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(54) **A vending and dispensing system.**

(57) A vending and dispensing system, more particularly an apparatus for receiving photographic film to be developed and for returning the developed film and prints. The apparatus 10 is computer controlled, having a keyboard 12, a printer 40 and a visual display unit 30. Once a person's identity has been verified, by means of his credit card, the apparatus 10 accepts the film to the developed which is stored in a tray or drawer 20. Such film is collected regularly and taken to a central processing centre for developing and printing (not shown). The developed film and prints are returned to the apparatus 10 and placed in compartments 32. The computer correlates which film or the identity of the owner thereof, and the compartment 32 in which it is housed so that when the person returns to collect his film the correct compartment 32 is addressed and the film and print removed therefrom and delivered to the person.

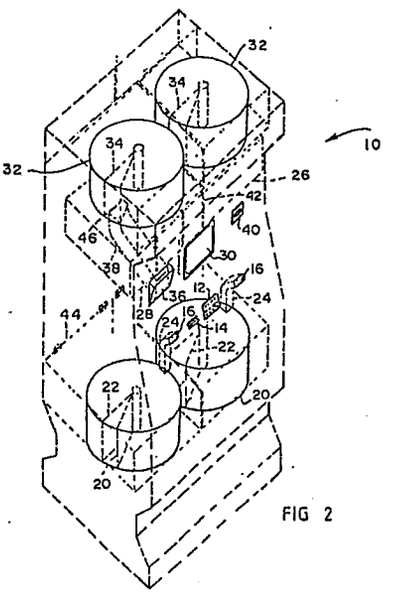

FIG 2

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Description

A VENDING AND DISPENSING SYSTEM

THIS INVENTION relates to a vending and dispensing system. More particularly, the invention relates to an apparatus for vending and dispensing articles. In a particular application, the apparatus may be for receiving photographic film to be developed, and for returning the developed film and prints.

According to a first aspect of the invention there is provided apparatus for receiving from a person photographic film to be processed and for dispensing such film after processing back to the person which includes

a data entering means for entering data;

a person identifying means for identifying the person;

a control means responsive to the data entering means and the person identifying means;

a receiving means, that is responsive to the control means, for receiving the unprocessed film;

a film housing unit which has a number of compartments in each of which a processed film may be housed;

a correlating means for correlating in which compartment the processed film of a particular person is housed; and

a displacing means, responsive to the control means and the correlating means, for displacing processed film of a particular person from the appropriate compartment to dispense the processed film to the person.

The data entering means may include a keyboard and the person identifying means may include a card reading device for reading and identifying a series of alphanumeric symbols carried by the card, or the like, and the control means is responsive to the card reading device and the data entering means to compare a series of symbols entered by the person via the data entering means and the series read by the card reading device to validate the identity of the person.

The receiving means may include a receptacle such as a tray, box or the like that is externally accessible via a door that is responsive to the control means, to be locked and unlocked thereby. This receptacle may also have a number of compartments, different film cassettes being received in successive compartments.

A labelling means may be provided, responsive to the control means, for providing a label for a film to be processed specifying the identity of the person and how the film is to be processed. Conveniently, the labelling means may include a printing device for printing the identity of the person and processing instructions on a suitable element, such as a card, piece of paper or even a packet into which the film is inserted, the packet then being inserted into the apparatus.

The control means may include a central processing unit, a program storage means for storing a set of operating instructions and a data storage means. A visual display unit may also be included, that is responsive to the control means, for displaying instructions to the person.

In a preferred form, the film housing unit has a plurality of groups of compartments, the compartments in each group being stacked one above the other and the groups being arranged in a circular manner such that they are circumferentially spaced about an axis and define a central hollow space, and the compartments are open at their radially inner and outer ends. The displacing means may be located within the central space.

According to a second aspect of the invention, there is provided an apparatus for vending and dispensing articles, which includes

an annular storage arrangement having a plurality of groups of storage compartments, the groups being circumferentially spaced about an axis to define a central hollow space, with the compartments in each group being one above the other in an axial manner, and with each compartment extending radially and being open at its radially inner and outer ends; and

a displacing means, located within the central space, for displacing an article in any selected compartment radially out of the said compartment.

The apparatus may include a collecting station from where processed film or other article is collected and a guide means for guiding the film or article pushed out from a compartment to the collecting station.

A sensing means may also be included for sensing if there is an article within a particular compartment.

The apparatus may have a check function. Thus it may include a code ascertaining means for ascertaining a code procvided on a processed film representative of the compartment in which it should be and for determining if that film is in the correct compartment. Thus, a scanning head may be provided to scan a bar or other code on the film or any other article.

The invention accordingly extends to a third aspect, which provides an apparatus for dispensing selected articles which includes

an array of compartments;

a displacing means for displacing an article in a selected compartment out of that compartment;

a code ascertaining means for ascertaining a code provided on an article in a compartment that is representative of the compartment in which the article is to be stored and for determining if an article is in the correct compartment.

This apparatus may include a compartment address monitoring means for monitoring the address of any compartment with which the displacing means is aligned.

In a preferred form the displacing means includes a displacing element; a radial moving means for moving the displacing element into and out of any compartment at its inner end to displace an article therein out of its outer end; an axial moving means for moving the storage arrangement and the displacing element relative to one another in an axial

direction; and an angular moving means for moving the storage arrangement and the displacing element relative to one another about the axis, such that the displacing element may be aligned with any desired compartment.

The invention is now described by way of examples with reference to the accompanying diagrammatic drawings.

In the drawings:-

Figure 1 shows a three-dimensional view of a first embodiment of an apparatus for receiving photographic film to be processed and for dispensing processed film;

Figure 2 shows a three-dimensional view of the apparatus of Figure 1 showing the interior thereof;

Figure 3 shows schematically the layout of a second embodiment of a dispensing apparatus in accordance with the invention;

Figure 4 shows a schematic vertically sectioned view of a storage and dispensing portion of the apparatus of Figure 3;

Figure 5 shows a schematic plan view of the storage and dispensing portion of Figure 4; and

Figures 6A and 6B show a block diagram of a circuit board used with the apparatus of Figure 3 to control the operation of various components of the apparatus.

