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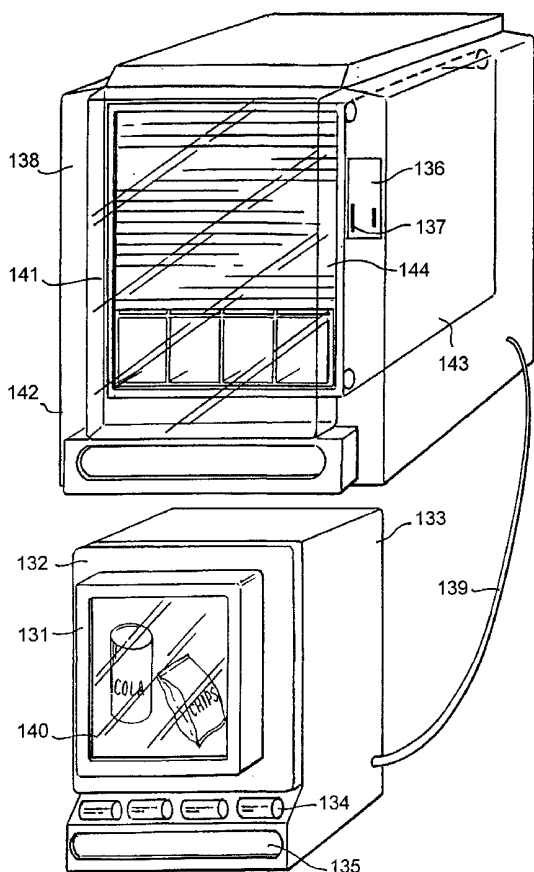
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(54) Title: CENTRALIZED VENDING METHOD USING CARTRIDGE-LOADED MACHINES



(57) Abstract: A vending machine (1) is housed in a light, yet sturdy enclosure (2) made of an external sheet metal shell (18) and an internal seamless plastic liner (22) between which a volume of expanded synthetic foam material is injected. One or more good-holding magazines (3, 77) are removably held within the enclosure. A keypad, alpha-numerical display and card reader are packaged in the door (4) closing the front of the enclosure. A driving motor module (61) and a coin acceptor (7) are removably mounted against the inside liner. Due to the absence of complex or delicate structure, the machine can be serviced, cleaned and sanitized within minutes. A pair of vending machine, one holding snack food, the other beverage can sare coupled to wrk together and dispense combinations of items from a single control panel. Both the beverage and snack food holding magazines are driven from the same type of motor module mounted inside the liner. The machines are used in connection with a centralized method for selling items through a plurality of such machines installed at various user's sites. The magazines are filled at the supply center and distributed along pre-established delivery routes. The servicing of each machine consists essentially of opening the machine, removing the previously installed magazine, substituting a new full magazine and securely locking the machine without any accounting of goods or currency or any other maintenance work.

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CENTRALIZED VENDING METHOD USING CARTRIDGE-LOADED MACHINE**Field of the Invention**

This invention relates to vending machines, and more specifically to the type of vending machines found on jobsites capable of distributing pastries, small snack items and beverages.

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Background of the Invention

Conventional vending machines for pastries, candy bars, soda cans and other snack products must be able to hold a substantial inventory of goods so that they do not need to be serviced too often. Accordingly, they tend to be bulky and heavy and occupy about a square meter (10 square feet) of floor space, with a height of almost 2 meters (72 inches).

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The reloading of such a machine is time consuming since items must be inserted one by one, and inventory of unsold items must be checked for expiration date, and, occasionally, replaced. Cash must then be collected and counted by the servicing person. The good-holding stations must be cleaned of all oil and grease that may have oozed out of the packaged goods. These cumbersome procedures are time-consuming, labor intensive, and sometimes give occasion for pilferage and theft.

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Conventional machines are not well-adapted to small job sites having 150 employees or less, because

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the profit generated at such a small site can not justify the labor cost of servicing the machines.

U.S. Patent No. 4,236,649 Fellner et al. offers a partial solution to the above-mentioned problems by the use of a removable and replaceable magazine for the goods which can be loaded in the factory then used to replace an empty magazine or partially empty one. However, this type of magazine is relatively inefficient since it can hold only one item of goods in each location. Moreover, the coins need still be collected and counted on site. The same type of shortcomings characterize the vending machine disclosed in U.S. Patent No. RE. 32,115 Lockwood et al. which uses a drum carousel to hold the goods to be sold. Although an empty carousel could be removed and replaced by a fully loaded one, each carousel station can only hold one item, and the cash must be handled separately. The inefficient designs of the above-devices inevitably leads to bulky vending machines which are not suitable for small locations.

The instant invention results from an attempt to palliate these various shortcomings.

Summary of the Invention

The principal and secondary objects of this invention are to substantially reduce the time and expense involved in the refilling and maintenance of

vending machines distributed at a plurality of locations over a given period, to reduce any losses due to pilferage of goods or theft of payment currency by maintenance personnel, and reduce the health hazard occasioned by spillage of beverage and food items within the vending machines.

These and other valuable objects are achieved by the use of compact vending machines in which all the dispensable goods are held within a removable and substitutable magazine. Sets of magazines are filled in a central location then delivered to a plurality of vending machines along a predetermined route. At each location, the servicing of the machine consists essentially in opening the machine, removing the previously installed magazine, installing a fresh new magazine, and securing the vending machine, in the absence of any other maintenance, counting or inventory-taking of remaining goods, item by item or counting of any collected currency. Payments are made through debit cards sold by the vending machine operators to owners of locations for distribution to their employees and customers. Payments can also be made by currency which, once deposited into the machine, are securely accumulated within the magazines and can only be retrieved at the central location with use of a special key. The selection of desired goods and payment therefor can also be made through wireless communication

with a cell-phone or other hand-carryable and hand-held device. At certain locations, combinations of beverage and snack food item vending machines work together to deliver specially advertised combinations obtainable at a discount price. Magazines returned to the central location are emptied of any unsold goods and collected currency, cleaned, sanitized and refilled with fresh goods before being assigned to a route for distribution to a new location.

The machine is opened by means of a memory chip-mounting card, also called "smart" card. Upon opening, the machine automatically down-loads" on the card, an account of all the sales that occurred since the last service call, including the amount of currency accumulated in the coin box. The card is returned along with the removed magazine to the distribution center where it is used to verify the integrity of the returned components and, thus, deters pilferage by the service personnel. The same "smart" card may be used to load into the machine the type, location and price of sellable goods contained in the new magazine.

Brief Description of the Drawing

Figure 1 is a front elevational view of a snack-food vending machine;

Figure 2 is a horizontal, median cross-sectional view thereof;

Figure 3 is a cross-sectional view taken along line 3-3 of Figure 1;

Figure 4 is an exploded perspective view of the magazine;

5 Figure 5 is a cross-sectional view of the beverage vending machine;

Figure 6 is a perspective view of a beverage can magazine;

Figure 7 is a side view of the gate mechanism;

10 Figure 8 is a block diagram of the electronic control system;

Figure 9 is a flow diagram of the machine operation;

15 Figure 10 is a perspective view of a multi-unit machine equipped with a scrolling display;

Figure 11 is a front elevational view of a first alternate embodiment of the vending machine according to the invention;

20 Figure 12 is a cross-sectional view taken along line 2-2 of Figure 11;

Figure 13 is a cross-sectional view of a dispensing channel equipped with a good-centering insert;

25 Figure 14 is a cross-sectional view of a can-dispensing mechanism;

Figure 15 is a top plan view of a gating plate;

Figures 16, 17 and 18 are cross-sectional views

taken along lines 6-6, 7-7, and 8-8 respectively of Figure 15;

Figure 19 is a detail cross-sectional view of a barrier mechanism;

5 Figure 20 is a cross-sectional view of an alternate version of the dispensing channel;

Figure 21 is a perspective view of a second alternate embodiment of a snack food dispensing machine;

10 Figure 22 is a side cross-sectional view thereof;

Figure 23 is a perspective view of the magazine;

Figure 24 is a detail view of the locking mechanism;

Figure 25 is a perspective view of a magazine;

15 Figure 26 is a perspective exploded view of the cartridge locking mechanism;

Figure 27 is a side view of a locking pin;

Figure 28 is perspective view of a drive motor coupling mechanism;

20 Figure 29 is a perspective view of a cartridge tray;

Figure 30 is a cross-sectional view of an alternate beverage can distributing cartridge;

25 Figure 31 is a cross-sectional view of an alternative gating plate and barrier drive mechanism;

Figure 32 is a top plan view thereof;

Figure 33 is a perspective view of an alternate

package-feeding mechanism;

Figure 34 is an exploded view of a machine dedicated to beverage cans, minus the cabinet;

Figure 35 is a side view of an alternate goods
5 dispensing mechanism;

Figure 36 is a side view of the mechanism during the gate-opening sequence;

Figure 37 is a side view of the mechanism during the gate-closing sequence;

Figure 38 is a cross-sectional view of the
10 pusher drive mechanism;

Figure 39 is a top plan view of the alternate dispensing mechanism;

Figure 40 is a detail view of the gate actuator;

Figure 41 is a side view of another embodiment
15 of the dispensing mechanism;

Figure 42 is a top plan view thereof;

Figure 43 is a bottom plan view thereof;

Figure 44 is a front elevational view of the
20 whole vending machine;

Figure 45 is a diagrammatical side view of the magazine and enclosure;

Figure 46 is a top plan view of an arcuate dispensing gate mechanism;

Figure 47 is a side view thereof;
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Figure 48 is a top plan view of an actuating cam;

Figure 49 is a top plan view of yet another dispensing gate mechanism;

Figure 50 is a side view thereof;

5 Figure 51 is a side view of a beverage can dispensing mechanism and auxiliary magazine;

Figure 52 is a front view of the magazine interlocking mechanism;

Figure 53 is top plan view of a magazine gate;

10 Figure 54 is a block diagram of the vending machine electronic control;

Figure 55 is a block diagram of the central processing facility's data processing system; and

Figure 56 is a block diagram of a magazine processing.

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Description of the Preferred Embodiment of the Invention

Referring now to the drawing, there is shown a compact, counter top vending machine 1 housed in a molded plastic and sheet metal cabinet 2. A substitutable, quadrangular magazine 3 is securely held into the cabinet behind the cabinet front door 4. The customer interface includes a message display 5, a keypad 6 upon which the selection of a desired goods can be made, a currency-acceptor 7, a card reader 8 and a dispensing pocket 9. The goods 10 and the numbers of the stations or cells 11 holding them can be observed through the transparent door of the cabinet.

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Each station or cell 11 can hold a plurality of goods having the same sale price. Each station is identified by a letter (A-C) and a number (1-6). In each station 11, a plurality of goods are held between the coils of a spiral rack 13. These goods may be of various configurations or sizes. When a spiral rack is rotated, it acts as an Archimedes screw, and shifts the goods toward the access port 14 along the front of the magazine. The magazine comprises three trays or layers 15 of good-holding station units. It should be understood that the number of stations in each unit and the number of units in a magazine can be varied to accommodate different sizes and varieties of goods. Typically, small goods such as candy bars can be loaded on a narrow cells such as the one shown on the right side of each tray. Large items such as pastries and potato chip packs that require a larger cell, can be loaded into stations such as the ones shown on the center and left side of each tray.

The lower, lateral corner of the magazine 3 rests upon shelf 16 formed inside the cabinet.

The cabinet 2 comprises an external shell 18 made of a first sheet 19 of metal bent to form the top and two opposite lateral walls, a second sheet 20 closing the back of the cabinet and a third sheet 21 forming the bottom.

A plastic liner 22 is nested within the shell 18

and through its open front. The shell and liner are joined about their respective flanged, peripheral frontal edges 23, 24. The liner defines a cavity closed by the door 4. The cavity is divided into a load compartment 26 which occupies its major portion, and the pocket or receptacle 9 that receives the delivered goods below the load compartment.

The shelf 16 that separates the load compartment and the pocket is supported by an angled plate 28 secured to the three sheets 19, 20, and 21 forming the shell.

A volume of expanded, insulating polyurethane resin foam material 17 is injected between the liner 22 and the shell, excluding the space 29 defined under the angled plate 28. Once solidified, the foam material combines with the shell and liner to form a strong, yet light box. The external shell can thus be made of relatively thin sheet material whether steel, aluminum or plastic, typically, 2 mm thick. Similarly, the thickness of the plastic liner can be limited to approximately 1.5 mm.

The structural components of the door 4 comprise a molded top piece 30, a molded bottom piece 31 and two extruded lateral pillars 32, 33 joining the top and bottom pieces. Those four components frame a transparent polycarbonate window panel 34. The door is hinged along the external edge of the left pillar 33 to the joined flanged left sides of the shell and liner

peripheral edges. The top and bottom pieces and the pillars are flanged along their external edges so that when the door meets the joined peripheral edges of the shell and liner, the vertical center portion of the door stands apart from the front edge of the cabinet. The space therebetween defines a chute 27 through which the selected goods fall toward the pocket 9. A resiliently compressible gasket 35 is secured to the edge of the door in order to provide a hermetic seal when the door is closed. A locking mechanism 36 with a keyhole 37 accessible at the top right edge of the molded top piece 30 is used to secure the door. Overlapping flanges 38, 39 along the peripheral edges of both the cabinet and the door prevent the introduction of a prying tool between those two components. Mounted behind the top door piece 30 is a fluorescent light fixture 40. Mounted against the back upper portion of the bottom door piece 31 is an electronic module 41 which includes the display 5, the keypad 6, the card reader 8 and the electronic control module 41 for the operation of the machine. An aperture 42 in the lower portion of the bottom piece provides access to the pocket 9 into which falls the purchased goods. The aperture is secured by a swinging door 43. When the door is pushed inwardly to gain access to the goods in the pocket, it prevents access to the chute 27 and any of the goods held in the cells of the magazine.

The currency acceptor 7 is mounted against the right wall of the liner 22. A two-section channel 44 acts as a coin slot from the right pillar 33 of the door to the inlet of the currency acceptor. A coin chute 45 connects the outlet of the currency acceptor to a coin receptor box 46 in the base 47 of the magazine.

As more specifically illustrated in Figures 3 and 4, the magazine comprises the base 47 three goods-holding trays 15, a cover 48 and a pair of locking straps 49 holding all those components together. The coin receptor box 46 which occupies the right portion of the base is closed by a lid 50 secured by a lock 51. In each station or cell 11 of the trays, the back end of the spiral rack 13 is connected to a short shaft that passes through the back wall 52 of the tray where it is supported by a bearing. The shaft has a female coupling 53 shaped and sized to be engaged by a corresponding male coupling 54 of a driving mechanism. When the spiral rack is rotated 360° by the drive mechanism, one of the goods 10 is selectively expelled from its cell and falls into the pocket 9 below. The cover 48 has a folding handle 55 in its center for conveniently carrying the magazine. The locking straps 49 are shaped and dimensioned to intimately cinch the other components of the magazine together. Their crooked left ends 56 lock into mating recesses 57 in the top of the cover 48. At the bottom ends of the straps, a similar hooked

end 58 locks into a similar recess in the base.

For each spiral rack, the driving mechanism consists of a motor assembly 60 including a control circuitry which allows the motor to make only one
5 revolution every time it is energized. A gang of six motor assemblies packaged in a sealed driving module 61 is mounted in recesses 62 in the liner's back wall behind each tray 15.

The wirings of the motor assembly in each
10 driving module are brought to a pigtail connector 63A that mates with a corresponding connector 63B on the main wiring harness 63 leading to the electronic control module 41 located in the cabinet door. The driving modules are held in place by snapping fasteners.
15 Accordingly, driving modules with different numbers of motor assemblies can be quickly substituted for one another to match the composition of the trays.

A detachable cover 12 is attached to the front of the magazine, in order to close all the access ports
20 14 during transportation to and from the central service facilities.

An electronic sensor 65 in the chute 27 detects the passage of the goods toward the distributing pocket. The output of the sensor is fed to the microprocessor 66
25 which constitutes the principal component of the electronic module 41. The microprocessor typically includes a storage memory or equivalent recording

medium. An infrared transceiver 68 provides access to the micro-processor data. This transceiver may be used by a service person to read useful information such as money paid, and goods sold using a wireless phone or any other type of hand-held downloading device well known to persons skilled in the art of data-processing, that can provide a communication interface with various types of devices and networks according to so-called "Bluetooth" technology.

10 The transceiver 68 can also respond to an order for goods and payment therefor from similar wireless communication devices.

15 It can now be understood that once a user has made a selection by dialing on the keypad 6 the identification of the station holding the desired type of goods, the good-extracting mechanism servicing that particular station can then be activated to cause the goods most frontally located on the spiral rack to fall through the chute 27 into the dispensing pocket 9.

20 As shown in Figures 8 and 9, the operation of the vending machine is controlled by the microprocessor 66. The motors are controlled by motor-control modules 69, and the address-decoder 70. The motor-control modules and the address decoder consist essentially of gated current drivers, that, under control of the microprocessor, feed the forward current to the two appropriate motor. A modem 71 provides the

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communication interface to the microprocessor via
conventional phone carrier services and/or via the
Internet. An LCD message display 72 which is part of
display 5 in the cabinet door is used to suggest to the
5 user an alternate selection when the selected items is
not available and to give other notices as will be
explained below. A power supply 73 is housed under the
angled plate 28. A wire harness 74 connecting the power
supply to the light 40 and to the electronic module 41
10 is the only component that passes through the liner 22.

As more specifically illustrated in Figure 9,
the operation of the machine begins when the currency-
acceptor detects that currency has been entered 101,
when a payment card has been inserted 102 or when an
15 alternate form of payment such as an electronic transfer
through the Internet, or out of a palm-held wireless
device has been detected. In case of payment by
currency, once the correct amount has been received 103,
the system waits for the user to dial his choice of
20 goods beginning with the letter corresponding to the
proper row. In the case of a payment by card, the
system first determines whether it is a credit card 104.
In that case, the card owner's identification is read
105, and a credit check is initiated 106 via the modem
25 71. If credit is refused, the user is so advised by
the display 108 of a rejection message. If the credit
card owner has sufficient credit, the system waits for

the user's selection. If the card is not a credit card, the system assumes that it is a debit, or so-called "smart card", and reads the card for the available balance 109. If the balance is not sufficient to pay for one of the offered goods, a rejection message is displayed 108. If that balance is sufficient to cover a purchase 110, the system waits for the user's selection.

Once the user has selected a row 111, that row identification is entered 112 into the microprocessor. The system then waits for the dialing of the appropriate column 113. When the column is dialed, its identification is entered into the processor 114. At that point, the corresponding motor is started 115 and, at the same time, a ten-second timer is also started 116. If the timer expires 117 before the electronic sensor 65 detects the passage of goods into the dispensing pocket, the motor is stopped 118 and a message suggesting an alternate selection 119 is displayed. A twenty second timer is also started 120. If that timer runs out 121 before a new row letter is dialed by the user, the magnetic card or the currency which has been introduced into the machine, is rejected 122. If a row letter is dialed before the expiration of the timer 123, the system proceeds with the entering of the row identification 112; then the column identification 114 as previously described. If the electronic sensor 65 detects the passage of the goods

124 before the ten-second timer runs out, the motor is
stopped 125. In the event of payment by currency 126,
the currency is accepted 127 and dropped into the
currency receptacle 46. In case of payment by credit
5 card 128, the charge is confirmed to the bank 129 via
the modem 71. In case of payment by "smart card", the
card is debited 130 by the price of the goods.

