

April 16, 1963

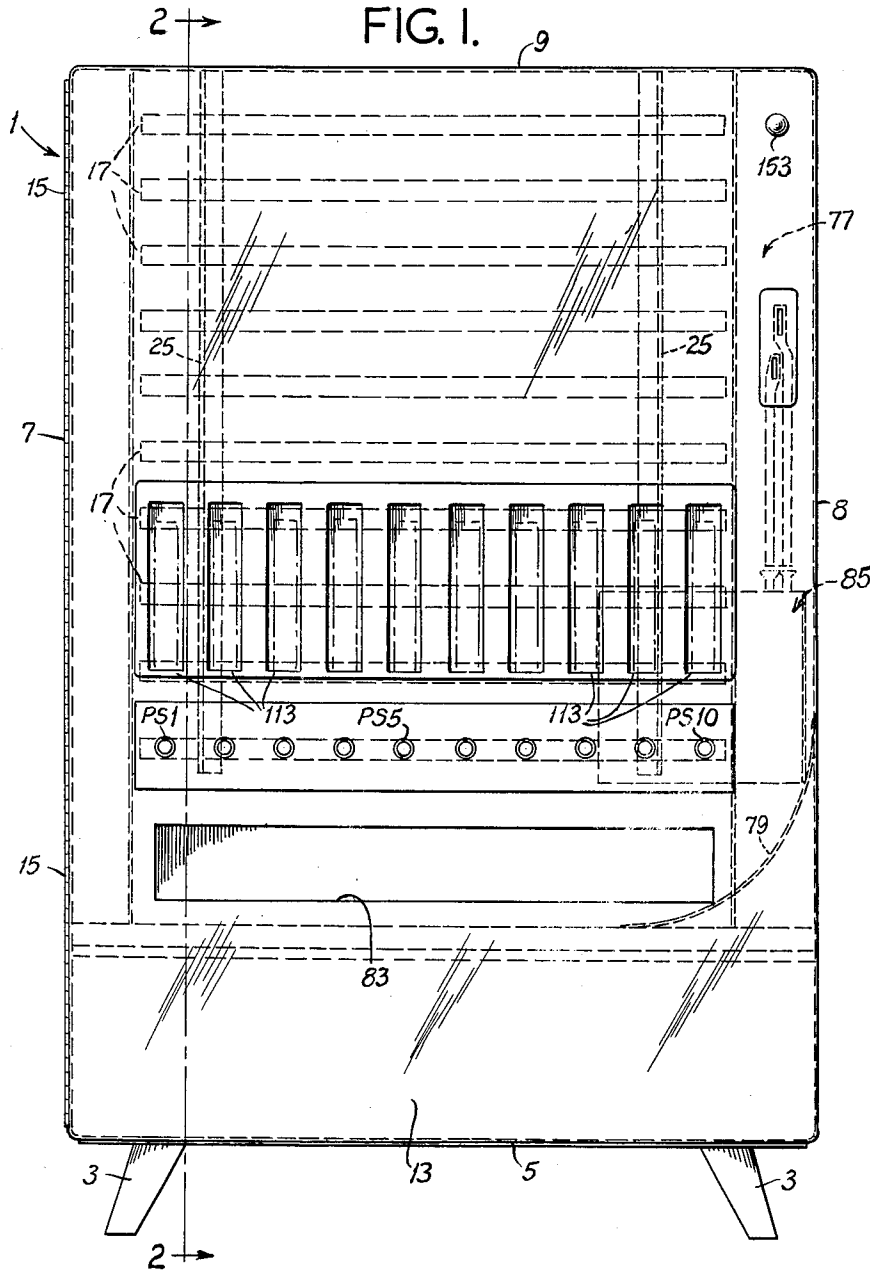
A. W. HOLSTEIN ETAL

3,085,711

VENDING MACHINE

Filed Aug. 23, 1961

4 Sheets-Sheet 1



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FIG. 2.

