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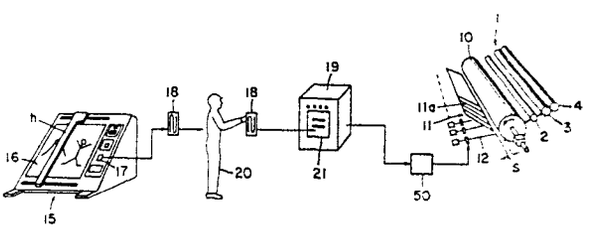
(54) Method of and apparatus for adjusting an ink fountain in a printing press.

(57) In a method and an apparatus for adjusting an initial gap between a ductor blade and a fountain roller, a positional reference value of each blade piece, given by a pattern area measuring apparatus, is compared, by a comparator, with a present value thereof given by a potentiometer, and the relative positional relationship therebetween is indicated on an indicating panel of an ink fountain.



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METHOD OF AND APPARATUS FOR ADJUSTING AN INK FOUNTAIN IN A PRINTING PRESS

BACKGROUND OF THE INVENTION

This invention relates to a method of and an apparatus for adjusting an ink fountain in an off-set printing press before a printing operation.

In an off-set printing press, as a rule, as density of ink must be adjusted according to picture patterns of a printed article, an ink fountain is adapted to be adjusted according to rates of picture pattern areas obtained from a printing plate. The ink fountain has a ductor blade which is divided into a plurality of pieces or regions. The ductor blade is disposed obliquely along an ink fountain roller or duct roller so as to form a wedge-like space, ink for printing is stored in an ink fountain and a certain amount of ink is fed therefrom to an inking arrangement through a gap between the distal end of the ductor blade and the surface of the duct roller. This adjustment is carried out during a proof operation. However, such a proof operation causes a great many of wasted printing papers and requires a relatively long time.

A certain type of ink fountain has a plurality of small driving motors, each of which drives an adjusting screw for adjusting a gap between a corresponding piece or region of the ductor blade and the surface of the fountain roller. If such drive motors are mounted on a conventional printing press, its modification requires a great expense.

Therefore, the inventors invented a method and an apparatus as disclosed in Japanese Laid-Open Publication No.114061/1984. In the method and apparatus, an adjusting unit is provided with respect to each piece of a ductor blade and a lot of light emitting diode elements as a display portion are disposed in the

form of a bar. The position of a blade piece is displayed in such a manner that a certain number of elements from its bottom, corresponding to a rate of picture pattern area, emits light. An adjusting screw is so adjusted by an operator that an indicator associated with the adjusting screw coincides with the uppermost one of the elements being emitting light. This adjustment brings a corresponding blade piece into a position corresponding to the rate of picture pattern area.

As mentioned above, in the method and apparatus invented by the same inventors as those of this invention, the diode elements disposed in a row emit light in the form of a bar-graph. Therefore, the display portion for showing a reference position of each blade piece requires a space for disposing a lot of the diode elements in a row. The space is relatively small in comparison with that of a fountain with a plurality of small driving motors mentioned above. However, a smaller fountain is required in the field of a printing press industry. Furthermore, in the above method and apparatus, a lot of light emitting diode elements must be provided in order to adjust more precisely a blade piece.

SUMMARY OF THE INVENTION

It is an object of this invention to provide a method and an apparatus for adjusting an ink fountain in an off-set printing press before a printing operation in which its construction becomes remarkably compact and a presetting operation for adjusting an initial gap between a blade piece and a fountain roller can be carried out precisely and reliably.

According to one aspect of this invention, there is provided a method for adjusting an initial gap between a ductor blade divided into a plurality of regions or pieces and an ink fountain roller wherein the ductor blade is disposed along the ink fountain roller so as

to form the gap between its distal end and the surface of the ink fountain roller, ink being fed through the gap toward an inking arrangement, the amount of ink to be fed being adjusted in such a manner that the distal end of each piece or region of the ductor blade is moved toward and away from the surface of the ink fountain roller by a corresponding adjusting member, said method comprising steps of: (a) converting a datum of a rate of picture pattern area corresponding to each adjusting member into a datum of position, to be preset, of the adjusting member; (b) comparing a positional reference datum, to be preset, of each adjusting member with a present position thereof in order to indicate a relative positional relationship between the reference position of the adjusting member and the present position thereof; (c) operating each adjusting member in such a manner that a present position of each adjusting member coincides with the positional reference datum thereof; and (d) letting an operator know, by means of light or sound, coincidence of a present position of each adjusting member and the positional reference datum thereof.

According to another object of this invention, there is provided a device for adjusting an ink fountain in a printing press before a printing operation which comprises: (a) a ductor blade divided into a plurality of pieces or regions and disposed along a ductor roller to form a gap therebetween through which an amount of ink is fed toward an inking arrangement; (b) a plurality of adjusting members for respectively moving the distal ends of the pieces or regions of the ductor blade toward and away from the surface of the ductor roller on the basis of data of rates of picture pattern areas, the adjusting members being manually operated; and (c) at least one indicating means for indicating a position, to be preset before printing, of each piece or region, the position to be preset being calculated on the basis

of a rate of pattern area, said indicating means comprising, (i) at least three comparators for comparing a datum of a position, to be preset, of each adjusting member with a datum of a present position of each adjusting member, and (ii) at least three light emitting or sound making elements for emitting light or making a sound according to a signal from each comparator, the first element being for emitting light or making a sound when a present position of each adjusting member is larger than a reference value, to be preset, thereof, the second element being for emitting light or making a sound when a present value of position of each adjusting member coincides with the reference value thereof, the third element being for emitting light or making a sound when a present value of position of each adjusting member is smaller than the reference value thereof.

According to still another object of this invention, there is provided a device for adjusting an ink fountain in a printing press before a printing operation which comprises: (a) a ductor blade divided into a plurality of pieces or regions and disposed along a ductor roller to form a gap therebetween through which an amount of ink is fed toward an inking arrangement; (b) a plurality of adjusting members for respectively moving the distal ends of the pieces or regions of the ductor blade toward and away from the surface of the ductor roller on the basis of data of rates of picture pattern areas, the adjusting members being manually operated; and (c) at least one indicating means for indicating a position, to be preset before printing, of each piece or region, the position to be preset being calculated on the basis of a rate of pattern area, said indicating means comprising, (i) at least one comparator for comparing a datum of a position, to be preset, of each adjusting member with a datum of a present position of each adjusting member, (ii) at least one converter for converting a signal of

difference between a present value of position of each adjusting member and a reference value, to be preset, thereof into a time signal, and (iii) at least one light emitting or sound making element being adapted to emit light or make a sound according to the time signal.

Additional objects, advantageous effects and features of this invention will be best understood from the following description of specific embodiments thereof when read in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

In the accompanying drawings:

FIG. 1 is a schematic view showing a whole construction of a device according to this invention;

FIG. 2 is a perspective view showing an ink fountain forming a part of this invention;

FIG. 3 is a vertical sectional view of an adjusting unit;

FIG. 4 is a block diagram of a control system of a controller for controlling an ink fountain;

FIG. 5 is a schematic view showing a construction of an indicating means provided in the adjusting unit;

FIGS. 6(a) and (b) are flow charts of an operation of the control system of FIG. 4, respectively;

FIG. 7 is a flow chart showing a subroutine for reading color data in FIG. 6(a);

FIG. 8 is a plan view of a magnetic card, showing matters recorded thereon;

FIG. 9 is a flow chart showing a subroutine for recording data in RAMS in FIG. 6(a);

FIG. 10 is a block diagram showing a construction of a DMA controller of FIG. 4;

FIG. 11 is a graph showing a functional curved line;

FIG. 12 is an electric circuit showing another embodiment with respect to the indicating means;

FIG. 13 is an electric circuit showing still another embodiment with respect to the indicating means;

FIG. 14 is a sequence diagram showing a comparison of two pulse signals generated from a V-F converter shown in FIG. 13;

FIG. 15 is a perspective view showing an embodiment of an indicating box;

FIG. 16 is a perspective view showing another embodiment of an indicating box;

FIG. 17 is a block diagram showing an electric control system with the indicating box of FIG. 16;

FIG. 18 is a perspective view of an adjusting screw in another adjusting system of this invention;

FIG. 19 is a perspective view of a knob of the adjusting screw with a broken part;

FIGS. 20 and 21 are two sectional views of a switch mechanism of the knob, respectively;

FIG. 22 is a block diagram showing an electric control system with the knob;

FIG. 23 is a block diagram of another control system of the controller;

FIG. 24 is a flow chart of the control system shown in FIG. 23; and

FIGS. 25 through 28 are block diagrams of other control systems of the controller, respectively.

DETAILED DESCRIPTION OF THE INVENTION

FIG. 1 shows a process for adjusting the amount of ink which is fed from an ink fountain 1 to an inking arrangement comprising a plurality of rollers 2, 3 and 4. The ink fountain 1 has an ink fountain roller or duct roller 10, a planar ductor blade or fountain blade 11 and a plurality of adjusting screws 12 for adjusting a gap S between the distal end of the ductor blade and the surface of the duct roller 10. The ductor blade 11 is divided into a plurality of elongated pieces made of elastic material. However, the

ductor blade 11 may be in the form of one continuous plate.

The ink for printing is stored in a wedge-like space formed between the ductor blade 11 and the surface of the duct roller 10 and is fed from the ink fountain 1 to the inking arrangement through the gap S when the roller 10 is rotated. The ink is fed finally to a printing plate (not shown) mounted on a plate cylinder (also not shown) in the case of an off-set printing press.

The density of ink on a printed matter, in general, depends on the amount of ink supplied to the printing plate. The amount of supplied ink is adjusted by an operator by adjusting the gap S by turning the adjusting screws 12. The data for adjustment of each screw 12 are given to the operator through a process described below.

Each piece of ductor blade 11 is adjusted on the basis of a datum of a rate of picture pattern area which is measured by a picture pattern area measuring apparatus 15. A printing plate 16 is put on a table of the apparatus 15. A measuring head h is moved over the printing plate 16 in order to measure rates of picture pattern areas on the printing plate 16 with respect to a variety of colors to be printed. That is, the head h has a photo-electric detector assembly for measuring a rate or the amount of a certain color occupying in a specific region along the head h, obtained by dividing the printing plate 16 into a plurality of pieces. Each specific region to be measured corresponds to a respective blade piece 11a of the ductor blade 11.

The picture pattern area measuring apparatus 15 is provided with a reading and writing device 17 for a magnetic card 18 by which data of rates of picture pattern areas are recorded on the magnetic card 18. In the case of four-color printing, four magnetic cards corresponding to four colors are prepared.

The picture pattern area measuring apparatus 15 is well known and, for example, is disclosed in U.S. Patent No.4,441,819 and 4,444,505 in detail. The method of recording data of rates of picture pattern areas on a magnetic card is also disclosed in the U.S.P. No.4,441,819 and is well known.

Data of rates of picture pattern areas can be obtained from film originals, proof-sheets and the like in addition to the printing plates mentioned above.

Furthermore, the data of rates of picture pattern areas can be recorded on magnetic tapes, paper tapes, paper cards, semiconductor memory elements and the like in addition to the magnetic cards.

Each magnetic card is taken out of the apparatus 15 and put into the input unit 21 of a controller 19. The controller 19 reads the data of the magnetic card input into the unit 21 and transfers them to a plurality of adjusting units 25 described below through a multiplexer 50.

FIG. 2 shows a perspective view of the ink fountain 1. The ink fountain roller 10 is rotatably supported between two frames (only one frame 22 is shown in FIG. 2). One of the frames 22 has the multiplexer box 42 thereon. The frames 22 support an adjusting box 24 via two rectangular arms 23, 23. The adjusting box 24 has a plurality of the adjusting units 25, each of which corresponds to a respective blade piece 11a of the ductor blade 11 and is in the form of a thin box. Furthermore, the adjusting units 25 are accommodated detachably in the adjusting box 24 in the manner of books accommodated in a book-case.

To the side walls of the adjusting box 24 are pivotably connected two legs 13, 13 of a blade supporting frame 14 on which the ductor blade 11 is supported. Accordingly, the frame 13 can be separated from the roller 10 when the ink fountain is to be cleaned.

Each adjusting unit 25 has an indicating panel 25a

which has three light emitting diode elements 26, 27, 28 separated from each other in the vertical direction. The upper light emitting diode element 26 is in the form of a triangle whose apex is directed downward. The upper element 26 emits light in case that the gap S of a blade piece 11a of the ductor blade 11 is larger than a predetermined intial value (reference value) obtained by the picture pattern area measuring apparatus 15. The central element 27 is in the form of a circle and emits light in case that the gap S of a blade piece 11a thereof is equal to a predetermined initial value. The lower element 28 is in the form of a triangle whose apex is directed upward and emits light in case that the gap S of a blade piece 11a thereof is smaller than a predetermined initial value. All elements 26, 27, 28 may have the same shape.

FIG. 3 is a sectional view of an adjusting unit 25 for showing its internal construction. The unit 25 has a box-like casing 29 with which an adjusting screw 12 is screw-engaged. The adjusting screw 12 extends through the casing 29 in the horizontal direction and its projected distal end abuts against the end face of a cam 30 rotatably supported on the casing 29. The forward end of the upper surface of the cam 30 abuts against the forward end of a blade piece 11a of the ductor blade 11. The rotation of the adjusting screw 12 causes the cam 30 to rotate about a pin P whereby the blade piece 11a of the ductor blade 11 moves toward and away from the surface of the roller 10. In this manner, the gap S corresponding to each blade piece 11a is adjusted. A gear 37 is supported on the middle portion of the adjusting screw 12 in a spline engagement so that the gear 27 is rotated without being moved in the horizontal direction when the adjusting screw 12 is rotated. The gear 37 is meshed with a gear 38 which is connected to a normal potentiometer 39. The two gears 37, 38 are held rotatably in a fixed box 31. When the gear 38 is rotated,

electric resistance of potentiometer 39 is changed. That is, the potentiometer 39 outputs a signal for indicating a present position of each blade piece 11a or the gap S thereof. The potentiometer 39 may be connected to the adjusting screw 12 via a belt and pulleys (not shown).

The adjusting screw 12 has a knob 12a at its distal end. The front face of the box-like casing 29 is covered with the indicating panel 25a having the above three elements 26, 27, 28.