The modem 71 can be used to communicate via the
Internet with a warehouse or other type of control
10 center in order to provide information about the status
of the vending machine such as the amount of goods
already sold, proceeds received including the exact
amount of currency which is now stored in the currency
receptacle 46. The microprocessor is programmed
15 according to well-known techniques to initiate that kind
of communication at preset intervals or specific times
through a conventional phone network or via the
Internet. The machine activities and sale data that is
compiled by, and stored by the microprocessor can be
20 down-loaded on site by the service personnel on a
recording medium, such as a smart-card, that is returned
to the central location along with the expanded
magazine. Alternately, the microprocessor can respond
to polling calls initiated from the control center.
25 From the information thus received at the control
center, the most appropriate time when servicing
personnel should be dispatched to exchange the magazine

of the machine can be determined. Moreover, the amount of money held in the currency receptacle, as well as the amount of goods remaining in the magazine are already known and can be verified upon receipt of the magazine.

5 Any tampering or pilfering by the service personnel can thus be abated.

The preferred embodiment of the vending machine has a total height of 85 centimeters (33.5 inches), a total width of 72.5 centimeters (28.5 inches), and a

10 total depth of 57 centimeters (22.5 inches), and an approximate weight of 34 kilograms (75 pounds), including an empty magazine. Such a vending machine can be easily transported and installed on a table or counter top where it occupies no more than 0.5 square

15 meters (5.4 square feet).

The previously described vending machine 1 intended to dispense a variety of snack foods can be advantageously combined with a similar machine 75 intended to dispense beverage cans, more specifically

20 illustrated in Figures 5-7. The beverage dispensing machine uses a cabinet 76 which is essentially similar to the one of the snack-vending machine. There is no currency acceptor, but four side-by-side can magazines

77. Each magazine is driven by only one motor assembly

25 60. Accordingly, there is only one motor-driving module 61 mounted against the load compartment section of the liner 22.

In each of the four magazines 77 up to twenty-four 355 ml (12 ounces) 12 ounce beverage cans are laid down one behind the other in a serpentine pattern forming a zig-zagging channel of a single cell 78. The channel has five directionally alternating sections whose slanted, product-supporting floors urge the can to roll toward a dispensing gate mechanism 80. Beyond the gate, an opening 81 in the bottom of the magazine allows the dispensed can to drop into the dispensing pocket 9.

The gate mechanism 80 comprises a horizontal shaft 82 joined to a coupling 83 in a lower section of the magazine back wall. This coupling is similar to the one used in connection with the spiral rack shaft of the first machine and is shaped and dimensioned to engage a corresponding coupling of one of the motor assemblies 60. At the opposite end of the shaft, a first fan-shaped barrier is perpendicularly mounted on one side of the shaft so that when the shaft is rotated, this first barrier rises radially across the path of the lowermost can 85 in the channel. A second fan-shaped gate 86 is mounted on the opposite side of the shaft 82 and in a radial direction opposite that of the first barrier 84, and at an axial distance corresponding approximately to the diameter of the can. Accordingly, when the first barrier is lowered by a 180° rotation of the shaft 82, the second barrier rises between the first can 85 and the second can 87 positioned immediately behind it. As

the first can rolls out of the magazine through the opening 81, the second can is held back by the second barrier 86 until the shaft completes a full rotation. At which time, the second barrier 86 is lowered below the slanted floor 79. The second can 87 rolls down until it is stopped and held by the now raised first barrier 84. Under the pull of gravity, all the remaining cans in the magazine roll down one position along the entire serpentine channel. The mechanism is now ready for expelling the second can. The beverage can dispensing machine 75 includes a refrigerating assembly comprising a compressor 88 mounted under the angled plate 28, a cooling coil 89 mounted against and above the ceiling portion 90 of the liner, and a condenser 91 mounted against the inner side of the back sheet 20.

A power supply 73 is housed under the angled plate 28 next to the condenser. It should be noted that the same cooling assembly can conveniently be provided in the snack-vending machine 1.

It should also be noted that except for the passageway for the harness 74, the liner 22 forms a seamless, hole-free wall surface. The harness passageway is automatically sealed when the insulating foam material is injected. Accordingly, the inside of the load compartment and pocket can conveniently be cleaned and and sanitized with strong detergents or a

germicidal solution. The absence of any metallic component or sensitive mechanism greatly expedites maintenance of the machines, and enhances their reliability. If necessary, during cleaning and sanitization, the driving module 61 and the currency receptor 7 can conveniently be pulled out and disconnected from the harness 74.

The use and profitability of the vending machine can be substantially increased by combining it with a programmable scrolling display of the type disclosed in U.S. Patent No. 5,493,802 Simson, which patent is hereby incorporated in this specification by this reference.

As illustrated in Figure 5, a scrolling display 131 is preferably incorporated into the door of an auxiliary vending machine unit 75 that dispenses only beverages. The beverage-dispensing machine does not require a transparent door to view the various available items. The type of available beverages can be indicated on a pictorial sign 132 located above the distribution pocket 9.

The selection of the beverage and payment therefor is done on the keypad 6 and by using the card reader 8 or currency acceptor of principal machine 1. A simple umbilical cable 133 connects the two machines. A wide variety of enticing messages can be carried on the scroll 134 of the display. The messages on the scroll are exposed for several seconds per frame in a

continuous mode of operation. Some messages may tout special packages combining a food item from the principal machine with a drink from the auxiliary machine at a reduced price. The display can also be programmed to match the message with the time of the day. Sandwiches and puddings may be emphasized around lunch or dinner time while candies and cookies are promoted during coffee breaks. The operation of the scrolling display is controlled by the microprocessor 66 operating under well-known programming routines. Entry of program commands can be made through the card reader 8, via the modem 71, through wireless communication, or by means of the servicing person's "smart card".

An alternate embodiment 201 of the invention illustrated in Figures 11-18 also features a merchandise and currency cartridge 202 which is removable from the enclosure cabinet 203. The cabinet, preferably made of molded plastic, includes a transparent front door 204 secured to the cabinet by a top horizontal hinge 205 and a bottom lock 206. The cartridge 202 is mounted on a pair of slides 207 secured to the lower section of the cabinet.

With the transparent door 204 open, the magazine can be pulled out and lifted from its supporting slides.

On a front right section of the cabinet is a keypad 208 upon which the user can dial his selection, a card slot 209 for accepting payment by bank card or

enter and down-load data on a so-called "smart card",
and a coin slot 210 for accepting cash payments. A
large opening 211 in the lower section of the door leads
to a dispensing pocket 212 into which purchased items
5 are dropped. In the lower back section of the cabinet
is a refrigerating unit comprising a compressor 213 and
a condenser 214. Attached to a backboard 215 is a
electronic module 216 and a series of motor assemblies
217. A light 219 mounted in the door 24 illuminates the
10 entire machine. The cartridge comprises three or more
merchandise-holding trays 219, 220 and 221, and a
triangle-shaped currency receptacle 222. The currency
receptacle forms the base of the cartridge and its lower
lateral ledges rest upon the slides 207. The trays are
15 stacked upon one another and upon the slanted top of the
currency receptacle. The trays have downwardly slanted
floors and tapering front faces 224 which are vertically
aligned exposing a marginal front section of their
underside which forms the dispensing openings 225 for
20 the stored merchandise. The trays have approximately
the same width. Accordingly, and due to their slanted
orientation, a back section 226 of each tray's underside
is also exposed. A cover 223 is used to seal the upper
tray 219. The cover, the trays and the currency
25 receptacle are secured together by screws engaged in
sets of lugs 227 along their respective lateral edges.

A cartridge may combine trays configured to hold

different types and sizes of goods. For the sake of illustration, the preferred embodiment is shown having a top tray 219 configured to hold small items such as candy bars and cookie packages. The intermediary tray 220 is configured to hold bags of snack foods such as chips or pretzels. The bottom tray 221 is configured to hold standard 355 ml (12 ounces) beverage cans. Each tray is divided into four or eight rows, each row is equipped with its own dispensing mechanism. Typically, a 60 centimeters (24 inches) wide cartridge can accommodate four rows of beverage cans or snack food packages, and eight rows of candies or cookies. Each row in the beverage can holding tray 221 comprises two layers of cans fed to the same dispensing gate. It should be noted that the number of layers of cans can be increased as shown in Figure 30, and that an entire cartridge devoted uniquely to beverages could comprise a single tray divided into four rows. As shown in Figure 13, a row initially configured for large snack food bags, can be modified by addition of an insert 231 to accommodate smaller items 232.

A sliding gate member 233 lining the bottom of each row has a front section that closes the dispensing opening 225. At the opposite end of the gate member, a toothed rack 234 is engaged by a pinion or gear 235 driven by an external electrical motor 236. A gang of motors, one for each row, is mounted on the motor

assembly 217 secured to the backboard 215. Accordingly, each tray requires a motor assembly board. If the tray configuration within the cartridge is changed, the arrangement of the motor assembly in the back of the cabinet must be reconfigured accordingly. As shown on Figure 28, when a cartridge is pushed into place in the cabinet, a flat key element 237 mounted at the end of the shaft 238 which drives the pinion 235 engages into a slot 239 cut into a head 240 capping the motor shaft 241. The motor can then be energized to drive the gear in either direction to open or close the dispensing opening 225.

As will be explained below, when the cartridge is being transported, all the dispensing openings are closed. Accordingly, the keys 237 can be oriented to always face the slot 239 in the motor shaft head 240.

In each tray, the goods are laid against the back of the front face 224 and are kept in this position by a triangular pushing block 242 inserted against the back face of the last item in a row. As the goods are dispensed one by one, the blocks keep sliding along with the remaining goods toward the front face 224 and the dispensing opening 225.

The pushing block is not necessary in connection with smoothly or roundly-shaped good which can slide toward the dispensing gate in the absence of any applied downward force other than gravity.

To make certain that no more than one item is dispensed with every movement of the gate member 233, a barrier 243 rises between the item being dispensed and the one next in line in synchronization with the backward movement of the sliding gate member 233. The barrier passes through a quadrangular window 245 cut into the forward end section of the sliding gate member 233.

In the beverage can tray 221, the barrier is constituted by a nylon plate 246 creased along three parallel lines to form three hinges 247, 248 and 249 articulating two rising panels 250 and 251 forming the barrier 243. The forward end 252 of the barrier is secured into the forward end of the window 245. The back end 253 is connected to a trapezoidal nylon pushbar 254 running within a similarly-shaped channel 255 along the length of the gating member 233. The back end of the pushbar is shaped into a toothed rack 255 which also engages the pinion or gear 235 in a diametrically opposed position to the rack 234 of the gate member itself. Accordingly, it be understood that when the gate member 233 is withdrawn toward the back of the tray to open the dispensing opening 225, the pushbar 254 moves in the opposite direction to cause the barrier to rise.

As illustrated in Figure 20, in order to prevent the heavy weight of the cans 256 from bearing upon the

gate member 233 and impeding its movement, the gate member is nested in a depression 257 in the center of the channel floor 258. The edges of the can thus ride on the remaining shoulders 259 on the lateral edges of the channel.

The second alternate embodiment 260 of a snack food distributing machine illustrated in Figures 21-24, is basically similar to the first embodiment 1 illustrated in Figures 1-9. However, the magazine 3 is secured by a guillotine-type cover plate 261 that can be removed through a slot 262 in the roof of the cabinet 2. A pair of notches 263 cut in the right edge of the cover plate are normally engaged by the bolts of two locks 264. The locks can be opened with the use of a special key kept at the central location where magazines are processed. The locks are activated by use of a smart-card. The card carries an identification number including the current date. The machine microprocessor maintains its own calendar. When the identification number and date read from the smart-card matches the ones stored into the microprocessor, the locks are activated. A lost or stolen card can only be used for the remainder of the day without becoming obsolete. The smart-card must be updated daily through special equipment at the central processing location. Each lock 264 comprises two interlocking modules. The first module 265A is mounted against the outer wall of the

magazine 3 next to a cover-plate holding channel 263A. A second module 265B is mounted against the inside wall of the cabinet 2, and interconnects with the first module when the magazine is inserted into the cabinet. Each module includes a spring-biased bolt 266A, 266B that can only be retracted under the pull of a solenoid. The bolts of the first module engage the cover-plate notches 263. The bolts of the second module engage mortises in the edge of the door 4. The cover-plate 261 cannot be removed when the door is opened. The door cannot be opened if the cover-plate is not locked into place on the magazine. The door cannot be locked if there is no magazine in the cabinet. These conditions can be easily implemented by use of contact sensors and simple logic circuits.

In the embodiment 201 of Figures 11-18, in order to lock all the gating members 233 in their most forward position where they close the dispensing openings 225, a locking mechanism is provided in each tray as illustrated in Figures 25-29. The locking mechanism comprises a locking bar 267 which runs along the back lower corner of each tray, and has a series of lugs 268 positioned to slide behind the back end of each rack 234 in the locked position. In the unlocked position, the lugs can be moved to fall within the gap 269 left behind the pinion 235. The left end of the bar passes through the tray wall and into a lock 270 mounted against the

lower back corner of the left face of the tray. The lock comprises an excentric cam 271 engaged into a circular bore 272 at the end of the bar 267. On the front end of the lock, a lever 273 can be actuated by the service personnel. The back end of the lock comprises a tumbler assembly which is configured and aligned to be engaged by a key 275, permanently secured to the backboard 215 of the cabinet, when the cartridge is fully installed into the cabinet. The tumbler assembly 274 prevents the lever 273 from being manipulated if the key 275 is not engaged. Moreover, in order to separate the tumbler assembly from the key, the mechanism must be put in the locked position. It can now be understood that when the cartridge is out of the cabinet all the dispensing openings 225 are closed and the levers 273 cannot be manipulated without the use of a key similar to the one installed into the machine. Once the cartridge is installed into the machine and the locking mechanism has been released by manipulation of the levers 273, the dispensing openings can only be opened by operation of the driving motors 236.

The coins fed into the coin slot 210 are led through a chute to a small aperture in the back of the currency receptacle 222. A sliding gate controlled by the same type of locking mechanism that secures the trays, closes that aperture when the mechanism lever is manipulated to release the cartridge. Accordingly, when

the cartridge is out of the magazine, the coin receptacle cannot be accessed through that aperture.

A locked door 277 is provided for emptying the currency receptacle at a service center. An alternate embodiment 278 of the gate member and barrier driving mechanism is illustrated in Figures 31 and 32 uses a threaded rod 279 driven by an in-line motor 280 instead of a rack-and-pinion assembly. The rod 279 engages a square nut 281 captured by a cavity in the gate member 233. The distal end 282 of the rod engages a bore in the back edge of the barrier 243. When the motor is turned in one direction, the progress of the rod through the square nut draws the gate member away from the dispensing opening, at the same time pushing against the back side of the barrier.

In the alternate embodiment of the feeding mechanism illustrated in Figure 33, the goods are held in separate packs 284 suspended to a rotating threaded rack 285 through pierced tabs 286. The aperture in each tab is axially and slidingly engaged upon the threaded rack 285 so as to move toward the dispensing opening when the rack is rotated. The rack is driven by the same motor that controls the gate member 233. Thus, the goods can be precisely delivered and dropped right above the dispensing opening in synchronization with the movement of the gate member.

The beverage can dispensing machine 287

illustrated in Figures 30 and 34 uses a series of side-by-side mounted can cartridges 288 each constituting a slight variation from the one illustrated in Figures 6 and 7. Each cartridge has a plurality of rows feeding the single dispensing opening as shown in Figure 30.

Each cartridge seats on a pair of slated support rails 289 and a front bar 290. The front bar mounts a series of pin keys that cooperate with lock assemblies 292 in the bases of the cartridges to secure the cartridge within the cabinet. A similar locking mechanism 293 is provided for the coin receptacle 294. Loading of the cartridges can be done through the dispensing opening or through a removable panel in either the top, side, or back wall. The slant of the rows in the beverage tray or cartridge is preferably between 10° and 20° from the horizon.

In snack food packages or candy bar rows, the slant is preferably between 20° and 30°.

A 60 cm (24 inches) wide, 75 cm (30 inches) high and 55 cm (22 inches) deep magazine can accommodate approximately 96 candy bars, 32 chip bags and 72 cans.

A 15 cm (6 inches) wide, 60 cm (24 inches) tall and 55 cm (22 inches) deep cartridge can hold 32 cans, for a total machine capacity of 128 cans.

Illustrated in Figures 35-40, is an alternate design for the dispensing control which does not rely on gravity to move the items toward the gate. It uses

instead, a pushing mechanism synchronized with the gate opening.

In the dispensing mechanism 300 a folding gate 301 is mounted across the dispensing slot 302, and is driven by a backboard-mounted motor 303 by means of a spline and threaded rod assembly. The forward end of the folding gate 301 is secured to a threaded spline 304 having its opposite end engaged in a threaded sleeve 305. The opposite end of the sleeve is fixedly attached to the end of a threaded rod 306 driven by the motor 303. Thus, when the motor is activated the folding gate 301 is withdrawn, forming a barrier between the item 307 first in line to be dispensed and the next one 308 as illustrated in Figure 37. The items to be dispensed are aligned and pressed against the front face of the dispensing channel by a pusher plate 310 which has a driving mechanism 311 riding in a longitudinal slot 312 in the floor 313 of the channel. This driving mechanism comprises a U-shaped bracket 314 having its ends engaged by the threaded rod 306. Captured between the legs of the bracket are a square nut 315 and a coil spring 316 both also engaged by the threaded rod 306. A spring leaf plate 317 allows the nut to follow the rotational movement of the rod 306 during clockwise rotation of the rod, but causes the nut to progress toward the distal end of the rod opposite the motor 303 when the motor direction is reversed to close the dispensing gate 301.

This movement of the square nut 315 apply pressure through the spring 316 against the distal end of the bracket 314 causing the pusher plate 310 to shift the items toward the dispensing slot as illustrated in Figure 37. The coil spring 316 against which the nut pushes, is provided to accommodate small differences in the sizes of the items and to avoid crunching goods such as potato chips under the action of the pusher plate 310. Accordingly, the pushing movements occurs only after one item has been dispensed and the next in line must be positioned over the folding gate 301.

It should be noted that by changing the position of the hinge on the folding gate and barrier, items of a different thickness can be quickly accommodated. Alternately, a transparent insert can be applied against the back side of the front face to reduce the width of the dispensing slot. Since the folding gate has a very light duty cycle and is not subject to any particular stress, it can conveniently be implemented with a nylon or other synthetic sheet of material that has been appropriately creased to form the hinge. The attachment of the gate elements to the spline and to the floor of the channel can be accomplished by simple snapping nib-and-cavity mechanisms. Accordingly, the gate barrier can be quickly replaced for adjustment to a new height and size or to replace it in case of excessive wear. Since the customer cannot reach the dispensing slot, it

is not necessary that the folding gate span the full width of the dispensing slot. Closing the central third of the slot may be sufficient. All the moving components of the system can conveniently be made out of nylon or similar self-lubricating and rust-proof material.

