop is not satisfactory the tangs are adjusted to accomplish the desired roller drop as indicated by the dial 26.

FIG. 3 shows the gaging of roller drop on an outer ring retained type of roller bearing 42. This type of roller bearing rests upon the V-shaped block 36. The top magnet 32 of the arm 30 is then brought into engagement with the roller with the roller in its downward position within the retainer ring. The set screw of the arm is then tightened to fixedly position the arm to the indicator rod 28. The arm 30 is then elevated until the roller reaches its top limiting position within the retainer ring. The dial of the indicator is then read to indicate the amount of roller drop of the particular roller measured.

Advantages and Features

Prior to the present apparatus an optical

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comparator was utilized for measuring roller drop. The optical comparator is a very slow process and is costly. The present apparatus is a very accurate mechanical arrangement for measuring roller drop of various sizes of inner or outer retainer ring types of roller bearings. The measuring process can be quickly accomplished and the results are accurate.

GPO 875 423

ROLLER BEARING DISASSEMBLY

Gary R. Toomer

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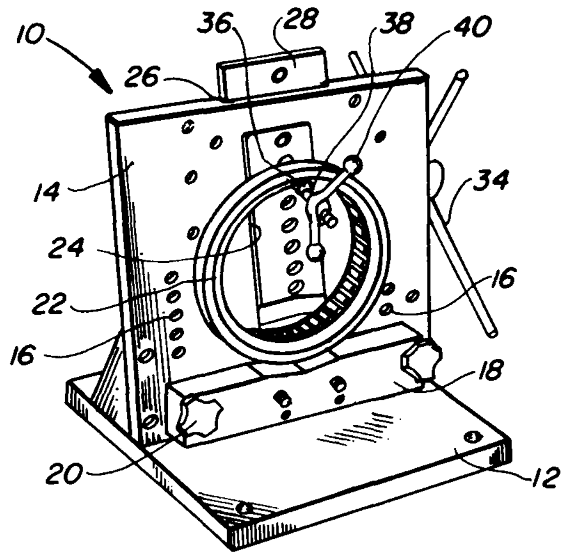

FIG. 1

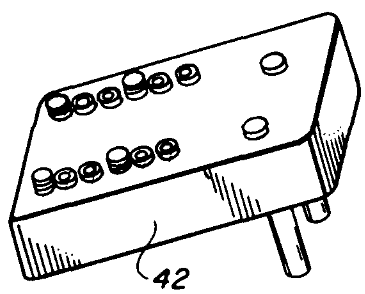

FIG. 3

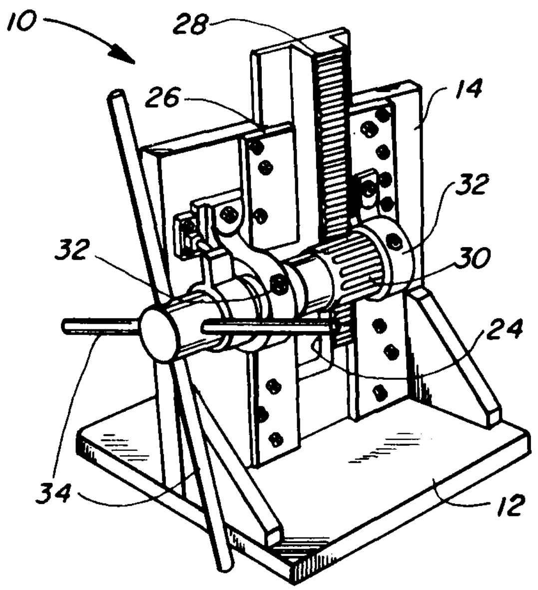

FIG. 2

Navy Tech. Cat. No. 1542 Navy Case No. 67532

ROLLER BEARING DISASSEMBLY

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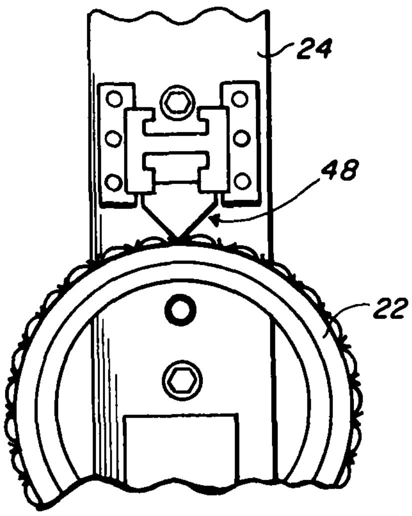

FIG. 4

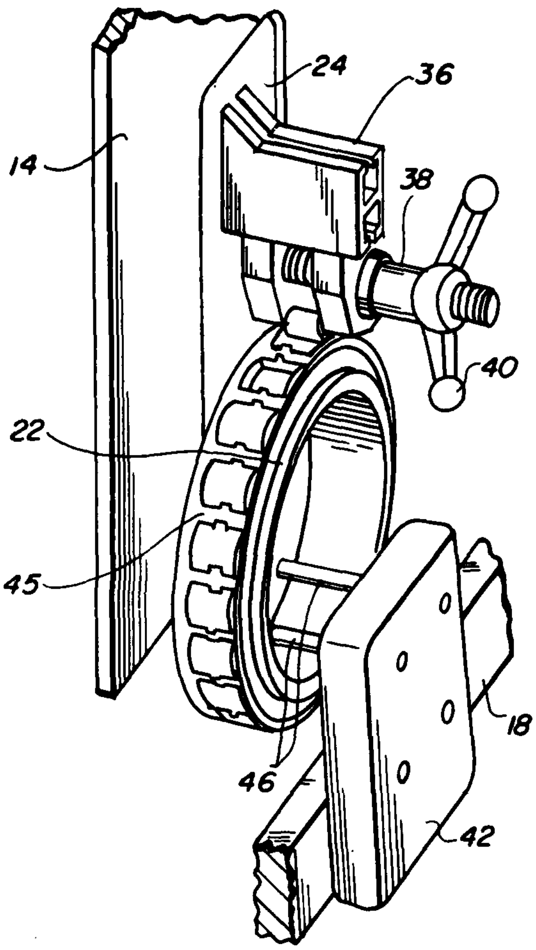

FIG. 5

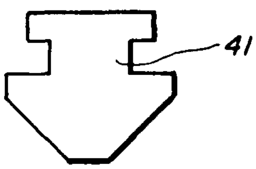

FIG. 6

Navy Tech. Cat. No. 1542 ____ Navy Case No. 67532

ROLLER BEARING DISASSEMBLY

Gary R. Toomer

Naval Air Rework Facility, San Diego, California

Abstract

A device is provided for disassembly or reassembly of cylindrical rollers from inner or outer ring retained roller bearings. The device includes a clamp, which is mounted on an upright plate, for clamping a cylindrical roller of a roller bearing. Also mounted on the plate is a manually operated puller for selectively pulling a clamp which holds a roller away from the bearing assembly, thereby removing the roller from its cage pocket.

Description

FIG. 1 is a front view of the roller bearing disassembly device with a roller bearing in place for removal of a cylindrical roller, FIG. 2 is a view of the back side of the roller bearing disassembly device, FIG. 3 is a view of a component which is utilized to hold an inner ring retained bearing in place as its roller is pulled upwards and out of its pocket, FIG. 4 is a view of a component utilized for bending the retainer tangs of the roller bearing back to their original positions, FIG. 5 illustrates work being performed on a roller bearing having an inner ring retained design, and FIG. 6 is a component which is utilized to push cylindrical rollers back into the cage of a roller bearing.

As shown in FIG. 1 the roller bearing disassembly and assembly device 10 includes a platform 12 upon which there is mounted a vertical plate 14. The plate 14 has a plurality of apertures 16 for selectively positioning a block 18 thereon by means of bolts 20. The block 18 has a "V" configuration at its top for receiving the outer periphery of a roller bearing 22.

As shown in FIGS. 1 and 2 the upright plate 14 is provided with an upright slot 24 which has a track 26 for reciprocally receiving a rack gear 28. As shown in FIG. 2, the back side of the upright plate 14 has a pinion gear 30 which meshes with the teeth of the rack gear 28. The pinion gear is mounted within bearings 32 and has handles 34 at the side of the plate 14 for manual operation of the rack gear 28.

As shown in FIG. 1 the front side of the rack gear 28 has a perpendicularly extending tool receptacle 36. The tool receptacle 36 receives a clamp 38 which has a pair of jaws for clamping one of the cylindrical rollers of the roller bearing 22. The jaws of the clamp 38 are open and closed manually by a handle 40. In FIG. 1 there is illustrated a roller bearing 22 of the type having an outer ring for retaining cylindrical rollers. One of the cylindrical rollers of the roller bearing 22 is firmly retained by the clamp 38. Upon turning the handle 34 the cylindrical roller is drawn downwardly to disassemble

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it from the retainer tangs of the roller bearing. If the same cylindrical roller was to be reassembled it would be placed into position manually and pushed into place using a tool 41 as in FIG. 6. The tool 41 is placed into tool receptacle 36 and the handle 34 would be appropriately turned to push the roller back into the tangs. As shown in FIG. 5, a retainer block 42, is provided with pins 46 which extend inwardly for insertion inside a roller bearing 45 which has an inner retainer ring design. The pins 46 prevent upward movement of the roller bearing by counter-acting the force of the disassembly of the cylindrical roller from the tangs of the roller bearing.

As shown in FIG. 1 the disassembly of cylindrical rollers from a roller bearing having an outer ring retained design the clamp 38 is utilized to clamp one of the cylindrical rollers. The bottom of the roller bearing is placed upon the block 18 and the handle 34 is then appropriately turned to withdraw the cylindrical roller from the roller bearing. In reassembly of a cylindrical roller into the roller bearing the cylindrical roller is manually set in place and pushed into its pocket using the tool 41 shown in FIG. 6, used similarly as shown in FIG. 4.

FIG. 4 simply shows a component 48 which can be inserted into the tool retainer 36 in lieu of the clamp 38. The component 43 is utilized for rebending the tangs

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of any roller bearing to the proper position to assure the desired "roller drop" of the cylindrical roller within the roller bearing.

Advantages and Features

Roller bearings can cost as much as $4,000 each. In the past it has been unpractical to refurbish such roller bearings since the only tools available were pliers and a screwdriver to remove the cylindrical rollers from the roller bearing. Most times the roller bearing was damaged when these tools were utilized. The present **device** enables refurbishment of differently sized roller bearings whether they be of the inner or outer ring retained type. Worn cylindrical rollers of the roller bearing can be removed and new cylindrical rollers can be replaced. After replacement the device can be utilized to appropriately set the tangs of the roller bearing so that each cylindrical roller has the proper "roller drop".