The controller 19, as shown in FIG. 4, has a magnetic card input unit 21, an operating panel 41, an input-output port (I/O port) 43, a central processing unit (CPU)44, a read-only memory (ROM)45, a plurality of random access memories (RAM)46 each corresponding to a respective one of adjusting units 25, a direct memory access controller (DMA controller) 47 for operating each RAM46 at the command of the CPU44, a plurality of digital-to-analog converters (D/A converters) 48 each coupled to a respective one of the RAMs46 in order to convert a digital output from each RAM46 into an analogous signal, a plurality of function circuits 49 each coupled to a respective one of the D/A converters 48, and a system bus 50B for connecting the I/O port 43 with the ROM45 and the RAMs46.

Each function circuit 49 is connected to an indicating means 25b of each adjusting unit 25 through a multiplexer 50 provided in the multiplexer box 42 as shown in FIG. 5. The multiplexer 50 is an analogous switch without no mechanical contact and comprises only semiconductors for controlling switch positions by electric signals. Such a switch is well known and sold in the market. For example, RCA Company (U.S.A.) sell such kind of switches as CD4067B.

Each indicating means 25b has three comparators 52, 52 for comparing a reference value, to be preset, corresponding to a rate of picture pattern area with a

present value of a corresponding blade piece 11a or adjusting screw 12. The present value is given by a corresponding potentiometer 39. The three comparators 52 correspond to the upper, central and lower light emitting diode elements 26, 27, 28. The upper light emitting diode element 26 emits light when a present value of a blade piece 11a is larger than an indicated (reference) value thereby to cause an electric current flow in a transistor 53. When the reference value is equal to a present value of a blade piece 11a, the central light emitting diode element 27 emits light due to an electric current flow in another transistor 53. Further, when a present value of a blade piece 11a is smaller than the reference value, the lower light emitting diode 28 emits light due to an electric current flow in still another transistor 53.

An electric control of the controller will now be described with reference to FIGS. 6 to 10.

In FIG. 6, first, a power source is turned on (S1) and a magnetic card reading button (not shown) of the operating panel 41 is turned on (S2). Then, a magnetic card 18 is inserted into the magnetic card input unit 21 (S3). Subsequently, the controller judges what color (printing unit) the magnetic card is for (S4). In general, four magnetic cards for black, cyan, majenta and yellow are prepared.

The judgement as to what color the magnetic card inserted thereinto is for is carried out in accordance with a flow chart as shown in FIG. 7.

As a rule, a magnetic card 18 has a start code 500, a color code 501 for showing what color the magnetic card is for, a key code 502 for showing how many keys are recorded on the magnetic card 18, a data recording column 503 in which data of rates of picture pattern areas are recorded and an end code 504 as shown in FIG. 8. The keys correspond to the respective blade pieces 11a.

As shown in FIG. 7, when the color of the magnetic card 18 is judged, first, the start code 500 is read by a magnetic head (S41). If the start code 500 does not exist, "error" is displayed (S42). If the start code exists, the color code 501 is read (S43).

If the magnetic card 18 is for black, data of the data column 503 are recorded by the RAM1. If the magnetic card 18 is for cyan, majenta, or yellow, the data of the respective cards are recorded by the RAM 2, 3 or 4, respectively (S5).

The recording of data of each RAM is carried out in a manner as shown in FIG. 9. First, the key code 502 for showing the number of keys (data) is read (S51) and then one datum in the data column 503 is read (S52). Thereafter the datum is recorded in a corresponding RAM (S53). Subsequently, the data are recorded continuously. At this time, the CPU44 sets a counter in the RAM to count number of data having been recorded in the RAM (S54). Until the number of data counted by the counter becomes equal to the number of keys, the reading and recording operation is repeated (S55).

Now back to FIG. 6(a), an operator judges as to whether any other magnetic cards 18 are left without being processed (S6). If all cards have been processed, the operator turns on a display button (not shown) of the operating panel 41 (S7). Then, the CPU44 releases each RAM46 from the system bus 50B and outputs a start signal to the DMA controller 47 (S8). The DMA controller 47 has, as shown in FIG. 10, a pulse generator 600 for generating pulses periodically. The generator 600 is connected to a counter 601 and a timing device 602 through two AND circuits 603, 604. The two AND circuits 603, 604 are also coupled to the CPU44 and the counter 601 has a reset contact 601a for initialization. The counter 601 outputs address signals to respective RAMs 46 at the same time. The counter 601 is initialized by a start signal of the CPU44 and the timing device 602

determines the timing of output signals of each RAM46. The timing device is also a kind of pulse generator. The counter 601 also controls the multiplexer 50 in such a manner that signal transmission positions of the multiplexer 50 are changed according to the pulse signals from the counter 601.

The data at designated addresses of each RAM46 are output therefrom to the corresponding D/A converters 48 each converting a digital signal into an analogous signal (S9, S10). The analogous signal is input into a corresponding function circuit 49 in which the analogous signal is converted into a positional signal of a blade piece 11a of the corresponding unit 25 through a functional curved line A obtained by many tests as shown in FIG. 11 (S11). The abscissa, in FIG. 11, indicates rates of picture pattern areas, and the ordinate indicates outputs, that is, the positions (gaps S) of the blade pieces 11a to be adjusted. The position of each blade piece 11a is indicated as a percentage when the maximum gap S of each blade piece 11a is determined 100%. The positional data obtained by the function circuits 49 are input into each indicating means 25b through the multiplexer 50 provided in the multiplexer box 42 (S12).

Each indicating means 25b shows the relationship between the reference value obtained by the controller 19 and a present position of each corresponding adjusting screw 12 or blade piece 11a. The operator adjusts each adjusting screw 12 so that the present position of the screw coincides with its reference position (S14). After adjustment of each adjusting screw 12, the display button is turned off (S14) and the DMA controller 47 is stopped.

In FIG. 5, three light emitting diode elements 26, 27, 28 are provided with respect to the three comparators 52, 52, 52. However, instead of the three luminous elements 26, 27, 28, three sound making elements whose tone colors (timbres) are different from each other may

be used. For example, a buzzer or bell 700 may be used with respect to each comparator 52 as shown in FIG. 12.

Further, FIG. 13 shows an embodiment in which only one luminous element 802 is provided in one adjusting unit 25, that is, in one indicating means 25b. The indicating means 25b has one comparator 800 coupled to a converter 801. The comparator 800 calculates an absolute value of difference between a reference value of an adjusting member and a present value thereof and the absolute value calculated is input into the converter 801. The converter 801 is a V-F converter (for example, AD537 of ANALOG DEVICES COMPANY is used as the converter 801) and outputs frequency signals corresponding to the absolute value. That is, when the absolute value is zero, that is, a present value is equal to a reference value, pulse signals with a period T_1 of 0.1 sec are output as indicated by a pulse form P_1 of FIG. 14. As the absolute value increases, the period of pulse signals at that time becomes long as indicated by a pulse form P_2 of FIG. 14. When the pulse signals are output, a diode element 802 emits light for a period corresponding to a length of a pulse. The period corresponds to the magnitude of the absolute value. The element 802 emits light when the pulse signals are in a risen condition. Accordingly, flashing period of the diode element 802 is changed according to the magnitude of the absolute value. The operator judges the flashing condition to adjust each adjusting screw 12. In this case, it should be understood that the difference between the present value and the reference value is converted into a time signal. In this method, both of analogous and digital signals can be processed. Instead of the diode element 802, a sound making element may be used. In this case, the difference between the present and reference values is converted into the tone level of sound.

FIG. 15 shows another embodiment in which an indicating box 55 is held on one of the frames 22 of the printing press. The indicating box 55 has a plurality of indicating means 25b each comprising three elements 26, 27, 28, comparator and transistors in the same form as that of FIG. 5. Each indicating means 25b corresponds to a respective blade piece 11a. Between the two frames 22, 22 is provided an adjusting box 400 in which a plurality of the adjusting screws 12 are disposed horizontally at certain space intervals. In the same manner as that of FIG. 5, a present position of each blade piece 11a is input into each indicating means 25b through a potentiometer 39.

In FIG. 15, the indicating box 55 is provided on one of the frames 22. However, the indicating box 55 may be fixed to a wall which is located in a position where an operator can see when he adjusts the respective adjusting screws 12. Further, the indicating box 55 and the adjusting box 400 have the same control system as that of FIGS. 4 and 5. In this case, each indicating means 25b emits light continuously according to the operation of the multiplexer 50 as shown in FIG. 5.

FIGS. 16 and 17 show another embodiment in which an indicating box 455 is held on one of the frames 22. The indicating box 455 has only one indicating means 25b comprising upper, central and lower light emitting diode elements 26, 27, 28 and comparators (not shown), etc. Between the two frames 22, 22 is provided an adjusting box 400 which has a plurality of adjusting screws 12 and a plurality of selection switches 100 in the form of push buttons. Each selection switch 100 corresponds to a respective adjusting screw 12. When the operator pushes a desired switch 100, both contacts 100a, 100b are closed at the same time. As a result, an indicated (reference) value of the blade piece 11a corresponding to the pushed switch 100 and the present value of the blade piece 11a are input into the

indicating means 25b thereby to cause one of three elements 26, 27, 28 to emit light.

In FIG. 16, three light emitting diode elements 26, 27, 28 are used as luminous elements. However, instead of the luminous elements, three sound making elements whose tones are different from each other may be used. For example, buzzers or bells may be used.

Instead of the selection switch 100 in FIG. 16, a switch mechanism may be formed on each adjusting screw 12 as shown in FIGS. 18 through 21. That is, a pair of slip rings 60, 61 are formed on each adjusting screw 12. The slip rings 60, 61 slidably contact two electrodes 62, 63, respectively. The knob 12a of the adjusting screw 12 has a switch circuit comprising a base plate 66 and a cover plate 68 both of which are wound around the knob 12a. On the base plate 66 are printed two electrodes 64, 65 disposed opposite to a conductive sheet 67 attached to the inner surface of the cover plate 68. When an operator grips the knob 12a in a state as shown in FIG. 20, the conductive sheet 67 contacts the two electrodes 64, 65 as shown in FIG. 21, so that the switch circuit closes. The switch circuit SC is connected to two multiplexers 51, 70 as shown in FIG. 22. The multiplexer 51 is also connected to the above multiplexer 50 into which two respective signals from one of the RAMs 46 and the DMA controller 47 are input. Further, the two multiplexers 51, 70 are coupled to the indicating means 25b. If a certain knob 12a is gripped by the operator, a corresponding output position of each of the multiplexers 51, 70 is selected. The indicating means 25b of FIG. 13 can be applied to the embodiments of FIGS. 15 and 16.

FIGS. 23 through 28 show other control systems of the controller 19.

The control system shown in FIG. 23 is the same as that shown in FIG. 4 with the exception of the number of the RAMs 46 and the D/A converters 48 in addition to the

DMA controller 47. That is, in the system of FIG. 23, only one RAM 201 is provided, the D/A converters 48 are provided with respect to each indicating means 25b, and the DMA controller 47 is omitted. Accordingly, the CPU44 has also the function of the DMA controller 47 in FIG. 4.

FIG. 24 is a flow chart showing the control system of FIG. 23. First, a power source is turned on (S100). Next, a magnetic card reading button (not shown) is turned on (S101) and a magnetic head reads data of the magnetic card to record them in the RAM 201 (S103). The CPU converts 3 byte data recorded in the RAM 201 into 1 byte data according to a program of the ROM 45 and records them in the RAM 201 again (S104). This operation is repeated four times because of four magnetic cards in the case of four color printing (S105). Then, a display button is turned on, whereby the CPU 44 reads 1 datum to give it to a corresponding D/A converter 48 (S107). The D/A converter 48 converts 1 digital datum into 1 analogous datum (S108). Therefore, the function circuit 49 converts the analogous datum into a positional datum of a blade piece (S109). This analogous positional datum is transmitted to a corresponding indicating means 25b (S110). After the operator adjusts each adjusting screw 12 of a certain ink fountain, he turns off the display button and then adjusts other ink fountains.

FIG. 25 shows a flow chart similar to that of FIG. 23. However, in this case, the CPU 44 carrys out a digital calculation with respect to data recorded in the single RAM 21 in order to convert them into positional digital data of the respective blade pieces 11a. The converted positional digital data are transmitted to the respective indicating means 25b through a plurality of transmission means 49a corresponding to each indicating means 25b. In this embodiment, the D/A converters 48 and the function circuits 49 as shown in

FIG. 23 are not necessary.

FIG. 26 shows a modification of the control system shown in FIG. 23. In this case, a single D/A converter 48 is provided with respect to each ink fountain and a function circuit 49 is provided in each adjusting unit 25. A multiplexer 210 is disposed between the D/A converter 48 and each adjusting unit 25. The switching operation of the multiplexer 210 is controlled by an address signal means 209 which functions in the same manner as the DMA converter 47 shown in FIG. 4. If the multiplexer 210 is assembled in the adjusting box 24, the number of transmission wires is decreased.

FIG. 27 shows a modification of the control system shown in FIG. 25. In this case, a digital signal in the RAM 201 is read by the CPU 44 to convert the digital signal into a positional signal of each blade piece 11a through a function circuit 49. The converted signal is transmitted to each indicating means 25b through a multiplexer 210 whose switching operation is controlled by an address signal means 209. The CPU 44 gives address data to the address signal means 209.

FIG. 28 shows a control system in which a positional datum of each blade piece 11a after a proof operation is recorded on a magnetic card in order to use the data recorded on the magnetic card when the same kind printing is carried out. That is, a proof operation is carried out after each adjusting screw 12 is adjusted on the basis of a reference value indicated by each indicating means 25a. During the proof operation, the adjusting member is adjusted slightly on the basis of a printed article (proof). This slight adjustment of each adjusting screw 12 is recorded on a magnetic card inserted into a magnetic card input and output device 21A. A potentiometer 211 as a position detecting means is provided with respect to each indicating means 25. A positional data obtained by the potentiometer 211 are transmitted to the

magnetic card input and output device 21A through a multiplexer 210A, an A/D converter 48A and the system bus 50B. The switching motion of the multiplexer 210A is controlled by an address signal means 209A. In this case, the potentiometer 211 outputs analogous signals. However, digital signals may be output by the potentiometer 211 through a known digital electric circuit.

According to this invention, the indicating means 25b for indicating a relative positional relationship between the reference position of the adjusting screw 12 and the present position thereof becomes remarkably compact.