In another alternate embodiment 401 of the vending machine illustrated in Figures 41-45, the driving power for the good-dispensing mechanism is provided by the user's opening of one of the pocket-doors 402 at the front of each good-holding station.

Each pocket-door has an inwardly curved bottom section 403 forming a trough which holds the item to be dispensed. The pocket-door is rotatively held by lateral bearings 404 about the horizontal axis of its curved section 403. When the pocket-door is pulled open by way of the handle 405, the tail-end of the curved section rises between the item 406 in the pocket and the next one 407 in line to be dispensed as shown in dotted line in Figure 41. At the same time, a barrier flap 408 actioned by a lever 409 coupled to the curved section 403 rotates downwardly. The barrier flap combines with the curved section 403 of the pocket-door to prevent access to the good remaining in the station.

A push-plate 410 behind the last item 411 in the station is advanced toward the pocket-door with every closing movement of the latter. The pocket-door is

biased toward the closed position by a pair of springs
412. The push-plate has a nib 413 which projects
downwardly through a slot 414 in the floor of the
station, and is secured to a pair of continuous driving
5 belts 415. The belts are driven by a ratchet gear
mechanism 416 coupled to a toothed part 417 in the
undersurface of the curved section 403 of the pocket-
door.

The pocket-door is locked shut by a solenoid-
10 controlled bolt 418 engaging a second toothed section
419 also in the bottom surface of the pocket-door. When
the solenoid is de-energized, the bolt 418 is pushed
toward the pocket-door by a coil spring 420, and into
engagement with the second tooth section 419; thus,
15 preventing the door from being opened.

In order to accommodate variations in the
thickness of the items, the driving belt 416 is
preferably given a certain amount of elasticity.
Alternately, some resilient slippage may be allowed
20 between the belt and the nib 413 of the push-plate. If
the station floor is slanted downward toward the pocket-
door, as was taught in connection with some of the
earlier described embodiments of the machine, the push-
plate and its driving mechanism may not be necessary.

25 The pivot-pins 421 for the barrier flap and the
pocket-door bearing 403 are secured to the front frame
422 of the station.

The removable and substitutable magazine 423 comprises the stations and their pocket-doors. The magazine front 424 which consists essentially of the pocket-doors and their mechanism is detachable along a line 425 from the rest of the magazine to allow serving and reloading at the supply center.

The currency receptacle 426 is located between the floor 427 of the lowest most station and the floor 428 of the magazine. The card reader 429 and the key pad 430 are mounted on the side of the machine enclosure.

Yet another embodiment of a dispensing gate mechanism 431 is illustrated in Figures 46-48. This mechanism is particularly adapted for dispensing irregularly shaped articles such as bags of chips. It could also be used for dispensing beverage cans. The moving gate 432 is arcuate and forms a trough having a quarter-round bottom 433. The gate is rotatably suspended on each side by a pair of pins 434 mounted on a pair of brackets 435. The bases of the brackets are secured to the lateral edges of a plate 436 that forms the bottom of a goods-holding channel. The plate slides in its longitudinal direction under the action of a rotating cam 437 activated by a motor 438. A pair of arms 439 projecting vertically from the top of the lateral walls of the arcuate gate 432 come in contact with two stationary posts 440 and 441 mounted astride

the arm. When contacting either one of the two posts, the arms 439 act as levers that cause the gate to swing around its supporting pins 434 about an axis perpendicular to the downward slant of the plate 436.

5 As illustrated in Figure 47, when under the action of the cam 437, the plate 436 is fully withdrawn, the gate 432 swings inwardly, opening the dispensing slot 442. It should be noted that the width of the dispensing slot
10 is the sum of the quarter-round chord of the gate plus the amount of translation of the plate 436. Accordingly, a gate having a radius of 2.5 centimeters (1 inch) when combined with a plate movement of 1.25 centimeters (.5 inch) can yield a total dispensing slot
15 opening of about 5 centimeters (2 inches). It should also be noted that the trailing edge 443 of the arcuate gate rises above the forward edge of the floor plate 436 to form a barrier that prevents the movement of the item next in line to be dispensed toward the dispensing slot
20 442. When the plate 436 is slid forward, the arcuate gate assumes the closed position illustrated in dotted line in Figure 47 wherein the trailing edge 443 of the gate meets the forward edge of the floor plate. As more particularly shown in Figure 46, the interface between
25 the back section 443 and the gate and the forward edge of the plate 436 form a series of intermeshing crenels 444, and 445. This configuration prevents pinching the bottom of some of the items to be dispensed between the

gate and the plate.

Another embodiment of the dispensing gate particularly adapted for dispensing beverage cans is illustrated in Figures 49 and 50. In this case, the gate is formed by a trapdoor 446 that drops under its own weight away from a resting stop 447 when the sliding plate 448 is withdrawn by as little as .625 centimeters (.24 inch). The trapdoor gate 446 is hinged to the end of the sliding plate 448 by a pin 449 located approximately 1.25 centimeter (1.5 inch) from the rear edge of the trapdoor gate 446. Accordingly, the back end 450 of the gate forms a barrier to prevent the passage of the next to be dispensed can 451 when the gate is down. A pair of horizontal posts 452 fixedly secured to the lateral wall of the good-holding channel come in contact with the upper surface of the rear section of the gate 450 when the sliding plate 448 is moved forward, causing the dispensing gate to rotate upwardly and close the dispensing slot.

Another convenient embodiment of a beverage can dispensing machine is illustrated in Figures 51-53. In this embodiment, the cabinet 444 and the principal magazine 455 are basically similar to those in the embodiment described in Figure 12. The front door 456 of the cabinet is hinged at its base 457 rather than its top edge in order to provide the space necessary to mount the auxiliary magazine 458 on top of the principal magazine 455. In this embodiment, the principal

magazine has a capacity of 16 cans. It includes a coin
receptacle 459, and a dispensing gate 460 driven by a
cam and motor mechanism 461 of the type illustrated in
Figures 47 and 48. The principal magazine is not
5 supported by slides but is installed by first placing
the front lower corner on a tilting angled bar 462 with
the front of the magazine in a horizontal position, then
tilting the magazine upwardly in the direction indicated
by arrow 463 until the back end of the moving plate 464
10 comes in contact with the cam and motor mechanism 461.
The cans roll along three levels of slides tilted at
approximately 5 degrees from the horizontal. The
magazine is loaded from a slot opening 465 on its top
which is closed by a sliding gate as will be explained
15 below. The principal magazine 455 can be either
completely refilled or simply topped from a portable
auxiliary magazine 458. Accordingly, the service person
has the option of either removing the principal magazine
and replacing it by a fully loaded one, or use the
20 portable auxiliary magazine 458 to add as many cans as
may be necessary to refill the principal magazine. The
auxiliary magazine 458 has a bottom geometry which is
designed to intimately mate with the geometry of the
principal auxiliary magazine top. Furthermore, the
25 dispensing gate 466 in the bottom of the auxiliary
magazine can only be opened when the two magazines are
completely mated. Both the filling opening 465 of the

principal magazine and the dispensing slot 466 of the auxiliary magazine are controlled by sliding gates which are activated by similar and mating mechanisms 467 and 468 more specifically illustrated in Figures 52 and 53.

5 Each sliding plate 469 has a pair of longitudinal slots 470 and 471 near its front edge 472. A first slot 470 is engaged by a lock 473 which is mounted by an angled bracket 474 against the front face of the corresponding magazine. The angled bracket is not attached to the

10 body of the lock but to the shaft that normally mounts the bolt. An enlarged area 475 in the forward end of the first slot is shaped and dimensioned to be engaged by the rotating main body of the lock 476, the lock is oriented such that when the key 477 is removed, the main

15 body of the lock 476 is locked in the position illustrated in Figure 53. Thus, preventing any movement of the gate 479. The second slot 478 is shaped and dimensioned to pass the key 477 of the other magazine lock. That key is also mounted by a bracket 479 against

20 the front face of the magazine. It can be now understood that in order to free the sliding gate 479 of either magazine, both magazines must be intimately mated with the keys 477 properly engaged into the respective locks. At this point, the main bodies 476 of each lock

25 can be rotated as indicated by a row 480 to allow the sliding gates 469 to be pulled out and open the feeding and dispensing slots 465 and 466 of the respective

magazines. A handle 481 associated with each lock body is provided to facilitate the rotation. The auxiliary magazine 458 can be reloaded in a service center by opening a lock-secured top lid 482.

5 It should be noted that the service personnel can never get access to the goods held by either one of the two magazines.

 Just like the first described embodiment of the invention, the alternate version of the the machine
10 accept payment by so-called "smart cards". A smart card is a type of debit card which mounts a microchip having the capability of holding a file to which data can be added or subtracted. Typically, a smart card can be purchased for a fixed price plus a small service charge.
15 The fixed price corresponds to the amount of money stored in the microchip. Machines adapted to accept payment with such a card have the ability of deducting, from the microchip file, the amount corresponding to the purchase. This type of smart card and associated
20 hardware and software technology are commercially available from Cardlogix of Irvine, California. As illustrated in Figure 54, the vending machine is equipped with a micro-processor 483 whose data bus 484 is connected to a variety of peripheral devices
25 including a smart card reader/writer 485 having the capability to read and write on smart cards 486 used by customers and smart cards used by service persons to

track the machine performance and inventory. The
microprocessor bus is also connected to a keypad 487
upon which the customer can dial his choice of goods,
and the service person can enter certain information and
5 instructions. The bus also accesses an alpha numerical
display 488 used to communicate visual messages to the
customers such as machine operating instructions and the
like. Once a customer has made his selection, commands
are transferred to a motor control 489 that selects and
10 activates the motor corresponding to the channel into
which the selected goods are stored. The position of a
variety of status switches 490 can be read by the
processor through the data bus in order to verify the
proper operation of the machine. An optical sensor 491
15 located at the entrance of the dispensing slot gives an
indication that the selected goods has been dropped into
the dispensing pocket. The microprocessor can also
release certain latches 492 which enable or disable
certain operations of the machine in accordance to
20 certain conditions reflected by the status switches 490.
For instance, the machine will not attempt to dispense
goods if the magazine is not properly inserted into the
machine and the front door closed. A solid state memory
or equivalent recording medium 493 is used to hold the
25 microprocessor operating application programs as well
as the inventory information. The microprocessor can
monitor all the sales and maintain a detailed inventory

in memory. Prior to servicing a machine, a service person introduces a smart card into the card reader and dials a code on the keypad instructing the microprocessor to transfer the inventory data from the solid state memory 483 onto the service person's smart card. The smart card may also contain program instructions that are read and executed by the microprocessor. Those instructions may include price changes or special promotional command to be scrolling display. The smart card, as well as the removed or partially empty magazine, can be turned in at the service center for processing, and refiling and restocking. The microprocessor 483 is also programmed to recharge a user's smart-card by an amount corresponding to currency introduced through the coin slot 210 and currency-acceptor 7.

As shown in Figure 55, the service center is equipped with a central processor 494 which is also provided with a smart card reader/writer 495 and a printer 496. The information read off the service person's smart card 497 is used to verify the returned cartridge contents is consistent with the quantities and types of goods dispersed by the machines, and to generate a complete inventory of the remaining goods held in various vending machines throughout the serviced territory, as well as a schedule of services to be performed during the next day in accordance with the

status, that is, the amount of goods still held by the machine previously serviced. Accordingly, the central processor 494 includes a return cartridge software module 498, a inventory control module 499 and a route
5 planning module 500. It should be understood that the central processor can also accumulate statistical data about the entire operation.

The smart cards and readers can be advantageously replaced by other recording devices and
10 communication interfaces including palm-held processors using "blue tooth" interfaces, or by direct link through the Internet according to technologies well-known to people in the data processing arts.

The block diagram of Figure 56 illustrates the
15 processing of a magazine at both the user's site and at the central processing location.

Upon arrival at a user's site, the service person may download 501 the sale data accumulated by the vending machine processor. The downloading can be made
20 on a smart card, a hand-held storage device or any other convenient recording medium. In the case where the machine is in direct communication with the central processing location, this step of downloading may be skipped.

25 Next, the service person secures 502 the expended or partially expended magazine that is inside the machine, and unlocks and opens 503 the cabinet door.

In some versions of the machine, those two steps are accomplished by the mere unlocking of the door. After removing 504 the expended or previously mounted magazine, a new full magazine is installed 505 into the cabinet. The cabinet door is then closed 506 and the newly installed magazine is unlocked 507. Again, in some versions of the machine, these two last steps are achieved by locking the door.

The expended magazine is returned 508 to the central processing location. As the machine is used, its micro-processor compiles 509 sales data such as goods sold and payments collected. On command from a remote location or as instructed by a program downloaded from the service person's smart card, or wireless communication device, the price of the goods in each station is entered, the display is activated or advanced 510, and special price discounts are set up 511 and advertised on the display unit.

When the magazine arrives at the central processing location, it and its contents including currency are inventoried and verified against the data collected on the service person's smart card 512. The magazine is then emptied, washed and sanitized 513. It is refilled 514 with goods and then assigned 515 to a route for distribution. The filled magazine is transported 516 to a user's site, and the above-described process is repeated.

While the preferred embodiments of the invention have been described, modifications can be made and other embodiments may be devised without departing from the spirit of the invention and the scope of the appended claims

CLAIMS

1 1. A method for selling a variety of goods from a
2 supply center to employees and customers of a plurality
3 of entities at a number of locations, said method
4 comprising the following steps:

5 installing at each one of said locations at
6 least one vending machine engineered to dispense a set
7 of said goods out of a removable magazine upon
8 acceptance of a payment;

9 at said supply center, filling a plurality of
10 said magazines with sets of a diversity of said goods;

11 establishing routes, each of said routes linking
12 a given number of said locations;

13 transporting said full magazines to said
14 locations along said routes, and, at each of said
15 locations, mounting one of said magazines in each of
16 said vending machines in place of any other magazine
17 previously mounted therein;

18 automatically compiling into each of said
19 machines, a record of good-selling transactions in a
20 readable medium;

21 returning each of said previously mounted
22 magazines to said supply center; and

23 servicing said returned magazines;

24 wherein, for each of said vending machines, said
25 step of mounting one of said magazines essentially
26 consists of:

27 opening said vending machine;
28 removing said previously mounted magazine;
28 inserting said full magazine in place of
30 said previously mounted one; and
31 securely locking said vending machine;
32 in the absence of any currency or discrete
33 goods handling or counting at said locations.

1 2. The method of Claim 1 which further comprises:
2 compiling a magazine delivery and machine
3 instruction table for said location;
4 recording said table in machine-readable form on
5 a hand-carryable medium, said table containing data
6 earmarked for at least one machine at each of said
7 locations;
8 at each location interfacing said hand-carryable
9 medium with one of said machines;
10 downloading onto said hand-carryable medium, the
11 record of good-selling transactions from the readable
12 medium of said machine; and
13 reading from said hand-carryable medium data
14 from said table earmarked for said machine.

1 3. The method of Claim 1, which further comprises
2 providing each of said entities, for a fee, a plurality
3 of debit cards for distribution to said employees and
4 customers, said debit cards being usable for payments or
5 on said vending machines.

1 4. The method of Claim 1, wherein said step of
2 installing comprises:

3 using vending machines engineered to accept
4 currency in payment of goods and to securely accumulate
5 said currency into said removable magazines mounted
6 therein; and

7 said servicing comprises removing said
8 accumulated currency from said magazines upon return to
9 said supply center.

1 5. The method of Claim 1, wherein said servicing
2 comprises sanitizing said magazines prior to said
3 refilling with said goods.

1 6. The method of Claim 2, wherein said step of
2 compiling a delivery and machine instruction table
3 comprises assigning a price to each type of said goods.

1 7. The method of Claim 6, wherein said step of
2 installing comprises installing at a plurality of said
3 locations at least one snack food vending machine, are
4 at least one beverage vending machine.

1 8. The method of Claim 7, which further comprises:

2 displaying on one of said vending machines a
3 discount price for at least one combination of a snack
4 food item and one beverage item; and

5 recording instruction on said table to program
6 said machines to deliver said combination upon
7 acceptance of said discount price payment.

1 9. The method of Claim 1, wherein said step of
2 compiling said record of good-selling transactions
3 comprises recording the method of payment for each of
4 said transactions; and

5 periodically down-loading said compiled record.

1 10. The method of Claim 9, which further comprises
2 compiling said record in said magazines; and

3 said step of servicing comprise down-loading
4 said record.

1 11. A vending machine which comprises:

2 an external shell having top, bottom and
3 opposite side walls, and an open front;

4 an internal plastic liner nested within said
5 shell and joined thereto about a peripheral frontal
6 edge, said liner defining a load compartment;

7 a volume of insulating material sandwiched
8 between said shell and liner;

9 a door releasably closing said open front, and
10 including a front panel and a peripheral flange meeting
11 said shell and liner about said frontal edge;

12 at least one product magazine removably held

13 within said load compartment;
14 means, within said magazine, for selectively
15 expelling therefrom a variety of products stored
16 therein;
17 driving means, within said load compartment,
18 engageable by said means for expelling;
19 control means responsive to user-initiated
20 signals for activating said driving means; and
21 means for generating said signals.

1 12. The vending machine of Claim 11, wherein said
2 magazine comprises:

3 at least one cell shaped and dimensioned to hold
4 a plurality of substantially similarly-sized products,
5 said cell having an opening spaced apart from said front
6 panel; and

7 said means for expelling comprise a drive shaft
8 engageable from a back section of said magazine opposite
9 said opening.

1 13. The vending machine of Claim 12, wherein said
2 driving means comprises at least one electro-mechanical
3 device mounted against said liner and positioned for
4 engagement with said drive shaft when said magazine is
5 placed into said load compartment.

1 14. The vending machine of Claim 13, wherein said

2 electro-mechanical device comprises a motor.

1 15. The vending machine of Claim 14, wherein said means
2 for expelling further comprise a spiral rack coupled to
3 said shaft.

1 16. The vending machine of Claim 14, wherein said means
2 for expelling further comprise a gate coupled to said
3 shaft, and shaped, dimensioned and positioned to
4 selectively block said opening.

1 17. The vending machine of Claim 16, wherein said cell
2 comprises a slanted product-supporting floor positioned
3 to urge products held therein toward said gate.

1 18. The vending machine of Claim 17, wherein said gate
2 comprises:

3 a first barrier radially connected to said
4 shaft; and

5 a second barrier radially connected to said
6 shaft opposite and axially distally from said first
7 barrier;

8 whereby a 180 ° rotation of said shaft lowers
9 said first barrier, allowing a first of said products to
10 escape said cell while a second of said products
11 immediately behind said first is held back within said
12 cell by said second barrier.

1 19. The vending machine of Claim 11, wherein said
2 control means comprise an electronic data entry module
3 mounted on said front panel.

1 20. The vending machine of Claim 11, wherein said
2 control means comprise an electronic data receiving
3 module.