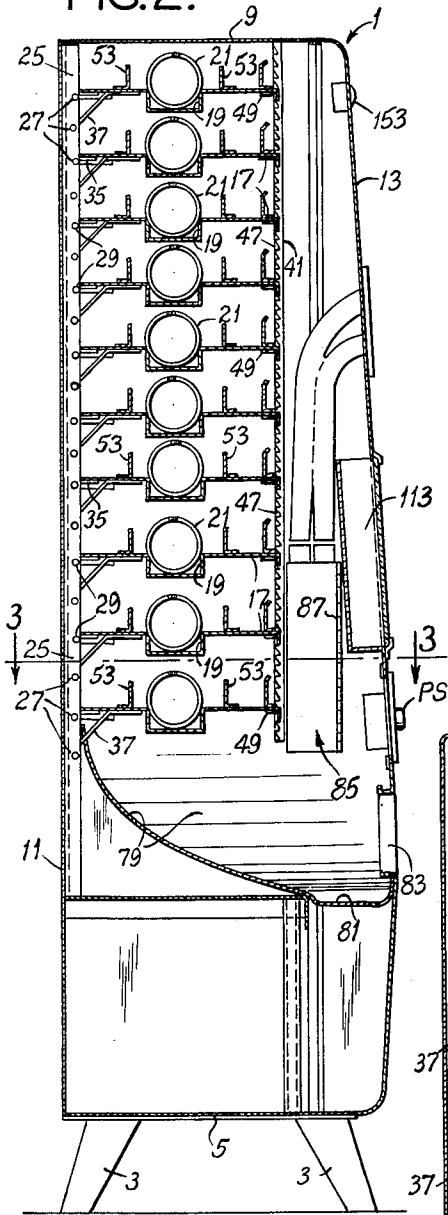


FIG. 4.

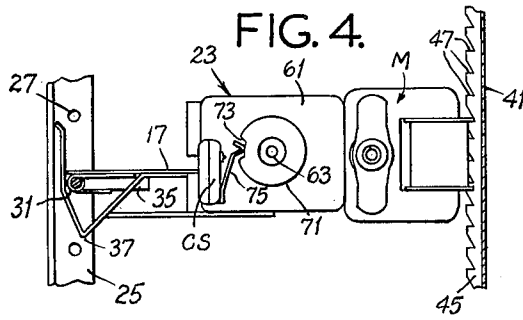
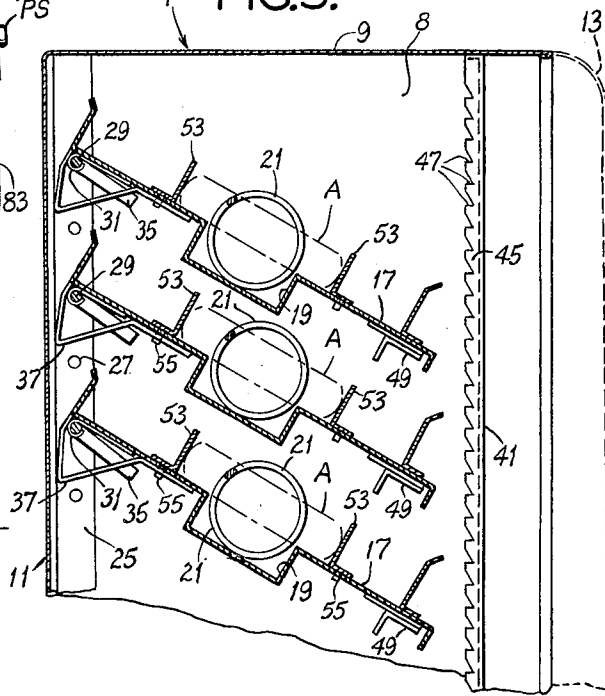


FIG. 5.