WHAT IS CLAIMED IS:

1. A method for adjusting an initial gap between a ductor blade divided into a plurality of regions or pieces and an ink fountain roller wherein the ductor blade is disposed along the ink fountain roller so as to form the gap between its distal end and the surface of the ink fountain roller, ink being fed through the gap toward an inking arrangement, the amount of ink to be fed being adjusted in such a manner that the distal end of each piece or region of the ductor blade is moved toward and away from the surface of the ink fountain roller by a corresponding adjusting member, said method comprising steps of:

(a) converting a datum of a rate of picture pattern area corresponding to each adjusting member into a datum of position, to be preset, of the adjusting member;

(b) comparing a positional reference datum, to be preset, of each adjusting member with a present position thereof in order to indicate a relative positional relationship between the reference position of the adjusting member and the present position thereof;

(c) operating each adjusting member in such a manner that a present position of each adjusting member coincides with the positional reference datum thereof; and

(d) letting an operator know, by means of light or sound, coincidence of a present position of each adjusting member and the positional reference datum thereof.

2. A method according to claim 1, wherein at least three light emitting or sound making elements are provided with respect to each adjusting member, the first element being adapted to emit light or make a sound when a reference value corresponding to a datum of position to be preset, of each adjusting member is larger than

a present value corresponding to a datum of a present position thereof, the second element being adapted to emit light or make a sound when the reference value is equal to a present value, the third element being adapted to emit light or make a sound when the reference value is smaller than a present value.

3. A method according to claim 2, wherein the reference value and a present value are compared with each other by at least one comparator, a decision signal obtained by the comparator being input into a corresponding light emitting or sound making element to emit light or make a sound.

4. A method according to claim 1, wherein at least one light emitting or sound making element is provided, a positional reference datum of each adjusting member being compared with a present position thereof, each compared signal obtained by the comparator being input into the element to emit light or make a sound in such a manner that flashing or sound making condition of the element is changed according to the magnitude of a compared value obtained by the comparator.

5. A method according to claim 1, wherein the relative positional relationship between the reference position of the adjusting member and the present position thereof is displayed on an indicating panel of each adjusting unit detachably accommodated in an adjusting box.

6. A method according to claim 1, wherein, with respect to each adjusting member, the relative positional relationship between the reference position of the adjusting member and the present position thereof is displayed by at least one indicating means of an indicating box which is provided separately from an adjusting box.

7. A method according to claim 6, wherein the number of the indicating means provided in the indicating box corresponds to that of the adjusting members.

8. A method according to claim 6, wherein the number of the indicating means provided in the indicating box is one, each of the adjusting members having a switch for changing an electric circuit in order to selectively display a reference position, to be preset, of a blade piece or region and its present position.

9. A method according to claim 1, further comprising a step of recording a result of a slight adjustment of each adjusting member after a proof operation on a memory means such as a magnetic card.

10. A device for adjusting an ink fountain in a printing press before a printing operation which comprises:

(a) a ductor blade divided into a plurality of pieces or regions and disposed along a ductor roller to form a gap therebetween through which an amount of ink is fed toward an inking arrangement;

(b) a plurality of adjusting members for respectively moving the distal ends of the pieces or regions of the ductor blade toward and away from the surface of the ductor roller on the basis of data of rates of picture pattern areas, the adjusting members being manually operated; and

(c) at least one indicating means for indicating a relative positional relationship between a reference value calculated on the basis of a rate of pattern area, of each piece or region and a present value thereof, said indicating means comprising,

(i) at least three comparators for comparing

a datum of a position, to be preset, of each adjusting member with a datum of a present position of each adjusting member, and

(ii) at least three light emitting or sound making elements for emitting light or making a sound according to a signal from each comparator, the first element being for emitting light or making a sound when a present position of each adjusting member is larger than a reference value, to be preset, thereof, the second element being for emitting light or making a sound when a present value of position of each adjusting member coincides with the reference value thereof, the third element being for emitting light or making a sound when a present value of position of each adjusting member is smaller than the reference value thereof.

11. A device according to claim 10, wherein an adjusting member and an indicating means are provided integrally in each adjusting unit which is detachably accommodated in an adjusting box.

12. A device according to claim 10, wherein at least one indicating means is provided in an indicating box which is provided separately from an adjusting box.

13. A device according to claim 12, wherein the number of indicating means provided in the indicating box corresponds to that of the adjusting members.

14. A device according to claim 12, wherein the number of the indicating means provided in the indicating box is one, each of the adjusting members having a switch for changing an electric circuit in order to selectively display a relative positional relationship between a reference value of each blade piece or region

and its present position.

15. A device according to claim 10, further comprising a potentiometer for detecting a present value of each adjusting member the potentiometer being also operated correspondingly to the movement of each adjusting screw, its movement being memorized by a memory means such as a magnetic card.

16. A device for adjusting an ink fountain in a printing press before a printing operation which comprises:

(a) a ductor blade divided into a plurality of pieces or regions and disposed along a ductor roller to form a gap therebetween through which an amount of ink is fed toward an inking arrangement;

(b) a plurality of adjusting members for respectively moving the distal ends of the pieces or regions of the ductor blade toward and away from the surface of the ductor roller on the basis of data of rates of picture pattern areas, the adjusting members being manually operated; and

(c) at least one indicating means for indicating a relative positional relationship between a reference value calculated on the basis of a rate of pattern area, of each piece or region, said indicating means comprising,

(i) at least one comparator for comparing a datum of a position, to be preset, of each adjusting member with a datum of a present position of each adjusting member,

(ii) at least one converter for converting a signal of difference between a present value of position of each adjusting member and a reference value, to be preset, thereof into a time signal, and

(iii) at least one light emitting or sound making element being adapted to emit light or make a

sound according to the time signal.

17. A device according to claim 16, wherein an adjusting member and an indicating means are provided integrally in each adjusting unit which is detachably accommodated in an adjusting box.

18. A device according to claim 16, wherein at least one indicating means is provided in an indicating box which is provided separately from an adjusting box.

19. A device according to claim 18, wherein the number of indicating means provided in the indicating box corresponds to that of the adjusting members.

20. A device according to claim 18, wherein the number of the indicating means provided in the indicating box is one, each of the adjusting members having a switch for changing an electric circuit in order to selectively display a relative positional relationship between a reference value of each blade piece or region and its present position.

21. A device according to claim 16, further comprising a potentiometer for detecting a present value of each adjusting member, the potentiometer being also operated correspondingly to the movement of each adjusting screw, its movement being memorized by a memory such as a magnetic card.

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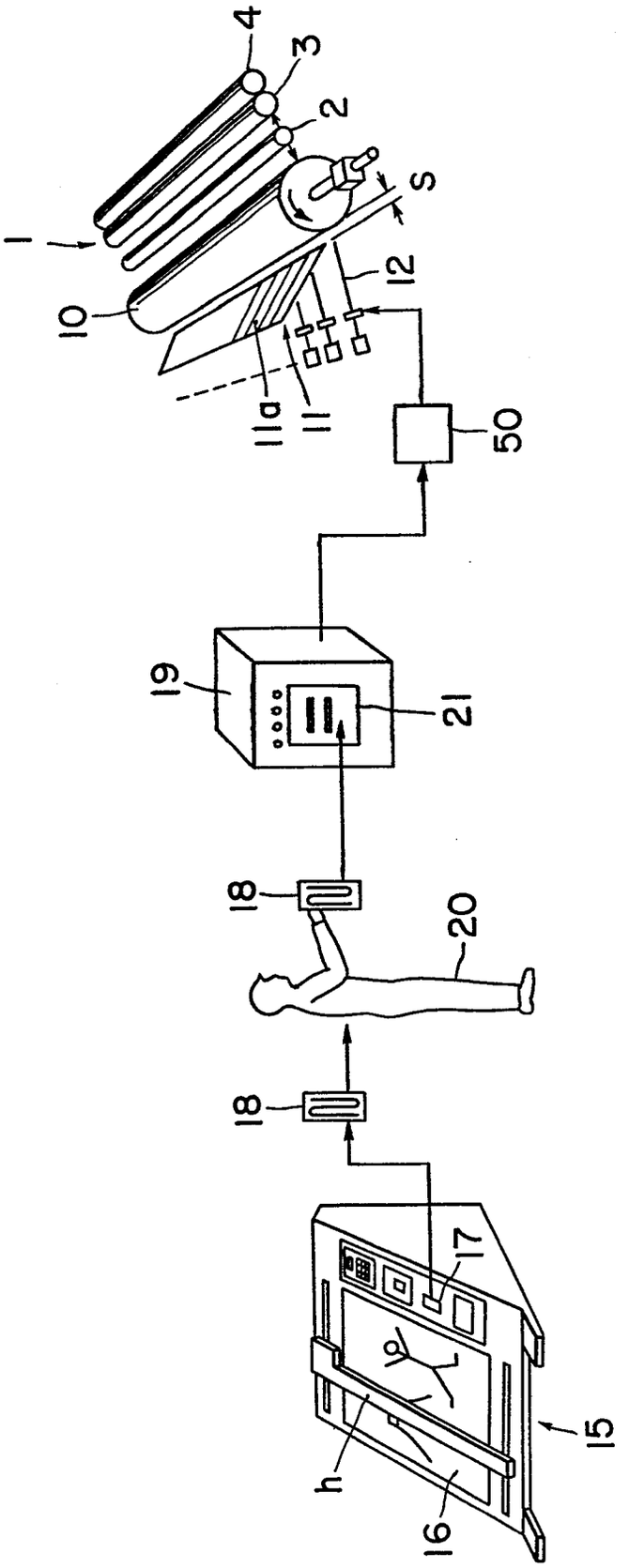

FIG. 1

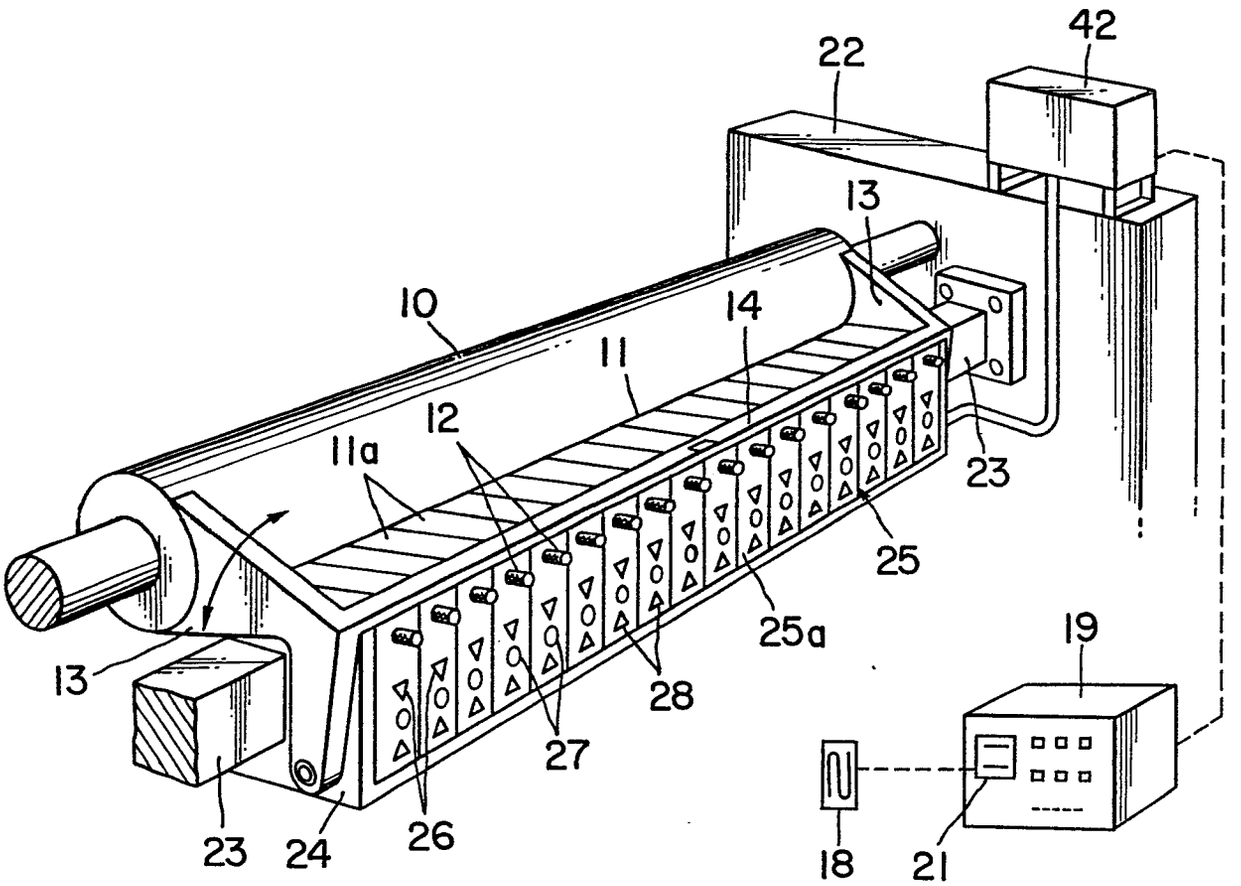

FIG. 2

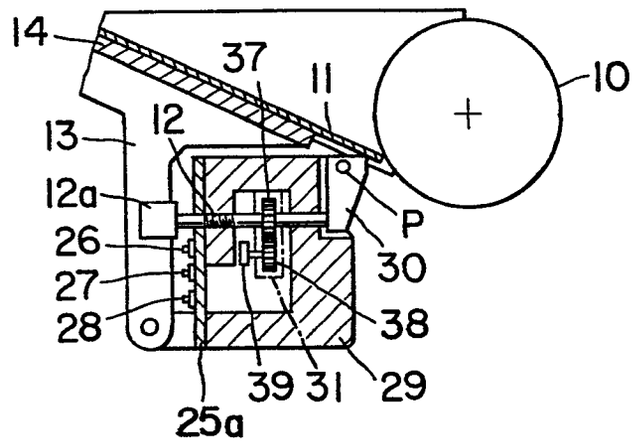
14
37
11
10
13
12
12a
26
27
28
P
30
38
39
31
29
25a

