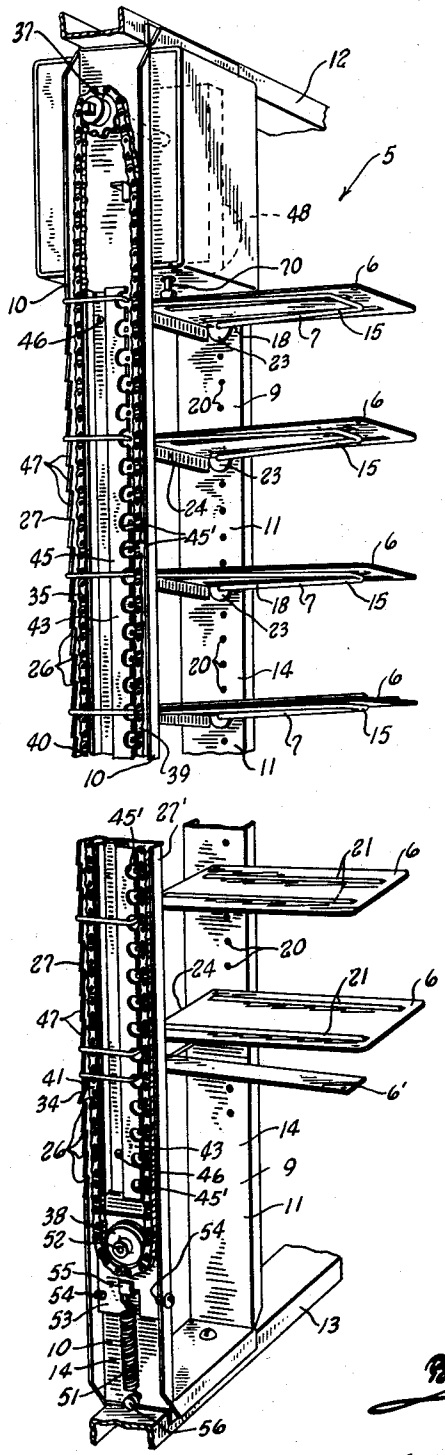
May 17, 1960 D. D. FORST ET AL 2,936,931

VENDING APPARATUS

Filed Feb. 10, 1958 3 Sheets-Sheet 1

Fig. 1.



Inventors
David D. Forst
Lloyd D. Merkl
By Dewitt & Jones
Attorney

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Fig. 3.

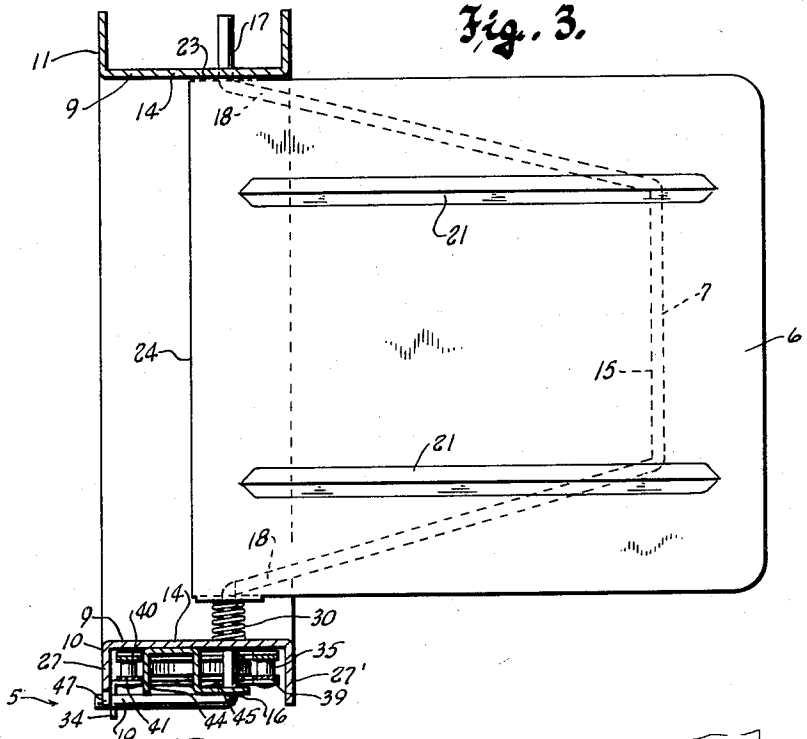
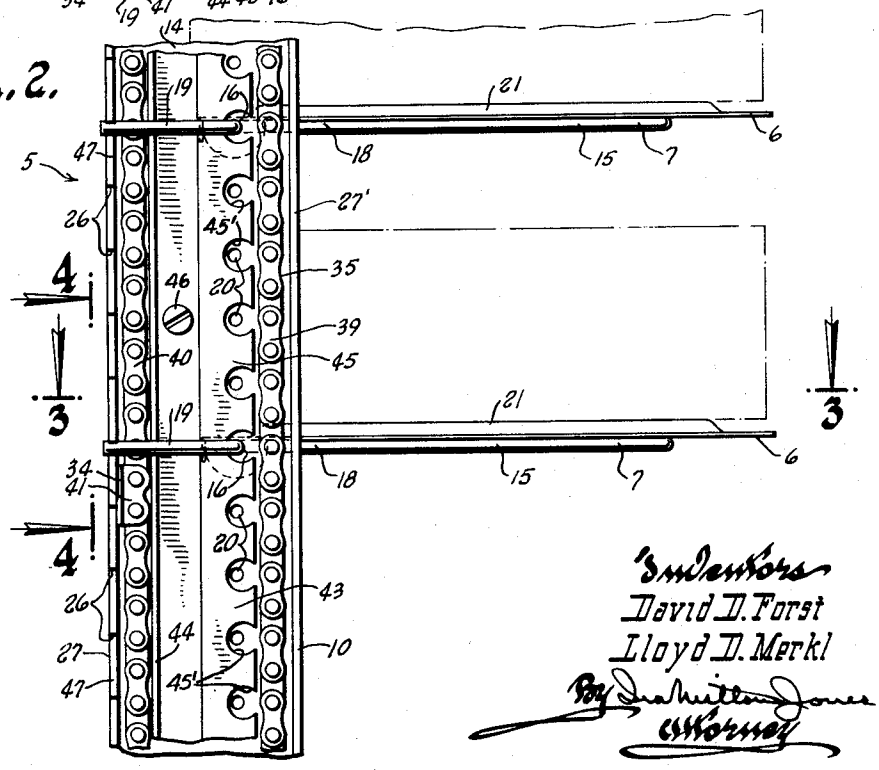