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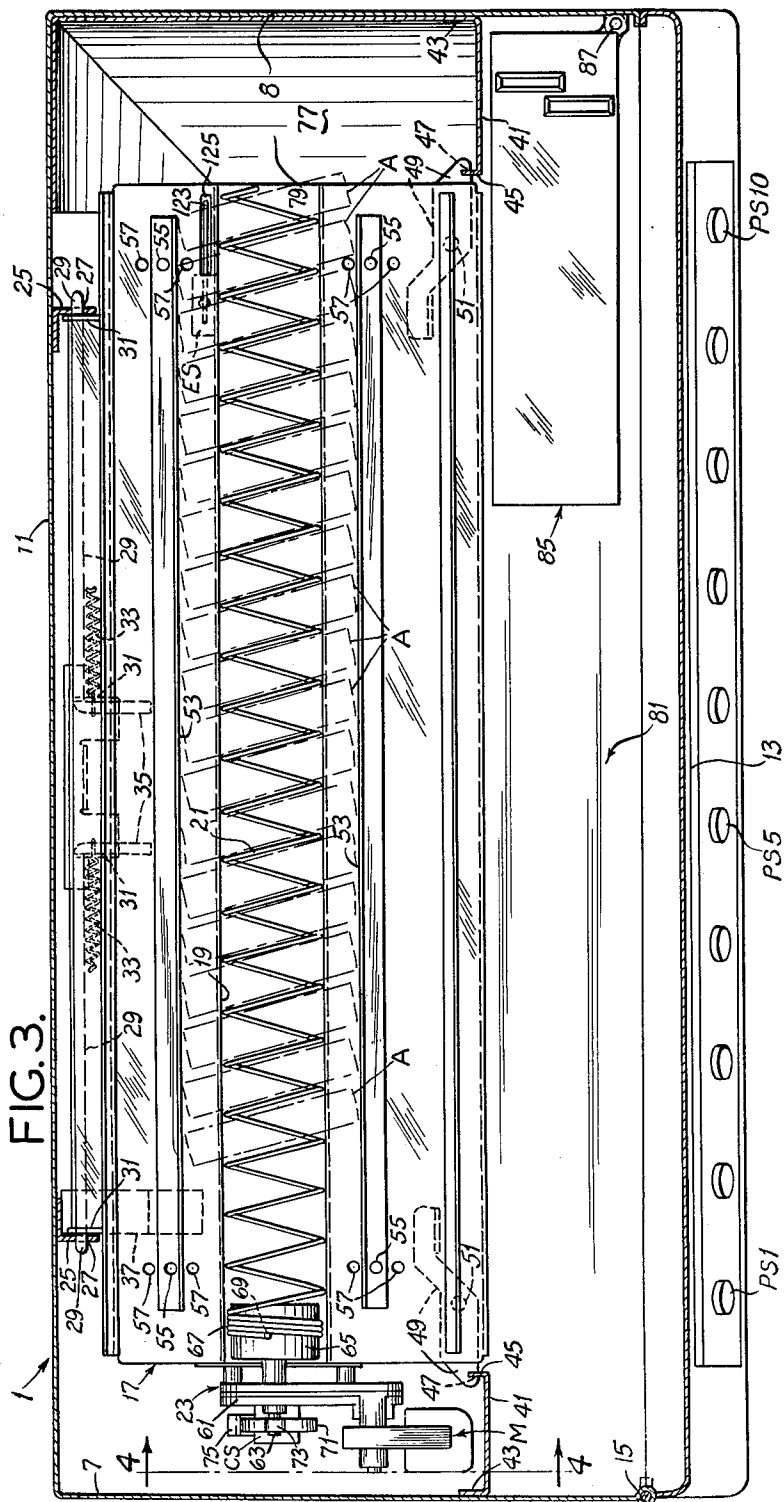


FIG. 3.

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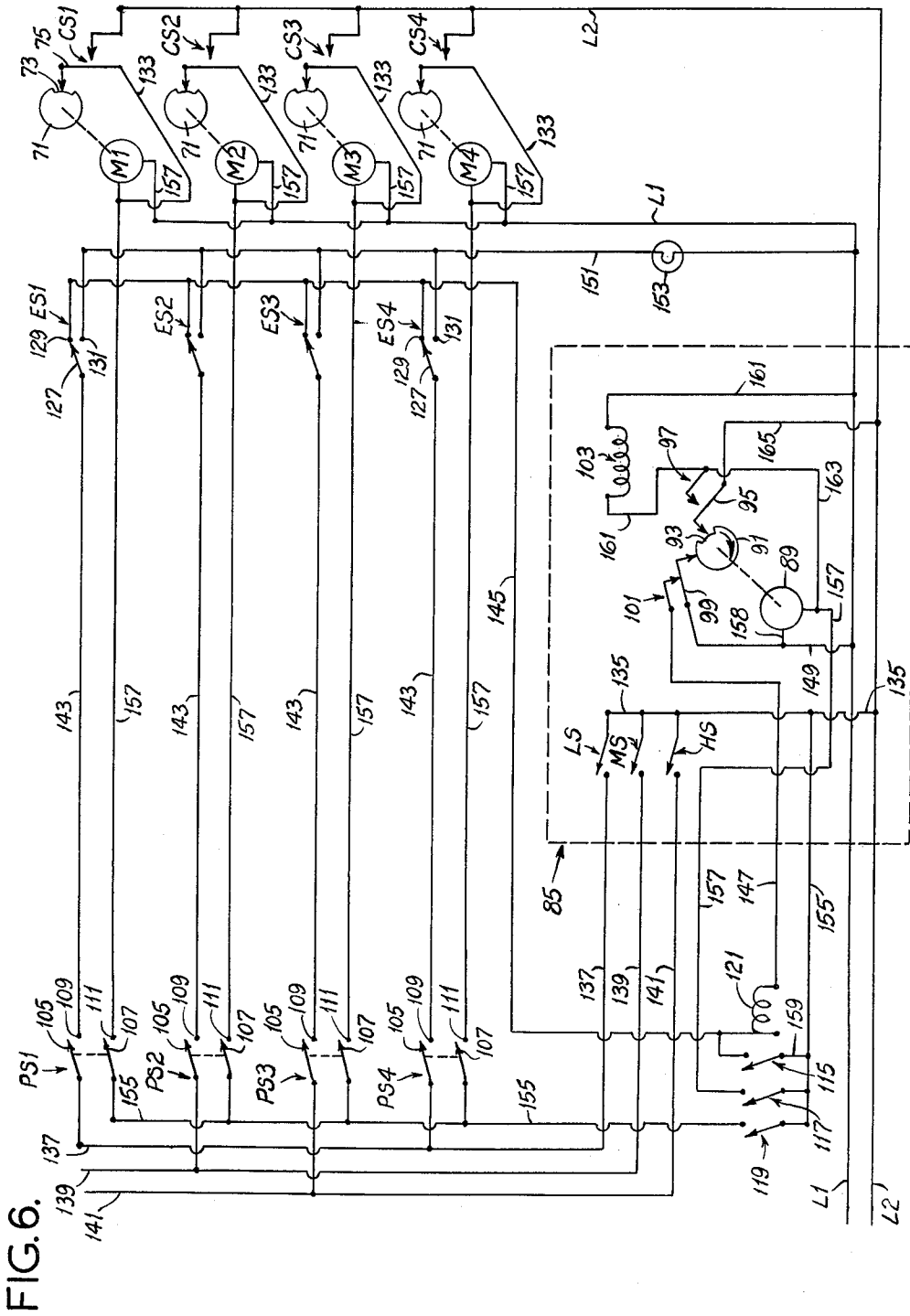
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3,085,711

