Feb. 25, 1964 E. C. JOHNSON 3,122,401

UNIVERSAL VENDING APPARATUS

Filed July 12, 1960 6 Sheets-Sheet 1

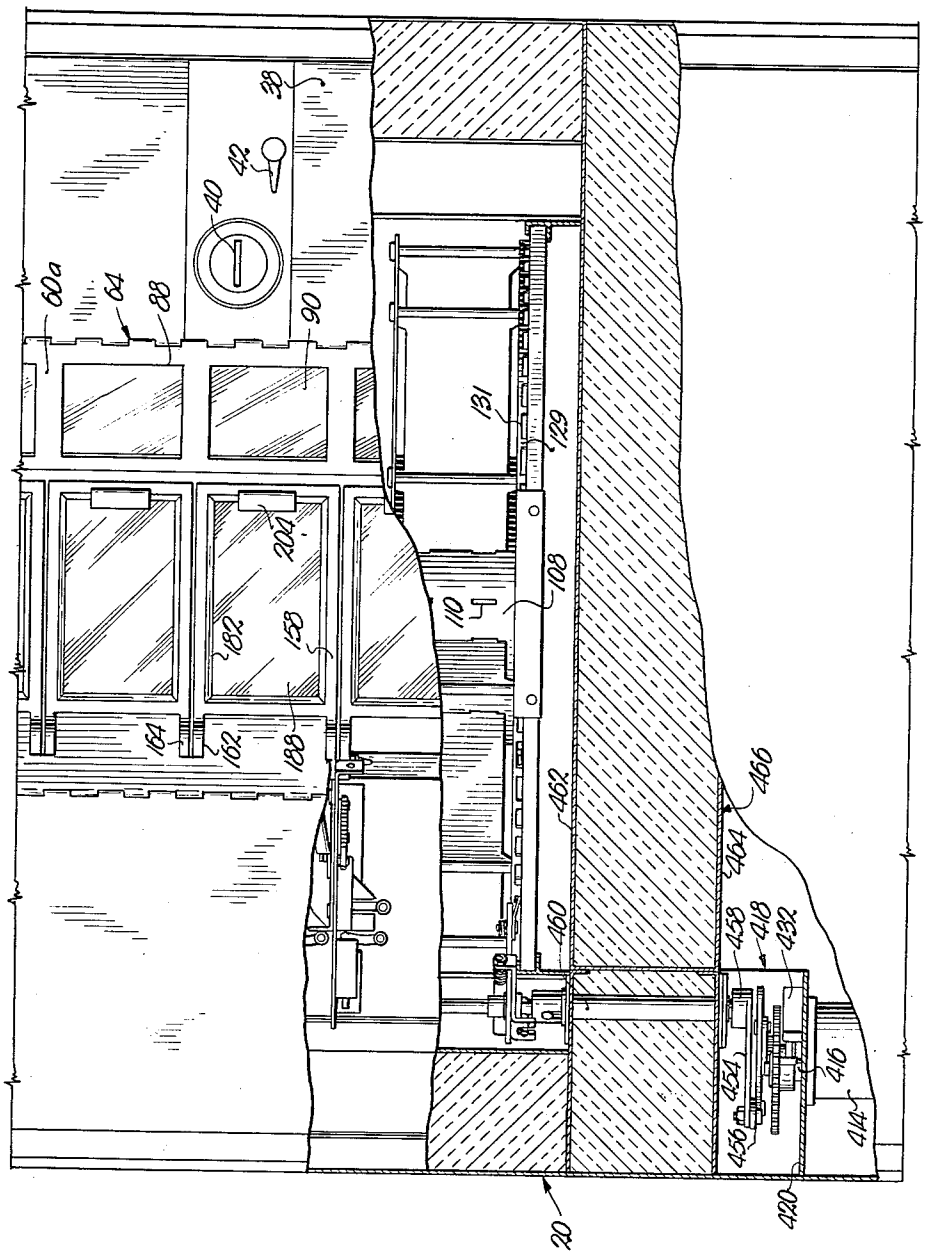

Fig. 1.

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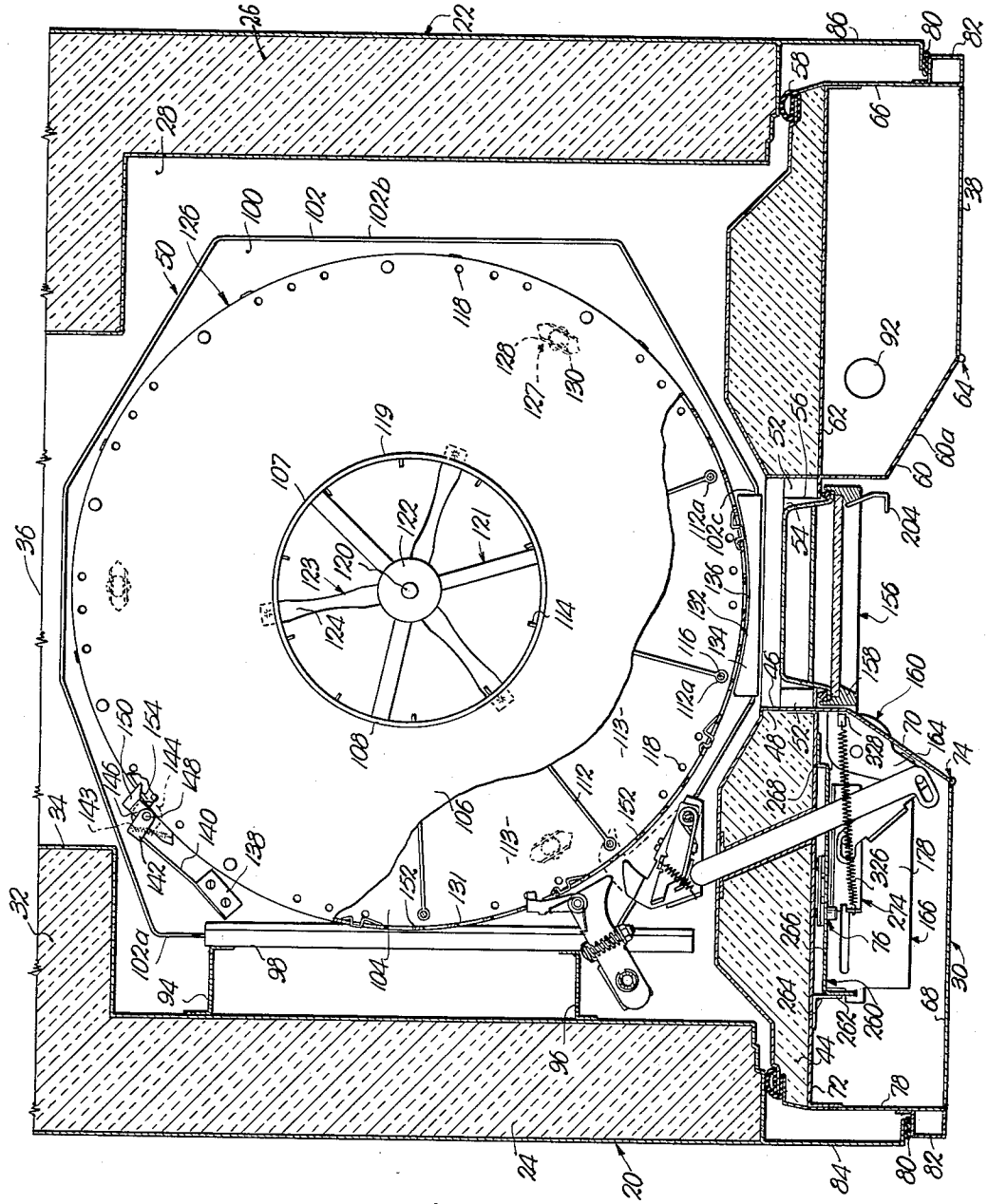

Fig. 2.

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UNIVERSAL VENDING APPARATUS

Filed July 12, 1960 6 Sheets-Sheet 3

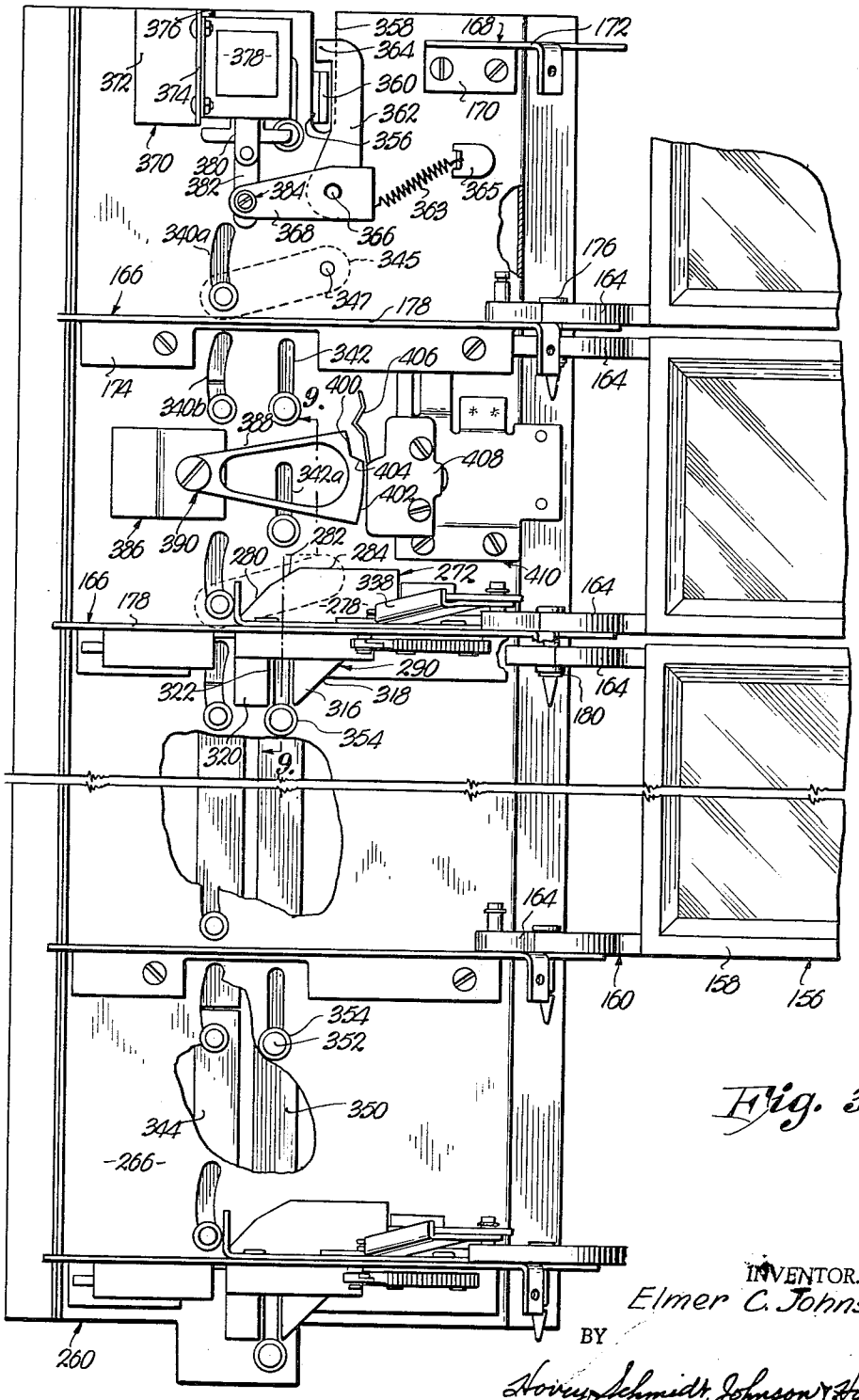

Fig. 3.

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UNIVERSAL VENDING APPARATUS

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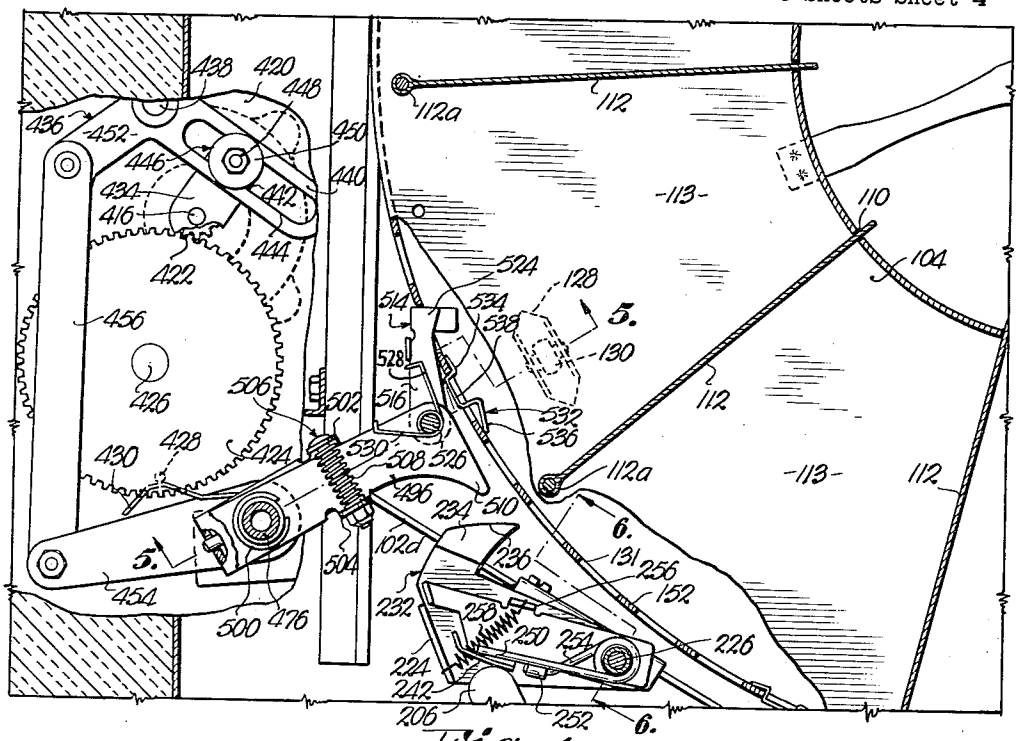

Fig. 4.