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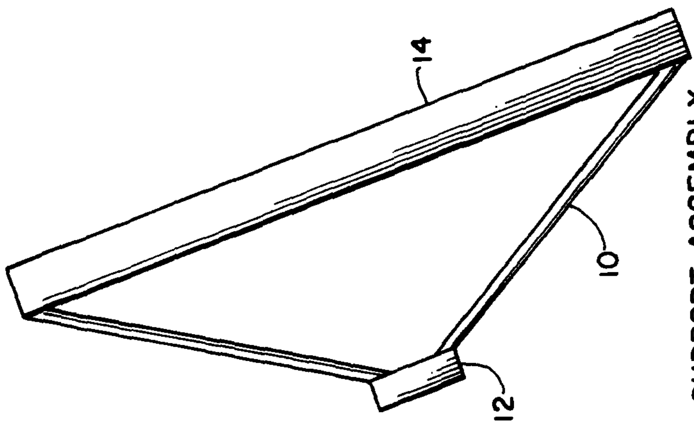
Navy Tech. Cat. No. 5626 Navy Case No. 66918

FEED ALIGNMENT FIXTURE FOR PHASED ARRAY RADAR

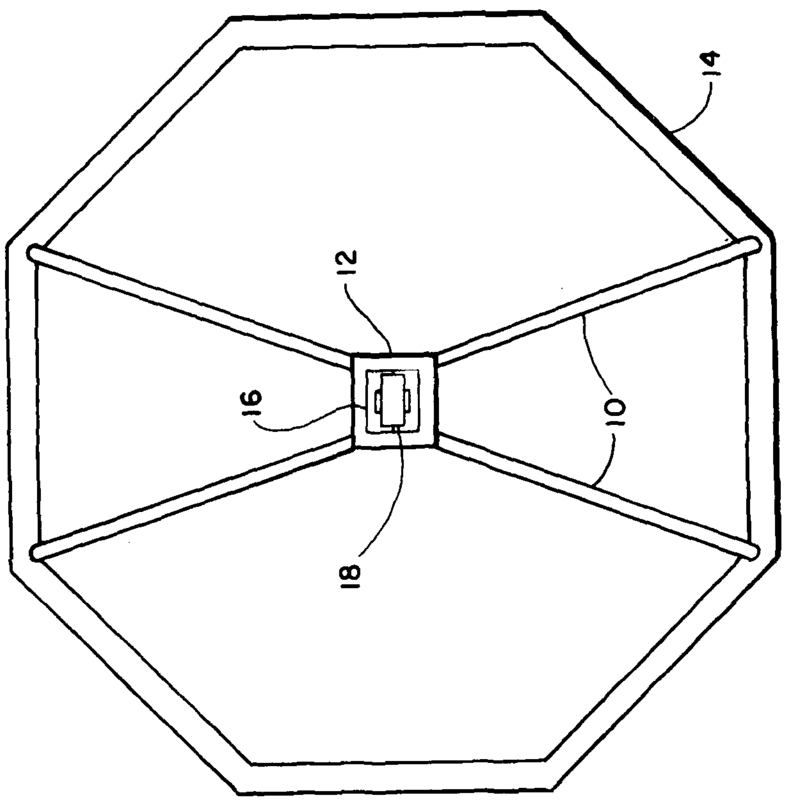
Jarl Dahl

Raytheon Corporation, Sudbury, MA



SUPPORT ASSEMBLY (SIDE VIEW)

FIG. 2



FEED HORN COMPARATOR SUPPORT ASSEMBLY (BACK VIEW)

FIG. 1

Navy Tech. Cat. No. 5626 ____ Navy Case No. 66918

FEED ALIGNMENT FIXTURE FOR PHASED ARRAY RADAR

Jarl Dahl

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Abstract

An alignment fixture is presented which is attached to a Multiple Target Instrumentation Radar (MIR) phased array radar antenna, and which allows adjustment of a monopulse feed-horn comparator at the focal point of the radar. The alignment fixture enables the feed horn to be adjusted in pitch, yaw and roll with respect to the electrical center axis of the radar lens and to be translated in three orthogonal directions.

Description

A quadrapod support was developed in combination with a monopulse feed-horn comparator mounting assembly for the MIR phased array radar antenna. As shown in FIGS. 1 and 2 the quadrapod support 10 is a four-legged structure which supports the feed-horn mounting assembly at approximately the focal point of the radar antenna lens.

One end of each leg is attached to the tubular frame 14 which encircles the antenna phase shifter support structure. The other ends of the legs converge to the focal point of the radar and attach to an outer frame of the feed-horn mounting assembly 12.

The frame is a square box which has two open ends 1[illegible], one facing toward and the other away from the back

GPO 875 423

face of the antenna lens. The feed-horn comparator 18 is attached to a structure within the box which allows the horn to be positioned accurately and securely at the electrical focal point of the lens.

Positioning the feed-horn is accomplished using a combination of shims, spacers, and slotted holes. The slotted holes are in intermediate mounting plates. The plates are positioned within the feed-horn mounting assembly 12 using shims and spacers. The slots allow the horn to be moved relative to the plates.

The adjustment structure enables the feed-horn to be adjusted in pitch, yaw and roll with respect to the electrical center axis of the lens and to be translated in three orthogonal directions. Although pointing is limited to just a few degrees, and translation is limited to the frame of the box, these movements are sufficient to achieve the desired alignment.

Initial mechanical alignment of the feed-horn is achieved using a specially made pointer which attaches to a ball joint fitting at the center of the horn. The pointer extends from the center of the horn to locations on the antenna face whose positions are accurately known. The horn is adjusted with respect to these known locations using the pointer as a measurement rod.

Final electrical alignment is accomplished through proper adjustment of the above described combination of shims, spacers, and slotted holes.

Advantages and Features

The alignment fixture provides for fixed support to the frame of the antenna phased shifter support structure and adjustable positioning to allow efficient and effective electrical adjustment of a monopulse feed-horn comparator at the focal point of the radar antenna lens. By mechanically fastening the feed-horn mounting assembly to a point approximately located at the focal point of the radar antenna lens, initial mechanical alignment of the feed-horn is achieved using specially made components which are designed for this purpose in the array. Final electrical adjustment is then performed in an effective manner through the use of a combination of shims, spacers, and slotted holes which make up the alignment structure contained within the frame for holding the feed-horn comparator.

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Navy Tech. Cat. No. 5626 Navy Case No. 66916

ANTENNA ARRAY FEED CABLES

Louis A. Dindo and Robert F. Ross

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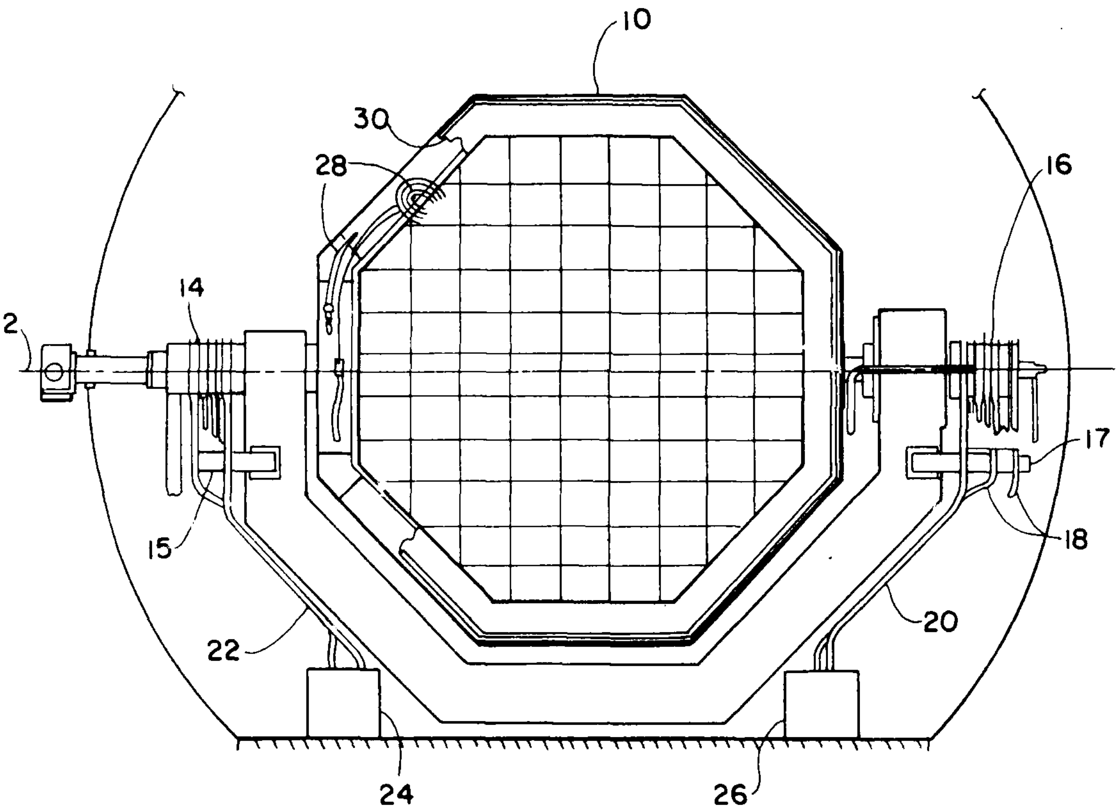

FIG. 1

Navy Tech. Cat. No. 5626 Navy Case No. 66916

ANTENNA ARRAY FEED CABLES

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Raytheon Corporation, Sudbury, MA