Referring to Figures 1 and 2 an apparatus for receiving photographic film to be processed and for dispensing processed film is designated generally by reference numeral 10. The apparatus 10 has a numeric keyboard 12 and a card reader 14. The card reader 14 is adapted to read a credit card of a customer.

The apparatus 10 further has a pair of slots 16 each being closable by a door 18 through which photographic film to be processed can be inserted.

The apparatus 10 further has two transversely spaced receiving receptacles in the form of rotatable trays 20 of circular cross-section within which the film to be processed is received. Each rotatable tray 20 is divided into a plurality of segments 22 (only one of which is shown for the sake of clarity). The rotatable trays 20 are mounted below the slots 16. Each slot 16 is in communication with the rotatable tray 20 below it via a chute 24.

The apparatus 10 is micro-processor controlled and includes a central processing unit (CPU) 26 as well as data storage means in the form of floppy discs driven by floppy disc drives 28. The apparatus 10 further includes a visual display unit (VDU) 30.

Two transversely spaced housing units in the form of rotatable trays 32 of circular cross-section are provided. Each rotatable tray 32 is divided into a plurality of segments 34 (only one segment of each tray 32 is shown for the sake of clarity). Each rotatable tray 32 is in communication with a collection tray 36 via a chute 38. Each segment 34 of the dispensing trays 32 has a trap door 40 controllable by a command from the central processing unit 26. The trays 20 and 32 are rotated by suitable motors (not shown) in response to appropriate signals from the CPU 26.

The dispensing trays 32 and receiving trays 20 are identical and are interchangeable. The segments 22 and 34 of the trays 20 and 32 respectively are coded or indexed so that a particular customer's film to be processed, once it has been processed, is returned to the appropriate segment 34 of the dispensing tray 32. An index wich correlates the address of each segment 34 of the dispensing trays 32 and the identity of the person associated with a film in that segment is created by a master computer at the location where the film is created and written onto a floppy disc associated with a particular tray and the film therein. Thus, when a particular person returns to the apparatus 10 to collect his film, the CPU checks if his film is in one of the trays 32 and rotates the correct tray 32 so that the correct segment is above the chute 38 and opens the appropriate trapdoor 46.

The apparatus 10 further includes a printer 40 for printing out details of a transaction.

In use, to operate to the apparatus 10, a customer inserts a valid credit card into the card reader 14. The card reader 14 is linked to a main frame computer via a modem 42. The customer enters the credit card number, or a related code into the CPU 26 via the keyboard 12.

If the correct identification code is entered, then a menu of transactions will appear on the VDU 30 allowing the customer to choose the options he requires. The details of the required transaction can then be entered into the CPU 26 via the keyboard 12. When all the required information has been entered, the door 18 closing the slot 16 will open on a command from the CPU 26 to enable the customer to insert his film into the slot 16. The film to be processed falls under gravity through the chute 24 into a segment 22 of one of the trays 20. All the information regarding the transaction is stored on one of the floppy discs. A hard copy of the transaction including estimated costs, is generated by the printer 40 for the customer. The tray chute 24 for the next film.

The films to be processed are stored in the segments 22 of the trays 20. When a tray 20 is full, or at regular intervals, the trays 20 and the associated floppy disc are collected and taken for processing. The trays 20 and the floppy discs are removable from the unit 10 via doors 44 in the rear of the unit 10. Empty trays 20 and a new floppy disc are placed in the apparatus 10.

At the same time, the trays 32 and their associated floppy disc are removed and new trays 32 and floppy disc inserted. These new trays 32 have processed film in boxes or packets, in the appropriate segments. As described above, the floppy disc has an index correlating the identity of the person and the appropriate segment. The new trays were loaded at a central processing centre.

When a customer returns, he again inserts his credit card into the card reader 14 and enters his details via the keyboard 12. From the menu appearing on the VDU 30 he selects the required transaction eg. "Collect processed films". A summary of the transaction appears on the VDU 30. If this is acceptable to the customer, a hard copy of an invoice is printed by the printer 40 and the

customer's credit card account is automatically debited. The appropriate tray 32 is rotated until the correct segment is aligned with the chute 38, and its trap door 46 is opened by a command from the central processing unit 26. The processed film then falls down the chute 38 under gravity into the collection tray 36.

The segments 34 of the rotatable trays 32 are indexed, or coded, to ensure that the correct segment is aligned with the chute 38 by the CPU 26.

Referring to Figures 3 to 5, an apparatus for receiving exposed photographic film that is to be developed and prints made and for returning the developed film and prints to the owner thereof is designated by reference numeral 110. A portion of the apparatus for storing the prints and developed film and for dispensing them is designated by reference numeral 112.

The portion 112 has a storage arrangement 114 that has eight groups 116 of compartments, the groups 116 being circumferentially spaced about a vertical axis. Each group 116 comprises a number of vertically stacked compartments 118, each compartment 118 having a floor, a roof and two side walls, to define a rectangular horizontal cross-sectional profile. The compartments 118 are each open at their radial inner and outer ends so that correspondingly shaped boxes can be manually inserted into the compartments 118 from outside and can be pushed out by an ejecting unit 142 located within a central space defined by the groups 116. In between each group 116 there are two elongate vertically extending containers 126, each container 126 having a dispensing opening 128 at its bottom end, with one container 126 being positioned above the other. There are forty six compartments 118 in each group 116.

A platform 129 is provided that is rotatable about a vertical axis by a bi-directional motor 130 that is supported by a bracket 132. The platform 129 is supported on a base 134 of a support structure 136. The angular position of the platform 129 about the vertical axis is monitored by an encoder 138 that provides signals for a controlling computer 140 (see Figure 3). An electromagnetically operable brake (not shown) is provided to maintain the platform 129, and thus the compartments 118, at any desired angular position when they are not being rotated by the motor 130.

The compartments 118 and the containers 126 are supported on the platform 129. The support structure 136 also includes columns 156 supporting cross-pieces 158 located above the compartments 118. Depending from the cross-pieces 158 are two guide posts 141 that guide an ejecting unit 142 which comprises an ejecting arm 144 and a motor 146. The unit 142 moves up and down, being guided by the posts 140. The unit 142 is moved up and down by a screw-threaded rod 148 that is bi-directionally rotated by a lifting motor 150 tha also has an encoder 152. The lifting motor 150 is supported by the cross-pieces 158.