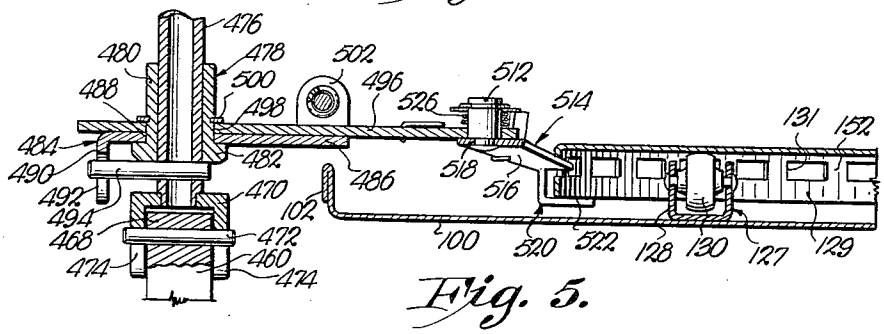

Fig. 5.

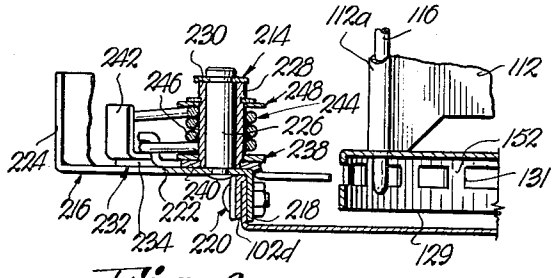

Fig. 6.

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UNIVERSAL VENDING APPARATUS

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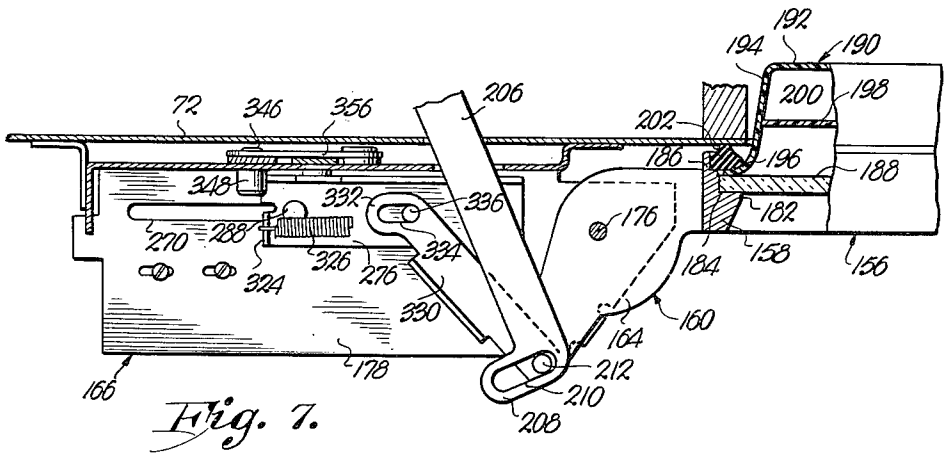

Fig. 7.

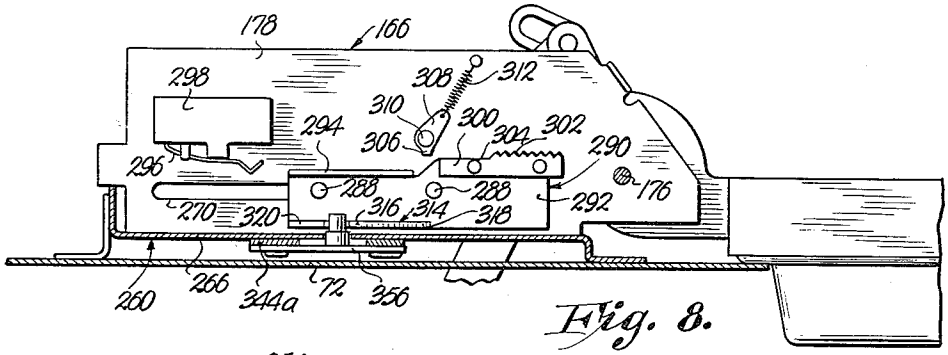

Fig. 8.

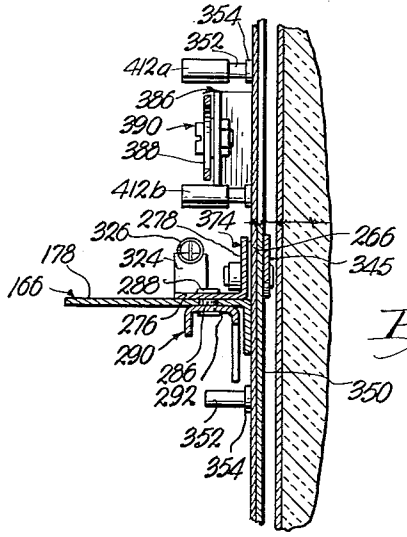

Fig. 9.

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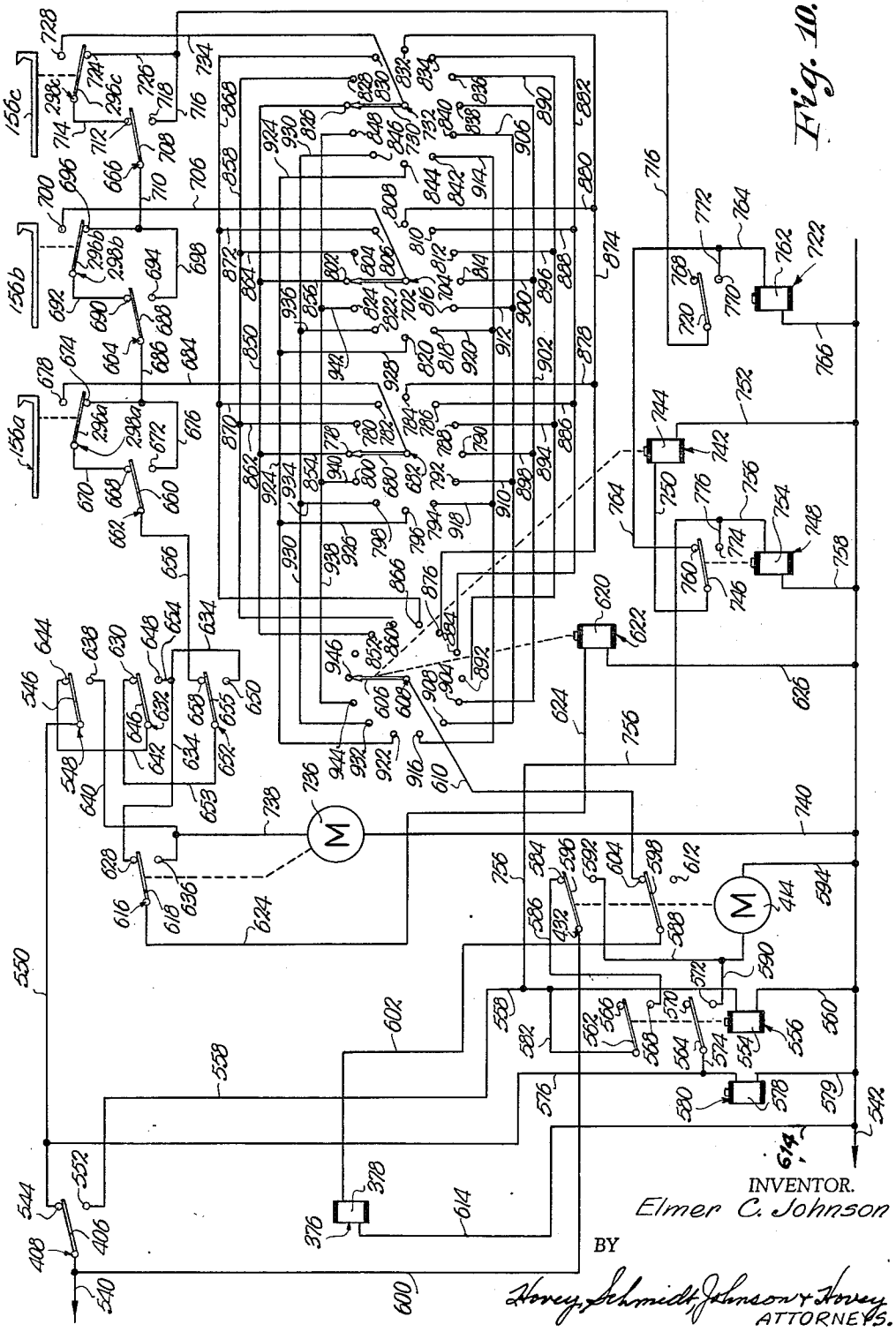
Fig. 10.



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United States Patent Office 3,122,401 Patented Feb. 25, 1964

3,122,401

UNIVERSAL VENDING APPARATUS

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Filed July 12, 1960, Ser. No. 42,408
12 Claims. (Cl. 312—97.1)

This invention relates to vending machines and particularly to equipment for vending a substantially infinite variety of articles from a single machine at any of a number of variable prices, and with little, if any, modification of the structure thereof being required in order that the machine may accommodate different articles, not only from time to time, but also so that the same are simultaneously available to the customer.

One of the most serious defects of prior vending machines has been the fact that only one product could be vended from a specific machine, or the choice of articles, if the machine handled a small number of products, was limited not only by the necessity of providing all of the articles of uniform size, but also by the requirement of the machine vending products at a uniform price or within a relatively narrow price range.

Multi-article machines have been developed within recent years but the same have not completely solved the problems referred to above, in that the number of products vendible from such machines is still relatively small, and it is generally necessary that the articles be packaged in containers of uniform size and thereby precluding vending of products of larger than a stipulated size without extensive modification of the machine being required.

Vending machines have not heretofore found widespread acceptance in the prepared foods field, not only because of the limitations set forth, but also because of the requirement of either maintaining the food in a hot, cool or extremely cold condition. Thus, the size of the prior machines was restricted because of the temperature conditions which had to be met for maintaining the food products at a selected temperature level and made it extremely difficult to vend various types of food products, regardless of the price thereof and with a relatively large number of each of the different food products being simultaneously available for vending.

It is, therefore, the primary object of the instant invention to provide a vending machine overcoming the disadvantages specifically defined, capable of dispensing a substantially infinite variety of prepared food products and in either a hot or cold condition as desired.

It is a further important object of the invention to provide a vending machine as described, having a housing mounting a plurality of independently rotatable shelves, each in turn having a number of radially disposed compartments therein successively alignable with respective vertically spaced openings in the cabinet of the machine and including novel power-operated means common to all of the shelf structures and including components for selectively coupling the power-operated means to a corresponding shelf structure from which a product has been removed by a customer to thereby move the next successive compartment of such shelf structure into alignment with the product delivery opening before the machine is again in condition for vending articles therein.

It is a very important object of the invention to utilize the opening movement of a vend door to provide an initial rotational movement of the corresponding shelf structure sufficient to accomplish the subsequent coupling of the shelf structure to a drive shaft common to all of the shelf structures, when the drive shaft is reciprocated after the vend door is reclosed.

A still further important object of the invention is to

provide a vending machine of the type described, including unique antipilfering mechanism for precluding opening of more than one door at a time normally disposed in vertically spaced, blocking relationship to the product delivery openings, to the end that the customer may select a desired product in any of the vertically aligned compartments and permitting him to remove such article from its corresponding compartment by simply inserting coins of predetermined value in the machine followed by opening the door in normal blocking relationship to the compartment.

An additional important object of the invention is to provide a vending machine wherein the power-operated means common to all of the shelf structures, is coupled to a respective shelf structure for rotating the latter to bring the next successive compartment into alignment with the product delivery opening associated therewith only after the customer has opened a product delivery door, removed an article from the compartment aligned therewith, and then returned the product delivery door to its initial position, this construction preventing dispensing of more than one article from the machine upon each insertion of coinage of predetermined value.

Also an important object of the invention is to provide a vending machine embodying the concepts discussed above and adapted to vend products of different sizes, not only from individual, vertically spaced shelf structures, but also from each rotatable shelf structure at different times, since the size of the separate compartments may be changed at will through the expedient of moving the walls defining opposed sides of respective compartments, to positions presenting compartments of predetermined equal width around the circumference of the shelf structure, although the number of such compartments vary with the number of walls employed.

An equally important object of the invention is to provide a vending machine for dispensing a large number of food products wherein the individual vend doors are transparent to permit the customer to examine the product in a corresponding compartment, and wherein the mechanism is designed so that the customer receives the product which he has visually observed.