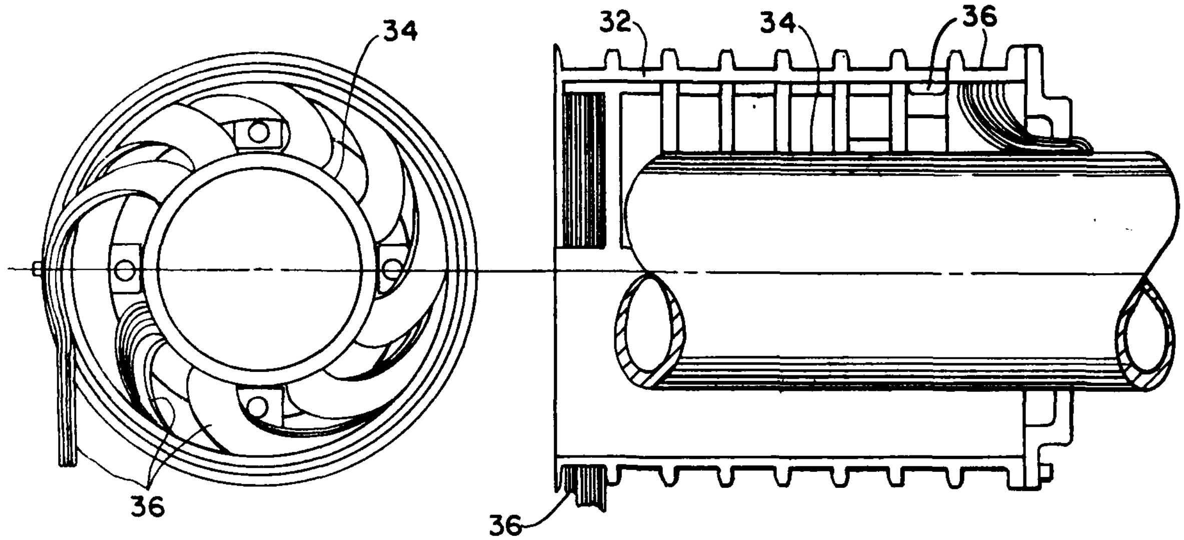

FIG. 2

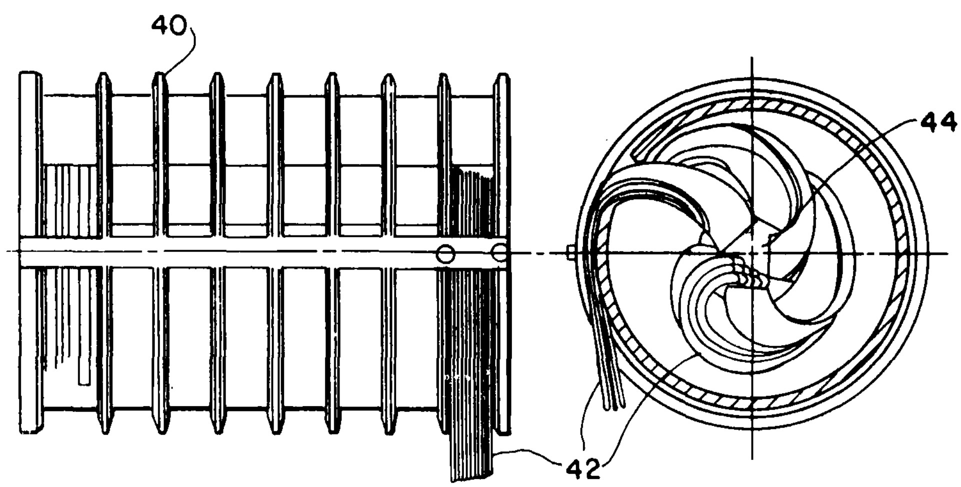

FIG. 3

Navy Tech. Cat. No. 5626 Navy Case No. 66916

ANTENNA ARRAY FEED CABLES

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Robert F. Ross

Raytheon Corporation, Sudbury, MA

Abstract

The wiring system was devised for the Multiple Target Instrumentation Radar (MIR) phased array radar antenna to allow the antenna to be rotated through two hundred and thirty degrees in elevation and to eliminate the need for slip rings. Specifically cables are wrapped around spools along the axis of elevation rotation and enter holes which lead to a hollow core of the elevation trunnion.

Description

FIG. 1 shows the MIR phased array radar antenna assembly with the antenna array feed spools attached in alignment with the elevation axis of rotation. The MIR phased array radar antenna 10 rotates about the elevation axis of rotation 12. Cables that must feed into the array hook-up system such as identified by cabling 28 must feed onto spools 14 and 16 and from the spools said cables are threaded into the face of the antenna where they are distributed among the array elements.

Power cables 20 and 22 from power sources and supplies 24 and 26 are fed to their respective spools, as well as are coaxial and sensing cables 18. Since slip rings are not a cost effective solution to the problem because of the large number of interconnections which are required, this method of antenna array feed of cables has provided an effective economical solution to the problem.

FIG. 2 presents a more detailed view of spool 14 in FIG. 1. Cables threaded onto spool structure 32 (item 14 in FIG. 1) are wrapped around spool 32 and enter the array through holes on the exterior of shaft 34 which lead to a hollow core of the elevation trunnion. The wires proceed through to the face of the antenna where they are distributed among the array elements.

In FIG. 3 spool 16 of FIG. 1 is shown in more detail. This spool 40 is displayed with cables 42 wrapped around it and being threaded into the center hollow core 44 whereby they proceed to the face of the antenna and are also distributed among their respective array elements.

The configuration of spool 32 (14) is designed so as to accommodate the penetration of shaft 34 completely through the spool. The design of spool 40 (16) does not require penetration of the axial shaft 34, and therefore facilitates the threading of its respective cables directly down a center hollow core.

Clamps 15 and 17 are attached to the frame of the MIR phased array radar antenna assembly for fastening and holding in place the cables threaded onto the spools. The radius of the spool and the placement of the clamps are designed to place minimum stress on the cables. The wires are clamped to the spool at a point which precludes their being sent through more than the radius of the spool. When the antenna is rotated in one direction the wire winds onto the spool and when it is rotated in the other direction it unwinds.

Advantages and Features

The antenna array feed cable system provides a cost effective solution to the problem associated with using slip rings where a large number of interconnections are required. This wiring system allows the antenna to be rotated through two hundred and thirty degrees in elevation, allows minimum stress to be placed on the cables, allows direct connection from the cables to the array elements, and creates a continuity of the cables which provides a lower noise solution than a system using slip rings.

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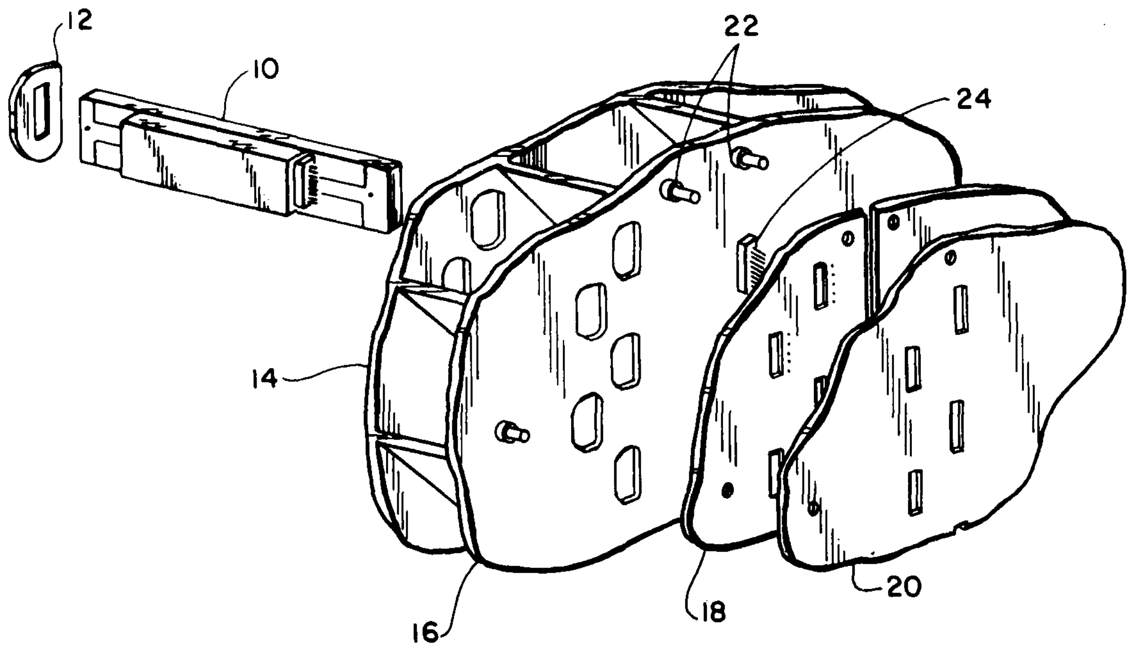
Navy Tech. Cat. No. 5626 Navy Case No. 66917

PHASE SHIFTER RETAINER CLAMP

Kathleen M. Keefe

Raytheon Corporation, Sudbury, MA



MIR ARRAY CONCEPT

FIG. 1

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Navy Tech. Cat. No. 5626 Navy Case No. 66917

PHASE SHIFTER RETAINER CLAMP

Kathleen M. Keefe

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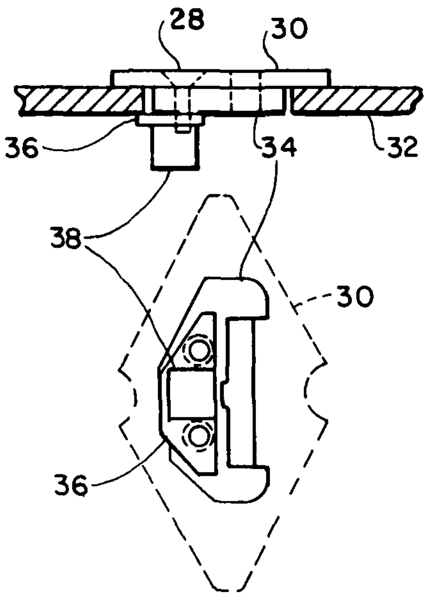
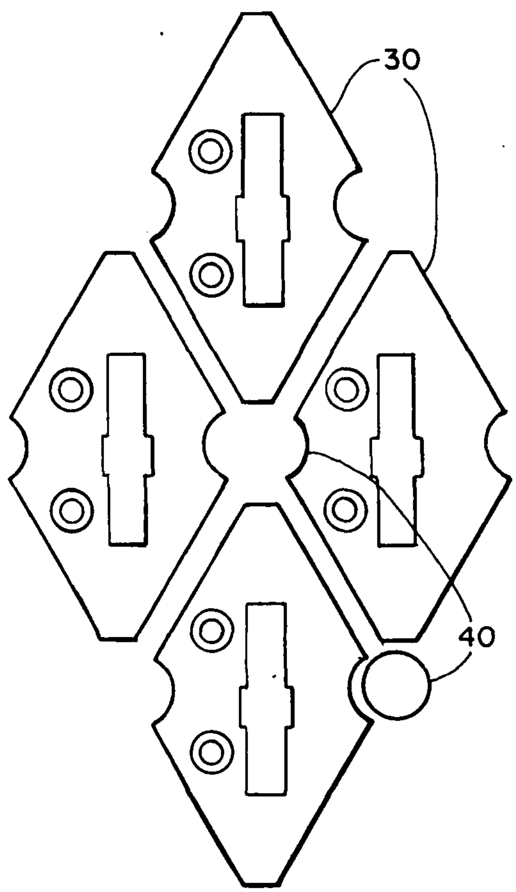