FIG. 3

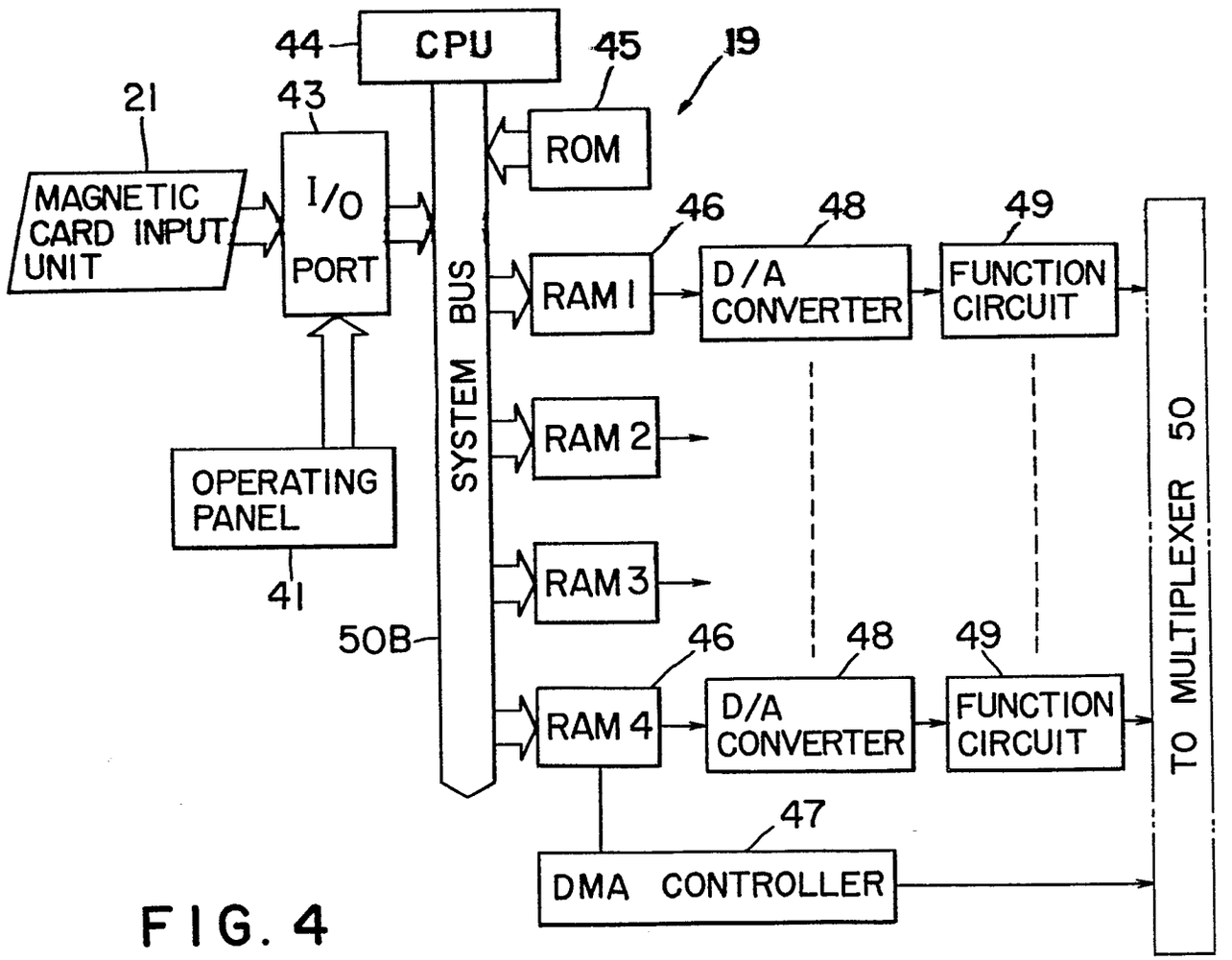
44
CPU
45
19
21
43
ROM
MAGNETIC CARD INPUT UNIT
I/O PORT
46
48
49
RAM 1
D/A CONVERTER
FUNCTION CIRCUIT
SYSTEM BUS
RAM 2
OPERATING PANEL
41
RAM 3
50B
46
48
49
RAM 4
D/A CONVERTER
FUNCTION CIRCUIT
TO MULTIPLEXER 50
47
DMA CONTROLLER

FIG. 4

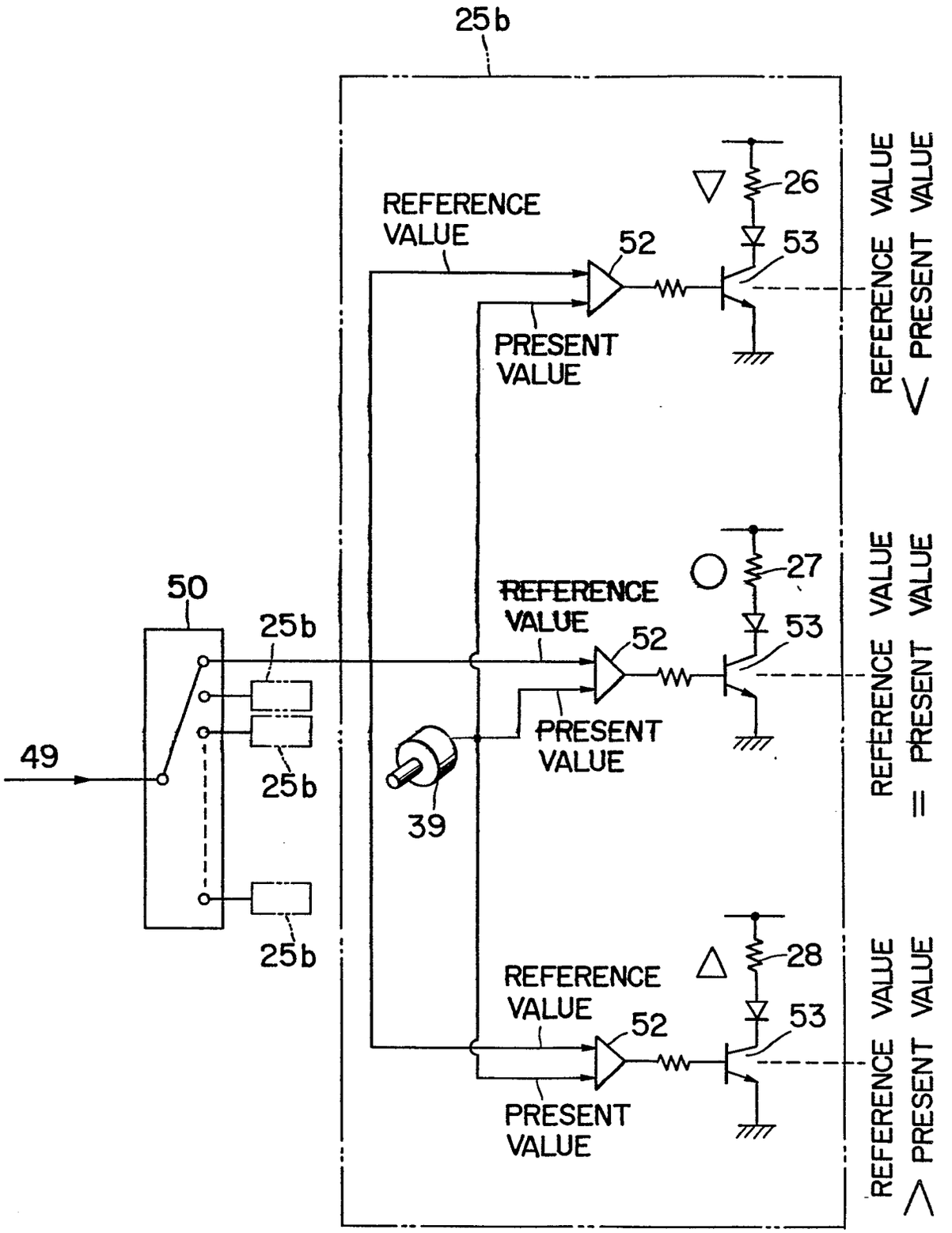
25b
REFERENCE VALUE
52
26
53
PRESENT VALUE
REFERENCE VALUE < PRESENT VALUE
27
REFERENCE VALUE
52
53
PRESENT VALUE
REFERENCE VALUE = PRESENT VALUE
50
25b
49
25b
39
25b
28
REFERENCE VALUE
52
53
PRESENT VALUE
REFERENCE VALUE > PRESENT VALUE

FIG. 5

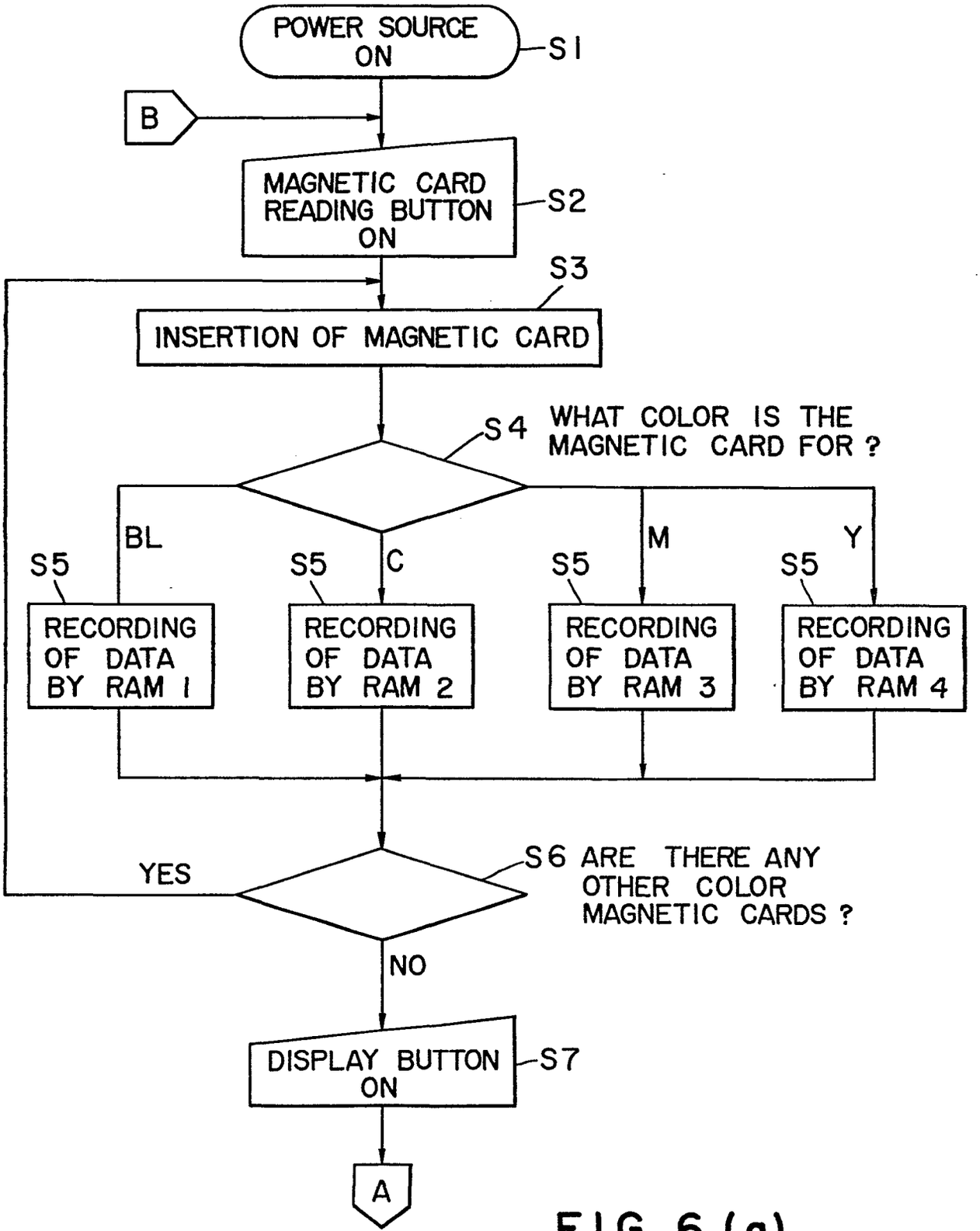
POWER SOURCE ON
S1
B
MAGNETIC CARD READING BUTTON ON
S2
S3
INSERTION OF MAGNETIC CARD
S4
WHAT COLOR IS THE MAGNETIC CARD FOR ?
BL
C
M
Y
S5
S5
S5
S5
RECORDING OF DATA BY RAM 1
RECORDING OF DATA BY RAM 2
RECORDING OF DATA BY RAM 3
RECORDING OF DATA BY RAM 4
YES
S6 ARE THERE ANY OTHER COLOR MAGNETIC CARDS ?
NO
DISPLAY BUTTON ON
S7
A

FIG. 6 (a)

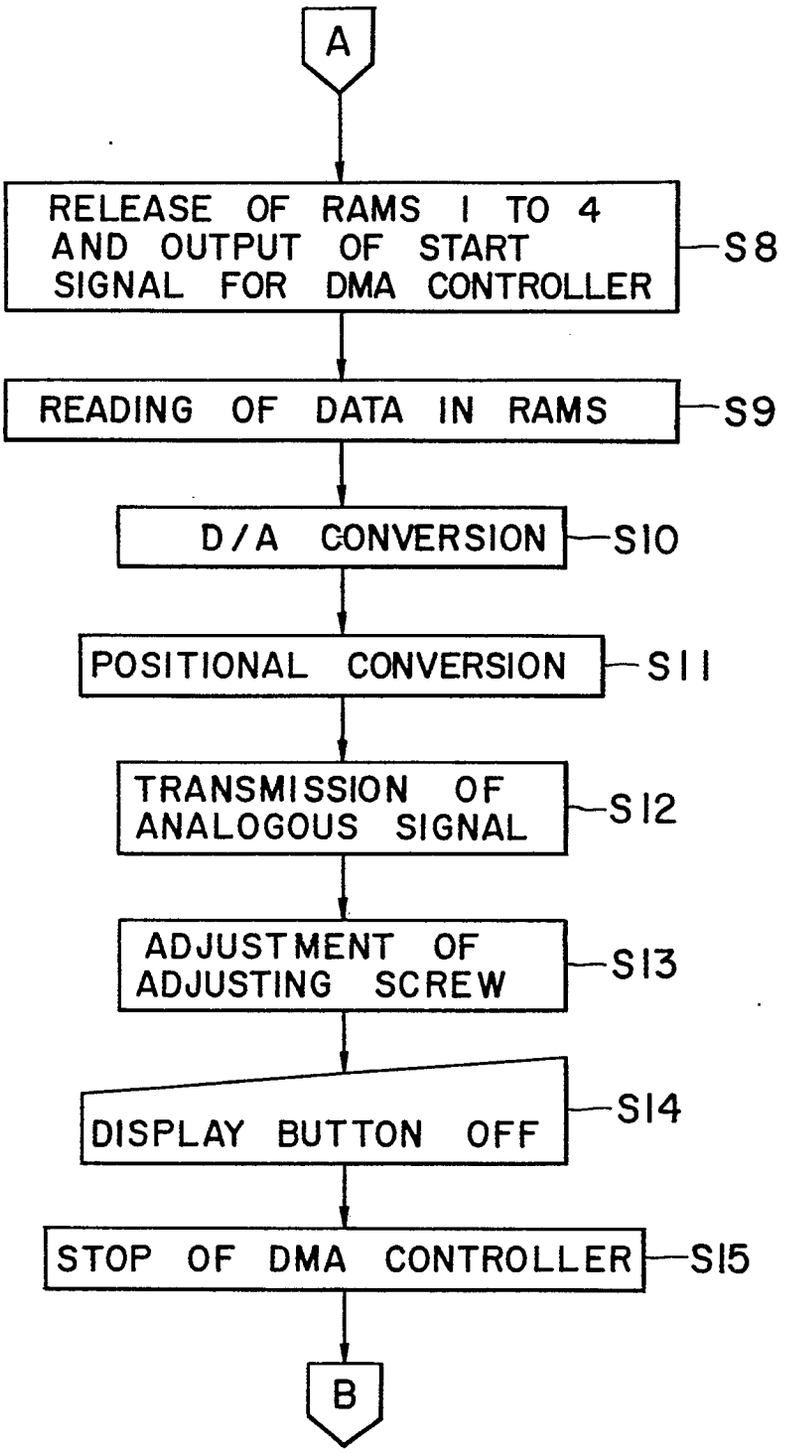
A
RELEASE OF RAMS 1 TO 4 AND OUTPUT OF START SIGNAL FOR DMA CONTROLLER
S8
READING OF DATA IN RAMS
S9
D/A CONVERSION
S10
POSITIONAL CONVERSION
S11
TRANSMISSION OF ANALOGOUS SIGNAL
S12
ADJUSTMENT OF ADJUSTING SCREW
S13
DISPLAY BUTTON OFF
S14
STOP OF DMA CONTROLLER
S15
B