Fig. 2.



Inventors
David D. Forst
Lloyd D. Merkl
By Dunham, Watson & Jones
Attorneys

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Fig. 4.

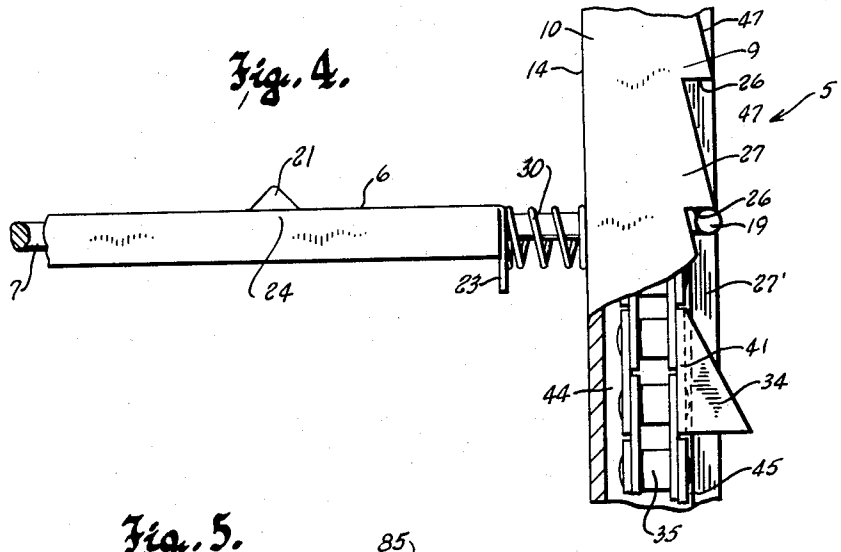
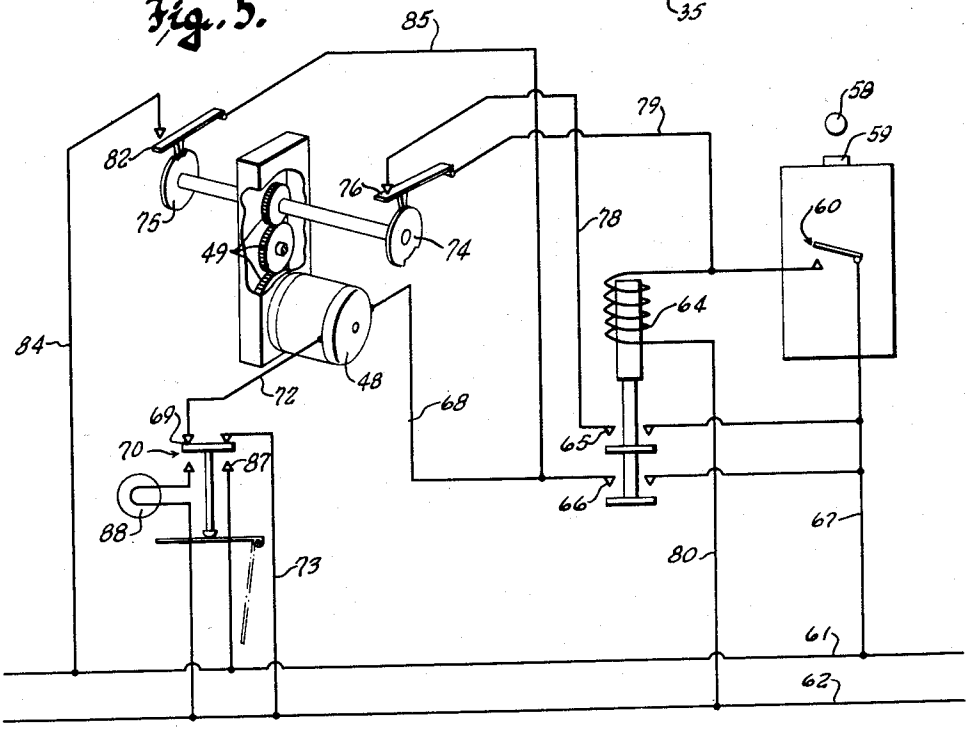