CLAMP ASSEMBLY
FIG. 2



ARRANGEMENT OF THE DIAMOND PATTERN
FIG. 3

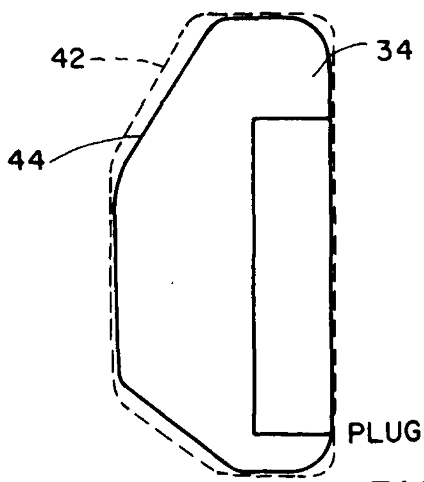


FIG. 4

Navy Tech. Cat. No. 5626 Navy Case No. 66917

PHASE SHIFTER RETAINER CLAMP

Kathleen M. Keefe

Raytheon Corporation, Sudbury, MA

Abstract

A retainer clamp is presented which is used to retain the phase shifters of the Multiple Target Instrumentation Radar (MIR) phased array radar in their appropriate lots in such a way that they can be removed easily for servicing. When installed in the array, the clamp prevents the phase shifter from backing out of its slot by locking the shifter in place through the use of a mechanical assembly which interlocks the phase shifter with the rear array plate. The retainer clamp comprises a top plate, a plug, a clamp, and a pressure pad all attached together by set screws.

Description

As shown in FIG. 1 the phase shifter 10 is placed through the rear array plate or ground plane 14, intermediate array plate 16, the multilayer wiring board 18, and the front ground plate 20. When the phase shifter is in place the logic and power receptacle connector 24 mates with it at the multilayer connector plate. The ends of the shifter protrude from the front and rear ground planes. The phase shifter is prevented from moving forward by the mating of the connectors 24. However, without the phase shifter retainer clamp, only the friction in the mating pins of this connector prevent the shifter from moving back out opposite to the way it was inserted. The phase shifter retainer clamp 12 prevents this from happening by locking the shifter in place using a mechanical assembly which interlocks the phase shifter with the hole in the rear array plate. Pins 22 are guide pins used between plate 16 and board 18.

As shown in FIG. 2 the phase shifter retainer clamp is an assembly of four parts and two screws. One part is a diamond shaped plate 30 that has a hole that just fits over the end of the phase shifter. A second part is a plug 34. This plug with outer shape 44 fills the space between the ground plane hole 42 and the phase shifter as shown in FIG. 4. The plug also provides the proper thickness between a clamp plate 36 and the diamond plane 30 which enables the clamp plate to press against the edge of the array plate insertion hole 42. The clamp is assembled by inserting two screws 28 through counter sunk holes in the diamond plate and clearance holes in the filler plug 34 to threaded holes in clamp plate 36. A sponge rubber pad 38 is fastened on clamp plate 36 by means of an adhesive.

The phase shifter retainer clamp is inserted by loosening the two screws 28 slightly and sliding the retainer clamp over the end of the phase shifter. The plug slips in place between the ground plane hole and the phase shifter,

Navy Tech. Cat. No. 5626 Navy Case No. 66919

ANTENNA ARRAY COOLING SYSTEM

Louis A. Dindo and Donald R. Sabean

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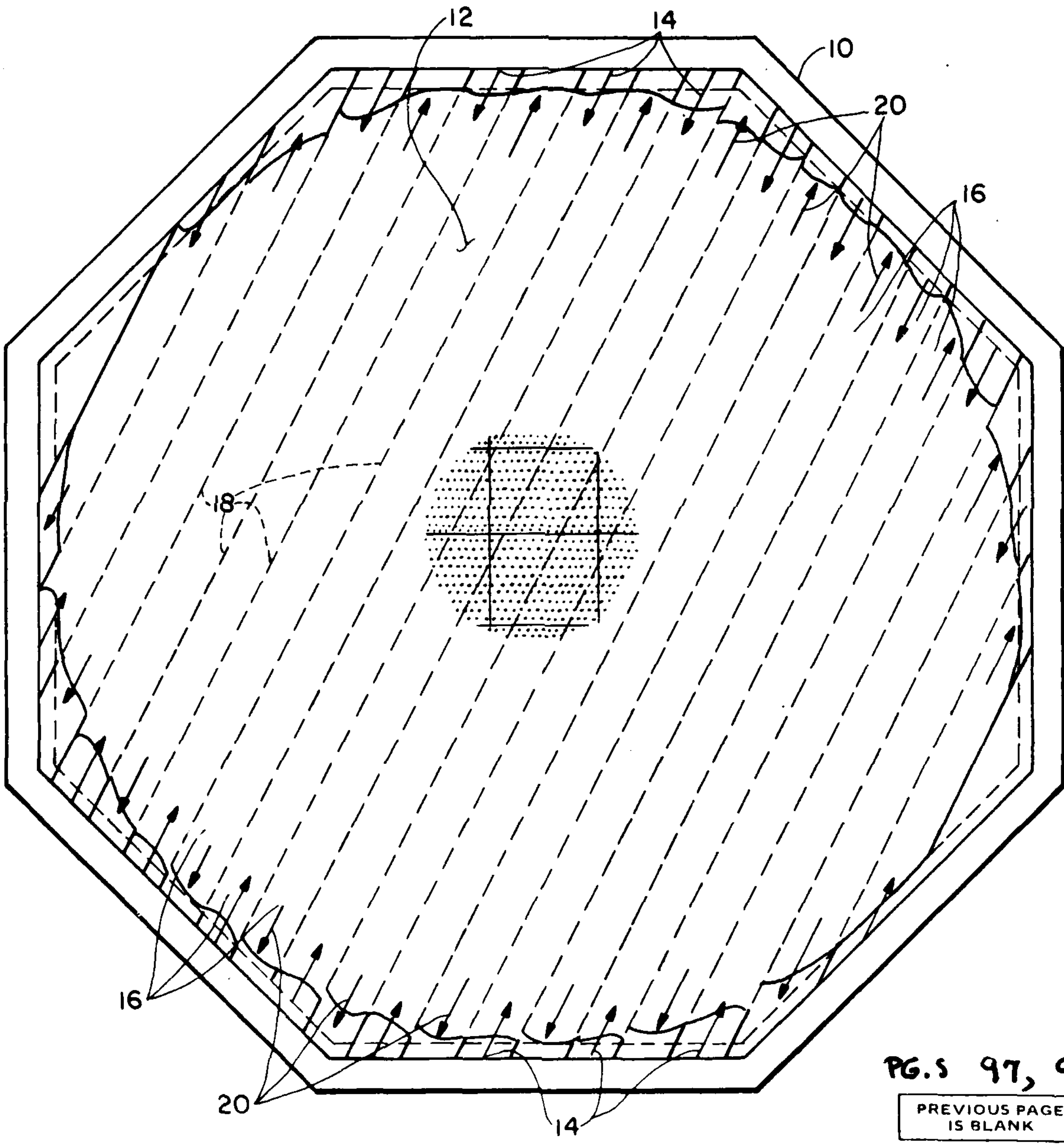

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Navy Tech. Cat. No. 5626 Navy Case No. 66919

ANTENNA ARRAY COOLING SYSTEM

Louis A. Dindo
Donald R. Sabean

Raytheon Corporation, Sudbury, MA

Abstract

A cooling system for a Multiple Target Instrumentation Radar (MIR) phased array antenna is presented which incorporates the use of structural ribs equally spaced between the rear ground plane and an intermediate plate near the front ground plane of the array, and positioned to run diagonally from one side of the antenna frame to the other. Circulating air is forced into the rib areas to traverse from one side to the other side and provide cooling to the array antenna face.

Description

The MIR phased array antenna incorporates a tubular frame 10 around the periphery of the antenna face 12 which provides rigid mechanical support and serves as a plenum for distributing pressurized cooling air to the antenna's phase shifting elements, as shown in the Figure. Cooling air exits from the frame through holes 14 located around the inner surface of the frame 10 and enters narrow duct structures 16 which are located between the rear ground plane and an intermediate plate near the front ground plane of the array. The Figure is a perspective of the array looking down upon the array from the front ground plane. The duct structures 16 are formed by sheets of metal 18 which run diagonally from one side of the frame to the other. The sheets are normal to the ground planes and extend from the rear plane to the intermediate plane. They also function as structural ribs in addition to forming the narrow duct structures. The sheets are equally spaced from four to ten array elements apart.

Air is fed into the ducts at one end 14 and exits from holes in the face of the array at the other end 20. Air is driven through adjacent ducts in opposite directions by alternating the location of the feed 14 and exit ports 20 located in the tubular frame 10 around the periphery of the antenna face 12. Air exits from the ducts by leaking out of the array faces at the element to ground-plane interfaces as well as by exiting from holes in the array face opposite the entry ports.

The combination of different sized holes 14 at the inner surface of the tubular frame and the duct structure assures controlled flow of air through each duct. Normally more air is passed through the ducts which pass through the center of the array.

Advantages and Features

The resulting structure enables pressurized cooling air from one or several air sources to be distributed to all elements of the phased array.