1 21. A mechanism, for discretely dispensing goods out of
2 a compartment, which comprises:

3 said compartment including a dispensing gate and
4 a floor having a downward slant and a front edge
5 proximate said dispensing gate; said compartment being
6 shaped and dimensioned to hold a single row of said
7 goods stacked one against the other;

8 said dispensing gate comprising a door having a
9 closed position and an open position;

10 said door being shaped and dimensioned to
11 hold no more than one of said goods when in the closed
12 position;

13 a barrier insertable between said no more than
14 one item and a following item in said row when said door
15 is moved from said closed position to said open
16 position; and

17 means for moving said door from one of said
18 position to the other.

1 22. The mechanism of Claim 21, wherein said door has a

2 substantially planar shape, said closed position is
3 substantially co-planar with said slanted floor; and
4 said open position is substantially angular to said
5 slanted floor.

1 23. The mechanism of Claim 21, wherein said door is
2 arcuate about an axis perpendicular to the slant of said
3 floor; and

4 which further comprise:

5 means for rotating said gate about said
6 axis between said closed position wherein said door has
7 a trailing edge contiguous to the front edge of said
8 floor, and said open position wherein said trailing edge
9 rises above said front edge to form said barrier.

1 24. The mechanism of Claim 21 which further comprises a
2 rotatable shaft, and wherein said door comprises a first
3 plate perpendicular to and radially projecting from one
4 side of said shaft;

5 said barrier comprises a second plate
6 perpendicular to and radially projecting from said shaft
7 opposite and axially from said first plate; and

8 whereby a 180° rotation of said shaft lowers
9 said first plate, allowing a first of said goods to be
10 dispensed while a second of said goods immediately
11 behind the first of said goods is held back by said
12 second plate.

1 25. The mechanism of Claim 21, wherein said floor
2 comprises a plurality of slanted segments positioned and
3 oriented in a serpentine pattern.

1 26. A vending machine which comprises:
2 a coded card reader/writer;
3 means for writing data upon and reading data
4 from a coded card through said card reader/writer;
5 means for accepting payment through said card
6 reader/writer;
7 means for monitoring sales transactions and
8 maintaining records thereof;
9 means for accepting program instructions through
10 said card reader/writer; and
11 means for outputting said records through said
12 card reader/writer.

1 27. The mechanism of Claim 21, wherein said floor
2 comprises a plurality of slanted segments positioned
3 and oriented in a serpentine pattern.

1 27. The vending machine of Claim 21, wherein said card
2 reader/writer is configured to interface with a memory
3 chip-mounting card.

1 28. A vending machine, for dispensing a plurality of
2 goods packaged in substantially symmetrical containers
3 having cylindrical walls, which comprises:

4 a good-holding tank;
5 a dispensing station;
6 a dispensing gate between said good-holding tank
7 and dispensing station;
8 said tank including a channel having a floor
9 slanted downwardly toward said dispensing gate, said
10 channel being shaped and dimensioned to hold a series of
11 said containers lying one behind the other on their
12 cylindrical walls;
13 whereby said containers can freely roll, in
14 line, down said slated floor toward said dispensing gate
15 in the absence of any applied force other than gravity;
16 said tank having a loading aperture in an upper
17 section thereof;
18 a lockable loading gate sealing said loading
19 aperture;
20 a portable refilling magazine shaped and
21 dimensioned to hold a plurality of said cylindrical
22 containers and interlock with said tank;
23 said magazine having a dumping aperture in a
24 lower section thereof;
25 a lockable dumping gate sealing said dumping
26 aperture;
27 said dumping aperture being shaped, sized and
28 located to line up with said loading aperture when said
29 magazine is interlocked with said tank;
30 a first locking mechanism associated with said

31 loading gate and a second locking mechanism associated
32 with said dumping gate;

33 wherein said mechanisms have interlocking
34 interfaces;

35 means for interlocking said loading gate and
36 said dumping gate when said tank and their locking
37 mechanism interfaces are securely interlocked;

38 whereby the tank can be reloaded from said
39 magazine without operator's access and handling of said
40 containers.

1 29. The vending machine of Claim 24 which further
2 comprises:

3 a scrolling display and a plurality of messages
4 on said display, promoting goods dispensable by said
5 machine.