Another important object of the invention is to provide a vending machine wherein the arc through which the independently rotatable shelf structures move after each vend operation, is determined by the width of a respective compartment inasmuch as rotation of the corresponding shelf structure is interrupted after the shelf structure has rotated a number of degrees equal to the width of each of the respective compartments, notwithstanding operation of the power-operated means for driving the shelf structures for a period after cessation of movement of the defined shelf structure.

A further important object of the invention is to provide a vending machine wherein all of the compartments adjacent corresponding product delivery openings, are slightly out of alignment with such openings when all of the product delivery doors are closed, and with mechanism being provided for moving a corresponding shelf structure through an arc sufficiently only to bring the product compartment of the respective shelf structure into direct alignment with the product delivery opening associated therewith upon opening of the product delivery door, and also serving to lock the respective shelf structure against movement throughout the period of time that the product delivery door is open.

Another important object of the invention is to provide a vending machine wherein the individual shelf structures have horizontally disposed members having a plurality of equally spaced slots in the peripheral margin thereof and adapted to receive oscillatory mechanism operated by

the defined power-operated means for driving the shelf structures, to thereby step each of the shelf structures through a predetermined arc as the oscillatory mechanism engages the member of each shelf structure in successive peripheral slots. An additional important object in this respect is the provision of unique clip means equivalent in number to the divisions of each particular shelf structure and adapted to be positioned in equally spaced relationship around disposed slots in the horizontal members of the shelf structures to preclude the oscillatory mechanism coupled to the power-operated means from engaging all shelf structures except that shelf structure which has been initially advanced by the opening of its corresponding vend door and furthermore, by means of such clips to effect the decoupling of the shelf structure which has been rotated, from the corresponding oscillatory mechanism when the shelf structure has been rotated through an arc corresponding to the width of the particular compartments therein.

Other imortant objects of the instant invention include the provision of novel antipilfering mechanism having improved interlocking means thereon for locking all of the remaining doors against opening when the customer commences to move one door toward a position that would provide access to the respective compartment aligned therewith, but before such access has been granted; a coin-operated vending machine wherein the antipilfering mechanism includes structure precluding movement of any of the vend doors to an open position until after coins of predetermined value have been inserted in the coin-receiving means, and with the antipilfering mechanism being designed so that upon insertion of coins corresponding to the value set up for a particular shelf structure, the door aligned with that shelf structure may be opened, but doors aligned with shelves set up for vending at different values, are precluded from being opened until the correct amount of coins is inserted in the machine; a machine wherein the total amount of coins required in the machine to effect unblocking of any of the product delivery doors, may be varied at will so that products of different values may be vended from any of the shelf structures during a selected period; a machine wherein loading of products into the housing thereof is facilitated by virtue of the fact that the housing is provided with a rear access door whereby products may be inserted in the individual compartments and as the individual shelves are independently rotated; a machine wherein products may be vended from the machine during loading thereof, with only the shelf structure into which objects are actually being loaded at a particular interval being blocked off so that customers cannot remove products from that particular shelf; the provision of a machine wherein the vend door is maintained in an open condition after the customer has swung the same through an arc sufficient to preclude movement of any of the remaining doors, whereby loss of the product by the customer is prevented, if he inadvertently lets go of the door; a machine as set forth wherein the same is readily adaptable to be set up for the vending of hot and cold articles from the same cabinet; a machine which may be maintained in a sanitary condition with relative ease, by virtue of the fact that the individual shelf structures may readily be removed from the cabinet of the machine for cleaning and repair purposes; and other important objects, advantages and details of construction of the present invention which will become obvious or be explained in greater detail as the following specification progresses.

In the drawings:

FIGURE 1 is a fragmentary, front elevational view of a vending machine embodying the concepts of the instant invention, with certain portions of the front door of the cabinet being broken away and the parts therebehind in section, to reveal details of construction of the unit;

FIG. 2 is a fragmentary, horizontal, cross-sectional view through the lower part of the cabinet as illustrated in FIG. 1, with certain components being broken away to better show the construction of the machine;

FIG. 3 is an enlarged, fragmentary, side elevational view of the antipilfering mechanism forming a part of the vending machine, and also illustrating the means connected to the product delivery doors for actuating the antipilfering mechanism;

FIG. 4 is an enlarged, fragmentary, horizontal, cross-sectional view illustrating in detail the portion of the mechanism shown in FIG. 2 in the lower left-hand corner thereof;

FIGS. 5 and 6 are enlarged, fragmentary, vertical cross-sectional views taken on irregular lines 5—5 and 6—6 respectively of FIG. 4;

FIG. 7 is an enlarged, fragmentary, plan view through a part of the antipilfering mechanism and showing in greater detail, the means for actuating the antipilfering mechanism in response to opening of one of the product delivery doors, certain parts of the unit being broken away and in section;

FIG. 8 is a bottom view looking upwardly, of the structure illustrated in FIG. 7;

FIG. 9 is an enlarged, fragmentary, vertical cross-sectional view taken substantially on irregular line 9—9 of FIG. 3; and

FIG. 10 is a schematic illustration of the wiring assembly forming a part of the vending machine and illustrating the electrical components associated with three of the doors of the vending machine.

A vending machine embodying the preferred concepts of the present invention is broadly numerated **20** in the drawings, and preferably includes an insulated cabinet or housing **22** having opposed side walls **24** and **26** extending the full vertical dimension of cabinet **22**, as well as a top wall and a bottom wall **28** across the upper and lower parts respectively of cabinet **22**.

The front wall **30** of housing **22**, constitutes a door which is also insulated and extends substantially the full length of the cabinet but terminating above a panel in overlying relationship to a refrigeration unit within cabinet **22**, if the machine **20** is to vend cold or cold and hot products. The back wall **32** of housing **22** has a relatively large rectangular opening **34** therein extending the full length of product-carrying shelf structures to be hereinafter described, and a rear door **36**, normally disposed in closing relationship to opening **34**, provides access to the interior of housing **22** from the rear thereof. Although not illustrated, it is to be understood that if hot and cold products are to be vended from cabinet **22**, a central, horizontal, insulated wall is positioned within cabinet **22** intermediate the top and bottom walls thereof.

Coin-controlled mechanism is provided within housing **22** behind swingable panel portion **38** of door **30**, and thus, panel portion **38** has a coin slot **40** therein and a rotatable operating handle **42** connected to the coin rejector and coin return units forming a part of the coin-controlled mechanism to thereby permit the customer to return coins which either do not pass through the rejector or the customer wants returned in lieu of purchasing an article.

Door **30**, hingedly mounted on housing **22** at the upper and lower extremities of the housing, adjacent the left-hand upright margin of the same, has a major insulated, substantially rectangular, interior section **44** having a rectangular inner opening **46** defined by the innermost margin **48** of section **44**. Opening **46** extends substantially throughout the vertical dimension of door **30** and thereby, provides access to all of the product compartments in the shelf structures **50** provided within housing **22** and which will be described in detail hereinafter.

A pair of elongated, transversely rectangular rails **52** of insulating material, secured to the inner opposed faces of margins **48** and extending the full length of opening **46**, serve in conjunction with a number of cross rails

54 connected to rails 52, to define a product delivery opening 56 for each of the shelf structures 50. In order to prevent heat transfer from the interior of housing 22 to or from the ambient atmosphere, door 30 is provided with an inner rectangular gasket 58 on the peripheral margin thereof adjacent to and normally in engagement with the side walls 24 and 26 of housing 22, as well as with the top wall and the adjacent edge of bottom wall 28.

Panel portion 38 of door 30 is hingedly mounted on a transversely L-shaped member 60 connected to the outer face of upright wall segment 62 of section 44, with the outer margin of panel 38 remote from hinge means 64 mounting the same on member 60 being in normally abutting relationship with wall 66 projecting outwardly from segment 62. It is to be understood that the coin-controlled mechanism (not shown) referred to above, is carried by bracket means on segment 62 and that access may be had to such coin-controlled mechanism upon swinging of panel 38 to the open position thereof.

The opposite side of door 30 is also provided with a panel 68 similar to panel 38, and hingedly mounted on a transversely L-shaped member 70 extending outwardly from outer wall segment 72 of section 44 in proximity to opening 46, as best shown in FIG. 2. Hinge means 74 coupling panel 68 to member 70, permits such panel to be swung to an open position exposing antipilfering mechanism broadly designated 76, and which is mounted on the outer face of segment 72. Panel 68 terminates adjacent a wall 78 projecting outwardly from the upright margin of segment 72. An additional peripherally disposed, generally rectangular gasket 80 is provided on the inwardly facing surface of a rectangular extension 82 on the periphery of door 30 defined by the outer margin of walls 66, as well as top and lower walls forming a part of door 30, and engageable with L-shaped wall sections 84 and 86 of side walls 24 and 26 respectively to effectively insulate the interior of housing 22 when door 30 is closed.

The outermost leg 60*a* of L-shaped member 60, has a series of rectangular openings 88 therein aligned with corresponding shelf structures 50, while one elongated plate, or a series of plates 90, are positioned behind leg 60*a* of member 60, so as to provide a translucent surface permitting light to pass therethrough. In this manner, transparent or translucent signs, designating the particular product in a respective shelf, as well as the price thereof, may be placed behind plates 90 so that the same may be easily read by a customer, particularly in view of the fact that an upright, fluorescent tube or the like 92, is provided within door 30 adjacent openings 88 as best shown in FIG. 2. It is to be understood that the display signs behind plates 90 may be readily changed by simply opening panel 38 to provide access to the adjacent portion of door 30.

A pair of parallel, upright, transversely Z-shaped support members 94 and 96, secured to the inner faces of side walls 24 and 26 respectively, extending inwardly into the interior of housing 22 and disposed in horizontally spaced relationship on opposite sides of such housing, mount a plurality of transversely U-shaped, inwardly opening channels 98 which serve as means for mounting corresponding shelf structures 50 within housing 22. Thus, it is to be understood that a pair of horizontal, parallel, directly opposed channels 98, are provided for each of the shelf structures 50 and positioned so that the product compartments of corresponding shelf structures 50, are in direct alignment vertically with respect to corresponding openings 56 in door 30.

Each of the shelf structures 50 is substantially identical in construction, although the effective vertical dimensions of the same may be varied as desired, to accommodate articles of different sizes, and thus only one of the shelf structures 50 has been illustrated in detail in FIGS. 2 and 4. Thus, the shelf structure 50 illustrated in FIG. 2, has a polygonal bottom wall 100 provided with an integral, upturned flange 102, it being noted that the opposed, peripheral marginal segments 102*a* and 102*b* of flange 102, are parallel in substantially perpendicular relationship to the major plane of door 30 and adapted to be slidably received in opposed channels 98, secured to upright members 94 and 96 respectively. In this manner, each of the shelf structures 50 may be removed from housing 22 by simply sliding the shelf structure out of channels 98 through the front opening in housing 22.

A pair of plate members 104 and 106 are rotatably mounted on each of the bottom walls 100 and are maintained in parallel, vertically spaced relationship by an inner cylindrical wall 108 positioned at the inner periphery of each of the members 104 and 106, and having a number of horizontally and vertically spaced, elongated, upright slots 110 therein as will be explained hereinafter. Also serving to maintain walls 104 and 106 of each shelf structure 50 in proper spaced relationship, are a series of radially disposed spacer walls 112 defining product compartments 113 therebetween and having spaced, parallel projecting tabs 114 on the innermost upright margin thereof and adapted to be received within a pair of vertically aligned slots 110 in wall 108, while the outer upright margins of each of the spacer walls 112 are bent into cylinder defining portions 112*a* adapted to receive pin means 116. As shown in FIG. 2, the outer peripheral margins of members 104 and 106, are provided with a series of perforations 118 therein which are adapted to be aligned with the cylindrical portions 112*a* of divider or spacer walls 112. Thus, pins 116 which have enlarged heads on the uppermost ends thereof, are passed downwardly through corresponding perforations 118 and wall 106, thence through cylindrical portions 112*a* and finally, through perforations 118 in member 104.

Bottom wall 100 has a central, circular opening 119 therein, bridged by a spider 121, which mounts an upright, centrally disposed stub shaft 120. A second spider 123 includes an annular disc portion 122, rotatable on shaft 120, and has a number of radially extending arms 124 secured thereto which are coupled to wall 108, or in the alternative, bottom member 104. In this respect, it should be understood that lower plate member 104, and upper plate member 106, are preferably secured to cylindrical wall 108 in vertically spaced relationship. Each shelf structure 126 is provided with a minimum of five fixed partitions or walls 112, while at least five removable partitions 112 are added to bisect each compartment established by the fixed partitions 112. Additionally, other partitions may be added, provided the compartments are of equal width.

In order to support the tray structure 126, a plurality of roller units 127 are mounted on the upper surface of bottom wall 100 and each includes a generally U-shaped, upwardly opening bracket 128 mounting a roller 130 disposed to engage the underside of the respective lower plate member 104. As best shown in FIG. 2, rollers 130 are rotatable about axes passing through the axis of shaft 120. The lower plate member 104 of each of the tray structures 126, has an integral, peripherally disposed, downwardly extending flange 129, provided with a series of equally spaced, elongated slots 131 therein, which are spaced with the centers thereof lying on radians positioned at 6° intervals around the circumference of tray structure 126.

A transversely L-shaped element 132 is secured to the forwardmost upstanding flange 102*c* of bottom 100, with the horizontal leg 134 of each element 132 extending toward the adjacent tray structure 126 and having a curved outer margin 136 spaced from, but complemental with, the peripheral margin of the adjacent plate member 104.