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Navy Tech. Cat. No. 1530 Navy Case No. 67665

TOROID, SUPPORT MOLDED

James F. Kilfeather, Robert M. Collins and Harry R. Schwarzer

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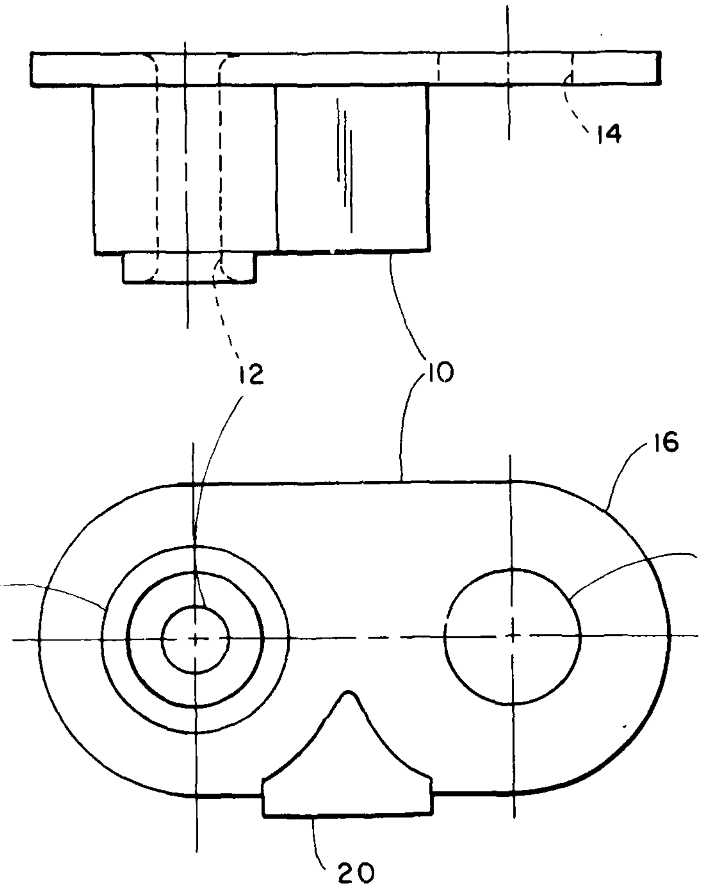

Navy Tech. Cat. No. 1530 ____ Navy Case No. 67665

TOROID, SUPPORT MOLDED

James F. Kilfeather
Robert M. Collins
Harry R. Schwarzer

General Electric Company, Pittsfield, Mass.

Abstract

A molded toroid support is presented which can be molded with a wide variety of materials, is non-magnetic, has low coefficient of thermal expansion, has no induced stresses, and is compact and economical to fabricate.

Description

The Figure shows the molded toroid support 10. Previous mounting methods for a ceramic toroid while the toroid is installed in a power supply required non-magnetic, [illegible] compressive stress types of materials and [illegible], or complete encapsulation of the toroid. Such [illegible] did not preclude shattering due to internal stresses [illegible] temperature changes.

The holder 10 can be molded with a wide variety of materials. The toroid can be secured to the holder with [illegible] adhesive. The holder has through holes 12 and [illegible] of the desired current carriers. The holder [illegible]-magnetic, has a low coefficient of thermal expansion, and [illegible] induced stresses. It is compact and economical to [illegible].

The holder is designed with a flat [illegible] 16 upon [illegible] cylindrical base [illegible] and a guide [illegible] is located. The

GPO 875 423

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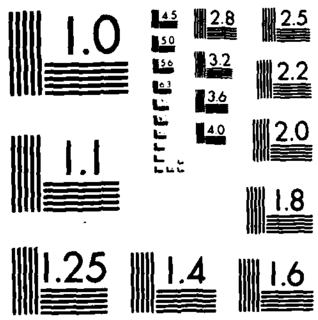

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963-A

cylindrical boss 18 contains the hole 12 through which passage of desired current carriers is accomplished. A hole 14 is placed in the base 16 at a preselected distance from the boss 18.

Advantages and Features

The holder can be molded with a wide variety of materials and is non-magnetic, has a low coefficient of thermal expansion, has no induced stresses, and is compact and economical to fabricate.

GPO 875 423

Navy Tech. Cat. No. 5260 ____ Navy Case No. 68122

METHOD OF ELIMINATING THE ADVERSE EFFECTS OF POSITIVE PHOTO RESIST PROCESSING ON PLASMA/RIE ETCHING OF AL/CU

James E. Scheppele

TRW, Redondo Beach, California

Abstract

Deposition of a thin film of titanium/tungsten over an aluminum/copper film prevents a columnar residue from forming on the film. Heretofore the columnar residue was a by product during the reactive ion etching of aluminum/copper films. Thicker layers of the titanium/tungsten protect the aluminum/copper from oxidation due to air exposure.

Description

During the sequence of precise operation required in fabricating very high speed integrated circuits, it was noted that a columnar residue remained after reactive ion etching of aluminum/copper films. It was discovered that the columnar residue was due to a reaction between the aluminum/copper film and the positive photo resist developer and deionized water rinse that were utilized in the photo resist imaging process. The problem could be avoided, however, by rinsing the exposed film in tap water after developing the photo resist. A consequence of using tap water were that impurities were found to be unacceptable for semiconductor processing. Carbon dioxide has been bubbled through the deionized water rinse tank for sometime with an acceptable degree of success. This is largely because the deionized water is highly reactive and will attack aluminum with the consequent creation of problems even with a wet etching process.

The control of the reflectivity of the surface was compromised by the columnar residue with a consequent loss of fine line definition and degradation in the photo lithographic processes.

Deposition of a thin film of titanium/tungsten to a thickness of about 50 angstroms over the aluminum/copper film greatly reduces the columnar residue. This thin film has been found adequate to prevent the reaction of the developer/deionized water with the aluminum/copper film and as a result has been demonstrated to prevent formation of columnar residue. A further advantage of the thin film of titanium/tungsten is the reduction of the reflectivity of the aluminum/copper layer to thereby improve the resolution and repeatability of the photolithographic process. Although titanium/tungsten has demonstrated a suitability for reduction of columnar residue, the concept is not restricted to these materials. Any layer which protects the aluminum surface from the deionized water/developer will serve with an acceptable degree of success. Thicker layers in excess of 1,000 angstroms protect the aluminum/copper film from oxidation due to air exposure, thus, eliminating the induction period frequently encountered in plasma/reactive ion etching of aluminum.

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Advantages and Features

This process eliminates the columnar residue otherwise remaining from the reactive ion etching of aluminum/copper films in integrated circuit fabrication. It reduces the reflectivity of the aluminum/copper film to improve the resolution and repeatability of the photolithographic process. Thicker protective films of titanium/tungsten protect aluminum/copper films in integrated circuit fabrication processes from oxidation.

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Navy Tech. Cat. No. 5260 Navy Case No. 68020

A SOFTWARE TRANSLATOR FOR THE NATIONAL SEMICONDUCTOR IMP-16C MICROPROCESSOR

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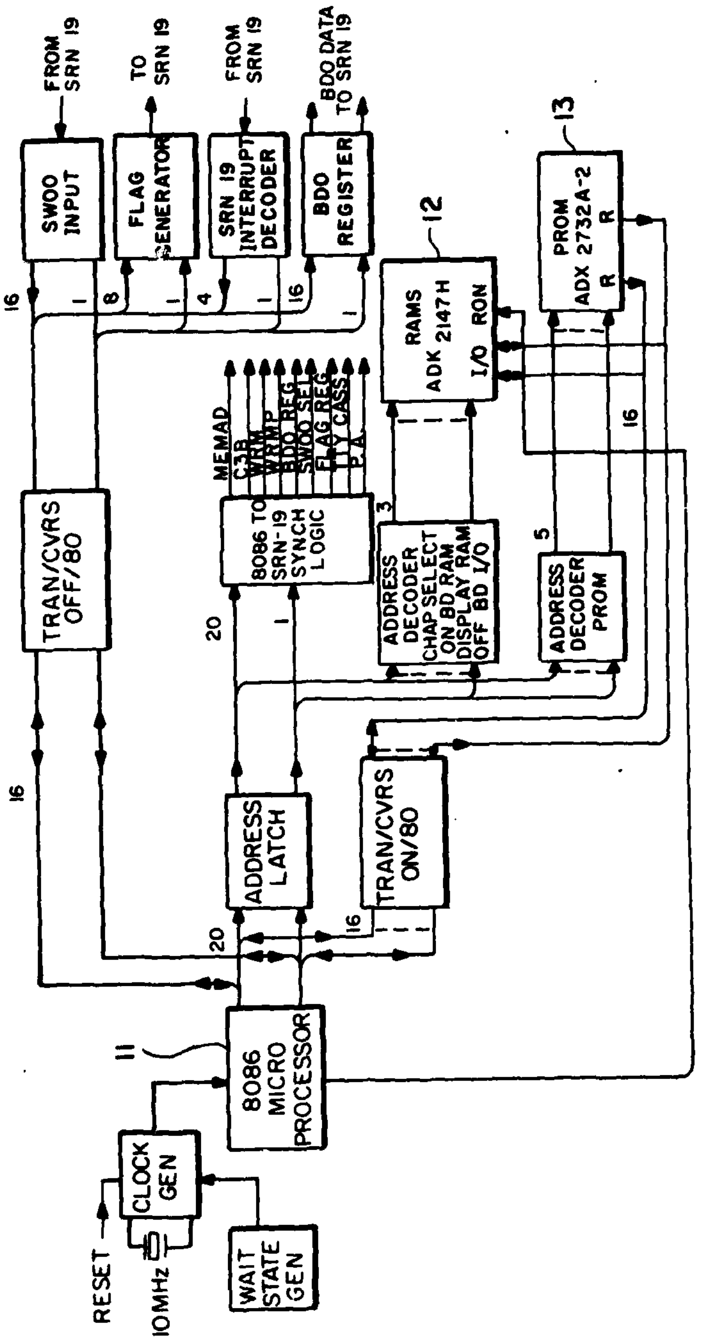

Navy Tech. Cat. No. 5260 ____ Navy Case No.68020

A SOFTWARE TRANSLATOR FOR THE NATIONAL SEMICONDUCTOR IMP-16C MICROPROCESSOR

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Abstract

A widely used microprocessor board, the IMP-16C can be replaced by a more current microprocessor the 8086. The replacement board requires a software translater to maintain functional consistency and translates absolute code that was burned into PROM's.

Description

AN/SRN-19 shipboard equipments heretofore provided with IMP-16C microprocessor boards are modified to include 8086 microprocessor boards. This modification is desirable because the manufacturer has discontinued manufacturing the IMP-16C microprocessor boards and is discontinuing maintenance and service of existing boards. The 8086 microprocessor is functionally interchangeable with the IMP-16C processor unit, the replacement 8086 microprocessor board can solve all algorithms associated with the AN/SRN-19 systems and handle all inputs and outputs as before.

In order to maintain functional consistency, a software translater is used. The existing software of the IMP-16C is translated into an absolute code required for the 8086 microprocessor board. The code was burned into PROM's and the 8086 microprocessor board remains functionally the same with new programs designated to mark 7.1 and 7.2 programs. These programs are software programs which enable additional Naval Tactical Data System capability via a jumper wire and enables the program to run or tie in with the data system.