2/25

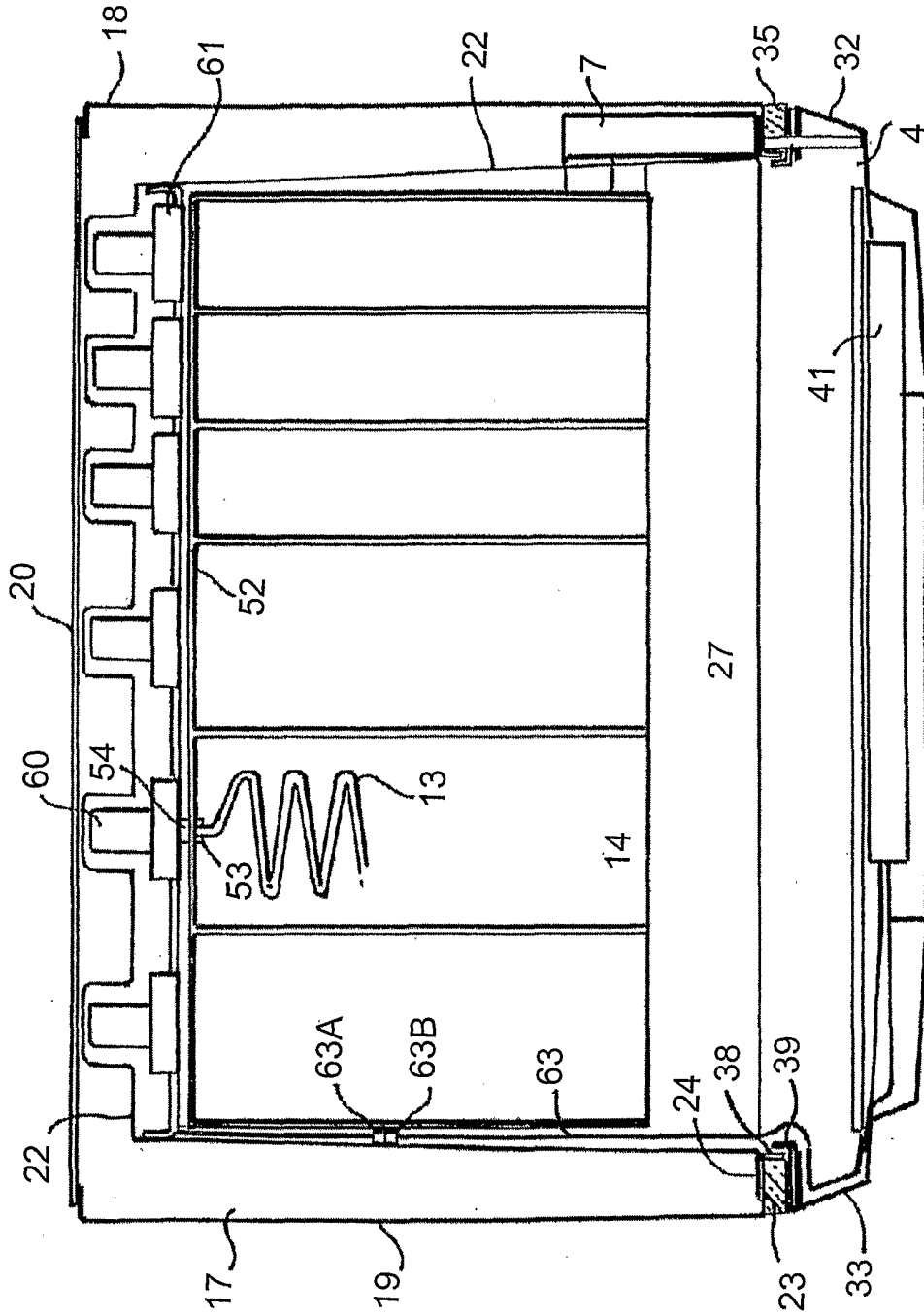


FIG. 2

3 / 25

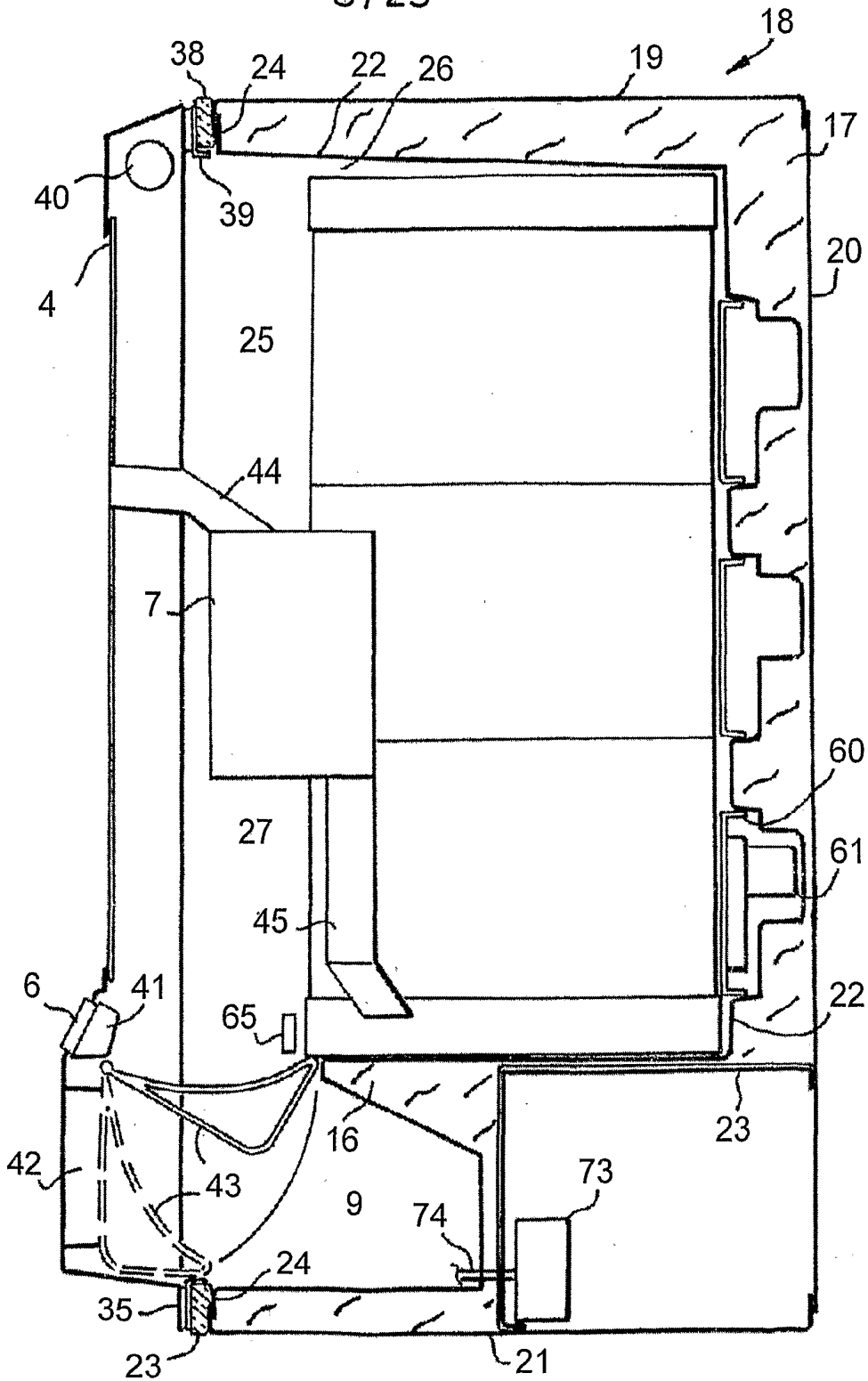


FIG. 3

4/25

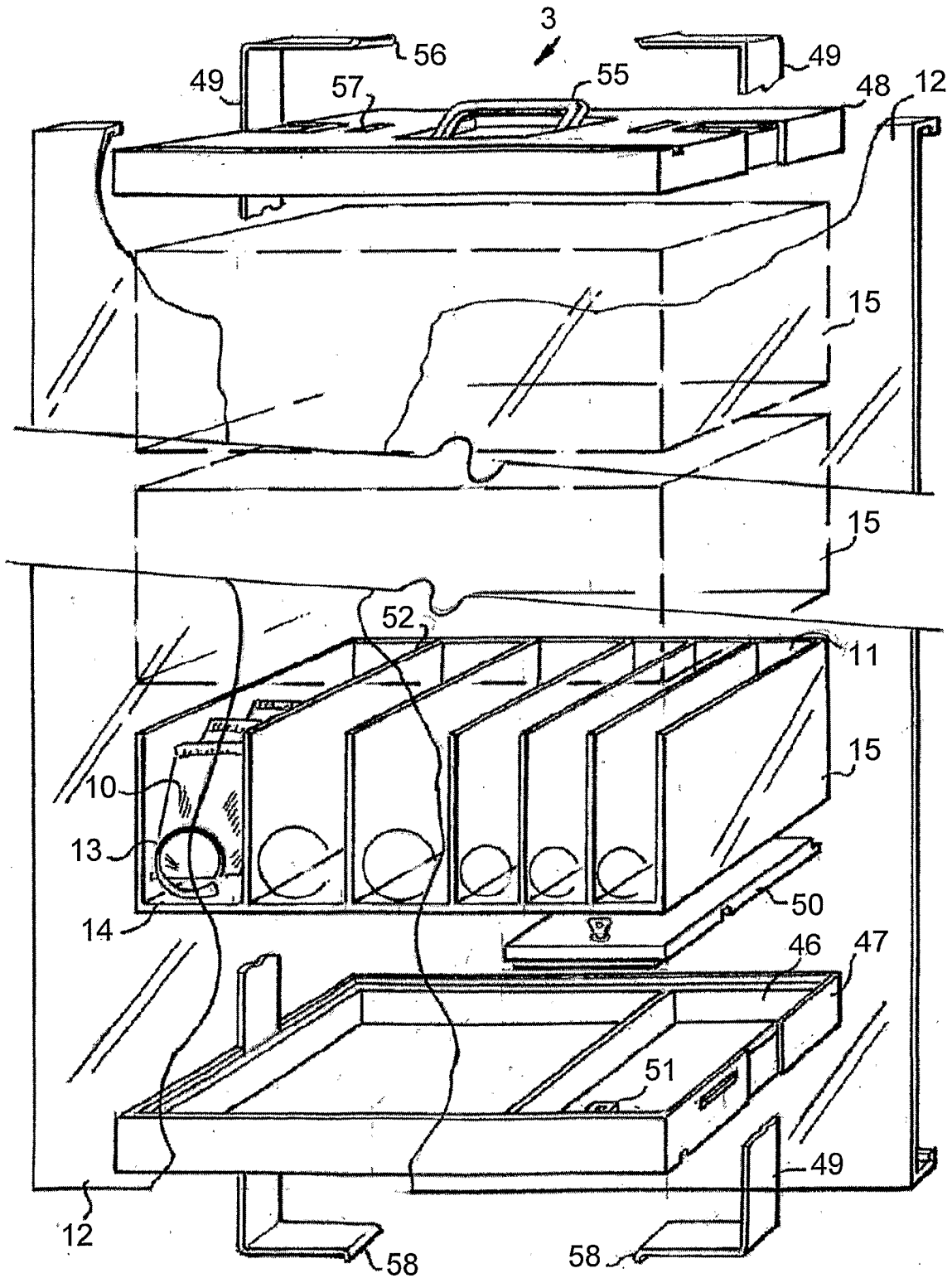


FIG. 4

5/25

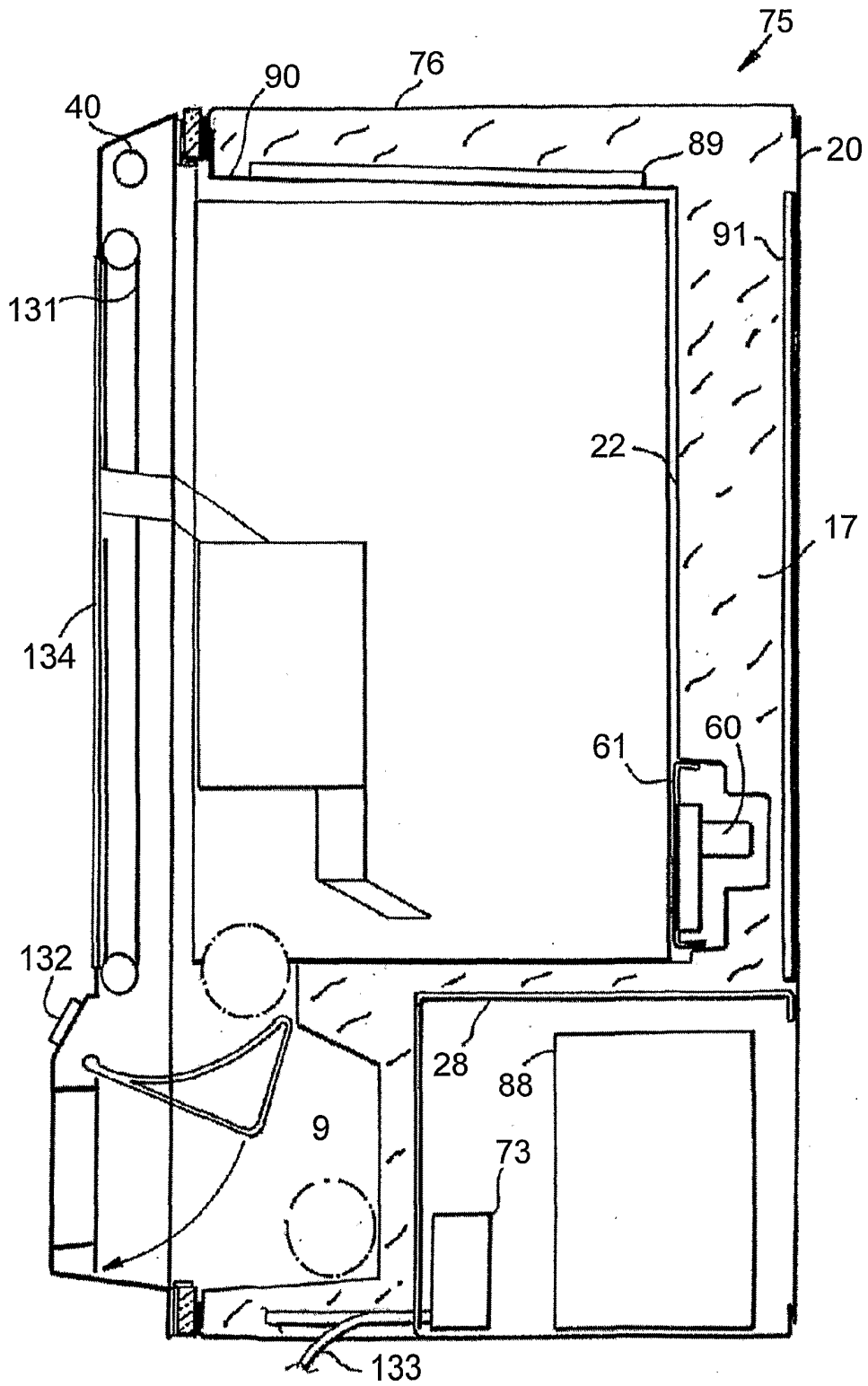
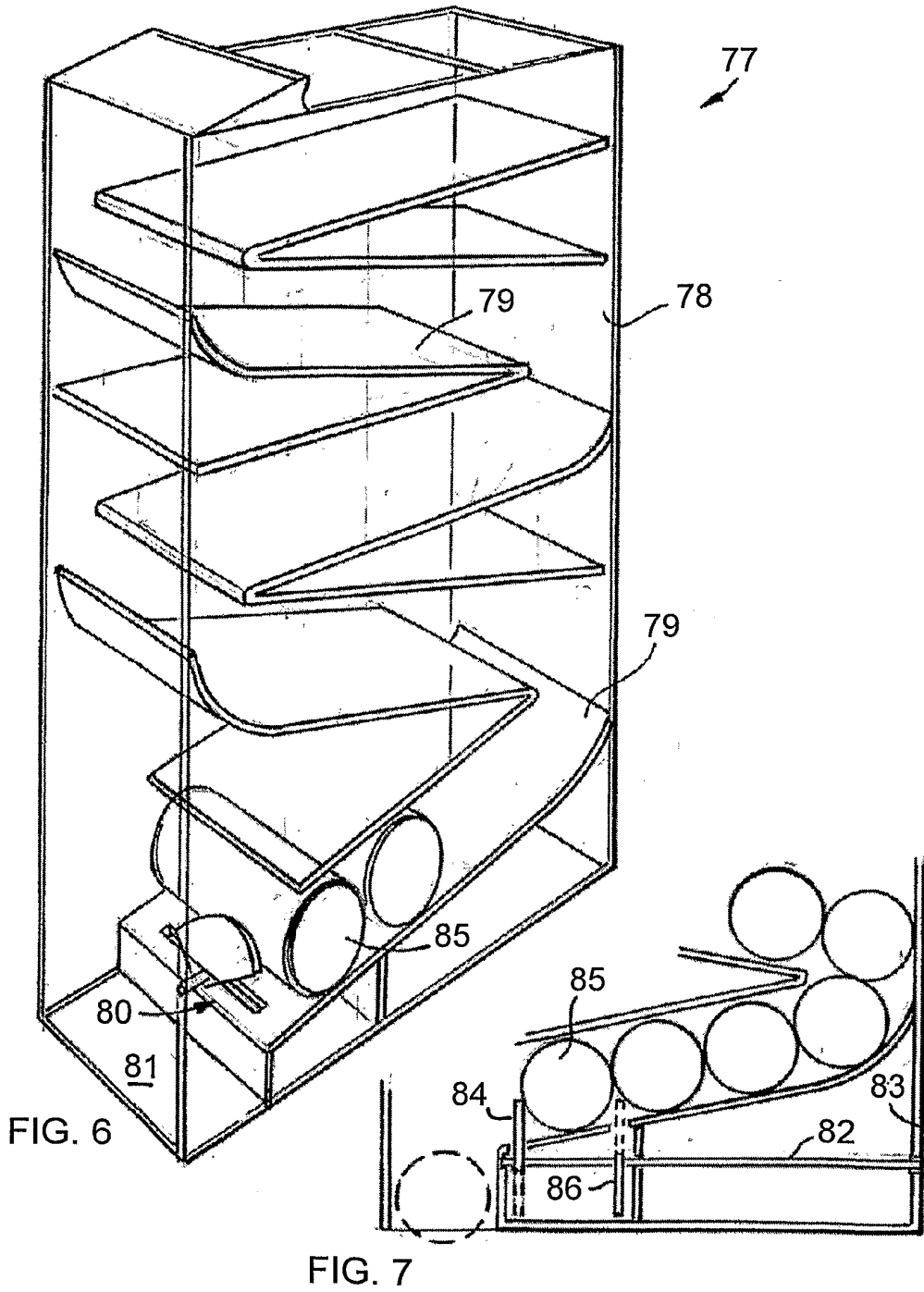


FIG. 5

6/25



7125

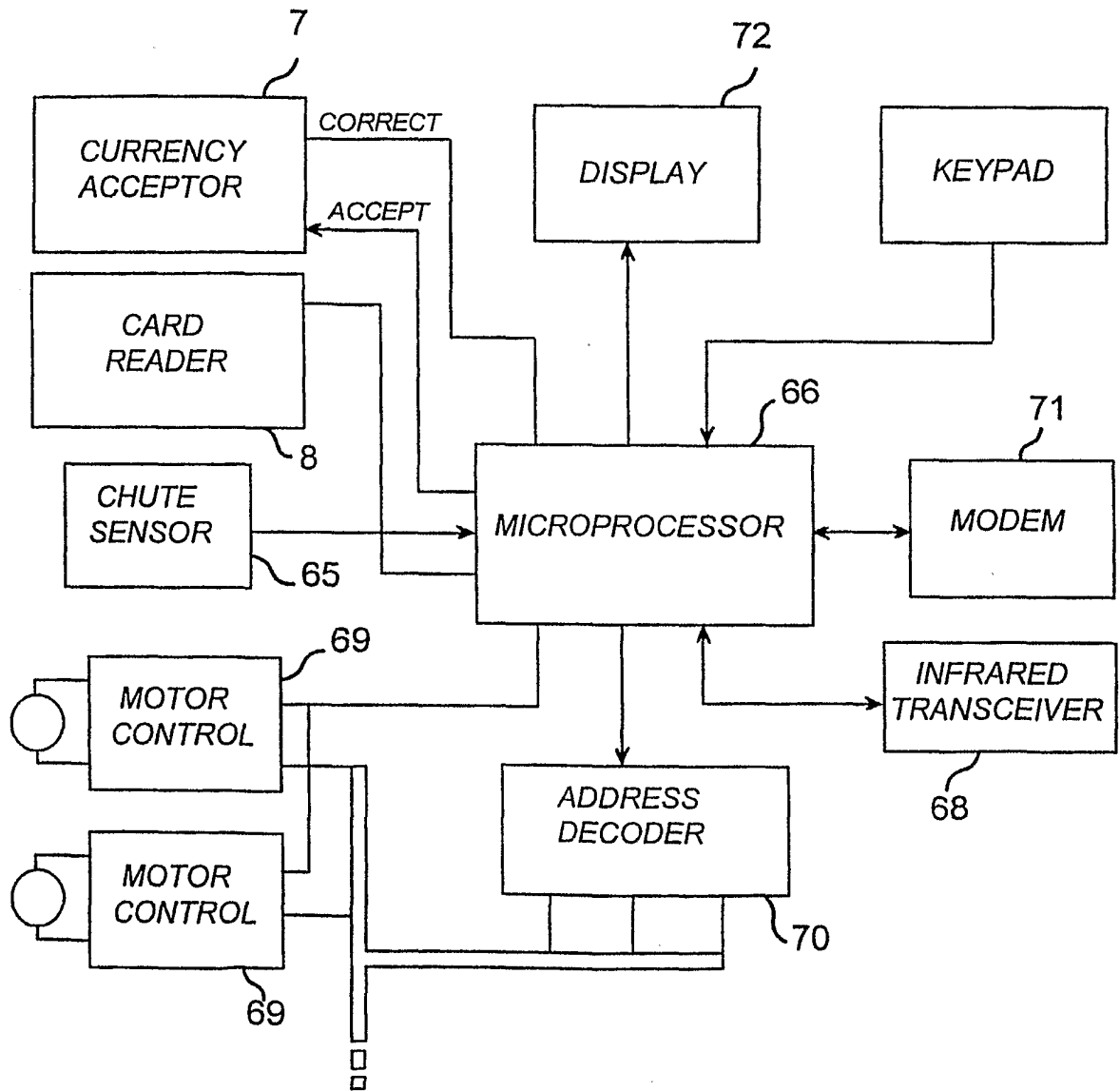


FIG. 8

8/25

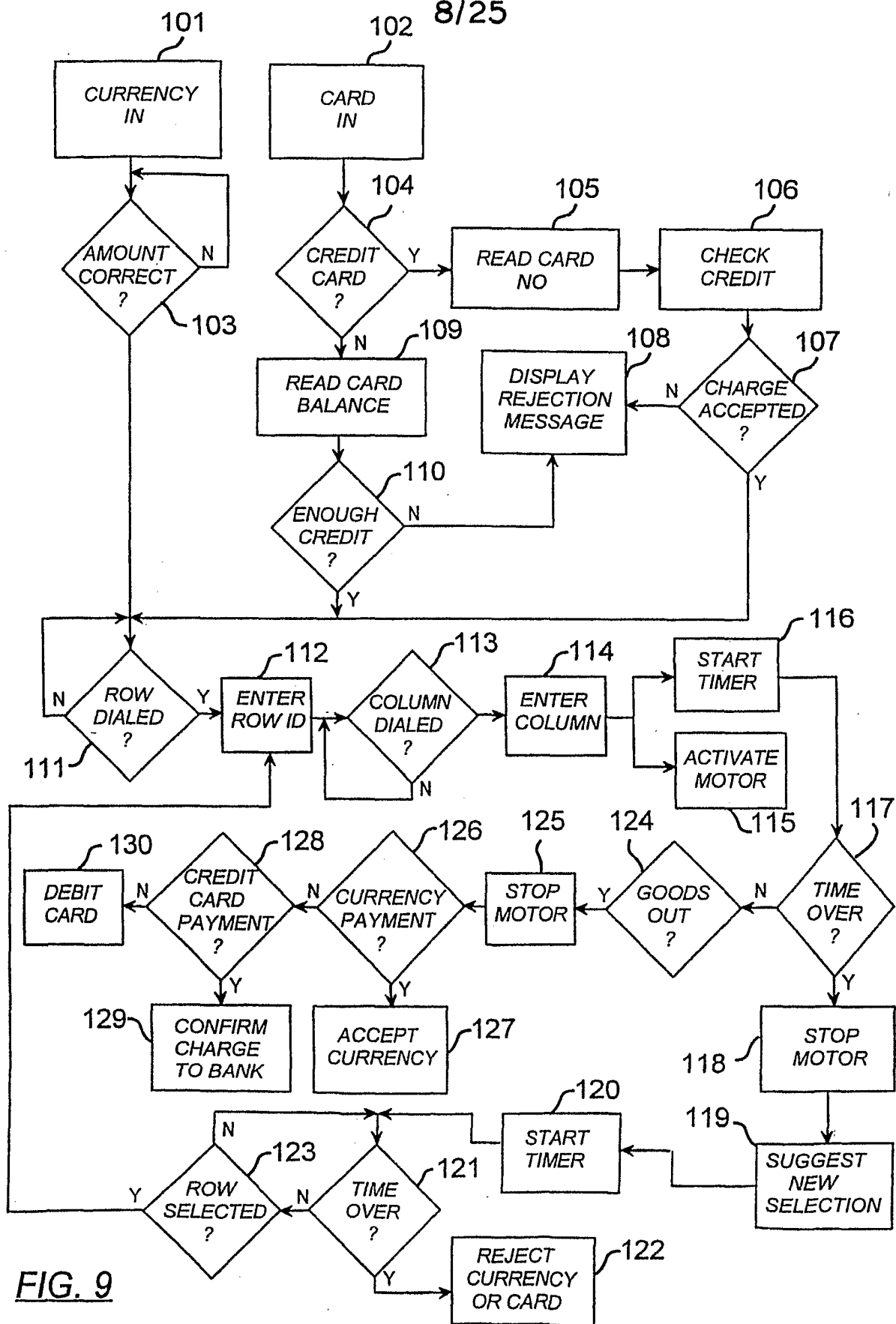


FIG. 9

9/25

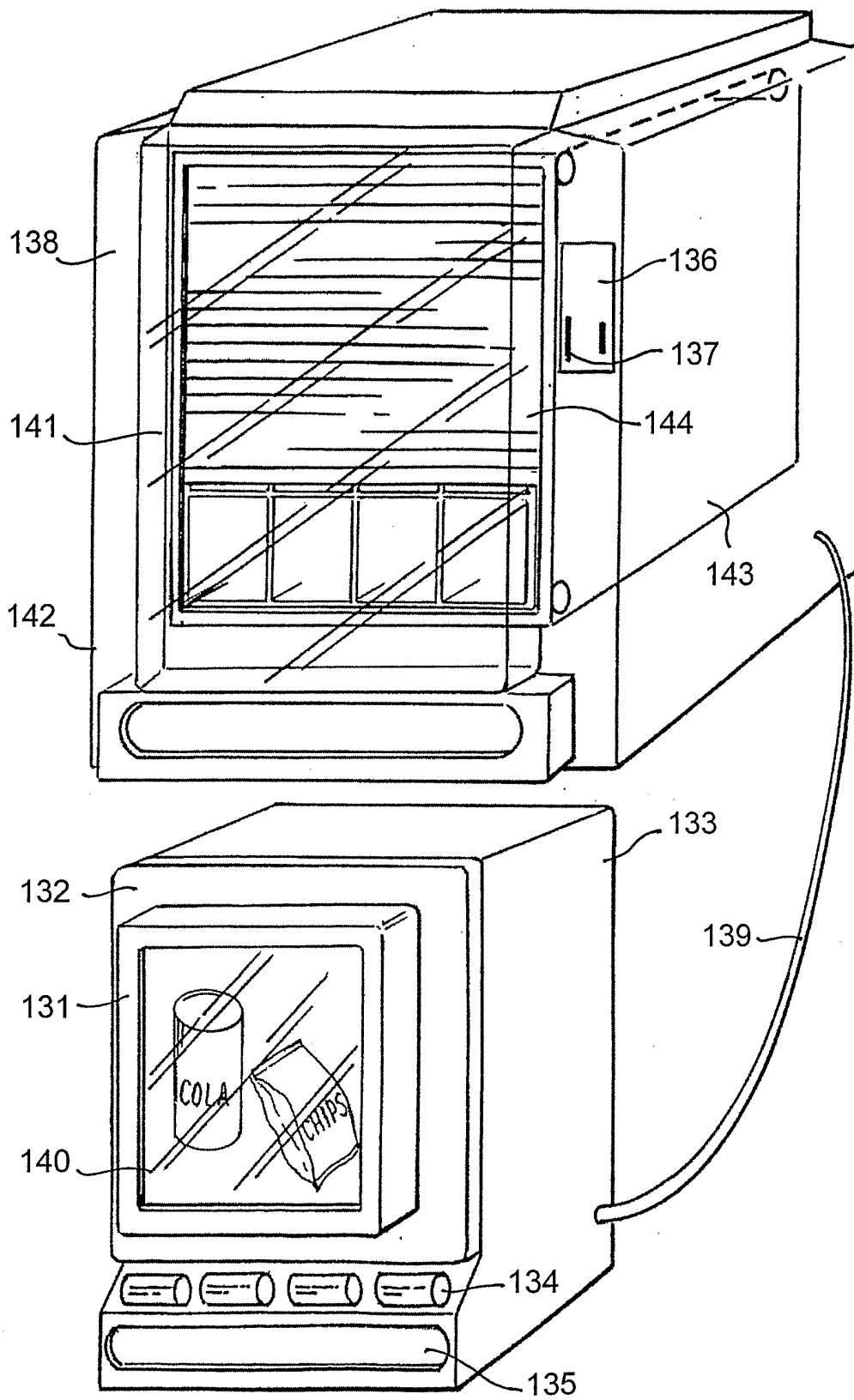
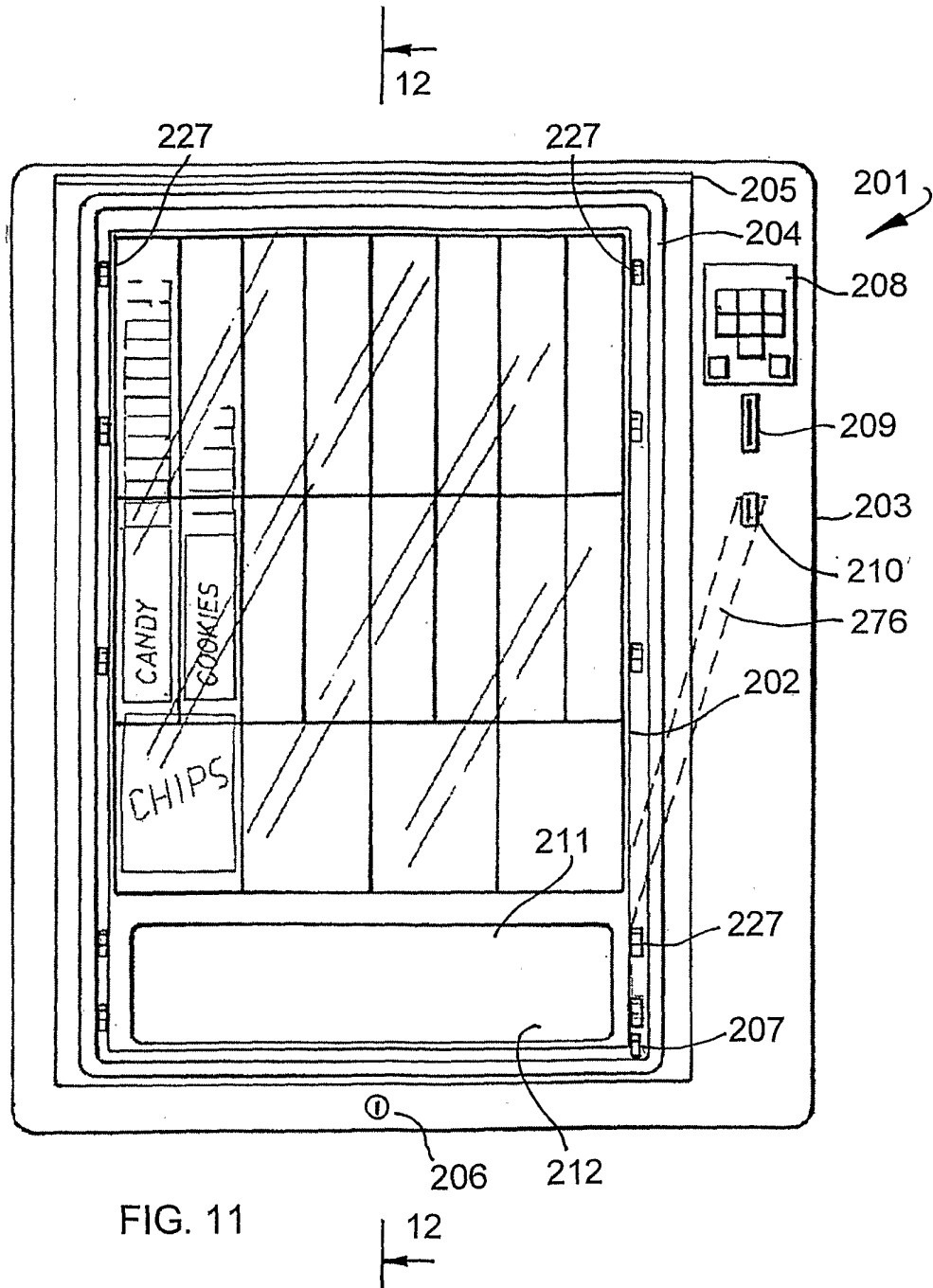