In order to prevent over-travel of each of the tray structures 126 as the latter is advanced by the reciprocating action of the driving mechanism, an L-shaped bracket 138 is secured to the upper face of wall 100 on each shelf structure 50, adjacent a rear corner thereof

in proximal relationship to side wall 24 and rear wall 32 of housing 22, with an elongated leaf spring 140 being mounted on bracket 138 and extending rearwardly therefrom (FIG. 2). A U-shaped member 142, carried by the outer end of leaf spring 140 remote from bracket 138, mounts a roller 144 rotatable about a vertical axis and disposed to be received in one of the slots 131 in flange 129 of the respective lower plate member 104.

An elongated catch 146 is carried by the shaft 148 mounting roller 144, and includes a laterally extending projection 150 on the extremity thereof remote from bracket 138 and adapted to extend into the slot 131 next adjacent to the slot in which roller 144 is disposed to preclude rotation of tray structure 126 in a counterclockwise direction.

Spring means 143 interconnects U-shaped member 142 and the end of element 146 adjacent bracket 138, for biasing element 146 in a clockwise direction. The inclined edge 154 of anti-backup projection 150, rides over the next successive web 152 as tray structure 126 is rotated in a clockwise direction with roller 144 serving to index the corresponding compartments 113 in predetermined relationship with respect to the product delivery opening 56 associated with the corresponding shelf structure 50.

Each of the product delivery openings 56 is normally closed by a product delivery door broadly numerated 156, and including a generally rectangular, outer frame 158, having a pair of generally L-shaped hinge elements 160 secured to the upper and lower horizontal outer margins thereof. As shown in FIGS. 2 and 7, L-shaped member 70 is provided with notches 162 therein, clearing the outer projecting portions 164 of each of the elements 160 which extend into and are located within the space presented by members 70, panel 68, wall 78 and segment 72 of door 30.

The means for mounting hinge portions 164 on door 30, comprises a series of generally horizontal, vertically spaced, parallel plate members 166 interposed between each proximal pair of superimposed hinge portions 164 (see FIG. 3). The uppermost hinge portion of the top door 156 is carried by a bracket 168 having vertical legs 170 secured to the outer face of segment 72, and a horizontal leg portion 172 provided with a perforation therein, registrable in a corresponding opening in the uppermost hinge portion 164 to permit a pin to be passed therethrough to rotatably secure the respective hinge portion to bracket 168.

Plate members 166, to be explained in greater detail hereinafter, are carried by section 44 in a manner to also be described. Pins 176 have enlarged heads passing through aligned openings in proximal hinge portions 164, as well as an opening in the horizontal portion 178 of each of the plate members 166. In this manner, the enlarged head of each of the plates 176, engages the hinge portion 164 of the lower hinge 160 on a corresponding delivery door 156, while a C-clip 180 received in a groove therefor in the lower end of each pin 176, and located below the lower surface of the hinge portion 164 of the uppermost hinge 160 of each delivery door 156, releasably maintains pins 176 in the defined disposition thereof.

Each of the frames 158 of doors 156 has a generally rectangular, centrally disposed opening 182 therein, with the normally rearmost, rectangular margin of frame 158 having a pair of circumferentially extending recesses 184 and 186. The innermost recess 184 receives a complemental transparent member 188 of glass or plastic, while a transparent insulating component 190 is also carried by frame 158 within recess 184. Note in FIG. 7 that component 190 is generally cup-shaped in transverse configuration and has an outer rectangular wall portion 192 generally parallel with member 188, while the peripheral skirt portion 194 of component 190 is integral with wall portion 192 and has an outwardly projecting, flared side portion 196 in direct engagement with the inner face of member 188.

A transverse wall 198 integral with skirt portion 194 of component 190, and disposed intermediate main wall portion 192 and member 188, presents a dead-air space 200 between main wall portion 192 and transverse wall 198, as well as between the latter and member 188. A flexible gasket 202 of generally rectangular configuration and received within recess 186 in each frame 158, and engaging flared side portion 196 of the corresponding component 190, is disposed to engage the outer faces of the upright rails 52, as well as corresponding cross rails 54, to provide an effective seal between door 156 and the product delivery opening defining rails carried by section 44 of door 30. Generally transversely L-shaped operating handles 204, secured to the upright segments of frames 158 remote from hinge elements 160, facilitates opening of corresponding product delivery doors 156.

As indicated above, the compartments 113 are slightly out of alignment with respective product delivery openings 56 when all of the doors 156 are in their closed positions, and the mechanism for shifting the compartment 113 of a shelf structure 50 into direct alignment with the corresponding product delivery opening 56, when a particular one of the doors 156 is shifted to the open disposition thereof, includes an elongated push member 206 operably coupled to the lowermost hinge element 160, connected to doors 156 and extending through section 44 of door 30 into the interior of housing 22 (FIG. 2). Each of the push members 206 has a projection 208 on the extremity thereof in proximity to the corresponding projecting portions 164 of the lower hinge elements 160, with projections 208 having elongated slots 210 therein clearing an upright pin 212 with a lock pin extending through the upper extremity of each of the pins 212 to preclude displacement of members 206 from corresponding pins 212.

The inner extremities of push members 206 are engageable with indexing devices 214 carried by the adjacent channel 98 of a respective shelf structure 50. Since all of the devices 214 are identical, only one of the same is illustrated in detail and reference is thereby made to FIGS. 2, 4 and 6.

A Z-shaped bracket 216, mounted on the flange 102*d* of the corresponding shelf structure 50, includes a leg 218 which is secured to flange 102*d* by bolt and nut means 220. The relatively long, horizontal leg 216 serves as the main support for the operating components of device 214, while an upright end leg 224 acts as a guide for the inner extremities of the corresponding push member 206 to restrict such push member to a substantially rectilinear path of travel.

An upright shaft 226 mounted on main leg 222 of bracket 216, and in proximal relationship to the flange 102*d*, has a sleeve 228 positioned thereover and maintained in predetermined disposition by main leg 222 at one end thereof, and a C-clip or equivalent structure 230, releasably secured to the upper end of shaft 226 in abutting relationship to the uppermost end of sleeve 228. A generally J-shaped, planer indexing member 232, is mounted for rotation on shaft 226 and is in flat engagement with the upper surface of main leg 222 of bracket 216. Leg portion 234 of indexing member 232, and projecting laterally from the main portion thereof toward the adjacent plate member 104, has an outer, angularly disposed, slightly longitudinally arcuate surface 236 adapted to engage the adjacent web 152 of flange 129 on the lower plate member 104 and thereby shift the corresponding tray structure 126 through an arc sufficient to cause leg portion 234 of indexing member 232 to pass completely into the proximal slot 131.

An L-shaped override plate broadly numerated 238, is also mounted on shaft 226 in surrounding relationship to the lower extremity of sleeve 228, the main horizontal leg 240 of plate 238 being disposed in flat engagement

with the upper surface of leg portion 234, while the upright leg portion 242 of plate 238 is disposed with the outer surface thereof at an angle with respect to the path of travel of the adjacent push member 206, and directly in the path of travel of the inner extremity thereof (FIG. 4). In this respect, attention is directed to the fact that the inner extremities of the members 206 are rounded so that the same may slide smoothly over the surface of corresponding leg portions 242 of plates 238.

A very strong coil spring 244, disposed with the coiled portion 246 thereof in surrounding relationship to sleeve 228 and maintained at the lower extremity of the latter by a washer and C-clip combination 248, has an elongated, outwardly extending, integral leg 250 at the upper end thereof projecting outwardly into engagement with the normally innermost surface of leg portion 242 of plate 238. Main leg portion 234 of indexing member 232, has an integral, upstanding, generally L-shaped lug 252 thereon which receives the lower, somewhat shorter, outwardly projecting leg 254 of spring 244.

Another upstanding, integral lug 256 on horizontal leg 240 of override plate 238, serves as means for receiving one end of a coil spring 258 which is coupled at the opposite end thereof to end leg 224 of bracket 216.

Antipilfering mechanism 76 for precluding opening of more than one of the doors 156 at a time, includes a main elongated, upright plate 260 having an outwardly projecting, longitudinally extending flange segment 262 secured to an L-shaped bracket 264 on the outer face of segment 72, in a manner to maintain the main plate section 266 of plate 260 in spaced relationship to segment 72. The opposed, transversely L-shaped margin 268 of plate 260, and integral with the main segment 266 thereof, projects toward, and is secured to segment 72 to maintain plate section 266 in parallel relationship to segment 72. Plate members 166 have downwardly projecting, integral flanges 174 thereon, secured to main plate section 266 of plate 260 through suitable screw means or the like.

Horizontal portion 178 of each of the plate members 166, associated with corresponding doors 156, are provided with elongated, vertically aligned, parallel slots 270 therein in relatively close proximity to plate section 266 of plate 260 (FIGS. 7 and 8).

Cam structure broadly numerated 272, is mounted on each of the plate members 166 for horizontal reciprocation in respective slots 270. Since all of the cam structures 272 are of identical construction, only one of the same will be described in detail and with particular reference to FIGS. 3, 7, 8 and 9. The slide member 274 of structure 272, and which is of generally transversely L-shaped configuration, includes a main elongated base section 276 overlying the upper face of a corresponding horizontal portion 178 of plate members 166, and in overlying relationship to the slot 270 therein.

The upstanding, elongated leg 278 of section 276 is in abutting relationship to the outer face of plate section 266 and provided with a leading cam edge 280 thereon extending upwardly from the margin of section 276 remote from a corresponding door 156, and at an acute angle with respect to the plane of the respective section 276, as well as an intermediate, angularly disposed cam edge 282 which extends from edge 280 to the upper horizontal cam edge 284 of leg 278, it being noted that cam edge 282 is of less angularity with respect to the plane of the corresponding section 276 than cam edge 280 relative thereto.

A rectangular slide block 286 secured to the underface of each of the sections 276, through connector means 288, extends through, and is slidably disposed within a respective slot 270, there being a generally U-shaped member broadly designated 290 secured to, and carried by block member 286 of each of the structures 272. As best shown in FIGS. 8 and 9, member 290 has a horizontal leg 292 which is secured to block 286 by connector means 288, with leg 292 being of generally rectangular configuration and extending longitudinally of the adjacent slot 270.

An outer, integral, depending leg segment 294 of member 290, and remote from plate section 266, is in parallelism with the longitudinal length of the corresponding slot 270 and disposed to engage switch arm 296 of a switch 298 carried by horizontal portion 178 of each of the plate members 166 in the disposition illustrated in FIG. 8.

Leg segment 294 terminates intermediate the ends of leg 292 and a rack member 300 is secured to the outer longitudinal margin of leg 292 along the length thereof, from the terminal end of leg segment 294 to the extremity of the same proximal to door 156. Rack member 300 has a series of outwardly-facing teeth 302 in the margin 304 thereof and disposed to receive the extension 306 of a pawl 308 pivotally carried by the underface of horizontal portion 178 of each of the plate members 166 by a respective pivot pin 310. A coil spring 312 connected to the outer end of each pawl 308 and to the horizontal portion 178 of each plate member 166, biases extension 306 into the disposition thereof illustrated in FIG. 8. By virtue of engagement of rack member 300 with pawl 308, retrograde movement of each of the structures 272 is precluded as will be explained hereinafter.

The other leg 314 integral with the margin of each leg 292 in direct opposition to leg segment 294 thereon, and of substantially equal length to the latter, is of generally trapezoidal configuration as shown in FIG. 3, and thereby includes a triangular segment 316 having an inclined, outer cam edge 318, as well as a rectangular segment 320 separated from segment 316 by a rectangular space 322 presenting a notch for receiving pin means to be hereinafter defined.

Upper base section 276 of each structure 272, has an upstanding lug 324 integral with the extremity thereof away from a corresponding door 156, with a coil spring 326 being connected to lug 324 and a respective lug 328 carried by member 70 of door 30 to thereby bias each of the structures 272 toward the product delivery openings 56 in the front wall or door 30 of cabinet 22.

Mechanism for shifting one of the structures 272 in response to opening and closing of a respective door 156, includes an elongated link 330 pivotally joined to the outer extremity of the projecting portion 164 of the lower hinge element 160 of a corresponding door 156, it being noted that pins 212 serve to join the links 330 to respective hinge elements 160. The innermost end 332 of each link 330 is at an angle with respect to the longitudinal length thereof, and is provided with an elongated lost motion slot 334 therein which receives an upstanding pin 336 secured to the section 276 of each of the slide members 274 as shown in FIG. 7.

In order to prevent opening of more than one door 156 at a time, a series of individually movable plates and a common coupling bar, are provided on the rear face of plate section 266 and operable in response to reciprocation of one of the structures 272 as the corresponding door 156 is opened by a customer. Plate section 266 has a number of arcuate slots 340*a* and 340*b* therein, with each pair of slots 340*a* and 340*b* being disposed on opposite sides of the horizontal portion 178 of the plate members 166 located in vertical alignment, curved in the same direction, of equal circumference, and located adjacent the outer extremity of a respective structure 272 when the latter is in the innermost end of its path of travel under the influence of a respective spring 326.

Plate section 266 also has a series of rectilinear, vertically aligned slots 342 therein in horizontal spaced relationship from the slots 340*a* and 340*b*. A slot 342 is provided below each of the horizontal portions 178 of plate members 166, with the exception of an additional slot 342 being provided intermediate the upper two plate members 166.