The 8086 microprocessor board is form, fit, and functionally interchangeable with the IMP-16C. There is no distinguishable physical difference in the board's size, placement, or installation. All circuitry, however, has been updated to state of the art technology, noting the FIG. showing the microprocessing board and all related circuitry.

The basic major components include an 8086 microprocessor integrated circuit 11, sixteen random access memories 12, ten programmable read only memories 13 and a series of associated bus control devices depicted in the FIG.

The 8086 microprocessor board performs under the same cabling requirements as the IMP-16C. No additional cabling or equipment is required. Installation of the 8086 microprocessor board merely calls for the removal of the IMP-16C microprocessor board and inserting the 8086 microprocessor board carefully into the same slot. Procedures for verification of operation call for the reference to standard operating procedures associated with the Mark-7 program. The starting up procedures and other operations are set forth in the IMP-16C operations manual, National

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Semiconductor Publication No. 420002lC. Caution should be exercised to avoid exposing the 8086 microprocessor to static discharge. The board should not be inserted or removed with the power turned on.

The library of National Semiconductor IMP-16C/200 source code for the navigation program is archived on the IBM 3033 computer system located at the Applied Physics Laboratory, Johns Hopkins University. The translater, written in the APL language, runs interactively and translates the IMP-16C source code to Intel 8086 source code. The resultant 8086 source code is then transmitted by an RJP link to the Intel Intellic microprocessor development system.

The translation process is done in three phases: (1) all explicit program counter relative jumps are removed, (2) each source code line is classified and parced, and (3) a translation table is used to build the 8086 code.

Advantages and Features

Replacement of the discontinued IMP-16C microprocessor board by the 8086 microprocessor board assures longevity of the AN/SRN-19 systems. All the algorithms associated with the system are compatible with the 8086 microprocessor board so that all inputs and outputs can be handled as before. Translating the existing software of the IMP-16C assures substantially identical capabilities for the 8086 microprocessor board.

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Navy Tech. Cat. No. 4901 Navy Case No. 67350

MINIATURE FLUOROMETER

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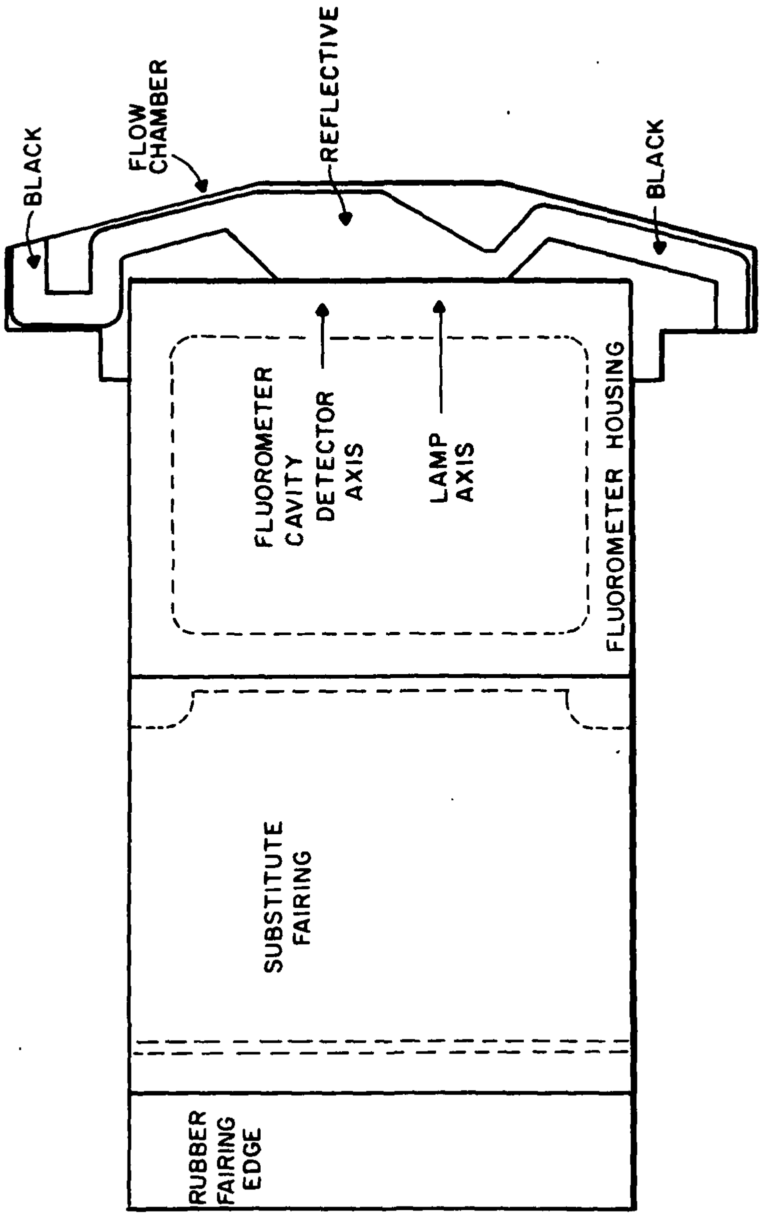

FIG. I

MINIATURE FLUOROMETER

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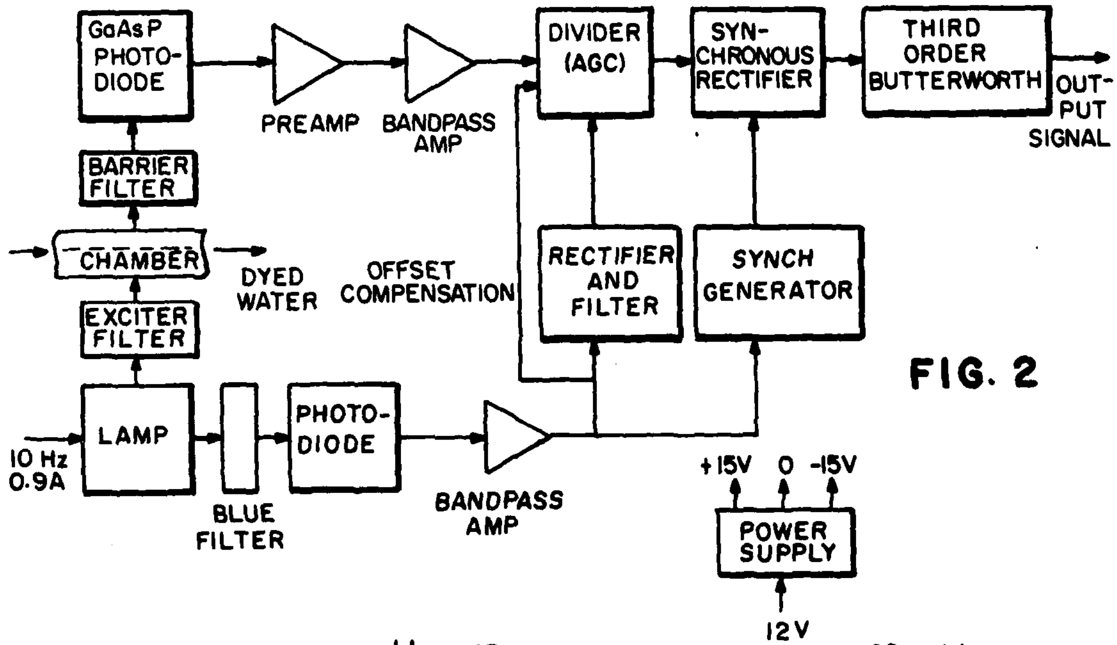

FIG. 2

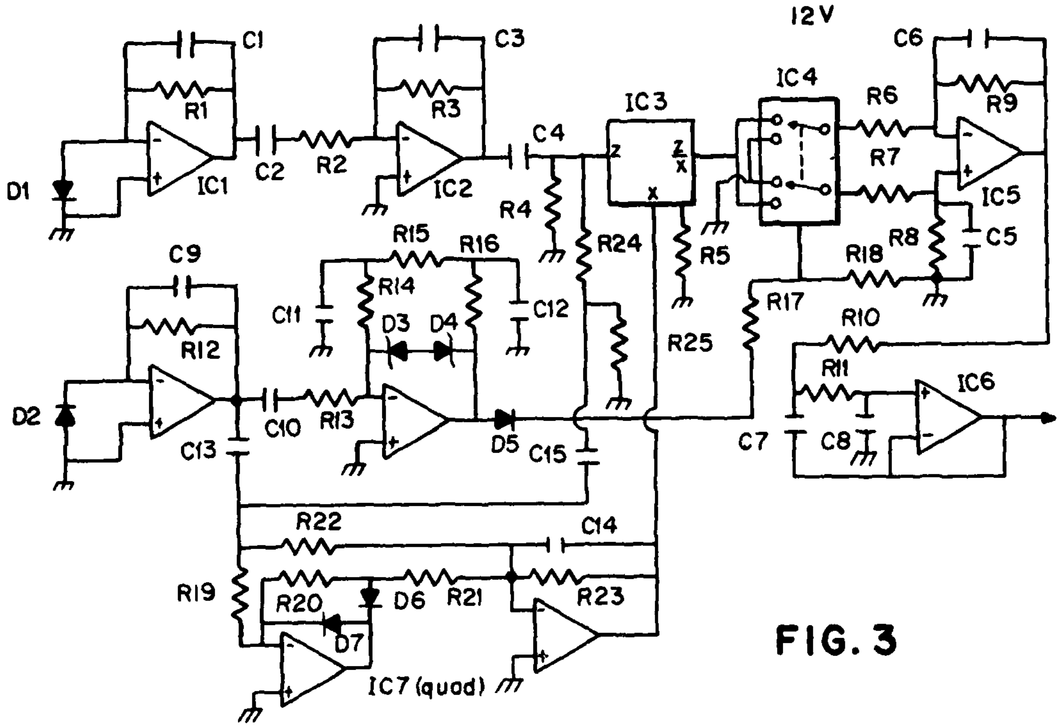

FIG. 3

Navy Tech. Cat. No. 4901 Navy Case No. 67350

MINIATURE FLUOROMETER

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Abstract

A miniature high sensitivity fluorescein fluorometer is presented which as been designed as an in-fairing fluorometer that may be submersibly towed and incorporated in an oceanographic sampling system. The present apparatus satisfies a particular need for a very small fluorometer that mechanically resembles an oceanographic chain fairing and provides high sensitivity to fluorescein. The system for measurement of fluorescent tracers in seawater, other than being installed within an oceanographic chain fairing, comprises a flow chamber which allows the seawater to flow past an exciting lamp and through a barrier filter where the resultant light intensity is detected by a galium arsenide phosphide photodiode. The circuit includes a preamp, bandpass amplifier, AGC divider circuit, synchronous rectifier, and third order Butterworth prior to outputting the analyzed signal. In addition, the system incorporates a synchronization and normalization portion which is comprised of a blue filter connected to the output of the same lamp that illuminates the sample chamber, a photodiode at the output of the blue filter, a bandpass amplifier at the output of the photodiode which inputs its output into a

rectifier and filter system and a synchronizing generator. The rectifier and filter connects and addresses the AGC divider circuit. The synchronous generator addresses the synchronous rectifier circuit.