FIG. 10

10/25



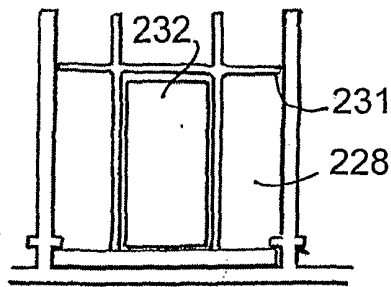


FIG. 13

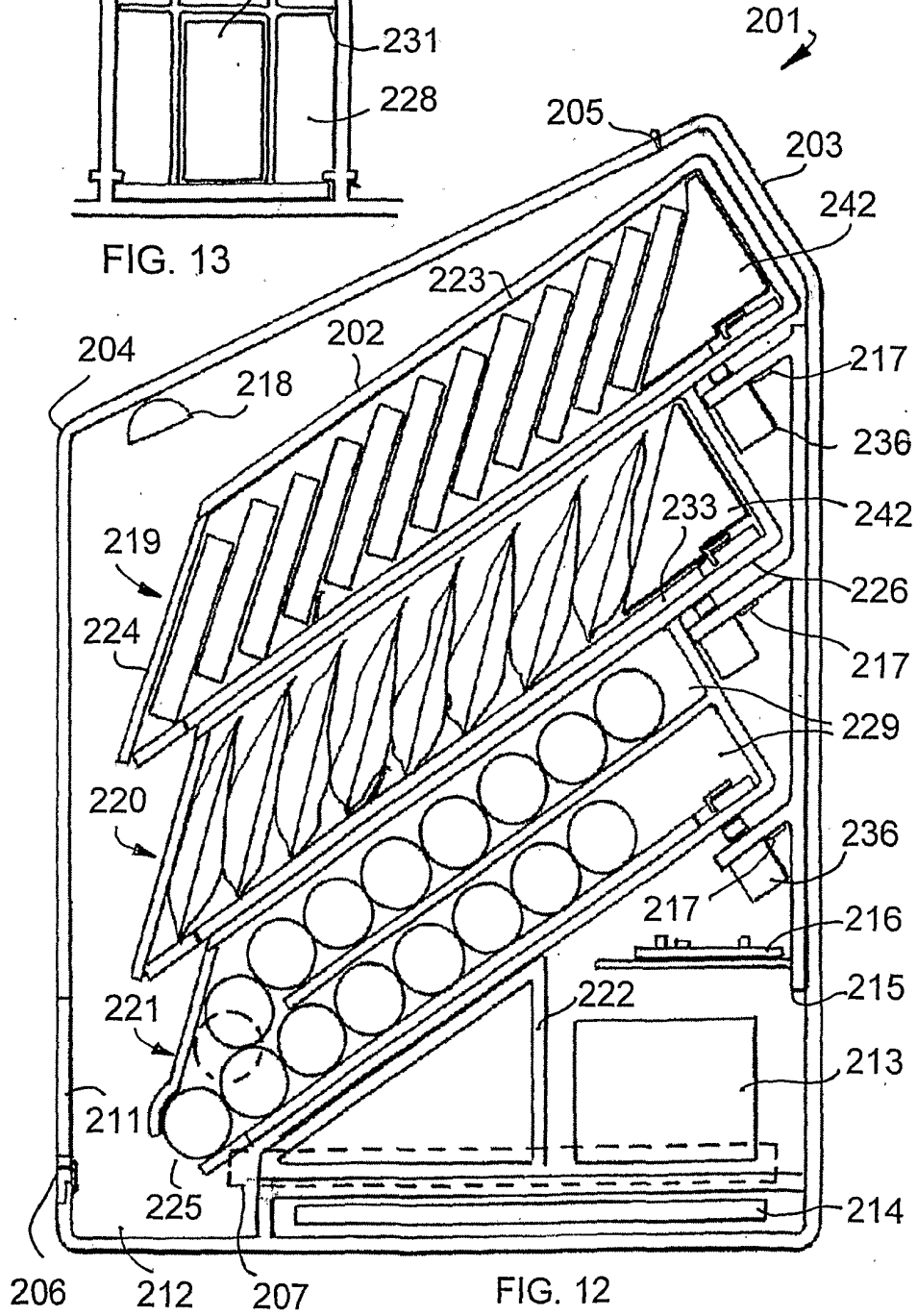


FIG. 12

12 / 25

FIG. 14

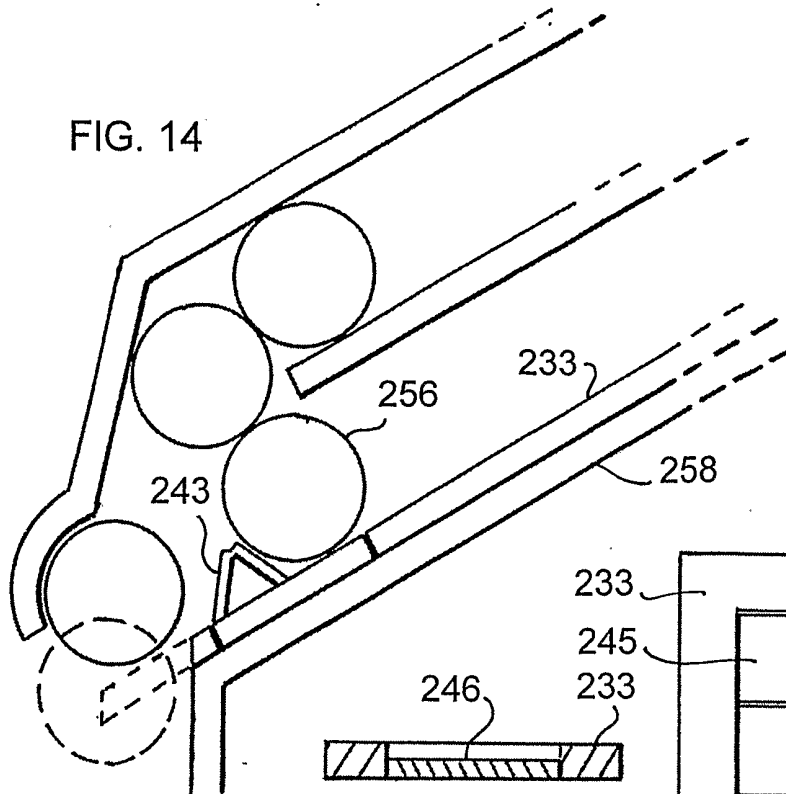


FIG. 15

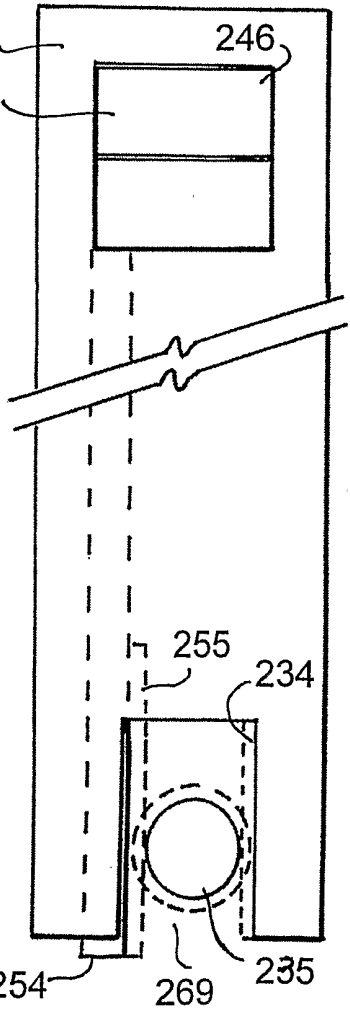


FIG. 16

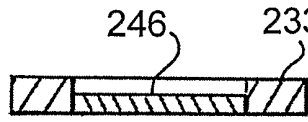


FIG. 19

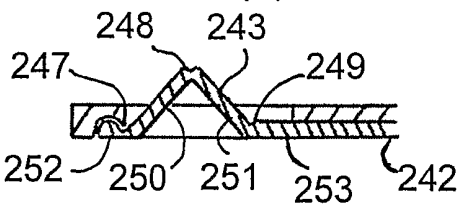


FIG. 17

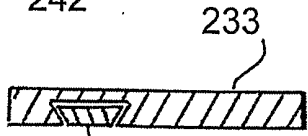


FIG. 20

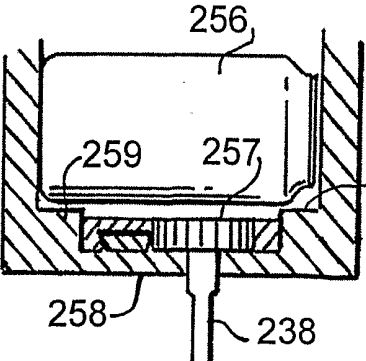
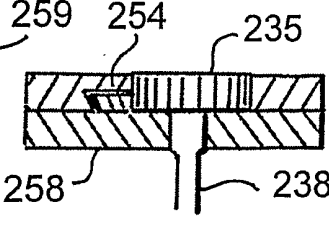


FIG. 18



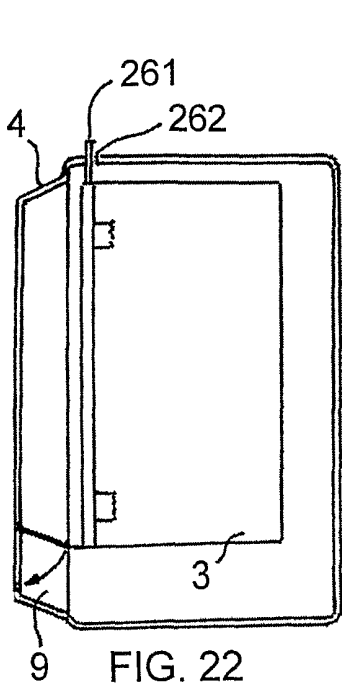


FIG. 22

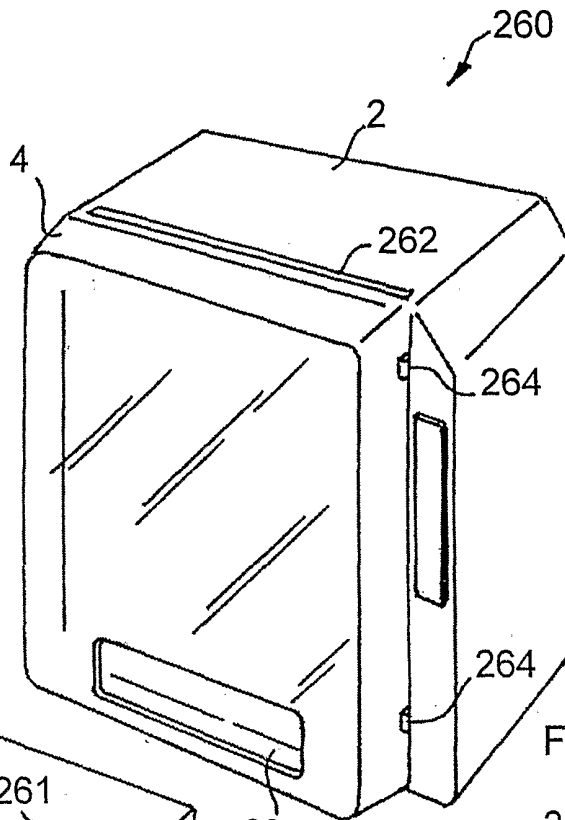


FIG. 21

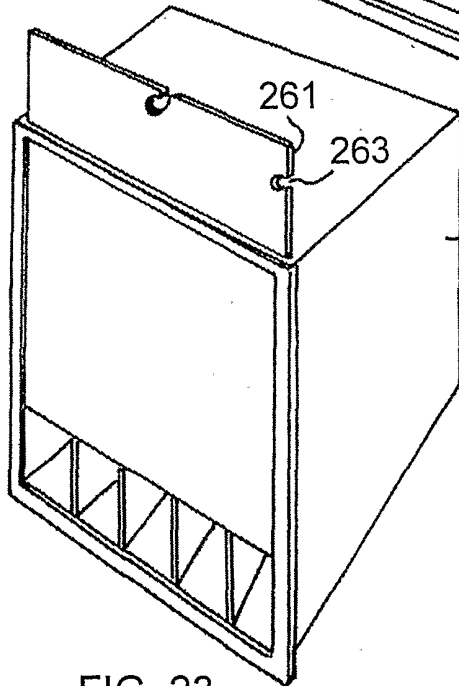


FIG. 23

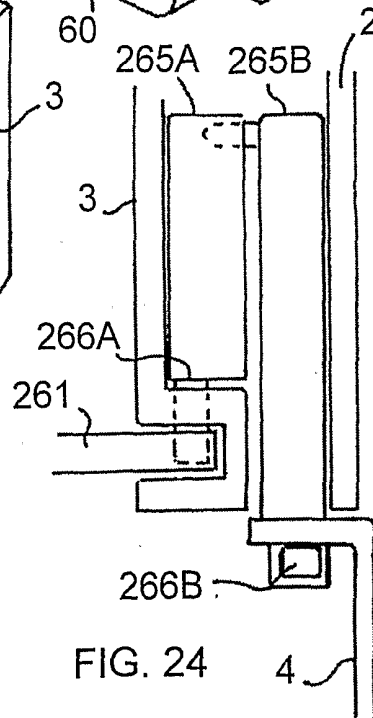
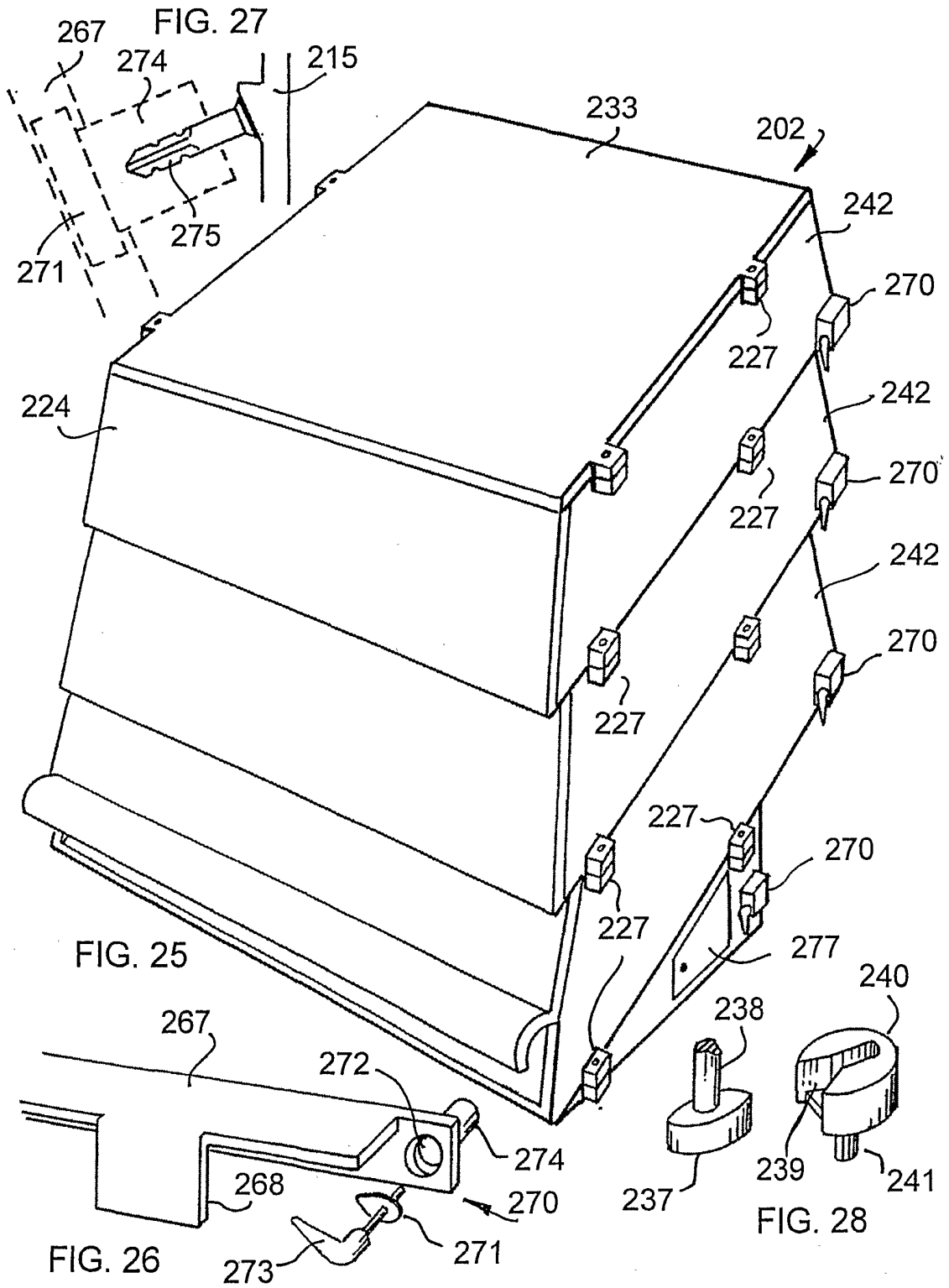