VENDING MACHINE

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Filed Aug. 23, 1961, Ser. No. 133,468
15 Claims. (Cl. 221-75)

This invention relates to vending machines, and more particularly to a vending machine for vending articles such as packaged items (candy bars, for example).

Among the several objects of this invention may be noted the provision of a vending machine of the class described which is adapted to operate on the so-called "first-in, first-out" principle, i.e., items first put in the machine are the first to be vended, to avoid items remaining for a long time in the machine and becoming stale; the provision of a vending machine such as described which has a relatively high capacity for its size, and which is relatively easy to load, with loading inherently resulting in first-in, first-out operation; and the provision of a vending machine such as described which is economical to manufacture and reliable in operation. Other objects and features will be in part apparent and in part pointed out hereinafter.

The invention accordingly comprises the constructions hereinafter described, the scope of the invention being indicated in the following claims.

In the accompanying drawings, in which one of various possible embodiments of the invention is illustrated,

FIG. 1 is a front elevation of a vending machine of this invention;

FIG. 2 is a vertical section taken on line 2-2 of FIG. 1;

FIG. 3 is an enlarged horizontal section taken on line 3-3 of FIG. 2;

FIG. 4 is a vertical section taken on line 4-4 of FIG. 3;

FIG. 5 is an enlarged fragment of FIG. 2 showing certain shelves swung down; and

FIG. 6 is a wiring diagram.

Corresponding reference characters indicate corresponding parts throughout the several views of the drawings.

Referring to the drawings, a vending machine of this invention is shown to comprise a cabinet generally designated 1 standing on legs 3. The cabinet has a bottom wall 5, left and right side walls 7 and 8, a top wall 9, a rear wall 11, and a front door 13. The latter is shown as hinged at the left as indicated at 15. Within the cabinet, there are a plurality of shelves, each generally designated 17. Ten shelves are shown, but this number is arbitrary. Each shelf is of rectangular shape and extends across the cabinet from near one side of the cabinet to near the other side. Each shelf comprises a sheet metal plate which is formed to have a trough 19 extending lengthwise thereof from one end of the shelf to the other. Each shelf carries a helix 21 extending lengthwise in the trough. This helix may consist of an open-pitch coil spring. The diameter of the helix is greater than the depth of the trough and the helix projects up out of the trough whereby items A to be vended (such as candy bars or packages of candy) may be placed between the convolutions of the helix with end portions of the items resting on the shelf at opposite sides of the trough. Means generally indicated at 23 is provided for rotating each helix in such direction as to feed the items, by the screw action of the helix, in the direction toward one end of the shelf (the right end as viewed in FIGS. 1 and 3). This end of the shelf is referred to as the discharge end of the shelf. The helix extends to the discharge end of the shelf so that it is adapted to feed items one-by-one off the discharge end of the shelf.

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Extending vertically at the rear of the cabinet (on the inside of the rear wall 11 of the cabinet) is a pair of angle irons 25. Each of these has one leg secured to the rear wall (as by welding) and one leg extending forward. The forwardly extending legs of these angle irons are provided with a vertical series of holes 27. Each shelf has a pair of retractable hinge pins 29 receivable in a respective pair of the holes 27 for pivotally mounting the shelf for swinging movement on a horizontal axis at the rear of the shelf and at the rear of the cabinet, the shelf thereby being swingable from a generally horizontal vending position (see FIG. 2) to a loading position (see FIG. 5) inclined downward toward the front of the cabinet. As shown in FIG. 3, hinge pins 29 are slidable lengthwise relative to the shelf in eyes 31 on the shelf, and are biased outward by springs 33. Each hinge pin has a forwardly extending handle portion 35, the handle portions of the two pins being positioned for being squeezed together against the bias of springs 33 for retracting the pins. Each shelf also has a stop such as indicated at 37 for limiting the swing of the shelf by engagement of the stop with the rear wall of the cabinet.