In order to align with any particular compartment, the brake is released, the motor 130 is operated to rotate the platform 129 until the arm 144 is in register with the particular group 116 in which the compartment in question is to be found, the brake is re-applied and the motor 150 is operated to lift or lower the unit 142 until the arm 144 is aligned with the compartment 118. In order to dispense a box 164 in that compartment 118, the motor 146 is operated to extend and retract the arm 144.

The arm 144 has a code scanning head 154 at its tip whereby a code on a box 164 in a compartment 118 may be read and supplied to the computer 140. The code on the box 164 may be a bar code.

Referring to Figure 3, the portion 112 is shown in a housing 160 of the apparatus 110. Further, the ejecting unit 142 is aligned with a chute 162 which guides boxes 164 that have been pushed out of any compartment 118 into a dispensing drawer 166. The dispensing drawer 166 is pushed open and closed by a motor (also not shown). A detection means to detect the presence of a customer's hand in the drawer 166, is provided on the drawer 166 in order to prevent the drawer 166 closing while the customer is still retrieving his processed film and prints from the drawer 166.

Further, the apparatus 110 has a collecting bin 168 into which film to be processed is inserted, and, as with the apparatus 10 of Figures 1 and 2 a disply unit 30, a keyboard 12, a card reader 14 and a printer 40.

The computer 140 may conveniently be a personal computer such as a MITAC PC/XT which is IBM compatible and has a colour graphics card for controlling the VDU 30, a real time clock, RAM, twin RS232 ports one of which is used for the card reader 14, a parallel port connected to the printer 40, a hard disc drive and controller and two floppy disc drives and a controller.

It is to be noted that the boxes 126 are filled, in use, with unexposed film 178, that is sold. Each packet 126 has a micro-switch 178 to detect if there are no longer any packets of film 178 to be sold.

In use, a person wishing to have film developed inserts a credit card into the reader 14, enters his personal identification code via the keyboard 12 which is verified to validate the persons identity and he then enters information, also via the keyboard 12 in response to queries provided by the computer 140 via the display unit 30. Various details are then printed onto an envelope by the printer 40 and supplied to the user. The user puts his roll of film into the envelope and places it in the bin 168. The user's credit card is returned to him. The computer 140 allocates a compartment 118 to the roll of film and stores the compartment number together with the credit card number. The allocated compartment number is marked on the envelope.

At selected intervals of time the bin 168 is cleared and the film therein is taken to a processing centre and processed. The developed film and prints are inserted in the boxes 164 which are marked with the address of the allocated compartment in numbers and letters so that an operator can read the address and also by means of a bar code. The boxes 164 are brought back to the apparatus 110 by the operator, the apparatus 110 is opened and the boxes are manually inserted into the appropriate compartments 118, with the bar codes facing inwardly. The

computer 140 keeps track at all times of those compartments 118 that are empty and which may be utilized.

The computer 140 then causes the arm 144 to scan each compartment 118 so that the reading head 154 reads the bar code of the box in that compartment. If the bar code and the number of the compartment agree, then the code of the box in the next compartment 118 is read. If the bar code and the compartment number do not agree, then the box is ejected and the operator is required to place the box in the correct compartment.

Once all the boxes are in the correct compartments, the operator closes the apparatus. When the user wishes to collect his processed film, he inserts his credit card again into the reader 14, and the computer 140 identifies the correct compartment for that purpose, checks if there is a box 146 in the compartment, using the scanning head 154, dispenses the box 146 in the appropriate compartment, causes the user's account to be debited and returns the credit card. The user removes his box from the drawer 166. If there is no box 146 in the appropriate compartment then this is detected by the scanning head 154 and the computer 140 supplies an appropriate message to the person and returns his credit card.

Referring now to Figures 6A and 6B, a prototype card that is used with the computer 140 is designated generally by reference numeral 200. The two Figures are to be considered as one, the common connections being indicated by the letters 'a' to 'l'.

The card 200 has two 8255 interface chips 202 and 204, an 8253 counter/timer chip 206, a 74LSO8 quad two-input AND gate 208, a 74LS14 inverter 210, a 74LS245 bi-directional bus-driver 212, two 74LS244 unidirectional bus-drivers 214 and 220, a comparator 216, a 74LS138 chip select chip 218, a 74LS08 quad two-input AND gate 222, a 74LS02 quad two-input OR gate 224, a 74LS04 hex inverter 226, a 74LS21 dual four-input AND gate 228, and a LM358 operational amplifier 230, used as a voltage follower buffer. The chips 212, 214, and 220 and 228 inclusive are standard on an IBM prototype board.

The board 200 has an output terminal 232 which is connected to a driver (not shown) for the motor 150 which is a stepper motor so that a series of pulses are supplied at the terminal 232. The motor 150 is always operated to return the arm 144 to a datum position which is at the top, so that the number of pulses is representative of the distance that the motor 150 will move the arm 144. The number of pulses is determined by the software and loaded into the timer/counter 206 via a databus 207 and an addressbus 209. As, in the particular application for which the board 200 was designed, the capacity of one counter in the chip 206 was not large enough for the maximum number of pulses that were required, two of the counters are used in a cascade manner, the routing of pulses being controlled by the AND gate 208 and the inverter 210. It will be appreciated that the motor 150 has a direction controlling reversing switch (also not shown), which is controlled via signals supplied at an output terminal 240. The keyboard 12 is connected to terminals 244, the encoder 138 to terminals 246 and the scanning head 154 to input terminals 254.

The board 200 has further output terminals 234, 236, 238,240 and 242. The terminals 234, 236 and 238 are connected to driving relays (also not shown), which control the operation of the motor for the drawer 166, the motor 146 for the arm 144, and the brake, respectively. The output terminal 242 is connected to a drive mpdule (also not shown) for the motor 130, the value of the voltage signal supplied at the terminal 242 determining the speed of operation of the motor 130. A low value creep signal or a higher value normal speed signal is supplied via the op-amp 230 from resistor networks 250 and 252 using energising signals from the interface chip 204. After the brake is released, the motor 130 is first supplied with a creep signal to accelerate it and then with the normal speed signal. The computer 140 monitors the angular position of the platform 129 via the encoder 138, and the software is such that when the platform approachs its desired position this is detected by the software and the motor 130 is then supplied with a creep signal to bring the platform 129 slowly to its desired angular position.