FIG. 6 (b)

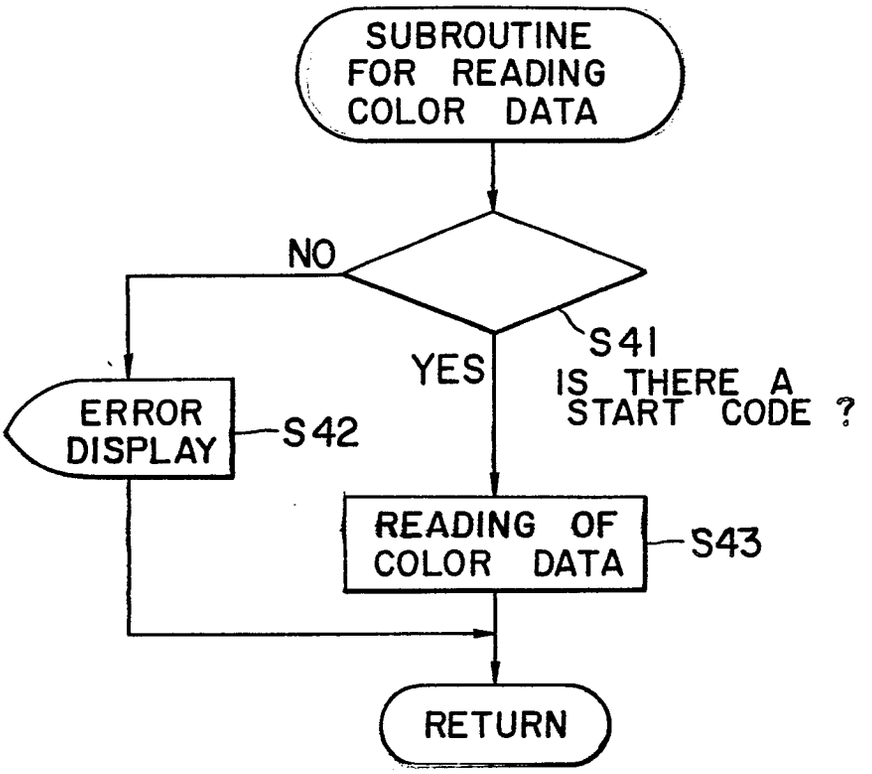
SUBROUTINE FOR READING COLOR DATA
NO
S41
IS THERE A START CODE ?
YES
ERROR DISPLAY
S42
READING OF COLOR DATA
S43
RETURN

FIG. 7

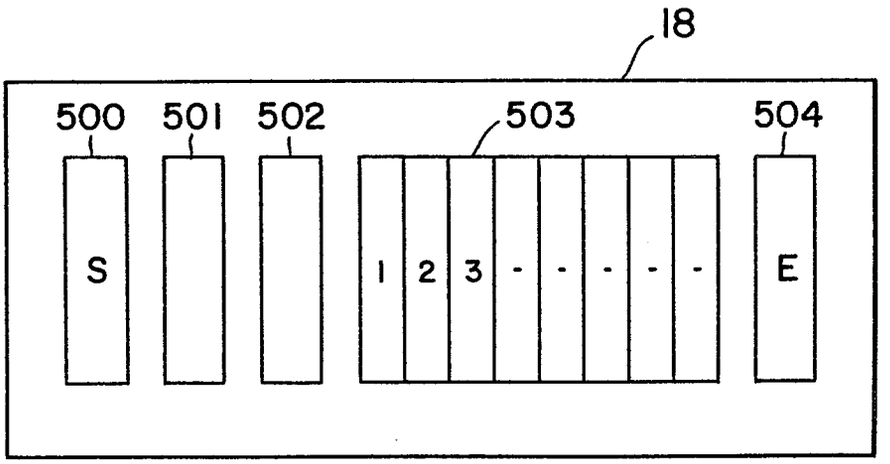
18
500
501
502
503
504
S
1
2
3
-
-
-
-
-
E

FIG. 8

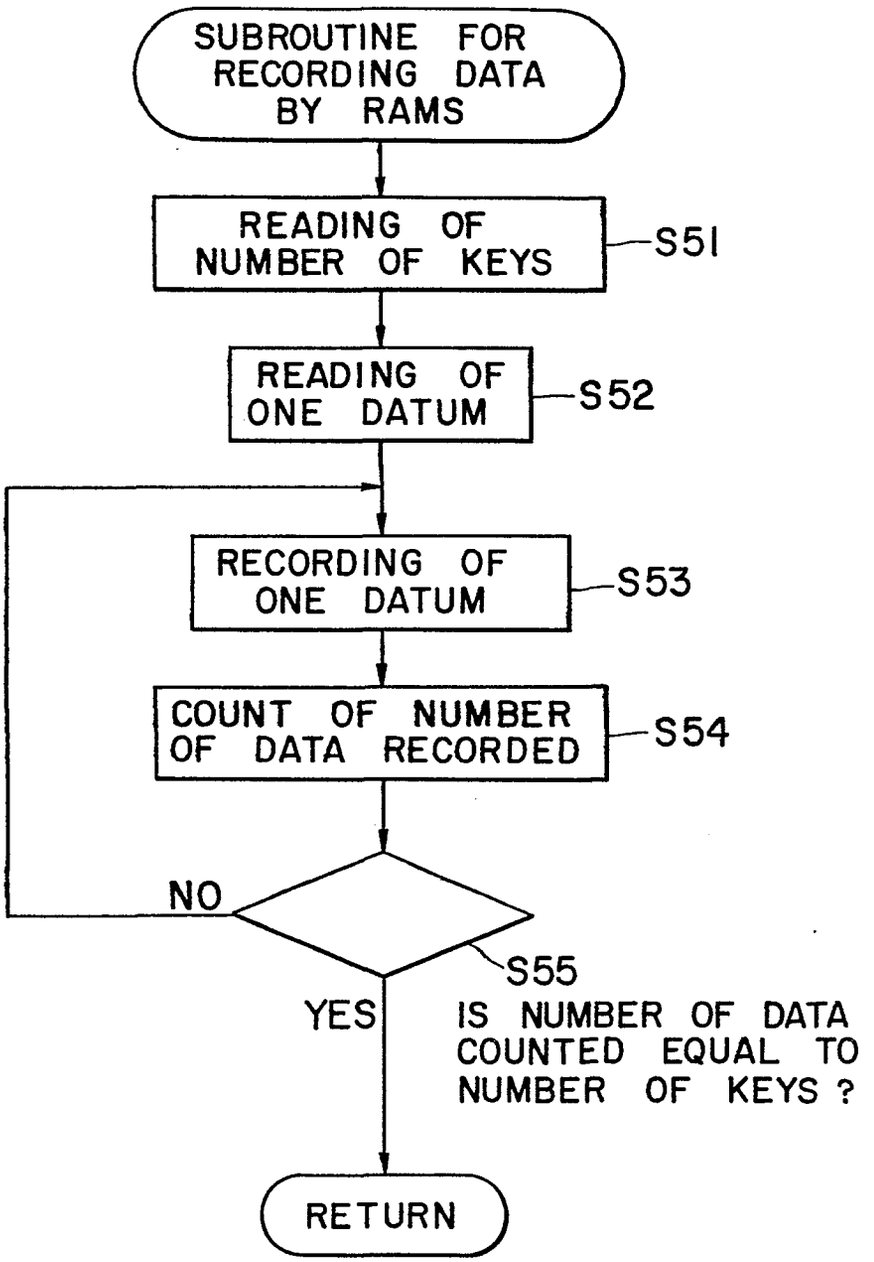
SUBROUTINE FOR RECORDING DATA BY RAMS
READING OF NUMBER OF KEYS
S51
READING OF ONE DATUM
S52
RECORDING OF ONE DATUM
S53
COUNT OF NUMBER OF DATA RECORDED
S54
NO
S55
YES
IS NUMBER OF DATA COUNTED EQUAL TO NUMBER OF KEYS ?
RETURN

FIG. 9

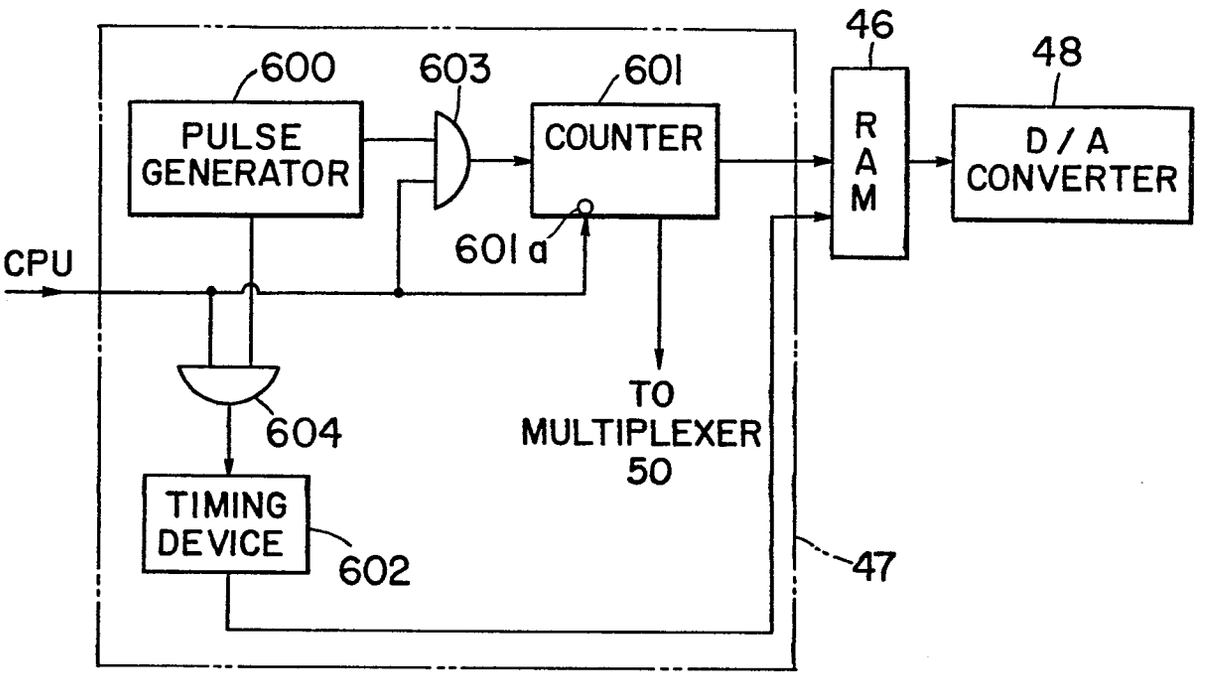
46
48
600
603
601
PULSE GENERATOR
COUNTER
R A M
D / A CONVERTER
CPU
601a
TO MULTIPLEXER 50
604
TIMING DEVICE
602
47