Means is provided for releasably holding each shelf in its generally horizontal vending position. As shown, this means comprises a pair of channel-section members 41 extending heightwise in the cabinet at the sides and toward the front thereof. These are arranged with their side flanges 43 and 45 extending rearward, and have their outer side flanges 43 secured to the side walls of the cabinet. Their inner edges are toothed as indicated at 47. Each shelf has latch members 49 pivoted as indicated at 51 underneath the shelf at the front corners of the shelf engageable with the teeth 47 to hold the shelf up in vending position, and swingable out of engagement with the teeth to allow the shelf to swing down.

Each shelf also has guides such as indicated at 53 on opposite sides of the respective helix for confinement of items endwise of the items while permitting the items to slide toward the discharge end of the shelf. As shown, each guide is an angle-section member. Pins 55 received in holes 57 in the shelf hold the guides in position. Series of holes 57 are provided for adjustment of the guides toward and away from the helix for endwise confinement of items of different length.

The means for driving the helix of each shelf comprises a speed-reducing gear box 61 mounted on the other end (the left end as herein illustrated) of the shelf from the discharge end of the shelf carrying an electric motor, generically designated by the letter M, coupled to the input of the gear box. The output shaft 63 of the gear box has a cylindrical hub 65 thereon. One end (the left end) of the helix (which as herein illustrated is constituted by a coil spring) has a number of close-pitch coils as indicated at 67 and an inturned end at 69 extending into a hole in the hub. On the outer end of the output shaft 63 of the gear box is a cam 71 comprising a disk having a single peripheral notch 73 (see FIG. 4). This is engageable by the actuating arm 75 of a so-called single-revolution switch generically designated by the letters CS mounted on the gear box.

The discharge ends of the shelves are sufficiently spaced from the right side wall of the cabinet to provide a space 77 through which items discharged from the shelves may drop. An item discharged from any shelf drops down through this space and is directed by a curved guide 79 to a pan 81 where it is accessible to a purchaser through an access opening 83 in the front door 13.

Referring now to the wiring diagram of FIG. 6, the electric motors for four of the shelves are shown and specially designated M1, M2, M3 and M4. The cam-operated switches associated with these motors are specially designated CS1, CS2, CS3 and CS4. The motors

and switches for only four shelves are shown to simplify the wiring diagram. At 85 is indicated a coin mechanism. This is shown in FIGS. 1-3 as pivotally mounted at 87 at the right of the cabinet (although this is not essential). This coin mechanism includes an electric motor 89 adapted to drive a cam 91 via a speed-reducing gear box (not specifically shown). Cam 91 comprises a disk having a single peripheral notch 93. It is engageable by the actuating arm 95 of a switch 97 and also by the actuating arm 99 of a switch 101. On energization of motor 89, cam 91 is driven at 60 r.p.m., for example, whereas on energization of any motor M1, M2, etc., the respective cam 71 (and the respective helix) are driven at 33 r.p.m., for example. The coin mechanism also includes three solenoid-controlled switches LS, MS and HS for three-price operation, LS being a low-price switch, MS being a medium-price switch and HS being a high-price switch. The solenoid for controlling these switches is indicated at 103. Switch LS is closed on insertion of coin in the amount of the low price. Switches LS and MS are closed on insertion of coin in the amount of the medium price. All three switches LS, MS and HS are closed on insertion of coin in the amount of the high price. Any one or two or all three of these switches are opened on energization of solenoid 103.

FIG. 6 also shows a plurality of purchaser-operable switches generically designated by the letter PS and specifically designated PS1, PS2, PS3 and PS4, each related to a respective shelf. These purchaser-operable switches are normally open double-pole push button switches, each being shown as having two blades 105 and 107 adapted to close on two contacts 109 and 111. They are mounted in a horizontal row on the front door 13 of the cabinet (see FIGS. 1 and 2) with suitable displays such as indicated at 113 thereabove to indicate the type of item obtainable from the respective shelves. Three solenoid-controlled switches 115, 117 and 119 are provided. The solenoid for controlling these switches is indicated at 121. These switches are normally open, and closed on energization of solenoid 121. The latter also constitutes a latching solenoid for the push-button switches PS, adapted when energized to latch any switch PS pushed in by a purchaser in closed position, and when deenergized to release the switch. For each shelf, there is a double-throw empty switch generally designated by the letters ES. The four empty switches shown in FIG. 6 are specifically designated ES1, ES2, ES3 and ES4. Each empty switch is mounted underneath the respective shelf adjacent the discharge end of the shelf with its actuating arm 123 extending up through a slot 125 in the shelf for engagement by an item on the shelf. Arm 123 is normally held down by an item, but, when the last item is discharged, arm 123 springs up. Each empty switch has a blade 127 and two contacts 129 and 131. When arm 123 is down, blade 217 is closed on contact 129. When arm 123 is up, blade 127 is closed on contact 131.