FIG. 24

14/25



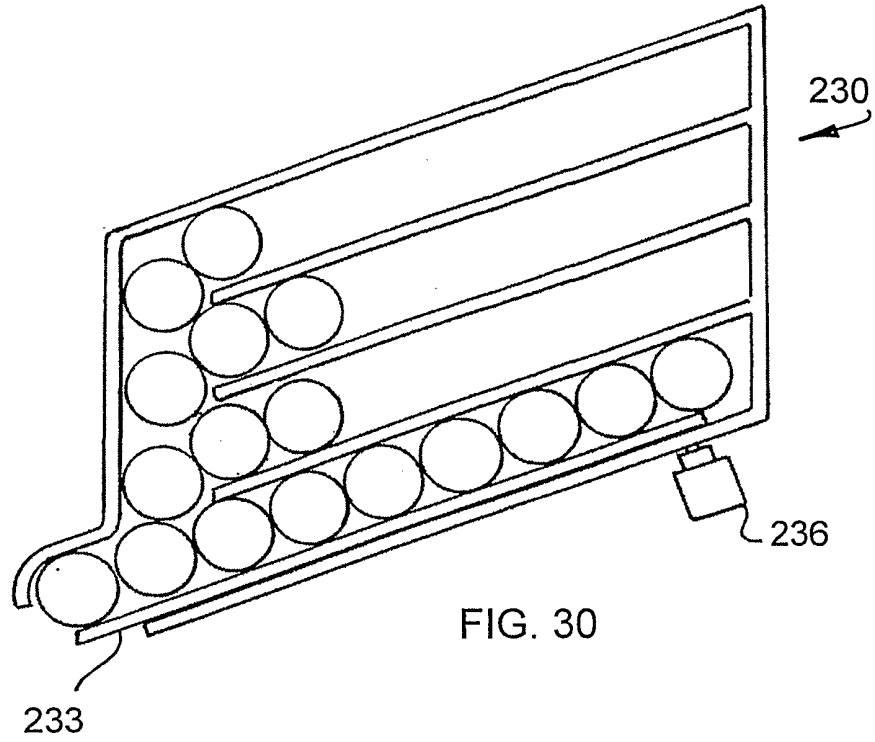


FIG. 30

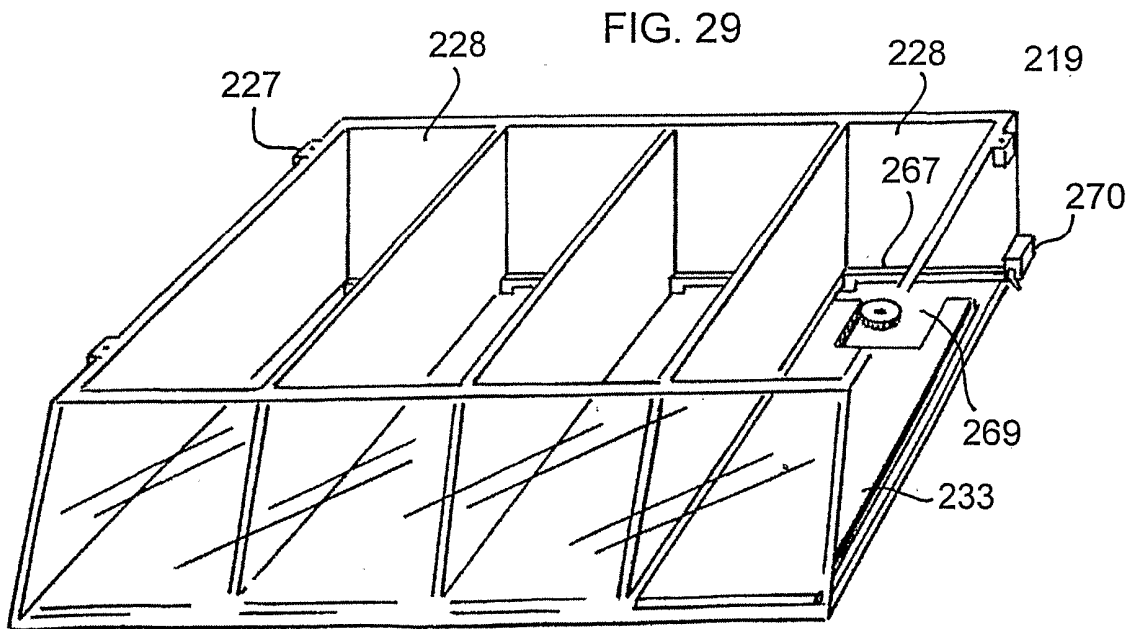


FIG. 29

FIG. 31

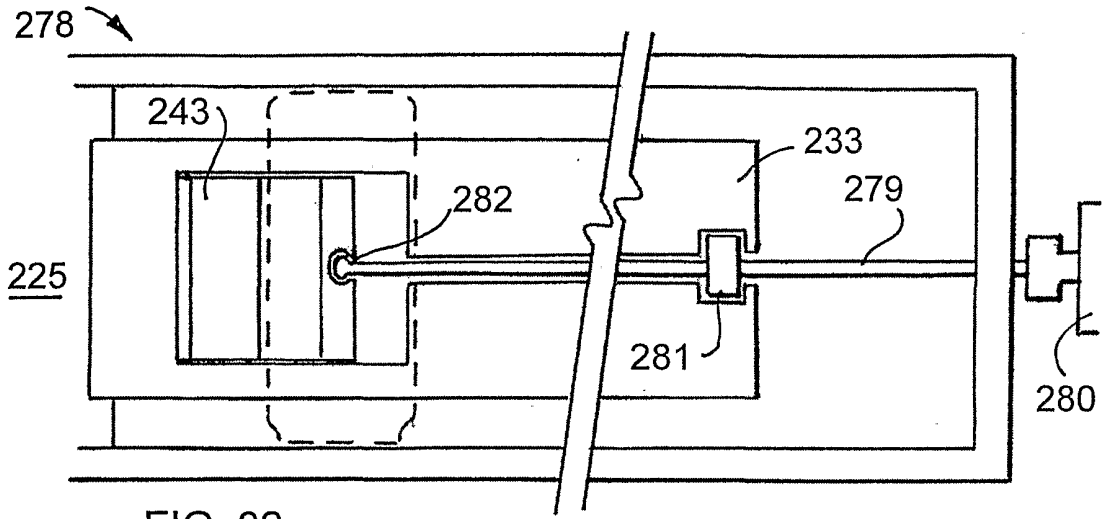
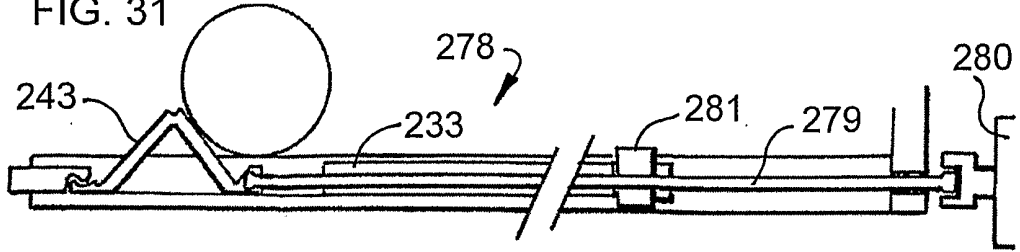


FIG. 32

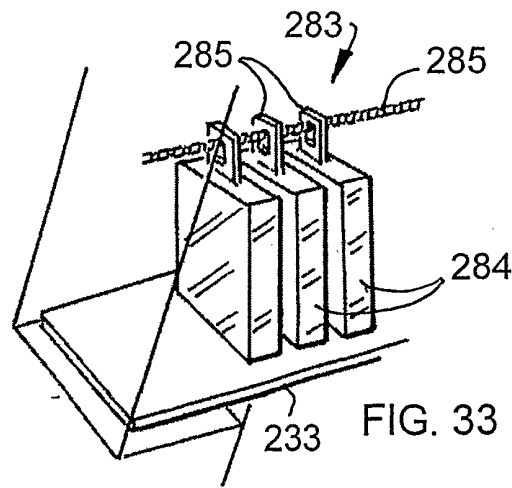


FIG. 33

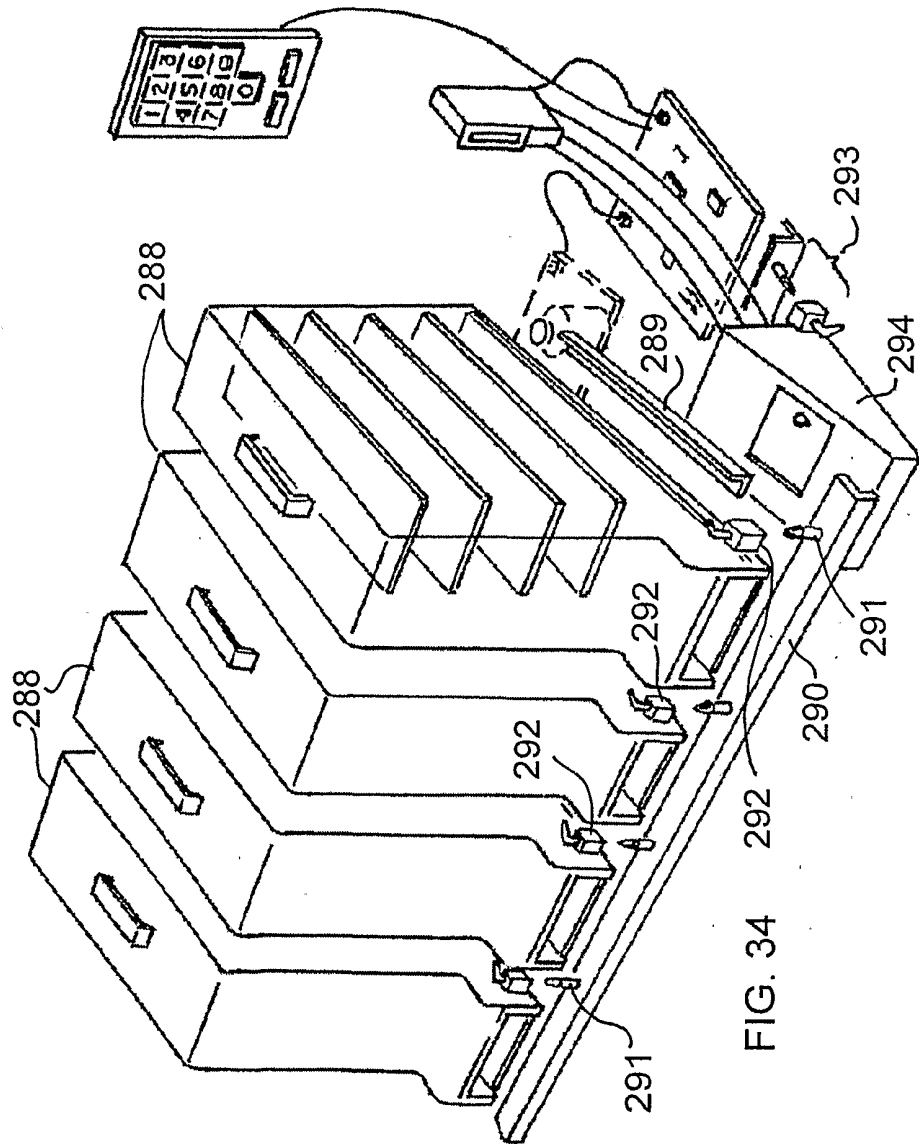
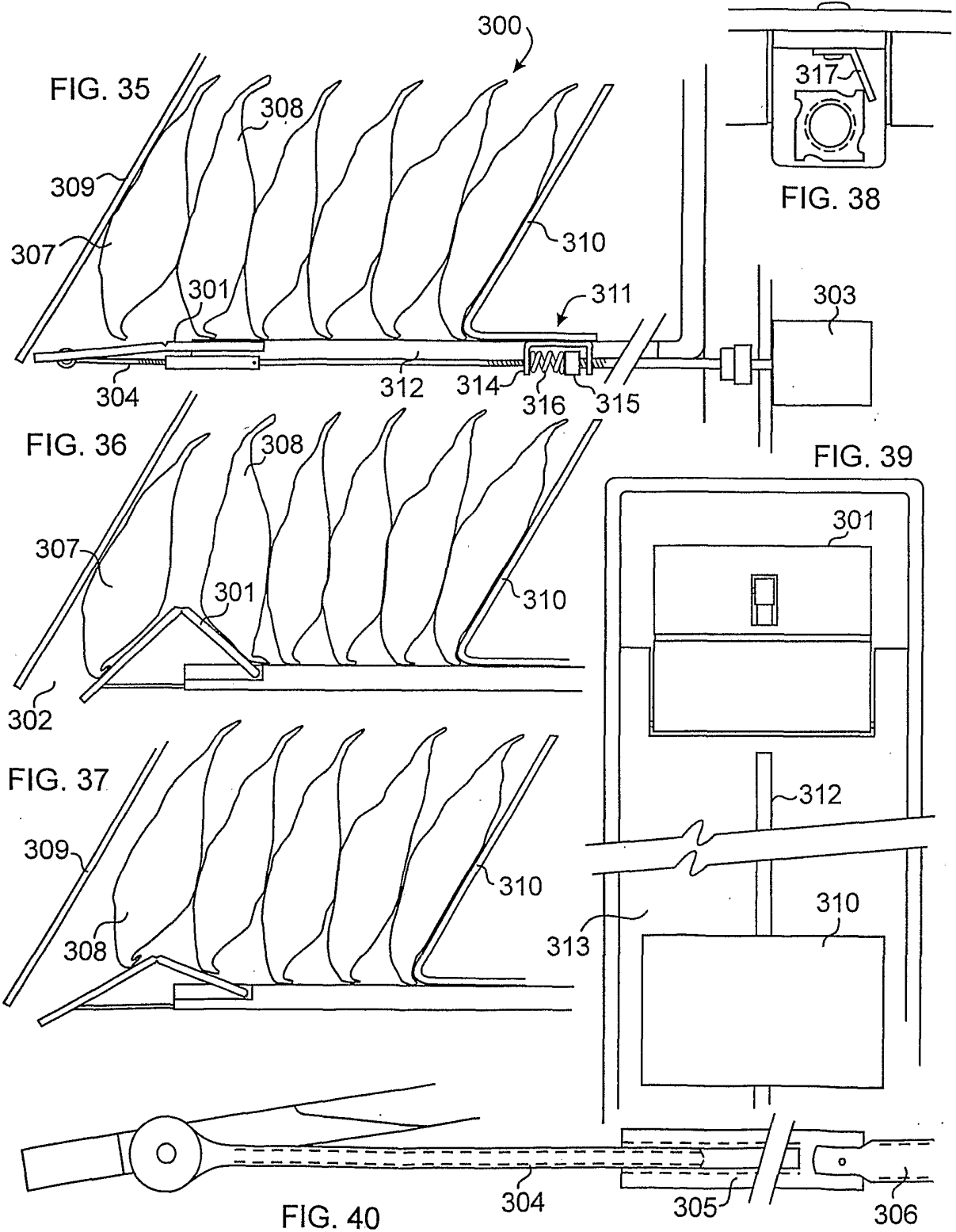
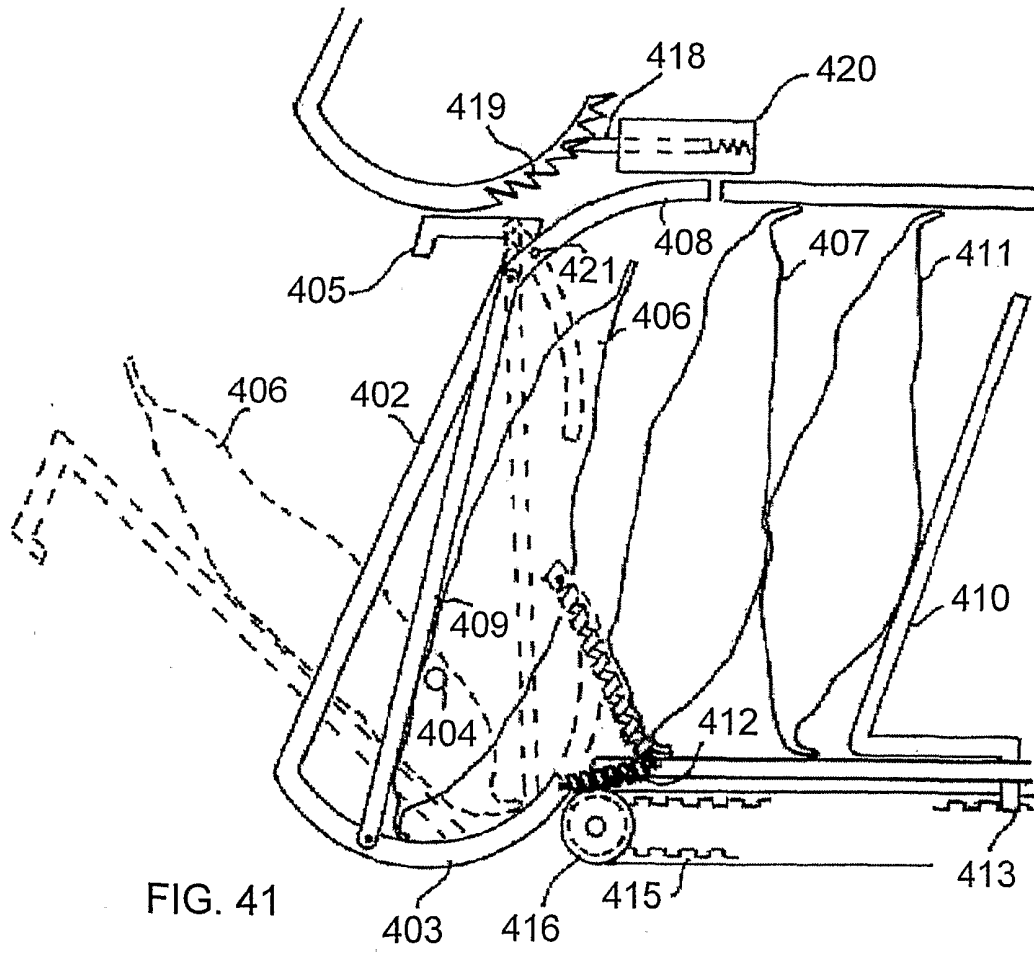