A number of elongated, individual, vertically aligned, parallel plates 344, are provided betwen the rear face of plate section 266 and wall 72 and disposed in direct alignment with arcuate slots 340*a* and 340*b*. As indicated in FIG. 3, there is provided one plate 344 for each of the structures 272, with such plates being in end-to-end, abutting relationship and having pins 346 thereon extending through and slidably received within adjacent slots 340*b*. Links 345, pivotally mounted at one end thereof on each of the pivot pins 346, are positioned behind plate 260 and are pivotally mounted on the latter through individual pivot pins 347 passing through links 345 at the ends thereof opposed to pins 346. Cylindrical elements 348 on pins 346 of greater diameter than the width of slots 340*a* and 340*b*, are in engagement with the outer face of plate section 266 to thereby maintain plates 344 in predetermined disposition on plate 260. It is to be preferred that elements 348 be rotatable on pins 346 and disposed to be engaged by cam edges 280, 282 and 284 on leg 278 of each structure 272, whereby, as the latter is shifted to the left, viewing FIG. 3, cylindrical elements 348 rotate as certain of the plates 344 are biased upwardly under the influence of the corresponding structure 272.

An elongated common bar 350, extending substantially the full length of plate 260, is disposed in direct opposition to slots 342 and parallel with plates 344. Pins 352 secured to bar 350 and projecting through corresponding slots 342, have flange means 354 thereon on the outer face of section 266 of plate 260, to thereby maintain bar 350 in proper relationship, but not in any way interfering with vertical reciprocation thereof. As shown in FIG. 3, pins 352 are of a diameter to be received in the notch 322 in member 290 of each of the structures 272 for locking purposes as will be hereinafter explained.

A connector link 356 is secured to the uppermost plate 344*a* and the upper extremity of bar 350 so that movement of plate 344*a* causes a corresponding movement in the same direction of the bar 350.

Plate 260 has a vertical notch 358 therein which clears an outwardly projecting extension 360 on link 356, while a J-shaped hook 362 is pivotally mounted on the outer face of plate section 266 in proximity to the upper edge thereof and disposed so that the outer hook portion 364 thereof is normally positioned to prevent upward movement of extension 360, and thereby bar 350 and uppermost plate 344*a*. Pivot pin 366 rotatably carrying hook 362 on plate 260, also pivotally receives connector link 368 which is rigidly secured to hook 362 so that, as connector link 368 is rotated about pin 366, hook 362 is pivoted therewith. A coil spring 363, connected to the end of link 368, adjacent pin 366, and also hooked over a bracket 365 mounted on the outer face of plate 260, biases hook 362 into the normal disposition thereof shown in FIG. 3.

An L-shaped bracket 370 having one leg 372 secured to the outer face of plate 260 in proximity to the upper margin thereof, has an outwardly projecting leg 374 mounting a solenoid 376 provided with a coil 378 and a reciprocable armature 380. A link 382 carried by the outer end of armature 380, is pivotally joined to the end of connector link 368 remote from pin 366 by bolt and nut means 384.

A generally Z-shaped bracket 386 carried by the outer face of plate section 266 of plate 260 and disposed between the two uppermost plate members 166, rotatably mounts an operator member 388 which is pivotal about bolt and nut means 390 extending through bracket 386. The outer end of member 388 remote from bolt and nut means 390, has a pair of longitudinally arcuate cam surfaces 400 and 402 thereon, separated by intermediate, angularly disposed cam surfaces 404 presenting a shoulder disposed to engage the outwardly bent portion of a switch arm 406 forming a part of switch 408 mounted on a bracket 410 in turn carried by plate 260. As shown in FIG. 3, the pins 352 extending through the uppermost slot 342 and slot 342*a*, have enlarged heads 412*a* and 412*b* respectively thereon, and disposed to engage member 388 and pivot the same in response to reciprocation of bar 350.

The mechanism for selectively driving shelf structures 50, includes a single motor 414 mounted in the lower part of cabinet 22 adjacent wall 24 and in proximity to front door 30, the output shaft 416 of motor 414 being disposed vertically and facing upwardly as indicated in FIGS. 1 and 4. A U-shaped bracket 418 in the lower part of cabinet 22, is provided with a horizontal leg 420 carrying motor 414, with leg 420 having an opening for clearing shaft 416.

A relatively small pinion 422 mounted on the upper end of shaft 416 for rotation therewith, is in intermeshing relationship with a relatively large timing gear 424 carried by a vertical shaft 426, secured to and extending upwardly from the upper face of leg 420 of bracket 418. A pin 428 secured to the underface of timing gear 424 adjacent the periphery thereof, is disposed to engage a switch arm 430 of switch 432 also mounted on the upper face of leg 420 adjacent the peripheral margin of gear 424.

A relatively short link 434 secured at one end thereof to the uppermost extremity of shaft 416 for rotation therewith, is positioned in a vertical plane slightly above the upper face of timing gear 424, and is operably coupled to a crank broadly designated 436 pivotally mounted on the upper face of leg 420 through an upright shaft 438.

As best shown in FIG. 4, one leg 440 of crank 436, extends into overlying relationship with the outer extremity 442 of link 434 remote from shaft 416, with leg 440 being provided with an elongated slot 444 therein which receives connector means 446 secured to the extremity 442 of link 434. Connector means 446 includes bolt and nut means 448 mounting a transversely H-shaped member 450, in turn carrying ball-bearing means having an outer ring portion slidably engaging the margin of leg 440 defining slot 444. It is to be understood that as link 434 is rotated, connector means 446 slides longitudinally in slot 444 to thereby rock crank 436 about the axis of shaft 438.

The other leg 452 of crank 436 is pivotally joined to a lever 454 by an elongated link 456. Lever 454 has an integral, tubular boss 458 thereon and extending upwardly from the same as shown in FIG. 1, with boss 458 receiving and being rigidly secured to an elongated shaft 460 extending upwardly through a pair of vertically-spaced, parallel walls 462 and 464 defining the lower internal partition 466 of cabinet 22.

The upper extremity 468 of shaft 460 is secured to a cup-shaped connector 470 by a crosspin 472, extending transversely through extremity 468 and projecting outwardly from the outer surface thereof and removably received in opposed, upwardly-extending notches 474 provided in the side wall of connector 470.

An elongated, tubular shaft 476, secured to connector 470 for movement therewith, extends upwardly within the interior of cabinet 22 from immediately above wall 462 to the lower surface of the top of the cabinet with bearing means being provided in such top to maintain shaft 476 in a vertical position, yet permitting free rotation thereof.

Coupling means broadly designated 478, is provided on shaft 476 for each of the shelf structures 50 and for purposes of the present description, only one of such coupling means is illustrated and described in detail with particular reference to FIGS. 1, 4 and 5. Each of the coupling means 478 includes a sleeve 480 rotatable on shaft 476 and provided with an integral, annular flange portion 482 at the lower end thereof, serving as bearing means for an elongated, generally Z-shaped connector element 484 having a central rectangular section 486 provided with an opening 488 therein, clearing sleeve 480 so

that section 486 rests in flat engagement with the shoulder presented by flange 482 on sleeve 480.

A lug 490 integral with the extremity of section 486 normally remote from the proximal shelf structure 50, is provided with an upwardly extending notch 492 therein which receives a pin 494 extending through shaft 476 as shown in FIG. 5.

An elongated plate 496 overlying section 486 of element 484, and in general longitudinal alignment therewith, also has an opening 498 therein receiving sleeve 480, while a C-shaped clip 500 serves to maintain connector element 484 and plate 496 on sleeve 480 for movement therewith.

An upstanding lug 502 integral with the extremity of section 486 of connector element 484 remote from lug 490, is in direct opposition to a lug 504 integral with the margin of plate 496 away from lug 502. Lugs 502 and 504 have openings therein for clearing bolt and nut means 506 interconnecting the same, while a coil spring 508, surrounding the bolt of bolt and nut means 506, is in engagement with opposed surfaces of respective lugs 502 and 504.

The outer extremity of plate 496 away from shaft 476, has a laterally extending integral tip 510 extending toward leg portion 234 of indexing member 232. Plate 496 has an upstanding pin 512 on the outer end thereof adjacent tip 510 with an advancement member broadly numerated 514 being swingably mounted on plate 496 through the medium of pin 512.

Advancement means 514 includes a primary leg portion 516 underlying plate 496 and provided with an opening 518 therein clearing pin means 512, while a generally L-shaped leg 520 is integral with leg portion 516 remote from pin 512. As shown in FIG. 5, the outer, generally horizontal portion 522 of L-shaped leg 520, is adapted to underlie the lower circular margin of flange 129, while the outer, trapezoidal tip 524 of leg portion 516 is adapted to be received in the adjacent opening 131 in flange 129 of the lower plate member 104. A coil spring 526 surrounding pin means 512, has one leg 528 in hooked engagement with horizontal leg portion 516 of advancement means 514, while the other leg 530 of spring 526 is in hooked contact with the margin of plate 496 to thereby cause advancement means 514 to be biased in a clockwise direction and thereby toward the adjacent shelf structure 50.

A number of clips broadly designated 532, are provided in certain of the openings 131, and include generally L-shaped legs 534 and 536 at opposite ends thereof locked behind a pair of adjacent webs 152 of flange 129, while the central section 538 of each clip 532 is wider than the vertical dimension of each of the slots 131, and is thereby positioned in flush engagement with the outer surface of the corresponding flange 129. It is to be pointed out that the central section 538 of each of the clips 532 is of a length to preclude entrance of tip 524 of the proximal advancement means 514 into adjacent slots 131. However, when one of the doors 156 is opened to thereby cause the indexing member 232 associated therewith to rotate the corresponding shelf structure 126 through an arc of approximately 3°, the tip 524 of advancement means 514 corresponding to the door 156 which has been opened, may move into the space remaining in the opening 131 proximal to advancement means 514 and not occupied by the central section 538 of the clip 532 therein. Engagement of tip 524 with the central section 538 in overlying relationship to leg 536 causes the corresponding shelf structure 126 to be rotated as will be explained.

The electrical components of machine 20 are illustrated schematically in FIG. 10, wherein, for purposes of clarity and simplicity, the upper shelf structure, the shelf structure next below the upper unit, and the lowermost shelf structure are indicated in the schematic representation. It is to be understood that as many shelf structures as desired may be incorporated into the machine with a duplication of the electrical components illustrated in FIG. 10.

A pair of primary power lines 540 and 542 are provided which lead to a suitable electrical plug or the like in the nature of a source of A.C. power. Line 540 is coupled directly to switch arm 406 of switch 408, while one contact 544 of switch 408, is joined to switch arm 546 of the 25¢ coin switch 548 by a line 550. The other contact 552 of switch 408 is coupled to the coil 554 of a motor relay 556 by a line 558.

The coil 554 of relay 556 is also electrically connected to power line 542 by a line 560. Relay 556 has a pair of switch arms 562 and 564, with arm 562 being movable between opposed contacts 566 and 568, while switch arm 564 is movable with arm 562 and into successive engagement with respective contacts 570 and 572. Line 574 joins relay arm 564 to a line 576 which in turn is coupled to line 550 and to the coil 578 of a coin return electromagnet 580. Line 579 couples coil 578 to power line 542. Relay arm 562 is electrically connected to line 558 by a lead 582.

Contacts 566 and 570 of relay 556 are open, but contact 568 is joined to contact 584 forming a part of switch 432 by a line 586. The other contact 572 of relay 556 is connected to a line 588 by a lead 590, it being noted that line 588 interconnects contact 592, opposed to, and associated with contact 584, with the field windings of drum drive motor 414. The field windings of motor 414 are also connected to power line 542 by a lead 594. Switch 432 includes a pair of switch arms 596 and 598 which are shifted in response to movement of arm 430, with switch arm 596 being coupled to power line 540 by a line 600 with switch arm 598 being electrically connected to the coil 378 of solenoid 376 by lead 602.

The contact 604 of switch 432 and associated with switch arm 598, is joined to the rotatable switch arm 606 of a stepper switch unit 608 by a line 610. The other contact 612 of switch 432 associated with switch arm 598, is open. Lead 614 serves to couple the coil 378 of solenoid 376 directly to power line 542.

Associated with stepper unit 608 is a stepper switch broadly designated 616 and including a switch arm 618 which is connected to the coil 620 of stepper solenoid 622 by a line 624. Coil 620 is coupled to power line 542 by a lead 626. It is to be understood that upon actuation of solenoid 622, the latter rotates switch arm 606 in a clockwise direction one increment along the initial path of travel thereof.

The contact 628 of stepper switch 616 is joined to contact 650 of 5¢ coin switch 652 by a line 634, while the other contact 636 of switch 616 leads to contact 638 of 25¢ coin switch 548 through a line 640. Line 642 serves to join contact 644 of 25¢ switch 548 to switch arm 646 of 10¢ switch 632.

The other contact 648 of switch 632 is joined to a line 634 by a line 654, while line 653 couples switch arm 655 of switch 652 to contact 630 of switch 632.

A line 656 joins the second contact 658 of 5¢ coin switch 652 to the switch arm 660 of a backdoor loading switch 662 associated with the uppermost door designated in FIG. 10 as 156*a*. In this regard, it should be noted that backdoor loading switches are provided for all of the shelf structures 50, and thus backdoor loading switch 664 is provided in conjunction with the delivery door 156*b*, the door immediately below the uppermost door, while another backdoor loading switch 666 is provided in association with the lowermost delivery door 156*c*. The door switches 298 have been designated 298*a*, 298*b* and 298*c* in association with doors 156*a*, 156*b* and 156*c*, it being noted that switch arm 296*a* of switch 298*a*, is electrically connected to contact 668 of backdoor loading switch 662 by a line 670. The other contact 672 of switch 662 is joined to contact 674 of switch 298*a* by a line 676. The contact 678 of which 298*a* is joined to

the switch arm 680 of a manually operable rotary switch 682 by a lead 684.