FIG. 10

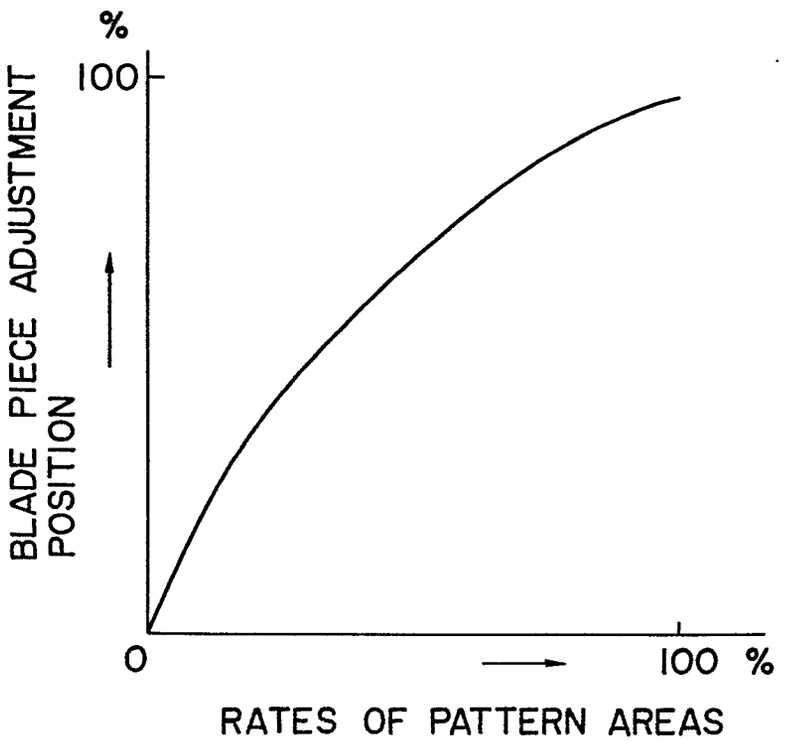
%
100
BLADE PIECE ADJUSTMENT POSITION
0
100 %
RATES OF PATTERN AREAS

FIG. 11

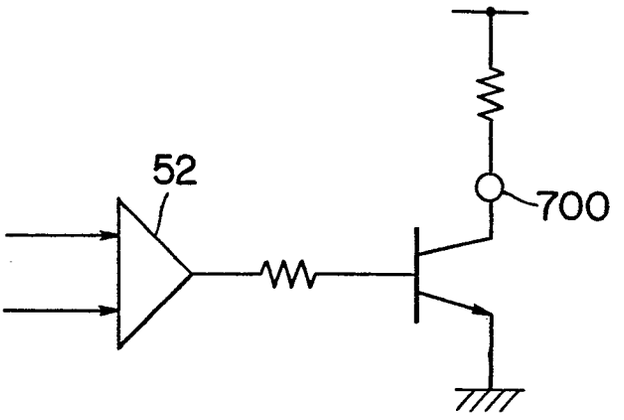

FIG. 12

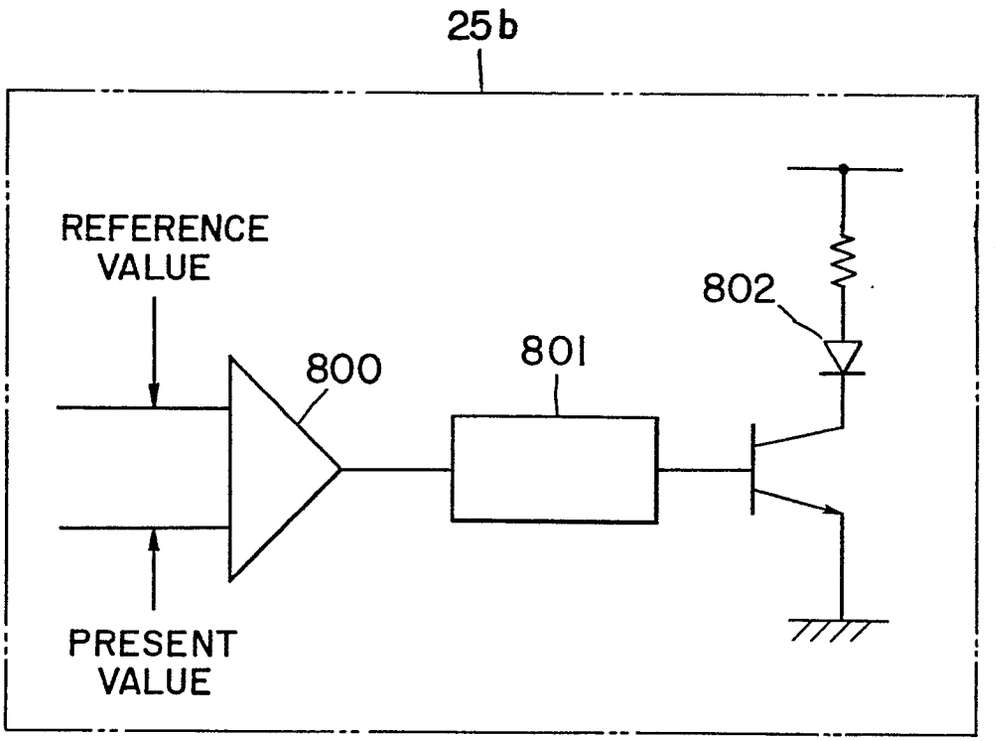

FIG. 13

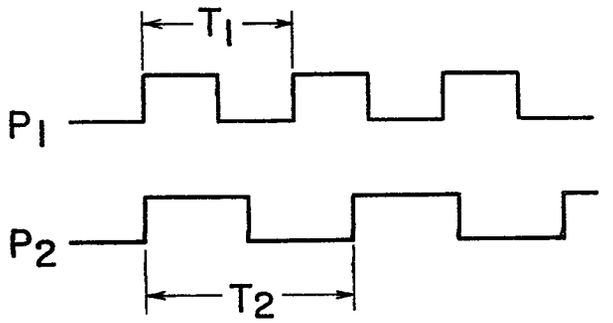

FIG. 14

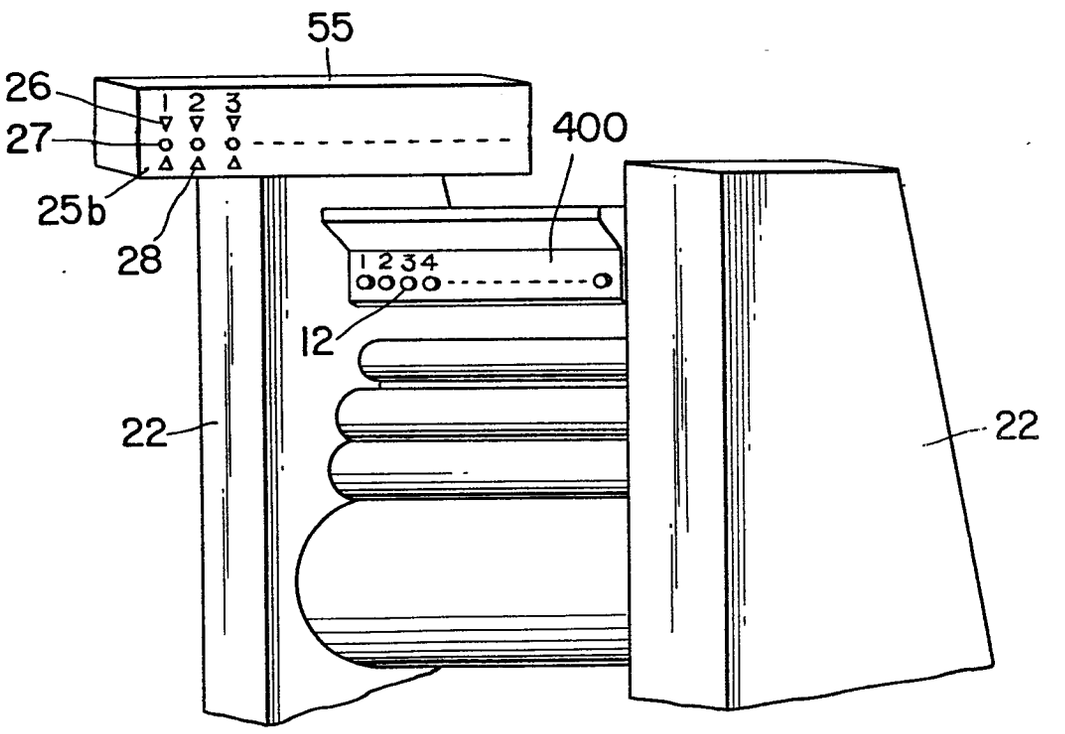

FIG. 15

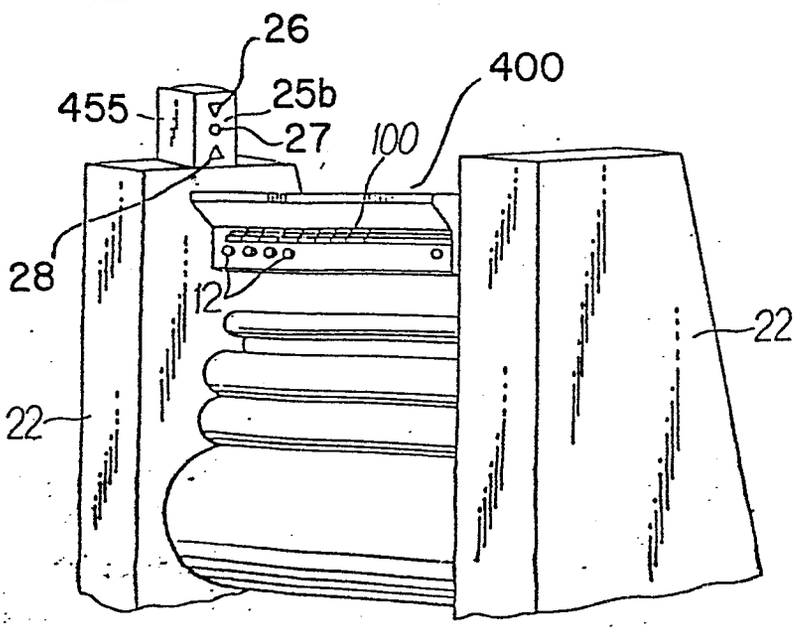
26
455
25b
27
400
100
28
12
22
22

FIG. 16

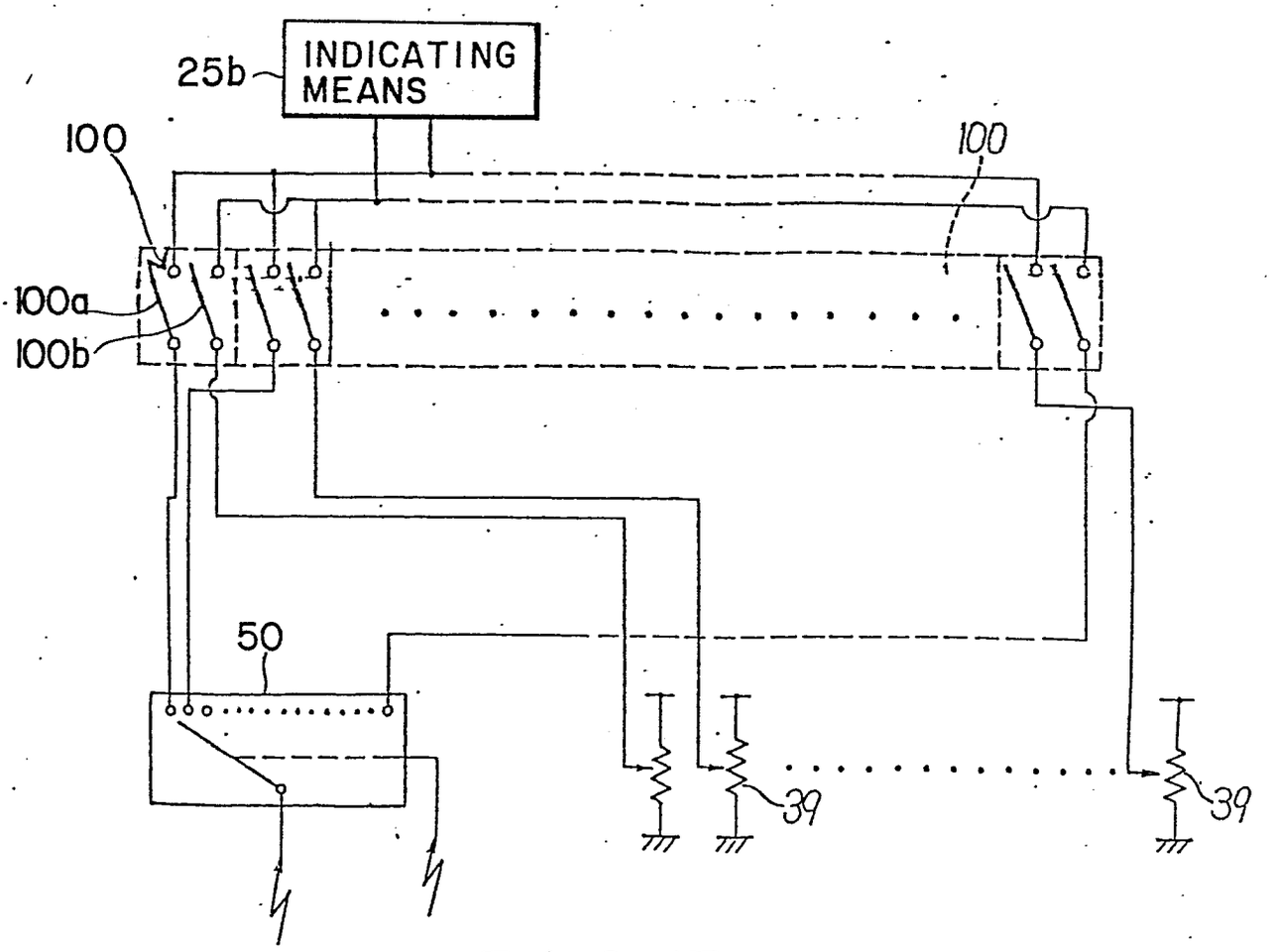
25b
INDICATING MEANS
100
100
100a
100b
50
39
39