Motors M1, M2, M3 and M4 are shown in FIG. 6 as connected across power lines L1 and L2 in circuits as indicated at 133 including the cam-operated switches CS1, CS2, CS3, CS4. Thus, when any of these switches is closed, the respective motor is energized. Normally, the actuating arm of each cam-operated switch is in notch 73 of the respective cam 71, and the switch is open. Switches LS, MS and HS have one terminal connected by a line 135 to power line L2 and lines 137, 139 and 141 extending from their other terminals. Line 137 may be referred to as a low-price line, line 139 as a medium-price line, and line 141 as a high-price line. Each of switches PS1 and PS4 is shown as having its blade 105 connected to the low-price line 137 whereby these control vending of low-price items from the respective shelves. Switch PS2 is shown as having its blade 105 connected to the medium-price line 139 and switch PS3 is shown as having its blade 105 connected to the high-price line 141 whereby these switches respectively control vending of medium and high-price items from the respective shelves. Lines

143 connect contacts 109 of the push button switches to the blades 127 of the empty switches. A line 145 connects contacts 129 of the empty switches to one terminal of solenoid 121, and a line 147 connects the other terminal of this solenoid to one terminal of switch 101. A line 149 connects the other terminal of switch 101 to power line L1. Contacts 131 of the empty switches are connected to power line L1 by a line 151 including an empty lamp 153. Switch 119 is connected in a line 155 shown as extending from line 135, hence connected to power line L2. Motors M1, M2, etc. are connected across line 155 and power line L1 in lines such as indicated at 157, the circuitry being such that, with switch 119 closed, pushing in any of push-button switches PS1, PS2, etc. energizes the respective motor M1, M2, etc. Motor 89 is connected across lines 149 and 155, hence across lines L1 and L2, by a line 157 connected to line 155 and including switch 117 and a line 158 connected to line 149. Switch 115 is connected across lines 145 and 155 in a line 159. Solenoid 103 is connected in a line 161 between power line L1 and one terminal of switch 97. A line 163 connects this terminal of switch 97 and line 157. A line 165 connects the other terminal of switch 97 and line L2.

Operation is as follows:

For loading, the front door 13 of the cabinet is opened, and latch members 49 are released to allow the shelves 17 to swing down to loading position (see FIG. 5). Items may then be placed between the convolutions of the helix 21 of the top shelf, access being provided to the top thereof since the shelf is inclined downward toward the front of the cabinet. After the top shelf is loaded, it is swung up and latched in its generally horizontal vending position. This provides for access to the second shelf from the top for loading thereof, after which the second shelf is swung up and latched in vending position, thereby providing for access to the third shelf from the top for loading thereof, and so on. The shelves, when in vending position, lie one above another with a minimum of space therebetween for maximum utilization of space in the cabinet (see FIG. 2). The spacing of the shelves will be determined by the width of the items (candy bars, packages of candy or the like) to be vended, and may be varied by pivoting the hinge pins 29 of the shelves in various pairs of the holes 27 in the angle irons 25. The teeth 47 on channel members 41 take care of latching the shelves in vending position regardless of the height-wise adjustment of the shelves.

Assuming a purchaser has deposited a sufficient amount in coin for purchase of a low-price item, switch LS will be closed. Then the purchaser pushes in switch PS1 (for example) for vending a low-price item from the shelf which carries motor M1 controlled by switch PS1. Assuming blade 127 of empty switch ES1 is closed on contact 129 (as it is as long as there are items in stock on the respective shelf), solenoid 121 is energized via line 149, switch 101 (which is closed at this time), line 147, the coil of solenoid 121, line 145, switch ES1, the respective line 143, switch PS1 (now closed) line 137, switch LS (now closed) and line 135. Switches 115, 117 and 119 thereupon close, and solenoid 121 also latches in push-button switch PS1. Upon closure of switch 115, a holding circuit is established for solenoid 121 via line 149, switch 101 (which is closed at this time), line 147, the solenoid 121, part of line 145, switch 115, line 159, line 155 and part of line 135. Upon closure of switch 117, motor 89 is energized via line 149, line 158, line 157, switch 117, line 155 and part of line 135. Solenoid 103 is energized via line 161, line 163, line 157, switch 117, line 155 and part of line 135. Solenoid 103 thereupon opens switch LS. Upon closure of switch 119, motor M1 is energized via line 155 and the respective line 157 (PS1 being closed).