Line 686 serves to couple line 676 to switch arm 688 of the backdoor loading switch 664 associated with the next to uppermost shelf structure 50, while contact 690 of switch 664 is joined to switch arm 296b of switch 298b by a line 692. The contact 694 of switch 664 is coupled to contact 696 of switch 298b by a line 698. The other contact 700 of switch 298b is joined to the manually operated switch arm 702 of rotary switch 704 by a lead 706.

Switch arm 708 of the backdoor loading switch 666 associated with the lowermost shelf structure 50, is connected to line 698 by a lead 710. Contact 712 of switch 666 is joined to switch arm 296c of switch 298c, associated with door 156c, by a line 714. Line 716 couples contact 718 of switch 666 to a coin return switch arm 720. The contact 724 of switch 298c is connected directly to line 716 by a lead 726. The other contact 728 of switch 298c, is connected to manually operated switch arm 730 of rotary switch 732 by line 734.

A motor 736 is provided for moving switch arm 618 of stepper switch 616 to effect stepping of switch arm 606 through five of the normal increments of travel thereof in response to closing of the 25¢ coin switch 548 by a quarter, and therefore, the field windings of motor 736 are connected to line 640 by a lead 738 and to power line 542 by a lead 740.

Inasmuch as stepper switch 608 acts as a totalizer, a stepper reset solenoid 742 is provided for returning switch arm 606 to the zero position thereof as illustrated in FIG. 10, upon completion of a vend cycle. The coil 744 of solenoid 742 is connected to the switch arm 746 of a solenoid 748 by a line 750, and also to power line 542 by a line 752.

Solenoid 748 is provided with a coil 754 electrically coupled to line 558 by a line 756, and to power line 542 by a line 758. The contact 760 of solenoid 748 is connected to the coil 762 of a coin return solenoid 722 by a line 764, while line 766 serves to connect coil 762 to power line 542. The contact 768 of solenoid 722 is open, but the contact 770 thereof is joined directly to line 764 by lead 772. The contact 774 of solenoid 748 and opposed to contact 760, is connected to line 756 by a lead 776.

Rotary switch 682 is provided with a series of contacts 778, 780, 782, 784, 786, 788, 790, 792, 794, 796, 798 and 800. Rotary switch 704 is similarly provided with a plurality of contacts 802, 804, 806, 808, 810, 812, 814, 816, 818, 820, 822 and 824. The contacts of rotary switch 732 are denominated 826, 828, 830, 832, 834, 836, 838, 840, 842, 844, 846 and 848 respectively.

It should be made clear that a rotary switch such as 682, 704 and 732, is provided for each of the shelf structures 50 and preferably mounted on door 30 behind panel portion 38 for ready access thereto.

Line 850 connects contact 826 of switch 732 with contact 852 of totalizer 608. Lines 854 and 856 join contacts 778 and 802 respectively of switches 682 and 704 directly to line 850. A line 858 serves to join contact 828 of switch 732 to contact 860 of totalizer 608. Lines 862 and 864 join contacts 780 and 804 respectively, to line 858. Contact 830 of switch 732 is connected to contact 866 of totalizer 608 by a line 868, while lines 870 and 872 couple contacts 782 and 806 respectively to line 868.

Line 874 joins contact 876 of totalizer 608 to contact 832 of switch 732 and lines 878 and 808 electrically connects contract 784 and 808 directly to line 874. Line 882 is connected to the contact 834 of switch 732 and contact 884 of totalizer 608, and lines 886 and 888 couple contacts 786 and 810 to line 882. A line 890 couples contact 836 of switch 732 to contact 892 of totalizer 608 and contacts 788 and 812 of switches 682 and 704 are joined to line 690 by lines 489 and 896.

The contacts 790 and 814 of rotary switches 682 and 704 are joined by links 898 and 900 respectively, to a line 902 extending from contact 838 of rotary switch 732 to contact 904 of totalizer 608. A line 906 connects contact 840 of rotary switch 732 to contact 908 of totalizer 608, while lines 910 and 912 join contacts 792 and 816 to line 906. Line 914 serves to join contact 842 of rotary switch 732 to contact 916 of totalizer 608, with lines 918 and 920 interconnecting line 914 and respective contacts 794 and 818 of switches 794 and 704.

The contact 922 of totalizer 608 is coupled to contact 844 of rotary switch 732 by a line 924 with lines 926 and 928 interconnecting contacts 796 and 820 with line 924. A line 930 joins contact 932 of totalizer 608 with contact 846 of rotary switch 732, and lines 934 and 936 connect line 930 to contact 798 and 822 respectively. The final contacts 800 and 824 of rotary switches 682 and 704 are connected to a line 938 by lines 940 and 942 with line 938 in turn coupling contact 848 of rotary switch 730 to contact 944 of totalizer 608.

Operation

It is initially assumed that all of the compartments 113 of tray structures 126, are filled with products to be vended, the totalizer switch arm 606 is in engagement with the zero contact 946, and all of the product delivery doors 156 are in the closed positions thereof.

In order that products of different prices may be vended from the respective vertically-spaced shelf structures 50, the switch arms 680, 702 and 730 of rotary switches 682, 704 and 732, as well as the remaining rotary switches associated with the other shelf structures 50, are manually moved to a contact corresponding to the contact of totalizer 608, representing the specific price at which the articles in compartments 113 are to be vended. Thus, it is to be seen that the products may be sold at the same price, or varying prices may be provided for the individual tray structures. For purposes of simplicity, all of the switch arms of the rotary switches illustrated in FIG. 10, are in engagement with contacts corresponding to totalizer contact 852 and which represents a deposit of 10¢ into the machine so that products may be removed from compartments 113 aligned with delivery doors 156a, 156b and 156c upon deposit of two nickels or a dime.

Under the assumption that the customer decides to purchase an article in a compartment 113 aligned with delivery door 156b, the customer inserts either a dime or two nickels in coin slot 40 provided in panel portion 38 of front door 30, whereby the coins gravitate through the coin-accepting mechanism, and finally into disposition where the same are held in escrow prior to passage to the coin box. If a dime has been inserted, the same moves switch arm 646 of switch 632 into engagement with contact 648, whereby a circuit is formed through power line 540, switch arm 406 of switch 408, contact 544, line 550, switch arm 546 of switch 548, contact 644, line 642, switch arm 646 of switch 632, contact 648, line 654, line 634, contact 628 of stepper switch 616, switch arm 618, line 624, the coil 620 of stepper solenoid 622, lead 626, and power line 542.

Energization of stepper solenoid 622 through the 10¢ coin switch 632, causes the switch arm 606 to be stepped through one of the increments of travel thereof. The coin also contacts switch arm 655 of switch 652, thereby effecting a second energization of solenoid 622 through a circuit including power line 540, switch arm 406, contact 544, line 550, switch arm 546, contact 644, line 642, switch arm 646, contact 630, line 653, switch arm 655, contact 650, line 634, contact 628, switch arm 618, line 624, coil 622 of solenoid 620, lead 626 and power line 542. Switch arm 606 is shifted by solenoid 620, into engagement with contact 852 of totalizer 608, whereby switches 298a, 298b and 298c are placed in series with rotary switches 682, 704 and 732, as well as the totalizer 608.

It is to be understood that the solenoid 378 is initially de-energized because the circuit thereto is broken at the totalizer 608 when switch arm 606 is in engagement with contact 946, thereby causing hook 362 to be biased into the position thereof illustrated in FIG. 3 under the influence of spring 363.

When hook 362 is disposed with the outer hook portion 364 thereof in overlying relationship to extension 360 on link 356, opening of any of the doors 156 is precluded by virtue of engagement of extension 360 with hook portion 364.

For example, if a customer attempts to open one of the doors 156 without insertion of any coins or an improper total of coins, initial swinging movement of door 156*b* for example, causes hinge elements 160 carrying such door, to be pivoted about the axis of a corresponding pin 176, whereby the projecting portion 164 on the outer end of the lower hinge element 160, corresponding to door 156*b*, is moved through an arc toward wall 72, and thereby causing link 330 coupled thereto, to be shifted as the same pivots about pin 212. As soon as the lost motion provided by slot 334 in end 332 of the corresponding link 330 is taken up, link 330, bearing against the pin 336 on base section 276 of slide member 274, and thereby moving the latter to the left, viewing FIGS. 3, 7 and 8 causes leg 278 of the corresponding structure 272, to also be shifted in a direction to engage the adjacent cylindrical element 348 on a corresponding pin 346. As cylindrical member 348 and thereby, pin 346 is biased upwardly by the inclined cam edge 280 of the corresponding leg 278 on slide member 274, the plate 344 connected to the pin 346, which is being moved upwardly, is also shifted in an upward direction, thereby biasing the uppermost plate 344 in an upward direction. Since link 356 rigidly interconnects the uppermost plate 344 and common bar 350, link 356 is moved upwardly with the uppermost plate 344 until extension 360 engages outwardly projecting hook portion 364 of hook 362. It is to be pointed out that although a very limited movement of the door 156 is thereby permitted, such door cannot be opened through a sufficient arc to permit removal of an article from the compartment 113 of the associated tray structure 126 and substantially aligned with the corresponding delivery opening 56.

During movement of the slide member 274 under the influence of the corresponding hinge element 160 and link 330, the leg segment 294 on slide member 274, engages the corresponding switch arm 296*b* of switch 298*b*, thereby moving switch arm 296*b* into engagement with contact 700, but closing of the switch in this manner does not permit further opening of the door because the circuit to the coil 376 of solenoid 378 is not completed upon closing of switch 298*b*, until the arm 606 of totalizer 608 has moved into engagement with the correct contact of the totalizer unit.

Returning to the description of vending of an article from the tray structure 126 corresponding to door 156*b*, and after insection of the dime to cause totalizer switch arm 606 to be stepped into engagement with contact 852, it can be seen that the coil 378 of solenoil 376 is actuated through a circuit including power line 540, switch arm 406 of switch 408, contact 544, line 550, switch arm 546 of switch 548, contact 644, line 642, switch arm 646 of switch 632 (which has now returned to the original position thereof as illustrated in FIG. 10), contact 630, line 653, switch arm 655 of switch 652, (also returned to the initial disposition thereof), line 656, switch arm 660 of switch 662, contact 668, line 670, line 296*a* of switch 298*a*, contact 674, line 676, line 686, switch arm 688 of switch 664, contact 690, line 692, switch arm 296*b* of switch 298*b*, contact 700, lead 706, switch arm 702 of rotary switch 704, line 856, line 850, contact 852 of totalizer 608, totalizer switch arm 606, line 610, contact 604, switch arm 598 of switch 432, lead 602, the coil 378 of solenoid 376, lead 614 and power line 542. It is to be understood that the switch 298*b* is closed and switch arm 296*b* thereby moved into engagement with contact 700 upon movement of the corresponding slide member 274 to the left, as shown in FIG. 3, to thereby cause leg segment 294 on leg 292 to engage the switch arm 296*b* as described above.

Energization of solenoid 376 causes the armature 380 to be drawn into coil 378, thereby pulling upwardly on link 382 and swinging link 368 about the axis of pin 366 and against the bias of spring 363. Hook 362 is pivoted with link 368 to move hook portion 364 thereof out of the path of travel of extension 360 and thus permitting the plate 344, associated with the structure 272 corresponding to the door 156*b*, to be moved upwardly, thereby biasing the uppermost plate 344 in an upwardly direction to move link 356 upwardly and as cam edges 280, 282 and 284 of leg 278 associated with door 156*b*, rides on the adjacent cylindrical element 348 to move plates 344 upwardly.

During such upward movement of the uppermost plate 344 and the plate there next below, common bar 350 is also shifted upwardly in the same direction and an equal distance, whereby the pins 352 on bar 350 move upwardly into corresponding opposed notches 322 in legs 314 of the slide members 274 which have not been shifted.

Thus, after the door 156*b* has been opened to a position providing access to the interior of the compartment 113 aligned therewith, opening of any of the remaining doors 156 is precluded by virtue of disposition of pins 352 on common bar 350 within notches 322, thereby preventing sliding movement of corresponding slide members 274 and preventing pivotal movement of the respective doors 156 operably connected thereto.

The push member 206 connected to the hinge element 160 secured to door 156*b*, is also shifted in response to opening of door 156 as projecting portion 164 of the respective hinge element 160, effects shifting movement of pin 212, thereby moving push member 206 inwardly through the slots provided therefor in section 44 of door 30. The innermost end of push member 206 contacts upright leg portion 242 of override plate 238, thereby causing plate 238 and indexing member 232, to be rotated about the axis of shaft 226.

The coil spring 244 surrounding shaft 226 and having legs 250 and 254 in engagement with upright portion 242 of plate 238 and lug 252 on indexing member 232, causes the latter to be shifted with plate 238 substantially as one unit. As the cam surface 236 of indexing member 232 engages the margin of a proximal web 152 on the flange 129 of the adjacent plate 104, the corresponding tray structure 126 is rotated clockwise as the leg portion 234 of indexing member 232 moves into the directly aligned slot 131 in plate 104. In this manner, the compartment 113 substantially aligned with the delivery opening 56 normally closed by delivery door 156*b*, is shifted into direct alignment with such delivery opening. The indexing member 232, in shifting the corresponding tray structure 126 through a slight arc, causes roller 144 to be moved out of one of the slots 131 as leaf spring 140 flexes longitudinally thereof.