Description

FIG. 1 shows a simplified sketch of the field fluorometer on a fairing. The flow channel is shown without its cover in the FIG. The portions of the fairing are clearly marked and include the rubber fairing edge and the substitute fairing region. The fluorometer is housed within the fluorometer housing. The detector and lamp axis are identified in the FIG. The flow chamber is identified with portions of the inlet and outlet being blackened and with the chamber in proximity to the detector and lamp axis being reflective in nature.

FIG. 2 shows a block diagram of the in-fairing fluorometer system. At the lower left of FIG. 2 is the miniature halogen lamp which is driven at ten hertz to produce light modulated at twenty hertz. The light is filtered carefully with the dye and interference exciter filter to send blue light to the reflective chamber through which seawater containing fluorescein flows. Green light emitted by the fluorescein dye passes through the Wratten Barrier Filter and is received at the GaAsP Photodiode. A current proportional to the light impinging on the photodiode is converted to the voltage output of the preamplifier.

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The Photodiode and Preamplifier are exceptionally sensitive; only 10^{-13} amperes represents the equivalent noise current from the diode. A Bandpass Amplifier follows the Preamplifier and presents a.c. signals in the millivolt to volt range to the remaining circuits. The signal from the Bandpass Amplifier is bandpassed at 20 hertz by two pulls and two zeroes.

The a.c. signal proportional to dye concentration is presented as the numerator to a divider circuit which functions as an Automatic Gain Control (AGC). The denominator of the quotient is proportional to the blue intensity from the lamp, as will be described below. The normalized twenty hertz signal from the AGC is converted to d.c. by the Synchronous Rectifier. The Synchronous Rectifier consists of a CMOS transistor switch coupled to a differential amplifier. The switch is reversed synchronously with the blue light waveform from the lamp. Synchronous rectification produces a d.c. signal proportional to the dye concentration with only near twenty hertz noises in phase with the flickering lamp superimposed on the perfect signal. A Third Order Butterworth filter limits the output bandwidth at one hertz.

A synchronization and normalization signals alluded to are generated in the subsystems shown along the lower edge of FIG. 2. A Photodetector monitors the blue emission from the lamp. Only the blue emission at twenty hertz is

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amplified and passed by the Bandpass Amplifier behind the Photodiode. The twenty hertz from the Bandpass Amplifier is converted to its main absolute value by a conventional full wave Rectifier and Filter to produce the normalization signal. The Synchronization Generator produces a 50% duty factor square wave in synchrony with the blue illumination. The synchronization signal drives the Synchronous Rectifier.

A subminiature isolated and regulated Power Supply draws current at twelve volts and puts out plus and minus fifteen volts to drive the circuits.

FIG. 3 shows the diagram of a circuit that may be employed to perform the functions described. A component list for FIG. 3 appears on Table 1.

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TABLE 1

CIRCUIT COMPONENTS

Part number	Part Type			
	Ic.	diode	resistor (Kohms)	capacitor (n farads)
1	BB3523L	G1117K(GaAsP)	100,000	0.08
2	OP-07	G1115K(GaAsP)	10	800
3	AD535	10v Zener	1000	8
4	AD7512DKN	10v Zener	5	1,500
5	OP-07	IN914	5	470
6	OP-07	IN914	100	470
7	TL084IN	IN914	100	1,200
8			301	470
9			301	0.8
10			160	800
11			160	470
12			10,000	470
13			10	800
14			1,000	1,000
15			1,000	22
16			1,000	
17			2.7	
18			15	
19			10	
20			10	
21			500	
22			1,000	
23			5,100	
24			trim	
25			510	

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Advantages and Features

The present apparatus satisfies a particular need for a very small fluorometer that mechanically resembles an oceanographic chain fairing and further provides high sensitivity to fluorescein. The advantages of the present apparatus are that the fluorometer is very small, inexpensive, has high speed and is highly sensitive. The fluorometer is roughly ten times better than the previous state-of-the-art devices in sensitivity, drift, rejection of non-dye signals, size, weight and towing drag while having approximately the same signal bandwidth, power consumption and output signal interfacing properties. The present apparatus provides reduction in system cost of about a factor of three and it is anticipated the dye usage may be reduced tenfold.

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Navy Tech. Cat. No. 0330 Navy Case No. 67132

TWO-STAGE NOZZLE FOR PREMIXING & SPRAYING SEPARATE MULTIPHASE MIXTURES

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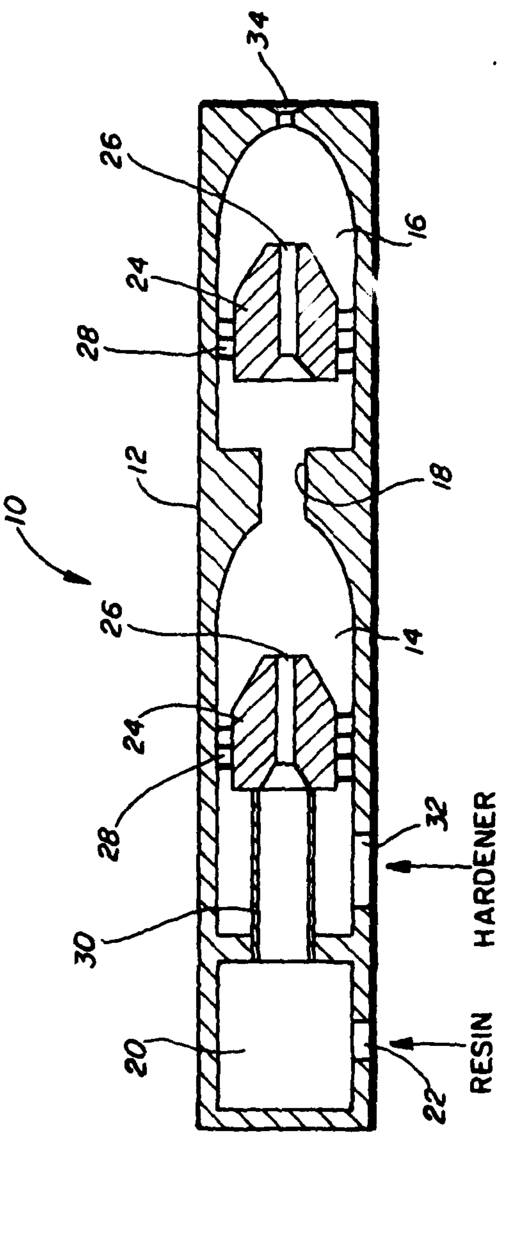

Navy Tech. Cat. No. 0330 ____ Navy Case No. 67132

TWO-STAGE NOZZLE FOR PREMIXING AND SPRAYING SEPARATE MULTIPHASE MIXTURES

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Abstract

A multichamber device is provided for mixing and spraying substances such as resin and a hardener to form an epoxy, a multiphase fuel and oxidizer to form a combustible mixture or chemicals in general that must be mixed in a controlled ratio prior to being atomized. The chambers are positioned in series, and each chamber contains a swirler, which is a device containing curved passages to induce swirl. In the upstream chamber, the more viscous substance is fed into the center jet of the swirler while the less viscous substance is fed to the spiral flow area of the swirler. With this arrangement both substances are mixed in the upstream chamber. The mixture is then fed to a downstream chamber, where the mixture goes through both the center jet and spiral flow area of another swirler for further mixing and spraying as the mixed substances are discharged through an orifice in the downstream chamber.

Description

As shown in the igure there is provided a two-stage nozzle 10 for mixing and spraying separate multiphase mixtures. A multiphase mixture is defined here to be a substance with fluid properties containing any number of elements or compounds in arbitrary combinations of liquid, solid, and gas phases. An example is a resin and a hardener. The two-stage nozzle 10 includes a housing 12 which has upstream and downstream chambers 14 and 16 which are interconnected by a passageway 18. The housing 12 may further include a staging chamber 20 for receiving the more viscous of the two substances, namely the resin. The resin may be inserted into the staging chamber 20 under pressure through a port 22. Each of the chambers 14 and 16 contain a respective swirler 24, each swirler having a center jet portion 26 and a spiral flow portion 28. The upstream end of the center jet portion 26 of the upstream swirler 24 is interconnected to the staging chamber 20 by a conduit 30. The upstream chamber 14 has a port 32 for receiving under pressure the less viscous substance, such as the hardener. In the operation of the mixing device the resin and hardener are introduced through the ports 22 and 32, respectively, under predetermined pressures. The resin enters the staging chamber 20 through the inlet port 22, thence through the passageway of the conduit 30, and thence through the center jet 26 of the swirler 24 to a high shear mixing region downstream from the swirler in the upstream chamber 14. The hardener enters through inlet port 32 and flows through the spiral flow portion 28 of the swirler and mixes with the resin in the high shear mixing region mentioned hereinabove. The mixture formed in this region has a ratio which is dependent upon the inlet pressures at the ports 22 and 32, the center jet geometry and area at 26, and the spiral flow area and geometry of the portion 28 of the swirler. The mixture formed passes through the passageway 18 into the downstream chamber 16 where part of the mixture goes through the center jet 26 and part of the mixture goes through the spiral flow portion 28 of the swirler 24. The final mixture again experiences a high shear mixing in the region downstream from the swirler 24 before it is sprayed out through the orifice or nozzle 34 in the downstream chamber. The uniformity of the mass flux and the degree of atomization in the spray from the orifice 34 is determined by the inlet pressure of the mixture in the passageway 18, the geometry and area of the center jet 26, the geometry and area of the spiral flow portion 28, and the geometry and area of the exit orifice 34.

Advantages and Features

The advantages of the two-stage nozzle in the upstream and downstream chambers are that the ratio of the substances to be mixed is fixed by inlet pressures and the flow area geometries of the first stage, and the degree of atomization and the uniformity of the mass-flux distribution in the mixture spray is fixed by pressure

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and flow area geometries in the second stage. The ratio of the mixture is not changed by the second stage. In prior art methods all of the spray parameters were established by one set of nozzle dimensions. Another advantage is that the device can be produced on lathes and assembled on one centerline axis making it very low in cost to mass produce.