Finally, the comparator 216 monitors the condition of a back-up battery power supply and if it drops below a predetermined value a flag is set which causes the computer 140 to shut itself down.

Claims

1. An apparatus for receiving from a person photographic film to be processed and for dispensing such film after processing back to the person which includes
a data entering means for entering data;
a person identifying means for identifying the person;
a control means responsive to the data entering means and the person identifying means;
a receiving means, that is responsive to the control means, for receiving the unprocessed film;
a film housing unit which has a number of compartments in each of which a processed film may be housed;
a correlating means for correlating in which compartment the processed film of a particular person is housed; and
a displacing means, responsive to the control means and the correlating means, for displacing processed film of a particular person from the appropriate compartment to dispense the processed film to the person.

2. The apparatus claimed in Claim 1, in which the data entering means includes a keyboard.

3. The apparatus claimed in Claim 1, in which the person identifying means includes a card reading device for reading and identifying a series of alphanumeric symbols carried by a card, and the control means is responsive to the card reading device and the data entering

means to compare a series of symbols entered by the person via the data entering means and the series read by the card reading device to validate the identity of the person.

4. The apparatus claimed in Claim 1, in which the receiving means includes a receptacle that is externally accessible via a door that is responsive to the control means to be locked and unlocked thereby.

5. The apparatus claimed in Claim 1, which includes a labelling means responsive to the control means, for providing a label for a film to be processed specifying the identity of the person and how the film is to be processed.

6. The apparatus claimed in Claim 5, in which the labelling means includes a printing device for printing the identity of the person and processing instructions on a suitable element.

7. The apparatus claimed in Claim 1, in which the control means includes a central processing unit, a program storage means for storing a set of operating instructions and a data storage means.

8. The apparatus claimed in Claim 1, which includes a visual display unit responsive to the control means for displaying instructions to the person.

9. The apparatus claimed in Claim 1, in which the film housing unit has a plurality of groups of compartments, the compartments in each group being stacked one above the other and the groups being arranged in a circular manner such that they are circumferentially spaced about an axis and define a central hollow space, and the compartments are open at their radially inner and outer ends.

10. The apparatus claimed in Claim 9, in which the displacing means is located within the central space.

11. The apparatus claimed in Claim 10, in which the displacing means includes a displacing element, a radial moving means for moving the displacing element into and out of any compartment at its inner end to displace film therein out of its outer end; an axial moving means for moving the unit and the displacing element relative to one another in an axial direction; and an angular moving means for moving the unit and the displacing element relative to one another about the axis, such that the displacing element may be aligned with any desired compartment.

12. The apparatus claimed in Claim 11, which includes a collecting station from where the person may collect the processed film and a guide means for guiding film pushed out from a compartment by the displacing element to the collecting station.

13. The apparatus claimed in Claim 1, which includes a sensing means for sensing if there is an article within a particular comparment.

14. The apparatus claimed in Claim 11, which includes a code ascertaining means for ascertaining a code provided on a processed film representative of the compartment in which it should be and for determining if that film is in the correct compartment.

15. The apparatus claimed in Claim 14, in which the displacing element carries a scanning head that forms part of the ascertaining means.

16. An apparatus for vending and displacing articles, which includes

an annular storage arrangement having a plurality of groups of storage compartments, the groups being circumferentially spaced about an axis to define a central hollow space, with the compartments in each group being one above the other in an axial manner, and with each compartment extending radially and being open at its radially inner and outer ends; and

a displacing means, located within the central space, for displacing an article in any selected compartment radially out of the said compartment.

17. The apparatus claimed in Claim 16, in which the displacing means includes a displacing element; a radial moving means for moving the displacing element into and out of any compartment at its inner end to displace an article therein out of its outer end; an axial moving means for moving the storage arrangement and the displacing element relative to one another in an axial direction; and an angular moving means for moving the storage arrangement and the displacing element relative to one another about the axis, such that the displacing element may be aligned with any desired compartment.

18. An apparatus for dispensing selected articles which includes

an array of compartments;

a displacing means for displacing an article in a selected compartment out of that compartment;

a code ascertaining means for ascertaining a code provided on an article in a compartment that is representative of the compartment in which the article is to be stored and for determining if an article is in the correct compartment.

19. The apparatus as claimed in Claim 18, which includes a compartment address monitoring means for monitoring the address of any compartment with which the displacing means is aligned.

20. The apparatus claimed in Claim 19, in which the displacing means includes a displacing element; a moving means for moving the displacing element to any desired compartment and for moving the displacing element into and out of said desired com partment to push an article in said desired compartment out of it.