The door 156*b*, while being moved to the completely open position thereof, is precluded from retrograde movement once the leg segment 294 on the slide member 274 corresponding to door 156*b*, has been shifted to disposition engaging switch arm 296*b* of switch 298*b*, by virtue of the fact that the teeth 302 of rack member 300, engage the extension 306 of pawl 308. Spring 312 maintains extension 306 in engagement with teeth 302 and thus prevents return movement of the door 156 which could cause the customer to lose his money without obtaining an article.

As soon as the door 156*b* is in the completely open position thereof, the customer may remove a product from the aligned compartment 113, but such customer cannot rotate the associated tray structure 126 about the

axis of shaft 120 to obtain other products because of the disposition of leg portion 234 of the respective indexing member 232 in one of the slots 131, and thereby, in engagement with a web 152 of the flange 129 on the lower plate 104.

Door 156 is maintained in the open position thereof until returned by the customer by virtue of the lost motion construction of push member 206, wherein it can be seen that when door 156*b* reaches substantially the outermost end of its path of travel, push member 206 does not continue to move inwardly, but pin 212 shifts in slot 210 toward the outermost end of projection 208 on member 206.

During return movement of door 156 to the closed disposition of the same, spring 326 assists return movement of such product delivery door as soon as pin 212 has returned to the position thereof illustrated in FIG. 7.

Also during upward movement of column bar 350, the head 412*b* on the pin 352 immediately below operator member 388, engages the lower margin of the latter and shifts the same upwardly about the axis of bolt and nut means 390. It can be seen, viewing FIG. 3, that cam surface 400 of operator member 388, initially clears switch arm 406 of switch 408 and, therefore, common bar 350 is permitted to move upwardly a predetermined distance prior to shifting of switch arm 406. However, as soon as shoulder 404 of operator member 388 engages the outwardly bent section of switch arm 406, the latter is moved to the opposite position thereof and maintained in a closed condition by arcuate cam surface 402. Shifting of switch arm 406 into engagement with contact 552, completes a circuit to coil 554 of relay 556 through a circuit including main power line 540, switch arm 406, contact 552, line 558, coil 554 of relay 556, line 560 and power line 542.

Movement of switch arm 406 into engagement with contact 552, also completes a circuit to solenoid 748 through power line 540, switch arm 406, contact 552, line 558, line 756, the coil 754 of solenoid 748, line 758, and power line 542. Energization of coil 754 causes the escrow plate of the coin mechanism to be shifted, thereby allowing coins to pass into the cash box. Movement of the armature of solenoid 748 also shifts the switch arm 746 whereby the totalizer reset solenoid 742 is energized from line 756 through lead 776, contact 774, switch arm 746, line 750, coil 744 of solenoid 742, line 752 and power line 542. The stepper solenoid 742, upon energization thereof, returns switch arm 606 of totalizer 608 into engagement with contact 946, thereby breaking the circuit to coil 378 of solenoid 376 and causing hook 362 to be biased toward the normal position thereof. Until extension 360 is permitted to shift downwardly, hook portion 364 of hook 362 is in engagement with the vertical side of extension 360. However, upon closing of the door 156*b*, as defined hereinafter, common bar 350 is again shifted downwardly to cause hook portion 364 of hook 360 to move into overlying relationship to extension 360 under the influence of spring 363.

It should be pointed out that when switch 408 is in a condition with the arm 406 thereof in engagement with contact 544, coin return electromagnet 580, is energized through a circuit including power line 540, switch arm 406 of switch 408, contact 544, line 550, line 576, the coil 578 of electromagnet 580, line 579 and power line 542. While electromagnet 580 is energized, projections which normally extend into the path of travel of coins through the coin-receiving mechanism, are maintained out of the path of travel of such coins, whereby the latter are permitted to gravitate through the unit to actuate respective coin switches 548, 632 or 652, whereupon the coins are then interrupted in their gravitational movement by projections extending into the path of travel of the same and under the control of cash box coin return and solenoids.

However, as soon as one of the doors 156 has been opened to a position providing access to an article in the compartment 113 aligned therewith, switch 408 is opened by the operator member 388 as described above, thereby shifting switch arm 406 into engagement with contact 552 and breaking the circuit to coil 578 of electromagnet 580 and effecting movement of the blocking projections into the coin chutes whereby any coins thereafter deposited in the mechanism may gravitate into the coin return chute.

Return of door 156*b* to the closed disposition of the same, and thereby movement of switch arm 406 into engagement with contact 544, results in energization of motor 414 through a circuit including main power line 540, line 600, switch arm 596 of switch 432, contact 584, line 586, contact 568, switch arm 562, line 582, line 558, coil 554 of relay 556, line 560 and power line 542.

It is to be remembered that relay 556 is maintained in an energized condition by virtue of the holding circuit outlined in detail heretofore. Operation of motor 414 causes the shaft 416 thereof to be rotated and effecting rotation of pinion 422, as well as link 434. Since pinion 422 is in intermeshing relationship with the large timing gear 424 carried by shaft 426, pin 428 on gear 424 is moved out of engagement with the switch arm 430, thereby permitting switch pieces 596 and 598 of switch 432, to shift into engagement with contacts 592 and 612 respectively. Motor 414 is maintained in an energized condition through a circuit including main power line 540, line 600, switch arm 596, contact 592, line 588, the field windings of motor 414, lead 594 and main power line 542. The holding circuit to relay 556 is broken however, upon shifting of contact 596 out of engagement with contact 584, thereby resulting in de-energization of relay 556 and return of switch arms 562 and 564 into engagement with the open contacts 566 and 570 respectively.

As link 434 rotates with shaft 422, connector 450 shifts longitudinally in slot 444 of crank 436, whereby the latter is rotated about the axis of shaft 438. Oscillation of leg 440 of crank 436 in response to rotation of link 434, also causes leg 452 of crank 436 to be reciprocated, thereby shifting link 456 along a reciprocable path of travel and effecting rotation of lever 454 about the axis of boss 458 thereon.

As shaft 460 is caused to oscillate, the connector element 484 is moved therewith and resulting in equal reciprocation of plate 496 by virtue of bolt and nut means 506 interconnecting opposed lugs 502 and 504 on connector element 484 and plate 496 respectively. The advancement member 514 is shifted along a generally rectilinear path of travel as plate 496 is swung with shaft 476, and therefore, the tip 524 of leg portion 516 of advancement means 514 is received in the proximal slot 131 having a clip 532 therein with tip 524 engaging the section 538 of such clip in overlying relationship to the leg 536 thereof whereby movement of advancement means 514 toward the rear of cabinet 22, causes the corresponding tray structure 126 to be rotated in a clockwise direction.

By virtue of the ratio of pinion 422 with respect to the gear 424, pinion 422 rotates six revolutions for each revolution of gear 424. Thus, advancement means 514 is reciprocated along the defined paths thereof, six times for each single revolution of gear 424. Since the slots 131 are provided at six degree intervals around the periphery of flange 129 on the corresponding plate member 104, it can be seen that the tray structure 126 is initially rotated through a 6° arc while tip 524 of advancement means 514 is in engagement with the clip 532 as set forth above. On the second reciprocation of advancement means 514 the shelf structure 126 corresponding thereto is only rotated through a 3° arc by virtue of the fact that the shelf structure was initially moved through a 3° arc by indexing member 232 when the door 156*b* was opened. During the second reciprocation of advancement means 514, the tip 524 thereof is in the center of the proximal slot 131 and the leading edge of tip 524 moves through a 3° arc before contacting the proximal web 152. The four

remaining reciprocations of advancement means 514 rotate the shelf structure 126 through an arc of 24°.

It is to be recognized that all of the advancement means 514 are reciprocated by shaft 476 and through equal arcs, but only the advancement means 514 corresponding to the door 156 which has been opened is coupled to the associated shelf structure 126. The tips 524 on the remaining advancement means 514 merely ride up on corresponding clips 532 without hooking behind the central sections 538 thereof.

As soon as pinion 422 has rotated through six revolutions, the pin 428 on gear 424, moves into engagement with arm 430 of switch 432, thereby returning switch arms 596 and 598 to the initial positions thereof in engagement with respective contacts 584 and 604. Motor 414 is thereby de-energized since the circuit to the same is broken, through contact 592 of switch 432, as well as contact 572 through relay 556.

The clips 532 on flange 129 of the lower plate 104 of each tray structure 126 are provided for not only coupling the latter to respective advancement means 514 but also for limiting the arc through which a respective tray structure 126 is rotated in response to rotation of timing gear 424 through a single revolution of the same. It can be seen that when the tip 524 of advancement mechanism 514 associated with each shelf structure 50, engages the central section 538 of one of the clips 532, tip 524 is prevented from engaging the adjacent web 152 on the flange 129 of the lower plate member 104 and, therefore, even though the advancement mechanism 514 continues to oscillate, the corresponding tray structure 126 is not rotated because the advancement mechanism 514 is prevented from operatively engaging the lower plate 104 in a manner to rotate the latter in response to operation of motor 414. The arc through which the respective tray structure 126 is rotated, is dependent upon the number of clips 532 on each shelf structure 126, it being remembered that one clip 532 is provided for each compartment 113. The initial movement of one of the shelf structures 126 by the corresponding underlying member 232 results in coupling of the shelf structure to the associated advancement means 514 and also effects decoupling thereof if more than ten compartments are provided on a particular shelf structure.

The number of clips 532 and the disposition thereof will be changed upon variation of the number of compartments 113 provided on a corresponding shelf structure 50 and defined by walls 112. Thus, if additional partitions 112 are placed in a particular shelf structure 50, the clips 532 are disposed so that the tray structure 126 is rotated only through an arc corresponding to the width of a respective compartment 113. It is still to be remembered however, that even with additional partitions 112 in the shelf structure 50, the compartment 113 adjacent the corresponding product delivery opening 56, is still slightly out of alignment with such opening prior to the customers shifting the door 156 normally blocking such delivery opening, with opening of the door resulting in indexing member 232 moving the tray structure 126 through a slight arc sufficient to bring the compartment 113 into direct alignment with the product delivery opening 56.

In the event a quarter is deposited in the machine, such coin passes downwardly through the coin-handling mechanism and shifts switch arm 655 of switch 652 into engagement with contact 650, thereby completing a circuit to motor 736 through power line 540, switch arm 406 of switch 408, contact 544, line 550, switch arm 546 of switch 548, contact 638, line 640, lead 738, the field windings of motor 736, line 740 and power line 542. Switch arm 655 is held in a depressed condition by magnet means to thereby maintain motor 736 energized until switch arm 655 is returned to the upper position thereof in engagement with contact 644.

Motor 736 is provided with cam means on the output shaft thereof engageable with switch arm 618 of switch 616, which effects energization of the stepper solenoid 622 through a circuit from line 550 and including switch arm 546 of switch 548, contact 638, line 640, contact 636, switch arm 618, line 624, the coil 620 of solenoid 622, lead 626, and power line 542. Motor 736 is actuated for a time to cause switch 616 to cause switch arm 618 of switch 616 to be moved into engagement with contact 636, five times to thereby cause switch arm 606 of totalizer 608 to be stepped five increments around the path of travel thereof in a clockwise direction, whereupon cam means operated by motor 736 engages arm 655 to return the same to the initial position thereof.

After the customer has inserted money into the machine and then changes his mind and does not wish to purchase an article, or in the alternative, wishes to remove an article from the cabinet of a different price from the money which he has inserted, he may obtain return of such money by actuating handle 42 on the front face of door 30. Through mechanical linkage connected to handle 42, switch arm 720 is moved into engagement with contact 770, thereby effecting energization of solenoid 722 through a circuit including power line 540, switch arm 406 of switch 408, contact 544, line 550, switch arm 546 of switch 548, contact 644, line 642, switch arm 646 of switch 632, contact 630, line 653, switch arm 655 of switch 652, contact 658, line 656, switch arm 660 of switch 662, contact 668, line 670, switch arm 296*a* of switch 298*a*, contact 674, line 676, line 686, switch arm 688 of switch 664, contact 690, line 692, switch arm 296*b* of switch 298*b*, contact 696, line 698, lead 710, switch arm 708 of switch 666, contact 712, line 714, switch arm 296*c* of switch 298*c*, contact 724, lead 726, line 716, switch arm 720, contact 770, line 764, the coil 762 of solenoid 722, line 766, and power line 542. Energization of coil 762 causes the escrow mechanism of the coin equipment to direct the money contained therein into the coin return chute.

Since the totalizer reset solenoid 742 is in parallel with the coin return solenoid 762, it is to be pointed out that energization of the latter, through the circuit traced above, also causes coil 744 to be energized from line 764, through contact 760, switch arm 746, line 750, coil 744, line 752, and power line 542. In this manner, the switch arm 606 of totalizer 608 is returned to the normal disposition thereof in engagement with contact 946. The machine is now in condition for another vend cycle upon insertion of coins into the coin-handling equipment.

When it is desired to reload any of the compartments 113 in a corresponding shelf structure 50, this may be readily accomplished by opening the backdoor 36 to expose the rear portions of all of the shelf structures 50, whereupon a backdoor loading switch, associated with the tray structure 126 which is to be loaded, is moved into the opposite position thereof. For example, referring to door 156*a* in FIG. 10, the backdoor loading switch is designated 662 and the switch arm 660 thereof is shifted into engagement with contact 672. Under these circumstances, a customer cannot open door 156*a* because the circuit is broken to switch 298*a*, thereby preventing closing of a circuit to solenoid 376, through switch 298*a* if the customer attempts to open door 156*a*. Door 156*b* and the other remaining doors can be opened however, through a circuit from line 656 to line 692, including switch arm 660, contact 672, line 676, line 686, switch arm 688 of switch 664, contact 690 and line 692.