FIG. 17

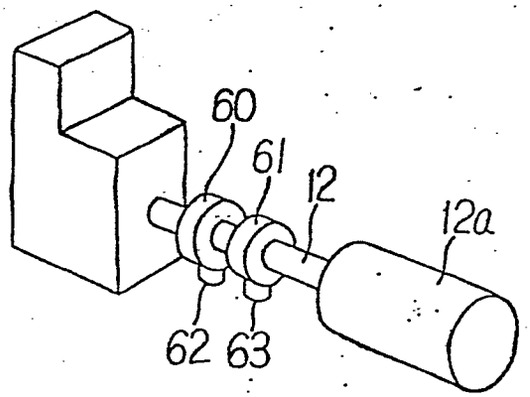

FIG. 18

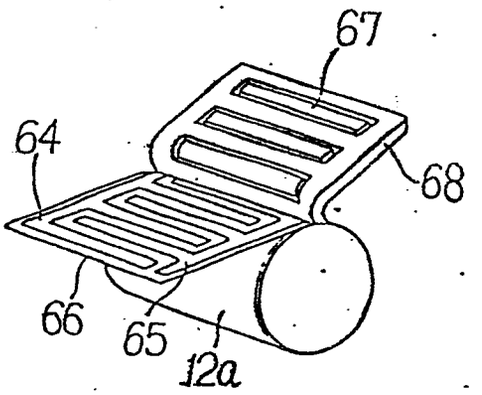

FIG. 19

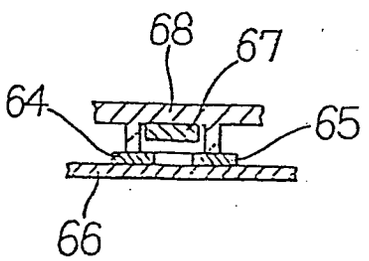

FIG. 20

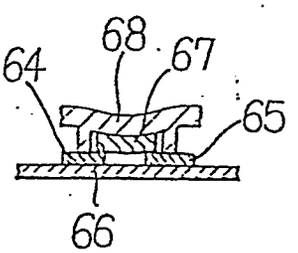

FIG. 21

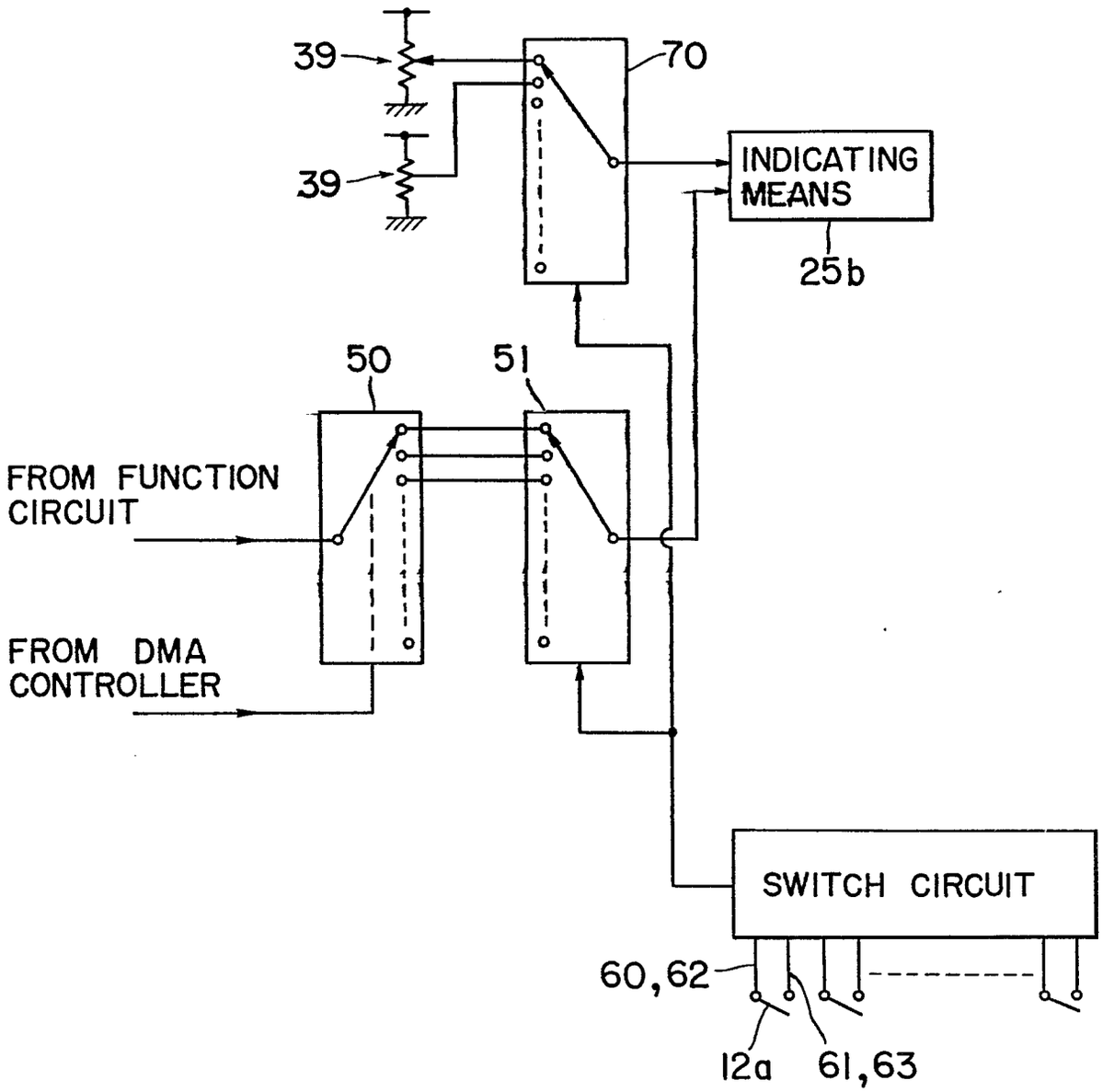
39
39
70
INDICATING MEANS
25b
50
51
FROM FUNCTION CIRCUIT
FROM DMA CONTROLLER
SWITCH CIRCUIT
60,62
12a
61,63

FIG. 22

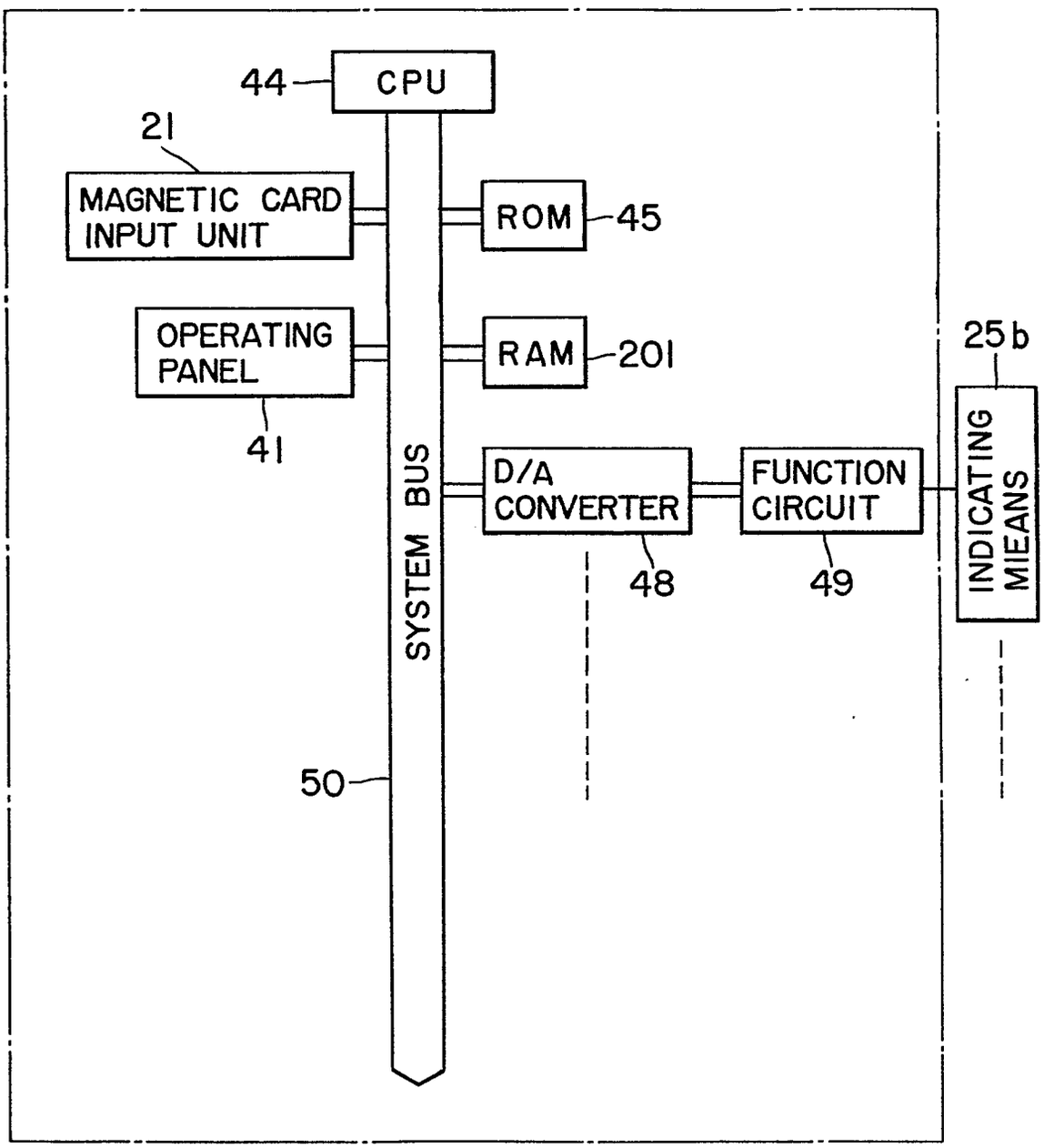
44
CPU
21
MAGNETIC CARD INPUT UNIT
ROM
45
OPERATING PANEL
RAM
201
25b
41
SYSTEM BUS
D/A CONVERTER
FUNCTION CIRCUIT
INDICATING MIEANS
48
49
50

FIG. 23

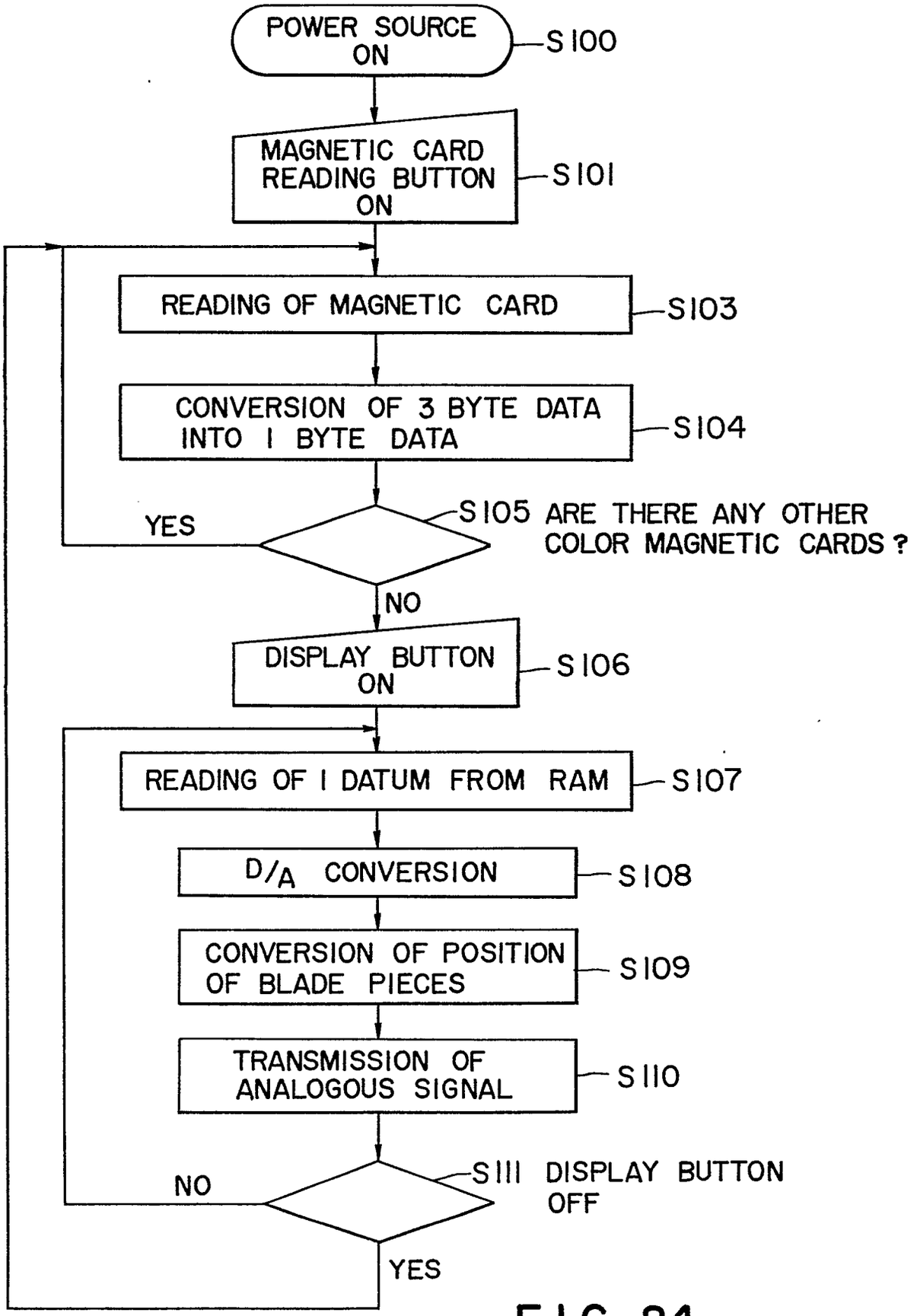
POWER SOURCE ON
S100
MAGNETIC CARD READING BUTTON ON
S101
READING OF MAGNETIC CARD
S103
CONVERSION OF 3 BYTE DATA INTO 1 BYTE DATA
S104
S105 ARE THERE ANY OTHER COLOR MAGNETIC CARDS ?
YES
NO
DISPLAY BUTTON ON
S106
READING OF 1 DATUM FROM RAM
S107
D/A CONVERSION
S108
CONVERSION OF POSITION OF BLADE PIECES
S109
TRANSMISSION OF ANALOGOUS SIGNAL
S110
S111 DISPLAY BUTTON OFF
NO
YES