21. The apparatus claimed in Claim 20, in which the displacing element carries a scanning head.

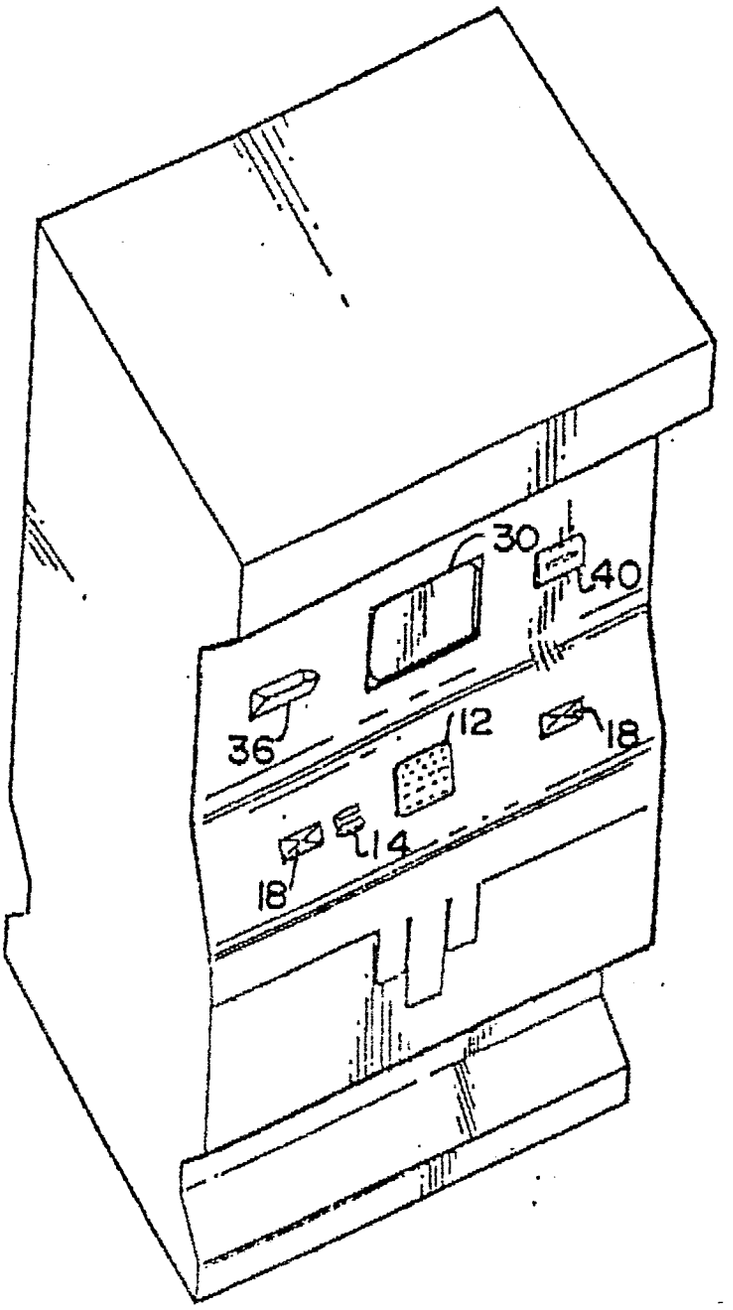


FIG 1

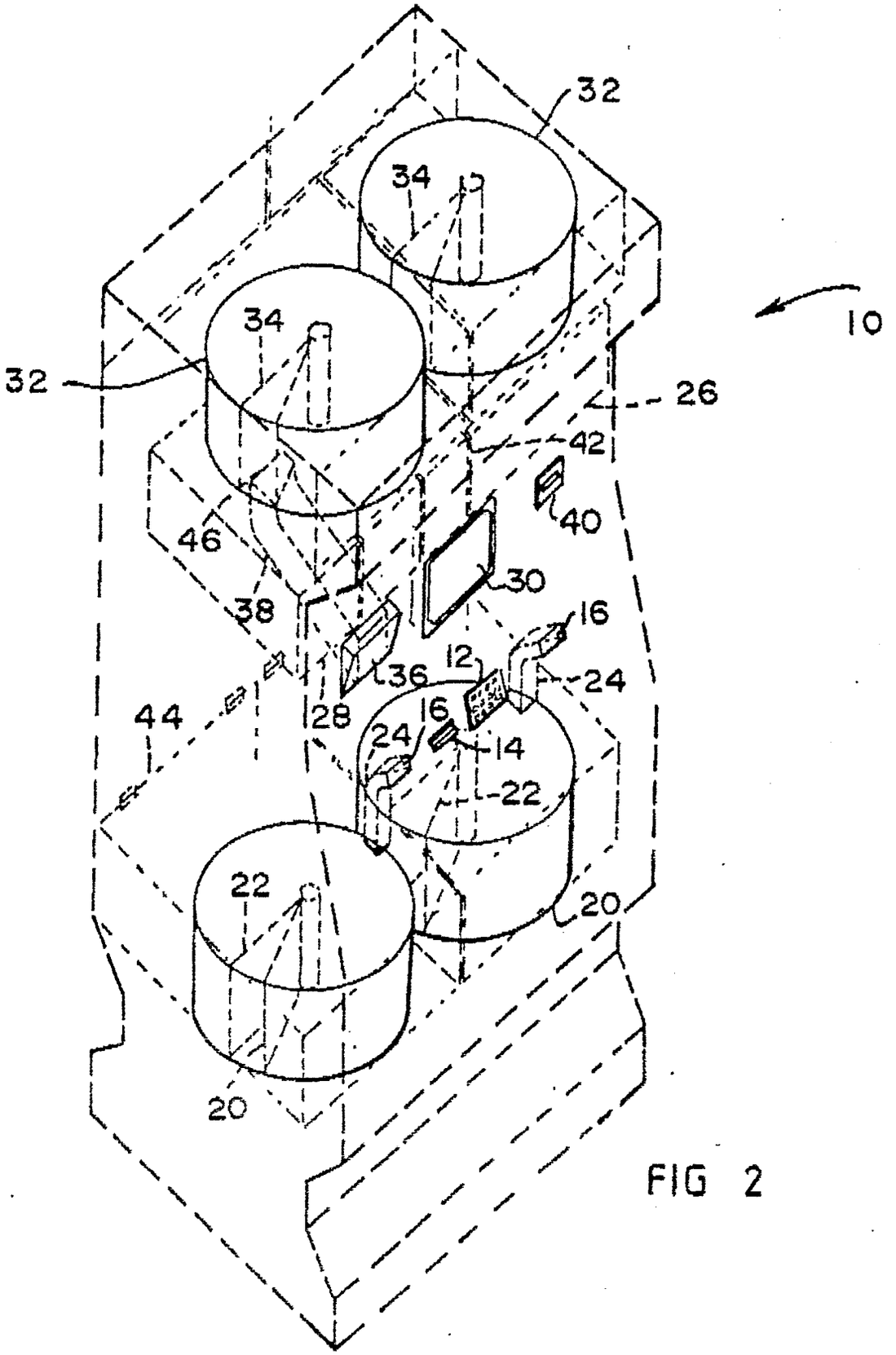
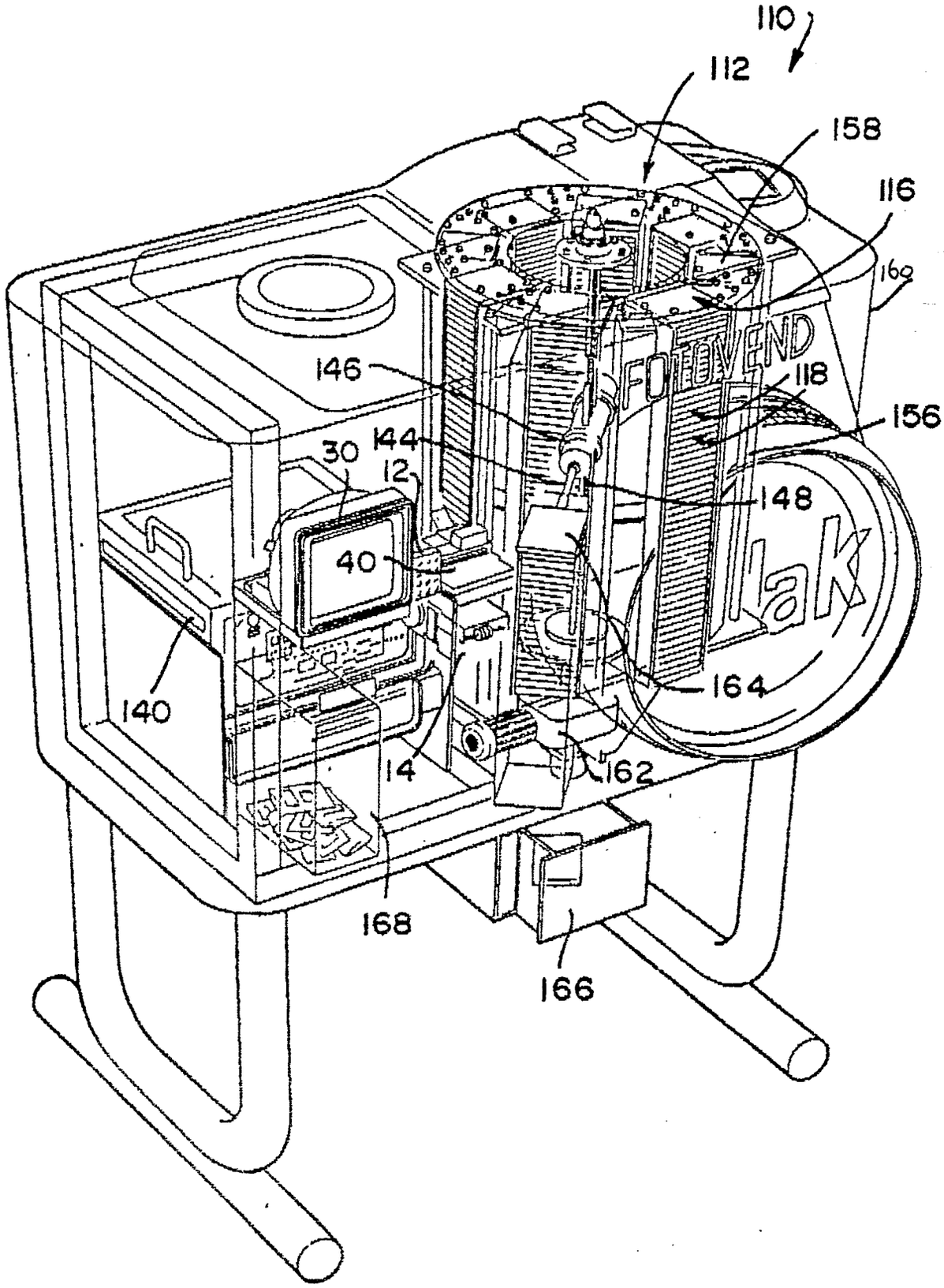