The tray structure 126 corresponding to the backdoor loading switch 662 may be rotated by hand in a clockwise direction as wheel 144 moves into and out of successive slots 131 as leaf spring 140 flexes longitudinally thereof.

The provision of manually operable rotary switches such as 632, 702 and 732, associated with the respective product delivery doors 156, is a particularly important feature of the instant mechanism because the individual

shelf structures 50 may be set up to vend at various prices and which may be selectively changed at will by simply moving the switch arms such as 630, 822 and 730 into engagement with a contact corresponding to the price at which the product is to be vended. In the preferred machine, each of the contacts 730 to 800 inclusive of rotary switch 632 for example, are equivalent to 5¢ increments and therefore, products may be vended from the uppermost tray structure 126 at any price from 10¢ to 65¢. It is necessary that the switch arm 606 of totalizer 608 be stepped into engagement with a contact corresponding to the contact which is engaged by switch arm 630 of switch 632 before solenoid 376 is energized to permit opening of the uppermost delivery door 156a.

Having thus described the invention what is claimed as new and desired to be secured by Letters Patent is:

1. In a vending machine, a housing provided with a series of vertically spaced product delivery openings; movable means for each of said openings and mounted on the housing for independent movement and in normal blocking relationship to respective openings; shelf structure for each of said openings and rotatably mounted within the housing for independent movement, each of said shelf structures being provided with a number of compartments therein successively registrable with a corresponding opening said shelf structures having optionally variable numbers of compartments therein and each shelf structure being further provided with a circular member thereon having a series of circumferentially spaced slots in the outer periphery thereof; control means on the housing and actuatable by said movable means to prevent more than one movable means from being moved at a time to a position providing access to a compartment aligned therewith; power operated means common to all of said shelf structures; means on the housing for actuating said power operated means only after the movable means which has been moved to an open position providing access to one of the compartments, has been returned to the closed position thereof in normal blocking relationship to the opening aligned therewith; means for maintaining the prime mover actuated for a predetermined period; and connector means operably connected to said power-operated means and engageable with the circular member of a respective structure within the slots therein for selectively coupling the shelf structure corresponding to the movable means which has been moved to said open position thereof, to said prime mover to effect rotation of the respective shelf structure through an arc sufficient to bring the next successive compartment thereof into substantial alignment with a corresponding opening.

2. A vending machine as set forth in claim 1 wherein said connector means includes oscillatory mechanism for each of said shelf structures and operably connected to said power operated means, each of said mechanisms being reciprocable along a predetermined path of travel in response to operation of said power operated means, and a component connected to each of said mechanisms and engageable in successive adjacent slots of a corresponding member to cause the respective shelf structure to be rotated through a predetermined arc during reciprocation of one of the components.

3. A vending machine as set forth in claim 2 wherein is provided blocking means in certain of the slots in said members of each of the shelf structures for peventing the corresponding components from engaging adjacent members within said certain slots therein and thereby limiting rotational movement of the shelf structures having said blocking means in said certain of the slots therein.

4. In a vending machine, a housing provided with a series of vertically spaced product delivery openings; shelf structures within the housing and aligned with each of the openings, each of said shelf structures being provided with a number of compartments therein successively registrable with a corresponding opening; movable means

for each of said openings and mounted on the housing for independent movement and in normal blocking relationship to respective openings; link means coupled to each of said movable means for movement therewith and extending into said housing; a cam unit for each of said movable means and shiftable in response to movement of a corresponding link means; a series of plates disposed in vertical end-to-end abutting relationship, there being a plate for each of said cam units and disposed in proximal relationship thereto; extension means projecting outwardly from each of the plates and toward the adjacent cam units; cam means on each of the cam units disposed to engage said extension means on respective plates and cam the corresponding plate and all the plates thereabove, in an upward direction; an elongated bar connected to the uppermost of said plates, of a longitudinal length substantially equal to the effective vertical height of said plates, and vertically reciprocable with said upper plate along a path of travel parallel thereto; pin means on the bar for each of said cam units and projecting outwardly toward the latter below respective cam means on said cam units, each of said cam units having upwardly extending, downwardly opening notches therein receiving opposed pin means of those cam units which have not been shifted in response to opening of a corresponding movable means whereby opening of more than one movable means at a time is precluded; means for restricting the plates and said bar against initial movement in a downward direction; coin controlled means provided with check mechanism normally disposed to preclude initial movement of the uppermost plate and said bar in an upward direction; and means for releasing said check mechanism to permit upward movement of said uppermost plate and the bar upon insertion of coinage of predetermined value in said coin controlled means.

5. In a vending machine, a housing provided with a series of vertically spaced product delivery openings; movable means for each of said openings and mounted on the housing for independent movement and in normal blocking relationship to respective openings; shelf structure for each of said openings and rotatably mounted within the housing for independent movement, each of said shelf structures being provided with a number of compartments therein successively registable with a corresponding opening and circumferentially extending means thereon having a series of circumferentially spaced slots in the outer periphery thereof; antipilfering mechanism on the housing and actuatable by said movable means; coin controlled means operably coupled to said antipilfering means for precluding actuation of the latter to prevent movement of any of said movable means until after coinage of predetermined value has been inserted in said coin controlled means, said antipilfering means preventing more than one movable means from being moved at a time to a position providing access to a compartment aligned therewith; power operated means common to all of said shelf structures; means on the housing for actuating said power operated means only after the movable means which has been moved to an open position providing access to one of the compartments, has been returned to the closed position thereof in normal blocking relationship to the opening aligned therewith; an upright, elongated shaft member mounted on the housing adjacent said shelf structures and extending from the lower shelf structure to the upper shelf structure; means coupling the shaft member to said power operated means for oscillating the shaft member during actuation of said power operated means; connector means on the shaft member for each of said shelf structures and engageable with respective circumferentially extending means thereon within the slots therein for rotating the shelf structure engaged by a respective connector means during oscillation of said shaft member; and means for preventing all of the connector means on said shaft member from engaging respective circumferentially extending means within one of

the slots therein, except the connector means corresponding to said movable means which has been moved to said open position thereof and then returned to the closed position of the same.

6. In a vending machine, a housing provided with a series of vertically spaced product delivery openings; movable means for each of said openings and mounted on the housing for independent movement and in normal blocking relationship to respective openings; shelf structure for each of said openings and rotatably mounted within the housing for independent movement, each of said shelf structures being provided with a number of compartments therein successively registrable with a corresponding opening and circumferentially disposed means thereon having a series of spaced slots in the periphery thereof; antipilfering mechanism on the housing and actuatable by said movable means; coin controlled means operably coupled to said antipilfering means for precluding actuation of the latter to prevent movement of any of said movable means until after coinage of predetermined value has been inserted in said coin controlled means, said antipilfering means preventing more than one movable means from being moved at a time to a position providing access to a compartment aligned therewith; power operated means common to all of said shelf structures; means on the housing for actuating said power operated means only after the movable means which has been moved to an open position providing access to one of the compartments, has been returned to the closed position thereof in normal blocking relationship to the opening aligned therewith; an upright, elongated shaft member mounted on the housing adjacent said shelf structures and extending from the lower shelf structure to the upper shelf structure; means coupling the shaft member to said power operated means for oscillating the shaft member during actuation of said power operated means; connector means on the shaft member for each of said shelf structures and engageable within the slots therein for rotating the shelf structure engaged by a respective connector means during oscillation of said shaft member, all of the shelf structures being disposed with the compartments therein adjacent respective delivery openings, out of direct alignment with corresponding delivery openings when all of said movable means are in the closed positions thereof; means operably coupled to each of the movable means and engageable with corresponding shelf structures for moving the shelf structure, corresponding to a movable means that is being moved to the open position thereof, to a location which will permit such structure to be subsequently rotated by said power operated means and in which location the product compartment is brought into direct alignment with the latter; and blocking means in certain of the slots in said circumferentially disposed means on the shelf structures, said blocking means being disposed to preclude movement of said connector means on the shaft member into a respective opposed slot in said circumferentially disposed means, while the shelf structures are in the initial positions thereof with all of said movable means closed, and permitting the connector means corresponding to the movable means that has been moved to an open position, to move into the adjacent slot of the respective circumferentially disposed means upon movement of a corresponding shelf structure to a location with one of the compartments therein in direct alignment with a respective delivery opening.

7. In a vending machine, a housing provided with a series of vertically spaced product delivery openings; movable means for each of said openings and mounted on the housing for independent movement and in normal blocking relationship to respective openings; shelf structure for each of said openings and rotatably mounted within the housing for independent movement, each of said shelf structures being provided with a number of compartments therein successively registrable with a corresponding opening and circumferentially extending means thereon having a series of circumferentially spaced

slots in the outer periphery thereof; control means on the housing and actuatable by said movable means to prevent more than one movable means from being moved at a time to a position providing access to a compartment aligned therewith; power-operated means common to all of said shelf structures; means on the housing for actuating said power operated means only after the movable means which has been moved to an open position providing access to one of the compartments, has been returned to the closed position thereof in normal blocking relationship to the opening aligned therewith; an upright, elongated shaft member mounted on the housing adjacent said shelf structures and extending from the lower shelf structure to the upper shelf structure; means coupling the shaft member to said power operated means for oscillating the shaft member during actuation of said power operated means; connector means on the shaft member for each of said shelf structures and engageable with respective circumferentially extending means thereon within the slots therein for rotating the shelf structure engaged by a respective connector means during oscillation of said shaft member, all of the shelf structures being disposed with the compartments therein adjacent respective delivery openings, out of direct alignment with corresponding delivery openings when all of said movable means are in the closed positions thereof; means operably coupled to each of the movable means and engageable with corresponding shelf structures for moving the shelf structure corresponding to a movable means that has been moved to the open position thereof, to a location with the compartment adjacent the respective delivery opening, into direct alignment with the latter; and blocking means in certain of the slots in said circumferentially extending means on the shelf structures, said blocking means being disposed to preclude movement of said connector means on the shaft member into a respective opposed slot in said circumferentially extending means, while the shelf structures are in the initial positions thereof with all of said movable means closed, and permitting the connector means corresponding to the movable means that has been moved to an open position, to move into the adjacent slot of the respective circumferentially extending means upon movement of corresponding shelf structure to a location with one of the compartments therein in direct alignment with a respective delivery opening.

8. A vending machine as set forth in claim 7 wherein said blocking means each comprise a clip having a pair of outwardly extending end sections and a generally U-shaped intermediate segment integral with proximal extremities of said sections, said U-shaped segments extending through respective slots away from the axis of rotation of the shelf structures and having a pair of legs and an intermediate bight, each of said bights being of a length less than the width of a respective slot to present a relatively narrow opening for receiving a corresponding connector means.

9. In a vending machine, a housing provided with a series of vertically spaced product delivery openings; movable means for each of said openings and mounted on the housing for independent movement and in normal blocking relationship to respective openings; shelf structure for each of said openings and rotatably mounted within the housing for independent movement, each of said shelf structures being provided with an optionally variable number of compartments therein successively registrable with a corresponding opening; power operated means common to all of said shelf structures; coupling means for each of said shelf structures, operably connected to said power operated means and disposed to be selectively coupled to respective shelf structures for rotating the latter; means on each of the shelf structures for preventing connection of the coupling means to respective shelf structures when the latter are in the normal disposition thereof prior to opening of one of said movable means; means operated by each of said movable means

and engageable with respective shelf structures for shifting each of the latter into disposition to be operably connected to said coupling means in response to opening of each movable means; and means for decoupling each of the shelf structures from a respective coupling means after the shelf structure has been rotated through an appropriate arc corresponding to the width of each compartment therein.

10. A vending machine as set forth in claim 9 wherein said power operated means is operated for a predetermined interval regardless of variation of the number of compartments in said shelf structures.

11. A vending machine as set forth in claim 9 wherein said power operated means includes an elongated shaft and means connected to said shaft for oscillating the same, said coupling means being connected to said shaft for oscillation by the latter and each including a coupling element provided with an extension thereon, each of said shelf structures having a peripherally disposed section having a series of slots therein for successively receiving the extension on respective coupling means for rotating the respective shelf structure in response to oscillation of said shaft, there being blocking means in certain of the slots in each shelf structure for precluding entrance of said extensions into adjacent slots in the shelf structure until each of the latter has been shifted into said disposition thereof and through a predetermined arc in the normal direction of travel thereof.

12. In a vending machine, a housing provided with a series of spaced product delivery openings; movable means for each of said openings and mounted on the housing for independent movement and in normal blocking

relationship to respective openings; structure for each of said openings and mounted within the housing for independent movement, each of said structures being provided with a number of compartments therein successively registrable with a corresponding opening; power operated means common to all of said structures; coupling means for each of said structures, operably connected to said power operated means and disposed to be selectively coupled to respective structures for shifting the latter; means on the structures for preventing connection of said coupling means thereto when said structures are in one position thereof with one of the compartments therein partially aligned with a respective opening and permitting intercoupling when the shelf structures are in another location of the same with said one compartment therein substantially aligned with a corresponding opening; and means operably connected to said movable means for shifting a structure associated therewith into said location thereof in response to movement of one of the movable means into the open position thereof.

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