With motor M1 in operation, the respective helix 21 is rotated to feed items forward along the respective shelf. The respective cam 71 is rotated and switch CS1 closes.

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The motor M1 is thereupon energized via the respective line 133. Meanwhile, motor 89 is operating to rotate cam 91. This closes switch 97 to establish a holding circuit for motor 89 via lines 149, 158, 157, 163, switch 97 and line 165. Ultimately, notch 93 in cam 91 comes around to arm 99 of switch 101 and the latter opens. This deenergizes solenoid 121, and switches 115, 117 and 119 open, and push-button switch PS1 is released to open. Upon opening of switch 117, solenoid 103 is deenergized. Then notch 93 in cam 91 comes around to arm 95 of switch 97 and the latter opens. This deenergizes motor 89 at the completion of a single revolution of cam 91. Motor M1 continues to operate until cam 71 completes a revolution and the actuating arm 75 of switch CS1 drops into notch 73.

As a result of the above, the helix 21 driven by motor M1 is rotated through a single revolution. All items on the respective shelf are thereby fed forward along the shelf a distance corresponding to the pitch of the convolutions of the helix, and the end item is fed off the discharge end of the shelf and drops down through the space 77 to the pan 81, on which it is accessible to the purchaser through access opening 83 in door 13. As noted above, cam 91 is driven faster than cam 71. Thus cam 91 completes its revolution before cam 71.

Assuming a purchaser has deposited a sufficient amount in coin for purchase of a medium-price item, switches LS and MS will be closed. Then the purchaser pushes in switch PS2 for vending a medium-price item from the shelf which carries motor M2 controlled by switch PS2. The vend cycle is then carried out substantially the same as above described, noting that solenoid 121 is energized via line 149, switch 101, line 147, line 145, switch ES2, the respective line 143, and line 139 (including switch MS).

Assuming a purchaser has deposited a sufficient amount in coin for purchase of a high-price item, switches LS, MS and HS will be closed. Then the purchaser pushes in switch PS3 for vending a high-price item from the shelf which carries motor M3 controlled by switch PS3. The vend cycle is then carried out substantially as above described, noting that solenoid 121 is energized via line 149, switch 101, line 147, line 145, switch ES3, the respective line 143, and line 141 (including switch HS).

It will be observed that, as to any shelf, loading is inherently carried out in such manner that any items which may remain on the shelf from previous servicing will be the first to be vended. This is because items loaded on a shelf are fed toward the discharge end of the shelf on each vend cycle, leaving empty spaces between convolutions of the helix trailing whatever items may remain on the shelf, and the serviceman will simply load up these empty spaces. Accordingly, the machine operates on the "first-in, first-out" principle.

In view of the above, it will be seen that the several objects of the invention are achieved and other advantageous results attained.

As various changes could be made in the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

We claim:

1. A vending machine comprising a cabinet having a door, a plurality of shelves in the cabinet, each shelf having a trough extending lengthwise thereof and carrying a helix extending lengthwise in the trough, the helix projecting up out of the trough whereby items to be vended may be placed between the convolutions of the helix with end portions of the items resting on the shelf at opposite sides of the trough, said helix, upon rotation thereof in one direction, being adapted to feed said items in the direction toward one end of the shelf constituting a discharge end of the shelf, and said helix extending to said discharge end of the shelf so that it is adapted to feed items one-by-

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one off said discharge end of the shelf, means carried by each shelf at the other end of the respective helix for rotating the respective helix in said one direction, and means individually mounting said shelves in the cabinet for movement between an inaccessible vending position and a position separately exposing each helix for individual loading, said shelves when in vending position extending horizontally in the cabinet one above another from near one side of the cabinet to near the other side of the cabinet with the discharge ends of the shelves sufficiently spaced from the adjacent side of the cabinet to provide a space through which items discharged from the shelves may drop, and each shelf when in loading position, and with the door of the cabinet open, being accessible from the top thereof for placing items thereon between the convolutions of the helix on the shelf.

2. A vending machine as set forth in claim 1 wherein said means mounting the shelves in the cabinet provides for adjustment of the shelves heightwise to different positions in the cabinet.

3. A vending machine as set forth in claim 1 wherein the means for rotating each helix comprises an electric motor carried by the respective shelf and a speed reducer carried by the respective shelf driven by the motor and having an output shaft connected to said other end of the helix.

4. A vending machine as set forth in claim 3 wherein the motors are connected in a circuit including coin-controlled means and purchaser-operable switches, one for each motor, adapted on insertion of appropriate amount in coin and actuation of any switch to energize the respective motor to rotate the respective helix in item-feeding direction until an item has been fed off the discharge end of the respective shelf and then to deenergize the motor.