FIG. 24

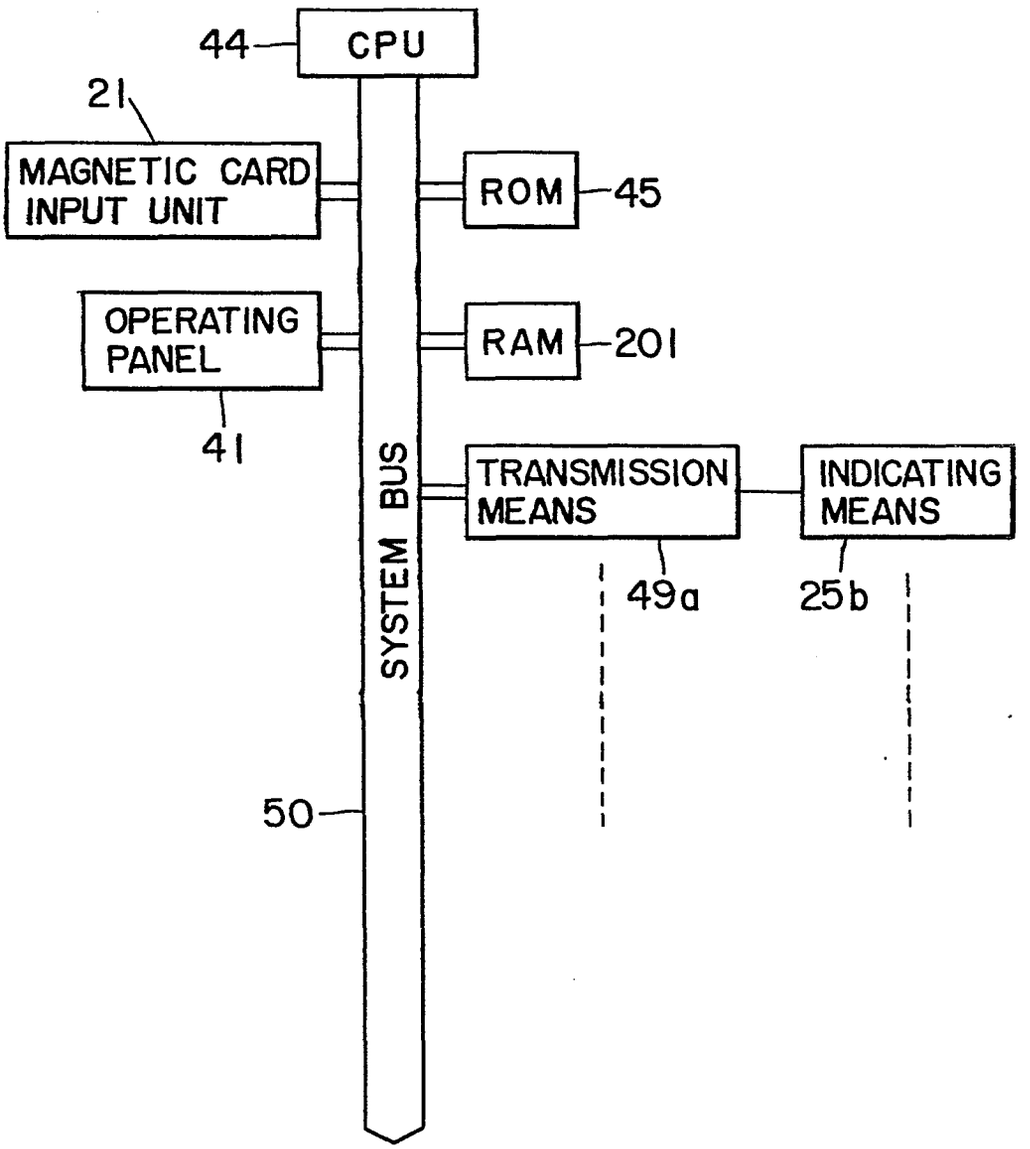
44
CPU
21
MAGNETIC CARD INPUT UNIT
ROM
45
OPERATING PANEL
RAM
201
41
SYSTEM BUS
TRANSMISSION MEANS
INDICATING MEANS
49a
25b
50

FIG. 25

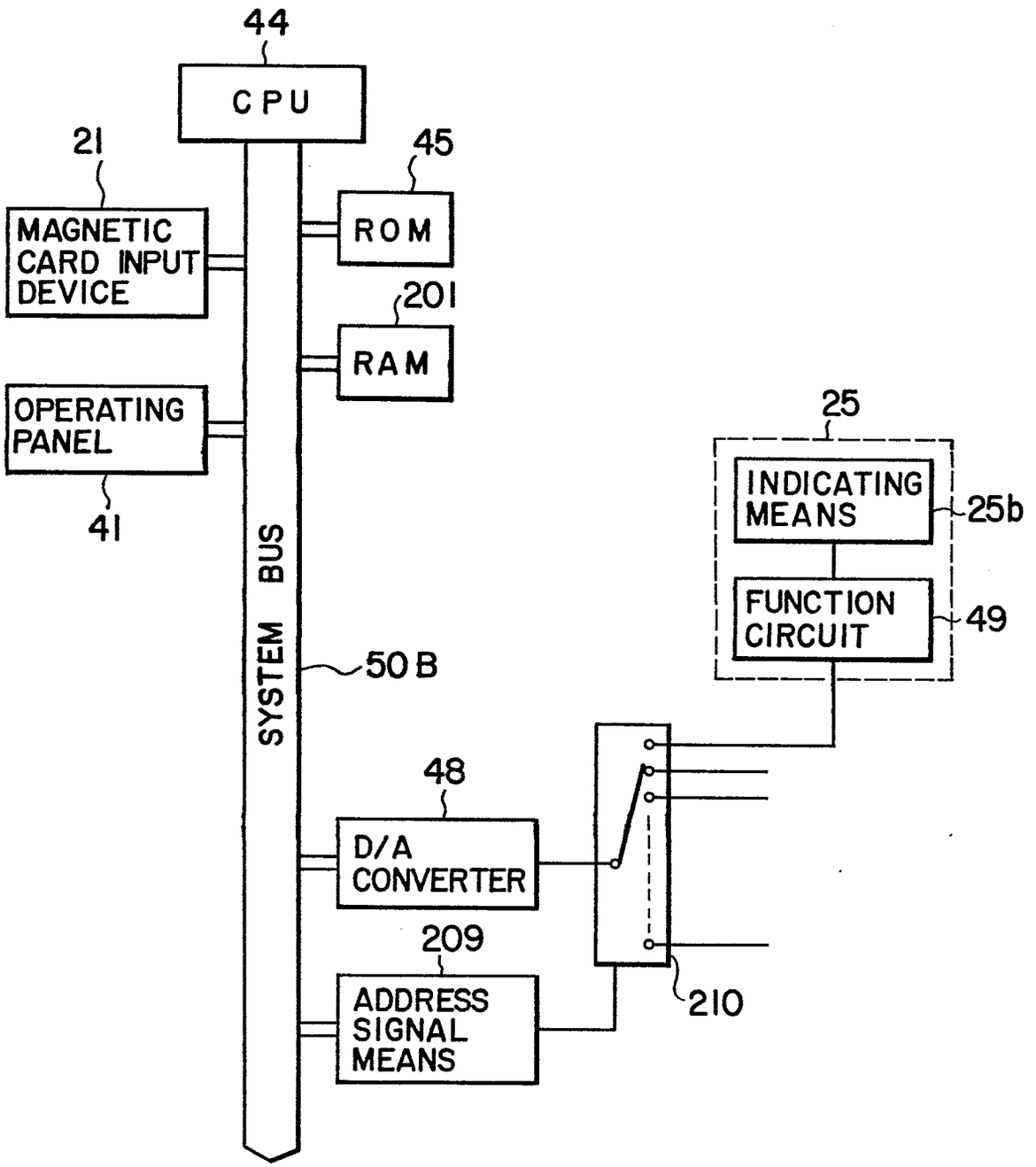
44
CPU
21
45
MAGNETIC CARD INPUT DEVICE
ROM
201
RAM
OPERATING PANEL
41
25
INDICATING MEANS
25b
FUNCTION CIRCUIT
49
SYSTEM BUS
50B
48
D/A CONVERTER
209
ADDRESS SIGNAL MEANS
210

FIG. 26

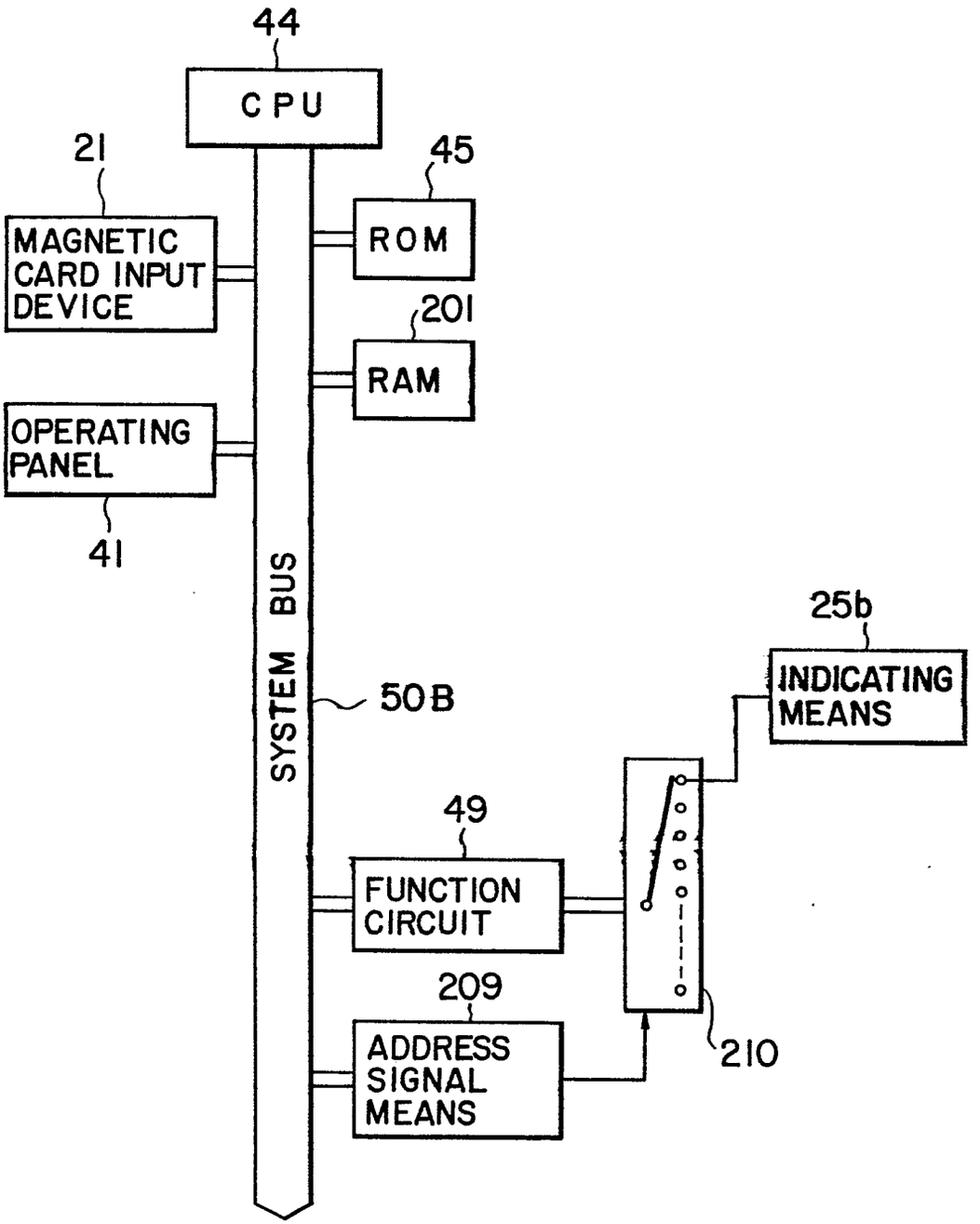
44
CPU
21
45
MAGNETIC CARD INPUT DEVICE
ROM
201
RAM
OPERATING PANEL
41
SYSTEM BUS
50B
25b
INDICATING MEANS
49
FUNCTION CIRCUIT
209
ADDRESS SIGNAL MEANS
210

FIG. 27

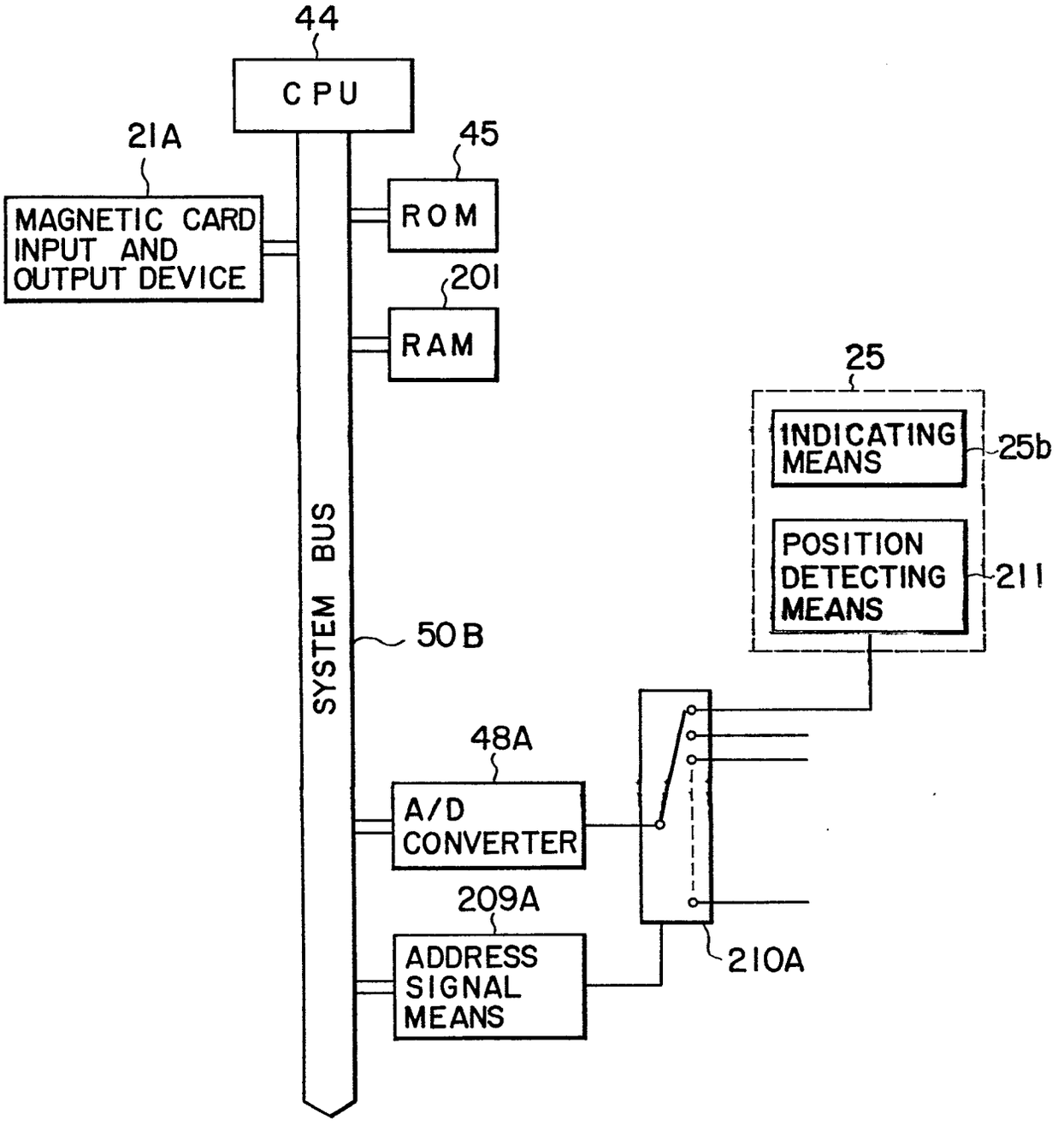
44
CPU
21A
45
MAGNETIC CARD INPUT AND OUTPUT DEVICE
ROM
201
RAM
25
INDICATING MEANS
25b
POSITION DETECTING MEANS
211
SYSTEM BUS
50B
48A
A/D CONVERTER
209A
ADDRESS SIGNAL MEANS
210A

FIG. 28