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CAMAC EIGHT-CHANNEL, TWELVE-BIT D TO A CONVERTER WITH SYNCHRONOUS AND ASYNCHRONOUS OUTPUTS

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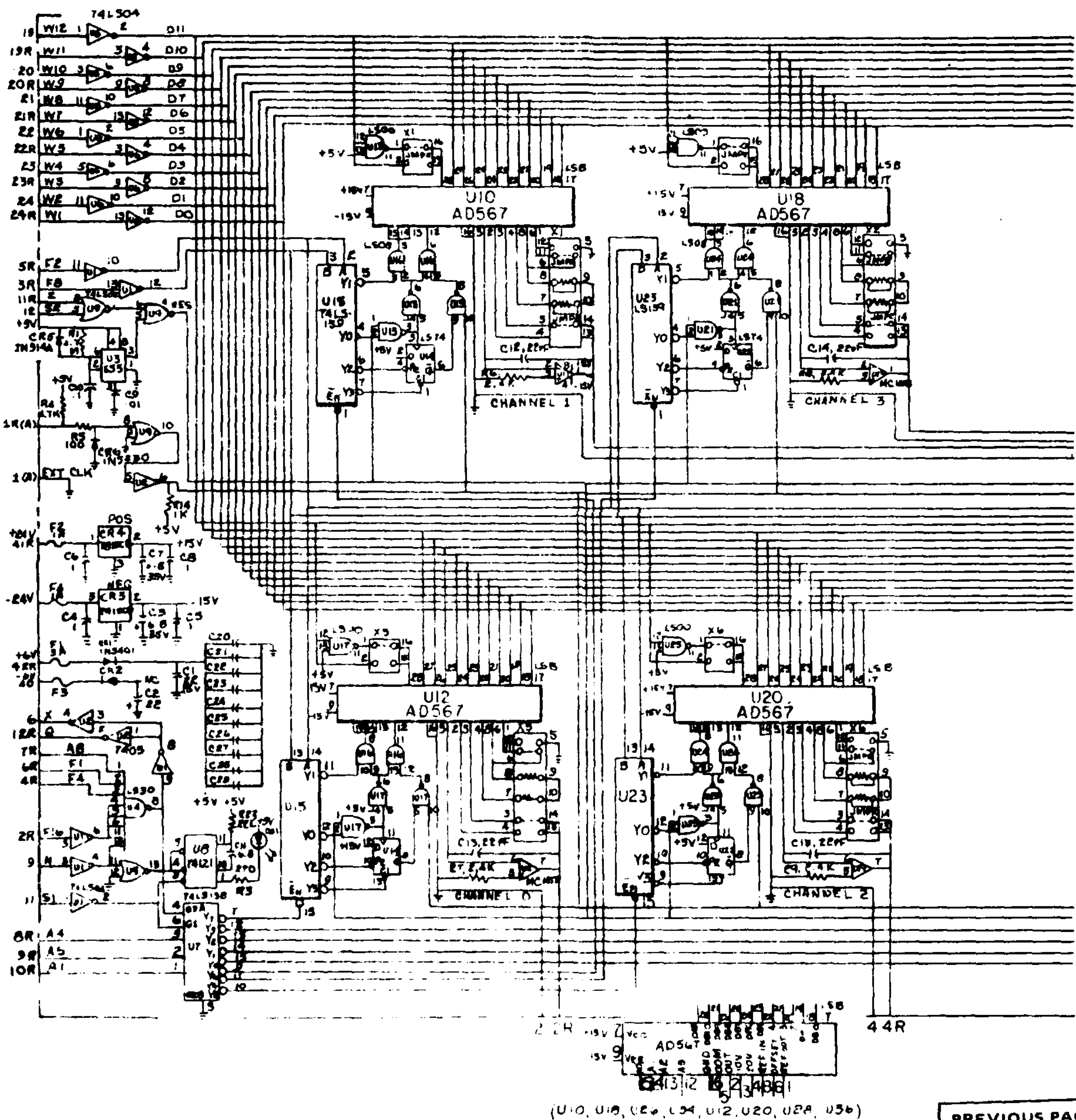

CAMAC EIGHT-CHANNEL, TWELVE-BIT D TO A CONVERTER WITH SYNCHRONOUS AND ASYNCHRONOUS OUTPUTS

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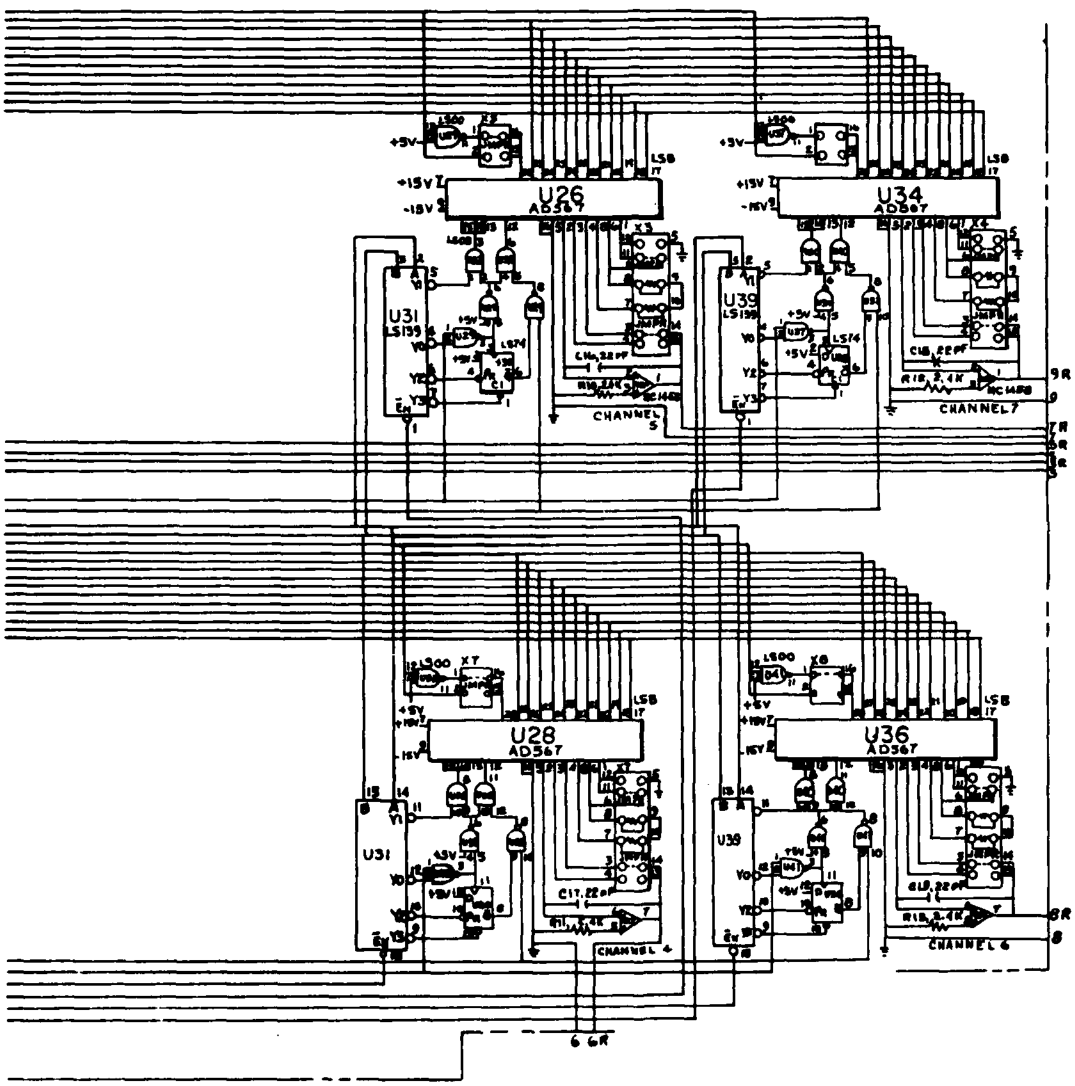

Navy Tech. Cat. No. 6440 ____ Navy Case No.67367

CAMAC EIGHT-CHANNEL, TWELVE-BIT DIGITAL TO ANALOG CONVERTER WITH SYNCHRONOUS AND ASYNCHRONOUS OUTPUTS

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Abstract

Digitized signals are buffered to digital-to-analog converters but the data conversion is implemented independently of the time of receiving the digital information to minimize distortion of the analog signal phases. Up to eight independent digitized waveforms are converted into analog voltages without distorting their phase and frequency information.

Description

Computer Automated Measurement And Control (CAMAC), IEEE Standard 583, is an internationally accepted instrumentation and interface system that offers significant advancement in a host of data processing applications. Heretofore, some CAMAC-compatible devices converted data immediately upon receiving digital data. Since the incoming data rate was affected by timing variations involved in the data telemetry, frequency and phase distortion resulted in the output analog waveforms. This limitation has been avoided by a single-width CAMAC module and is adaptable to a working model, a dual-width module to accommodate wire-wrap connections.

Looking to the drawing, the CAMAC dataway input lines are inverted by U5 and U6 and buffered to the D/A

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converters U10, U12, U18, U20, U26, U28, U34, and U36. Two function code lines F2 and F8 provide the four function combinations recognized by the module and are inverted and buffered by U1 to the dual function decoders U15, U23, U31, and U38. U3 provides a reset pulse for a half a second when power is applied.

When the module is addressed by the CAMAC rate controller, U8 lights a LED indicator for a tenth of a second. U4 signals valid commands to the dataway signals X and Q via the inverter U2, and to the address decoder U7. The selected address enables the function decoder at one of the eight channels. The Write Group 1 (F16) command causes the digitized data to be converted immediately for compatibility with earlier modules and may be used for slowly varying signals.

The Selective Overwrite Group 1 function (F18) loads the digitized data into the selected channel, but no conversion takes place and the converter output does not change until a pulse is received via the EXT clock input. The enable function (F26) allows the pulse at the EXT clock input to initiate conversions, while the Disable function (F24) causes the EXT clock pulses to be ignored.

Advantages and Features

Frequency and phase distortion caused by timing variations in the data telemetry are eliminated by the option of initiating data conversion independently of receiving the digitized data, allowing several channels to be loaded without changing the outputs until they may all be converted at the same time. Digitized data can be received within loosely controlled intervals via the CAMAC (IEEE Std 583) interface.

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