5. A vending machine as set forth in claim 4 wherein said circuit includes switches actuable by cams driven by the motors for deenergizing each motor in response to completion of a single revolution of the respective helix.

6. A vending machine as set forth in claim 1 wherein each shelf carries guides on opposite sides of the respective helix for confinement of items endwise of the items while permitting said items to slide toward the discharge end of the shelf.

7. A vending machine as set forth in claim 6 wherein said guides on each shelf are adjustable toward and away from the respective helix for endwise confinement of items of different length.

8. A vending machine comprising a cabinet having a bottom, sides, a top, a rear and a front door, a plurality of shelves in the cabinet extending across the cabinet from near one side to near the other side, means individually mounting each shelf for swinging movement on a horizontal pivotal axis at the rear of the shelf and at the rear of the cabinet from a generally horizontal and inaccessible vending position in the cabinet to a loading position inclined downward toward the front of the cabinet, for separately exposing each shelf for individual loading, means for releasably holding each shelf in its generally horizontal vending position, each shelf having a trough extending lengthwise thereof and transversely of the cabinet and carrying a helix extending lengthwise in the trough, the helix projecting up out of the trough whereby items to be vended may be placed between the convolutions of the helix with end portions of the items resting on the shelf at opposite sides of the trough, said helix, upon rotation thereof in one direction, being adapted to feed said items in the direction toward one end of the shelf constituting a discharge end of the shelf, and said helix extending to said discharge end of the shelf so that it is adapted to feed items one-by-one off said discharge end of the shelf, means carried by each shelf at the other end of the respective helix for rotating the respective helix in said one direction, said shelves when swung up to vending position extending generally horizontally across the cab-

inet one above another, the discharge ends of the shelves being sufficiently spaced from the adjacent side of the cabinet to provide a space through which items discharged from the shelves may drop, and each shelf when swung down to loading position, and with the front door of the cabinet open, being accessible from the top thereof for placing items thereon between the convolutions of the helix on the shelf.

9. A vending machine as set forth in claim 8 wherein the pivotal axis of each shelf is adjustable heightwise to different positions in the cabinet, and wherein the means for releasably holding each shelf in its generally horizontal vending position is adapted to hold the shelf in said vending position for any position of adjustment of the shelf.

10. A vending machine as set forth in claim 8 wherein the means for rotating each helix comprises an electric motor carried by the respective shelf and a speed reducer carried by the respective shelf driven by the motor and having an output shaft connected to said other end of the helix.

11. A vending machine as set forth in claim 10 wherein the motors are connected in a circuit including coin-controlled means and purchaser-operable switches, one for each motor, adapted on insertion of appropriate amount in coin and actuation of any switch to energize the respective motor to rotate the respective helix in item-feeding direction until an item has been fed off the discharge end of the respective shelf and then to deenergize the motor.

12. A vending machine as set forth in claim 11 wherein said circuit includes switches actuable by cams driven by the motors for deenergizing each motor in response to completion of a single revolution of the respective helix.

13. A vending machine as set forth in claim 8 wherein each shelf carries guides on opposite sides of the respective helix for confinement of items endwise of the items while permitting said items to slide toward the discharge end of the shelf.

14. A vending machine as set forth in claim 13 wherein

said guides on each shelf are adjustable toward and away from the respective helix for endwise confinement of items of different length.

15. Vending apparatus comprising a cabinet having a door, a plurality of shelves in the cabinet, each shelf having lateral portions on opposite sides of a space extending lengthwise of the shelf, a helix extending lengthwise of each shelf in the space between said lateral portions of the shelf, means associated with each shelf located below said space supporting the respective helix with part of the helix below said lateral portions of the shelf and part of the helix projecting up above said lateral portions, said means supporting said helix for rotation on the axis of the helix, whereby items to be vended may be placed on each shelf between the convolutions of the respective helix, each helix extending to one end of its respective shelf constituting a discharge end of the shelf and being adapted on rotation thereof in one direction to push the items toward said discharge end and feed them one-by-one off said discharge end, means in said cabinet mounting said shelves for individual movement between an inaccessible vending position and a position separately exposing each shelf for individual loading, said shelves in vending position extending substantially horizontally one above another in the cabinet in the same direction, said cabinet having a space at the discharge ends of the shelves through which items discharged from the shelves including any shelf above the lowermost shelf may drop to a position for removal by a purchaser, means at the other ends of the shelves for rotating the helices in said one direction, said shelves when in loading position, and with the door of the cabinet open, providing for loading of each shelf with items by placing items on the top of each shelf between the convolutions of the respective helix.

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