FIG 2


110
112
158
116
160
146
FOTOVEND
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156
30
144
12
148
40
140
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14
162
168
166

FIG. 3

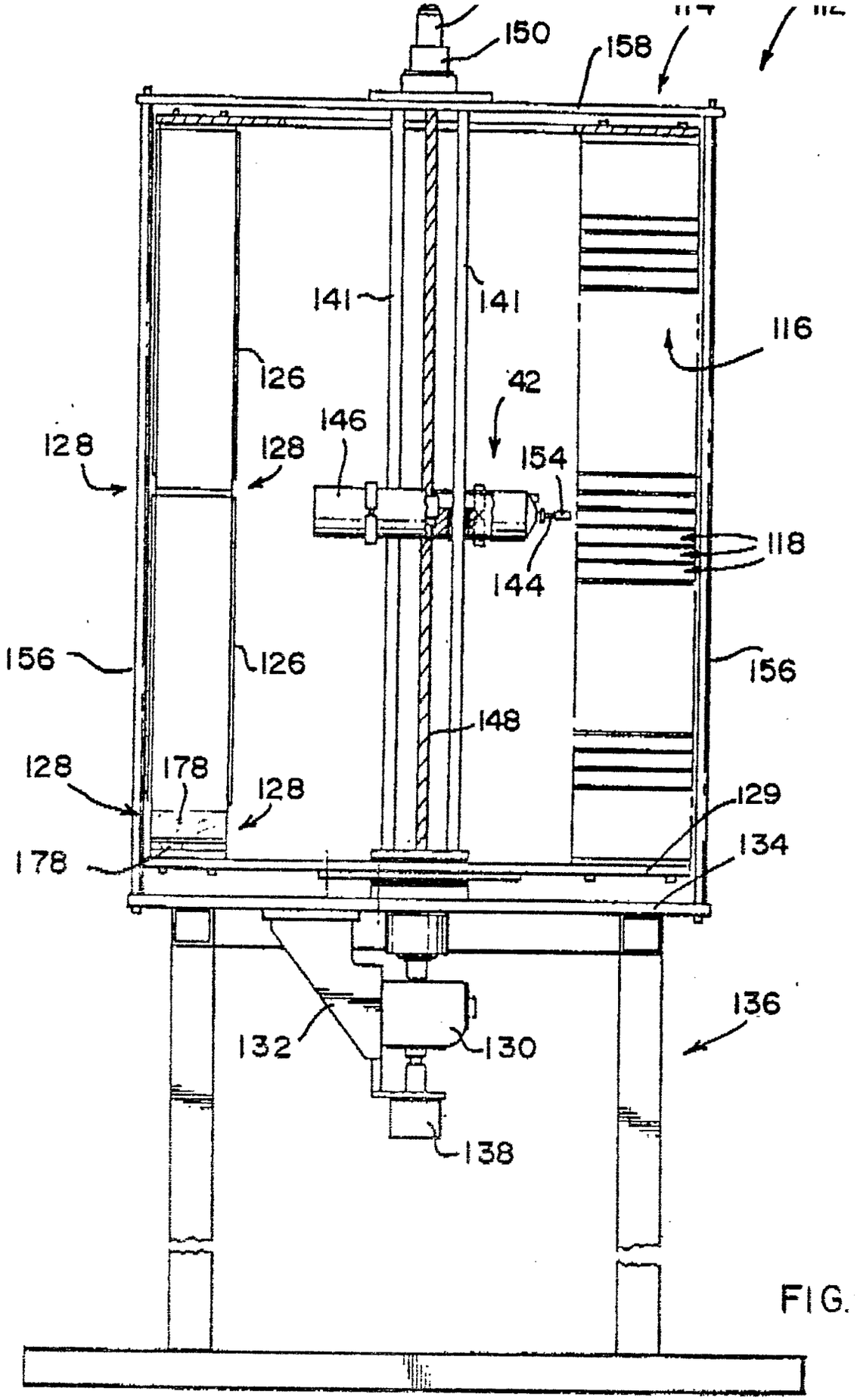
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FIG. 4