FIG. 34

18/25





20/25

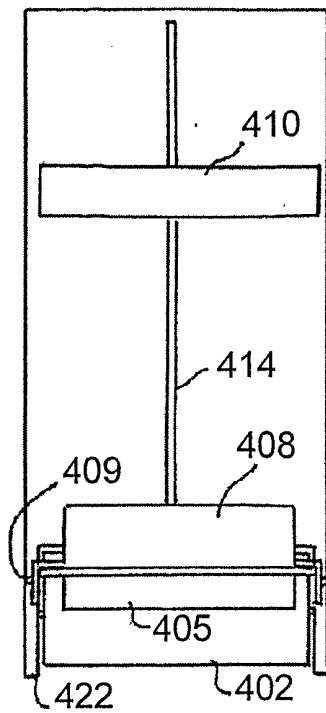


FIG. 42

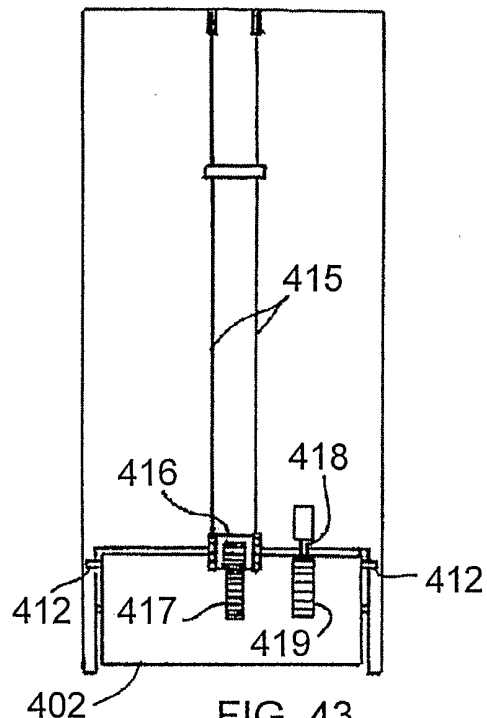


FIG. 43

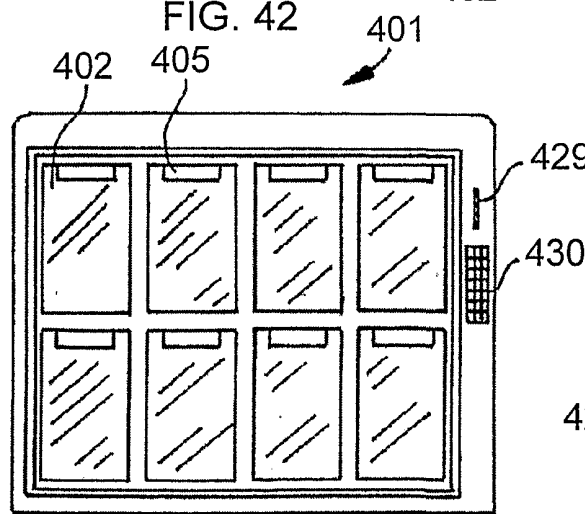


FIG. 44

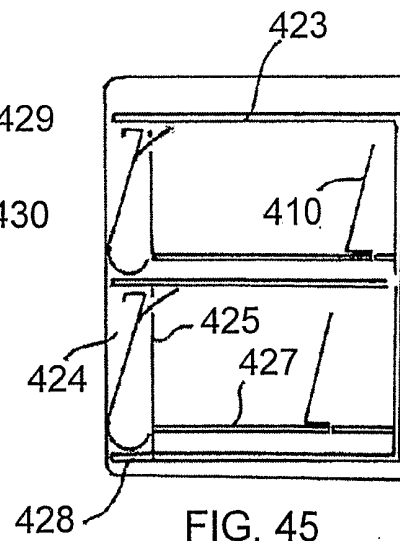
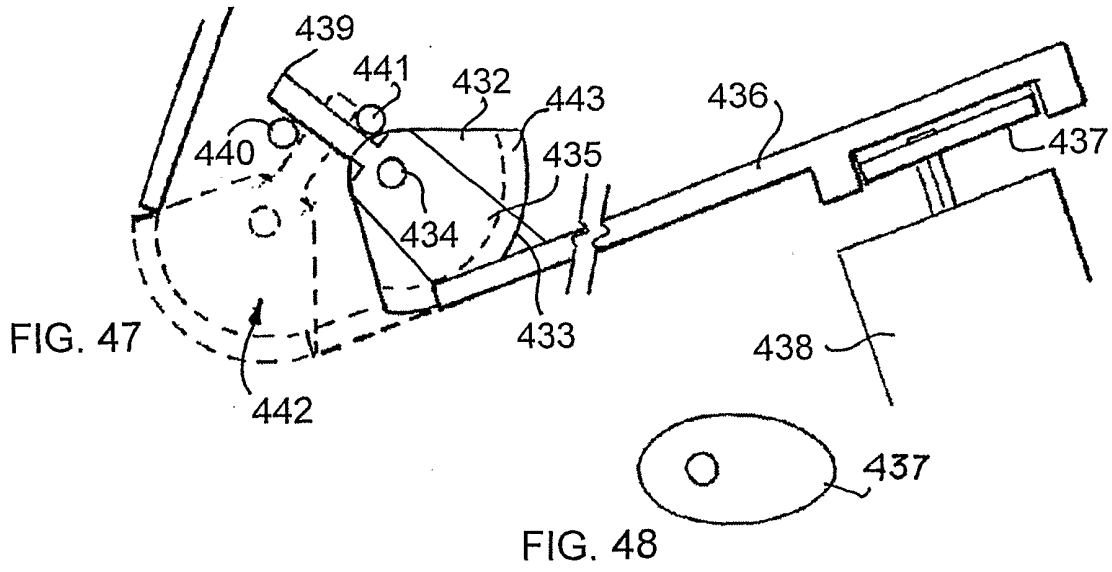
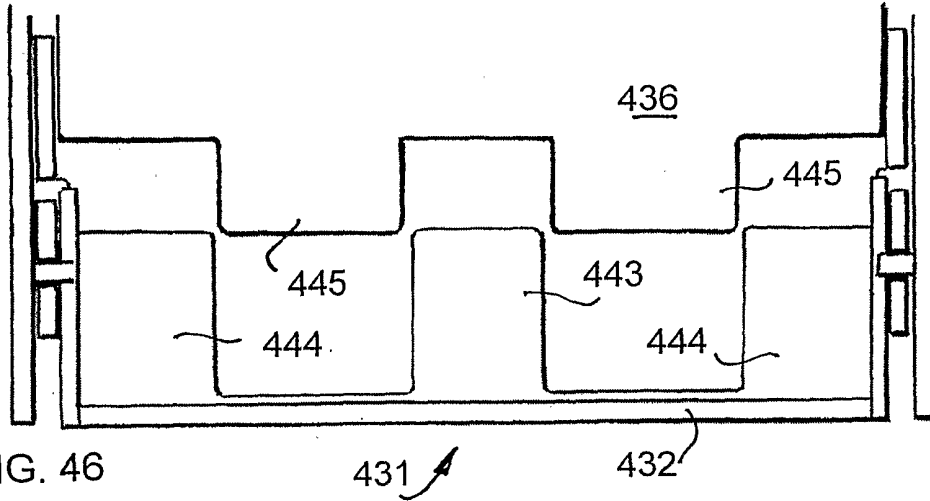


FIG. 45



22/25

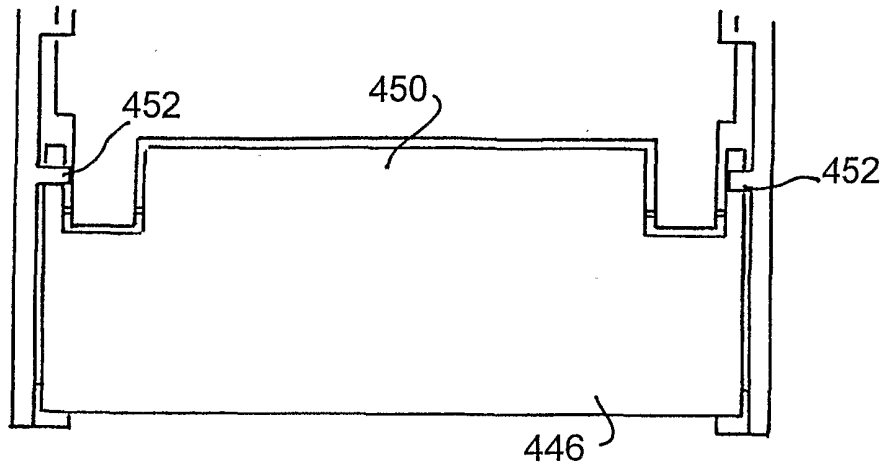


FIG. 49

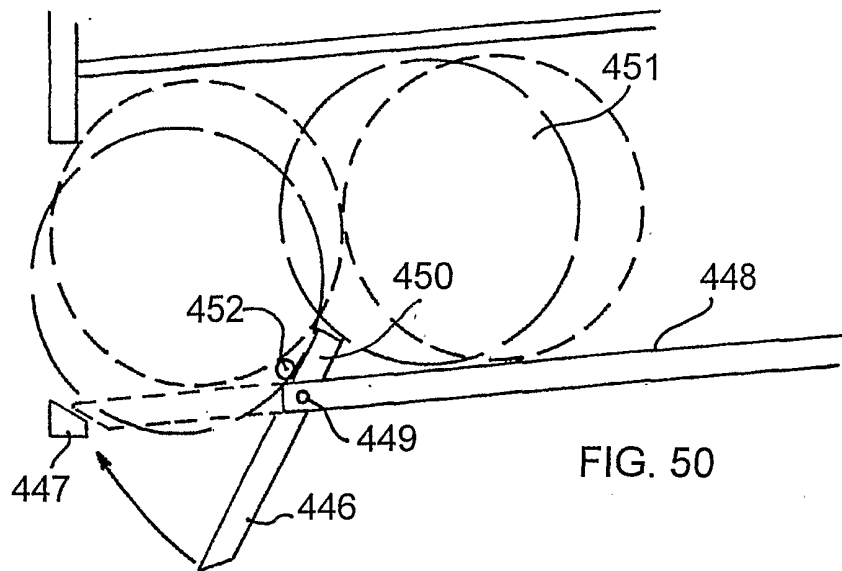
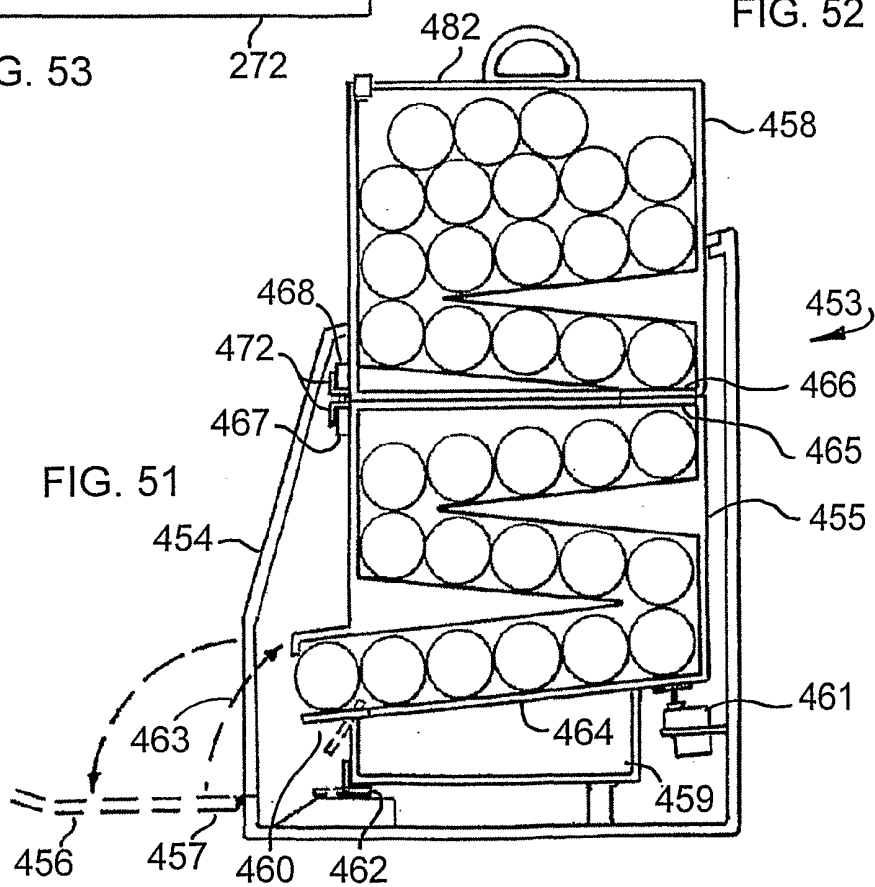
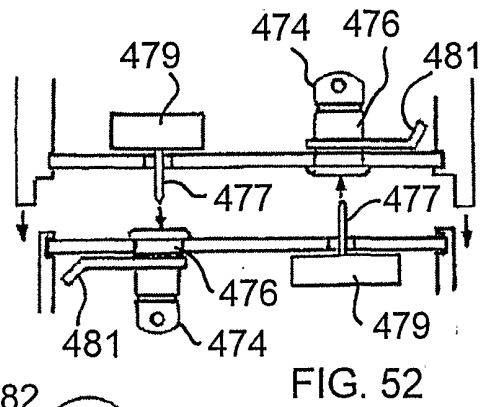
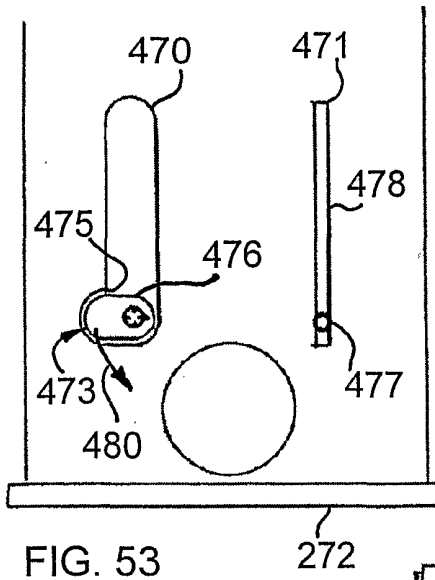


FIG. 50



24/25

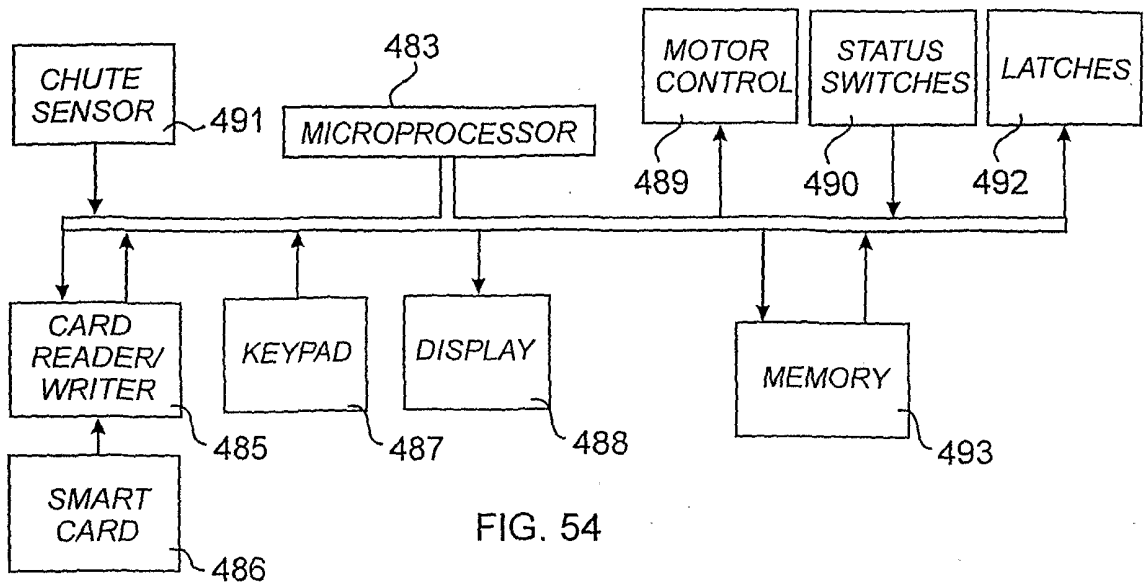


FIG. 54

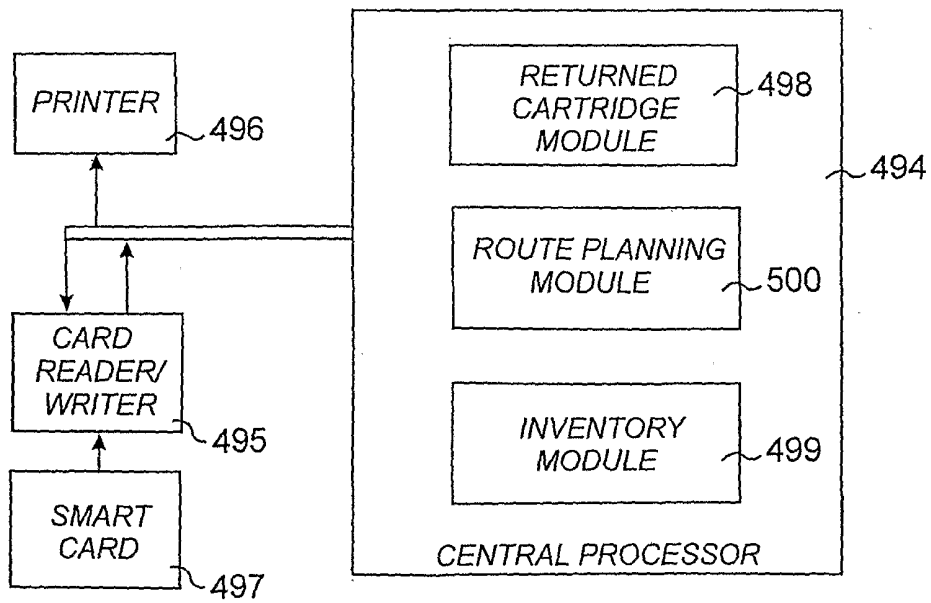


FIG. 55

25/25

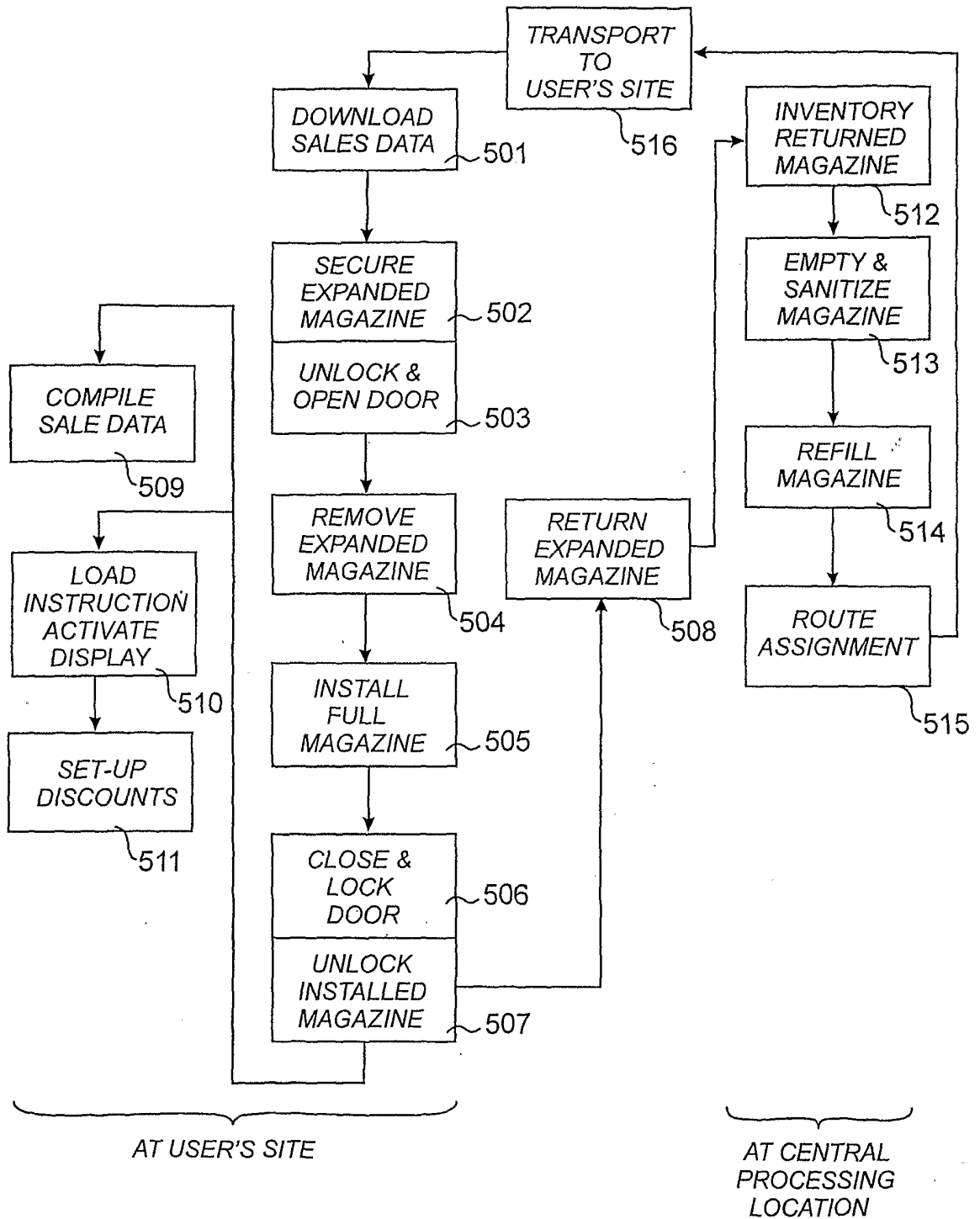


FIG. 56