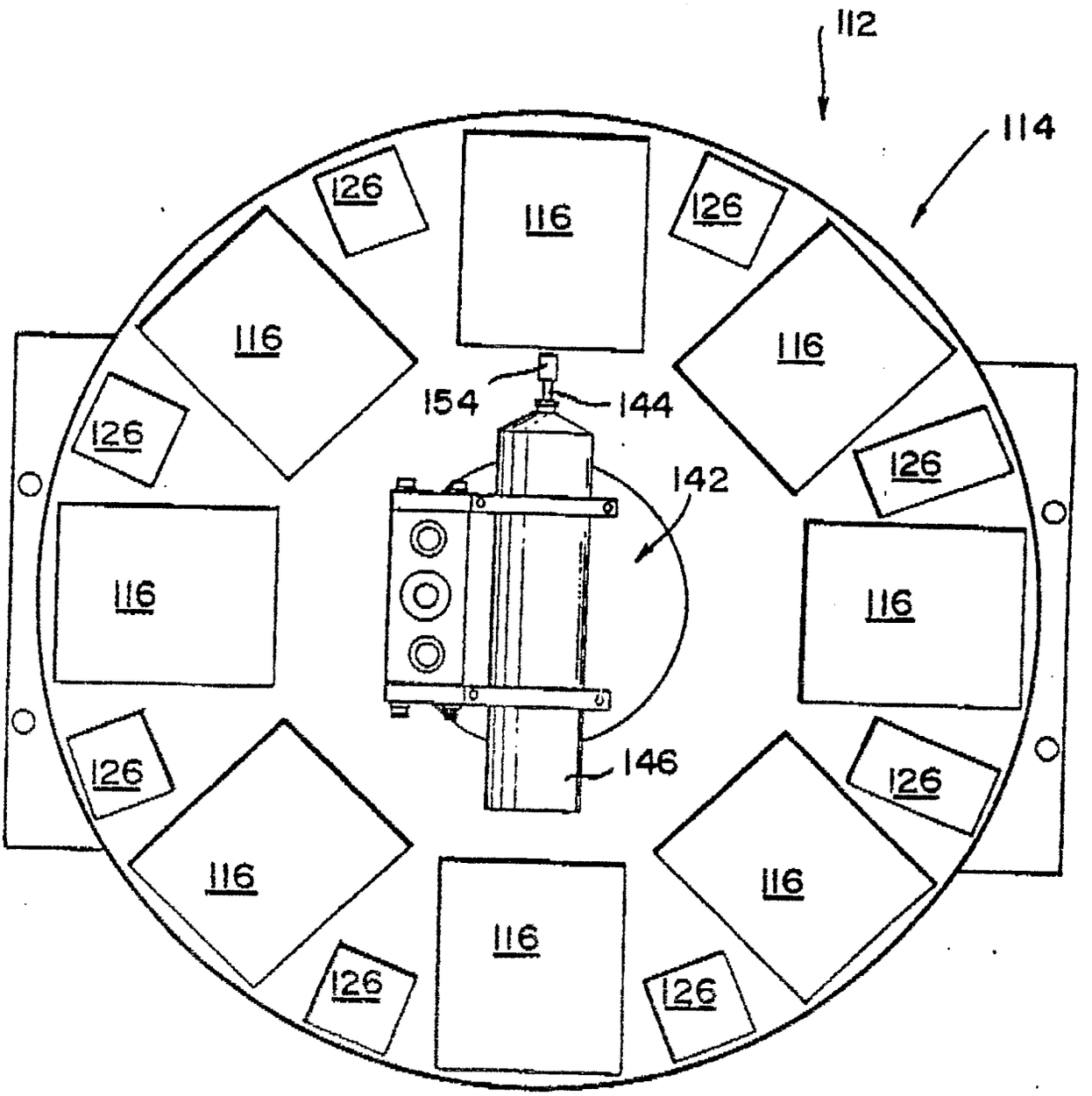

FIG. 5

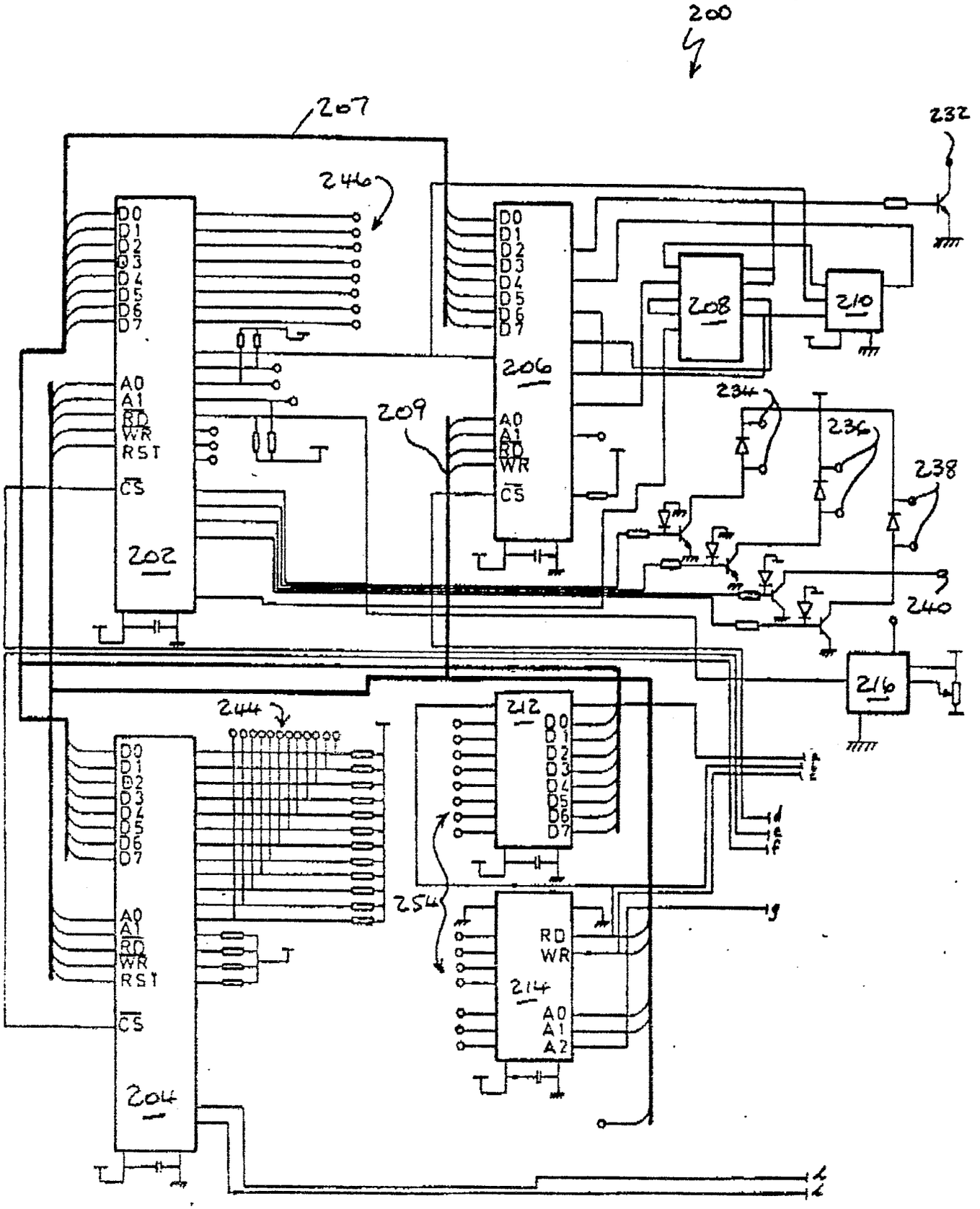
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FIG. 6A

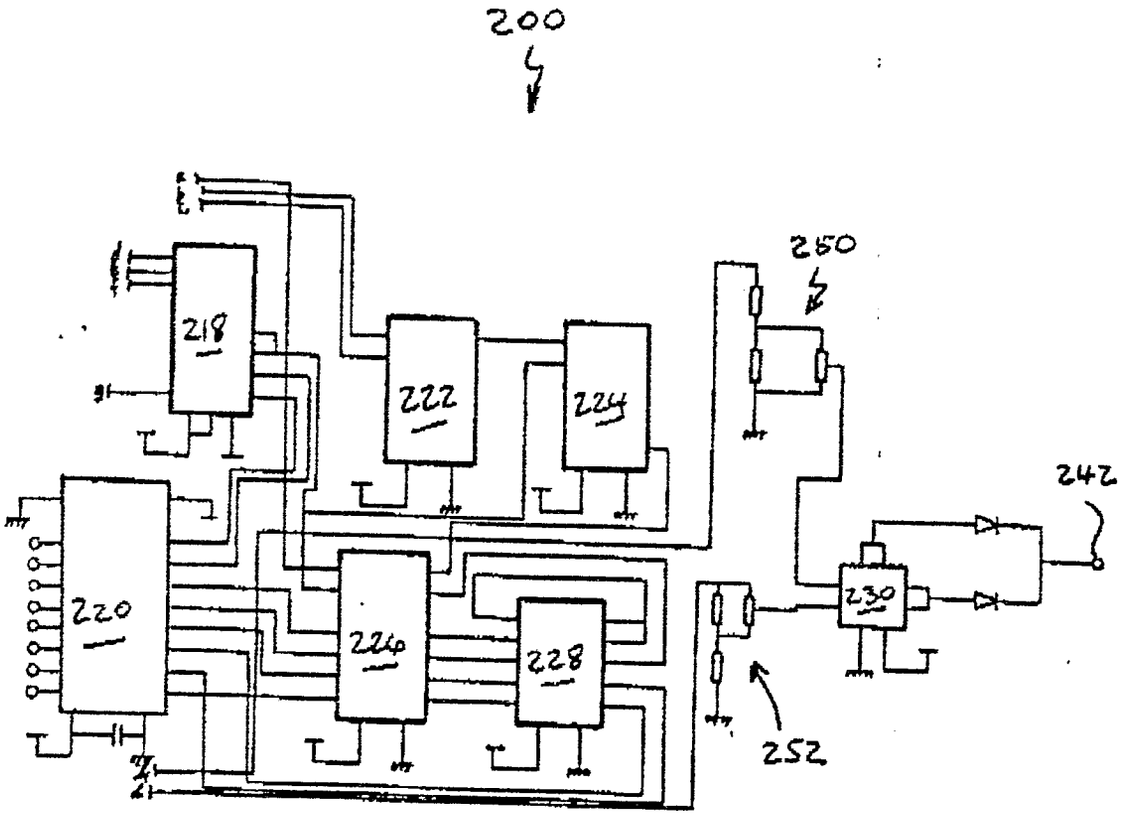

FIG. 6 B