Fig. 5.



Inventors
David D. Forst
Lloyd D. Merkl
By Schweitzer Jones
Attorney

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2,936,931

VENDING APPARATUS

David D. Forst and Lloyd D. Merkl, Mayville, Wis., assignors to Mayville Metal Products Co., Mayville, Wis., a corporation of Wisconsin

Application February 10, 1958, Serial No. 714,219

10 Claims. (Cl. 221—90)

This invention relates to coin operated vending machines and the like, and refers more particularly to apparatus for delivering articles of merchandise one at a time from a storage and display position to a delivery position, each such delivery being affected in consequence of deposit of a coin in a coin slot.

In general, the object of this invention is to provide apparatus for vending packs of cigarettes, candy bars, ice cream bars and similar individual articles of merchandise, which apparatus is not only simple, inexpensive and reliable, but is also readily adjustable to accommodate articles of different shapes and sizes.

More specifically, it is an object of this invention to provide a vending machine wherein individual articles of merchandise are stored and displayed on vertically spaced apart shelves, each of which is releasable, in consequence of insertion of a coin in to the machine for downward swinging movement from its horizontal article supporting position to a tilted or substantially vertical position, whereby an article of merchandise on the shelf is dropped down to a delivery position therebeneath.

It is also an object of this invention to provide a vending machine wherein articles of merchandise are individually stored and displayed on tiltable shelves which are arranged in vertically spaced apart relation, one above the other, and wherein the spacing between shelves may be very readily changed to enable the machine to accommodate items of merchandise of different shapes and sizes.

Another specific object of this invention is to provide a vending machine having article supporting shelves that are tiltingly swingable from a horizontal article supporting position to a vertical article releasing position, wherein each of the shelves is held in its article supporting position by simple and inexpensive readily releasable latch means, and wherein actuation of the latch means for each shelf is effected by means of a simple latch actuator mounted and driven for stepwise movement from one latch means to another.

In connection with the object of this invention just mentioned, it is a very important object of this invention to provide a vending machine which is particularly adapted for use with frozen foods, such as ice cream bars and ice cream sandwiches; and among the special objects of the invention are the provision of a vending machine mechanism which is well adapted to enclosure in a cabinet that can be readily refrigerated, and which is so simple and reliable in operation that accumulations of ice and frost on the parts thereof will not tend to produce failures or malfunctions.

It is also an object of this invention to provide a control means by which the aforesaid latch actuator is started in motion in consequence of tripping of a coin actuated switch, and by which control means the latch actuator is automatically stopped when it has released the latch means holding one of the shelves in its horizontal position, so that the shelves are released one at a time for article dropping swinging movement.

A further object of this invention resides in the provision of a coin operated vending machine which is

particularly adapted for the vending of frozen and refrigerated merchandise because of the fact that very little power is used to effect movement of articles of merchandise to be vended from their storage and display positions to their delivery positions, and consequently no appreciable heating takes place in consequence of such movement of the merchandise.

With the above and other objects in view which will appear as the description proceeds, this invention resides in the novel construction, combination and arrangement of parts substantially as hereinafter described and more particularly defined by the appended claims, it being understood that such changes in the precise embodiment of the hereindisclosed invention may be made as come within the scope of the claims.

The accompanying drawings illustrate one complete example of the physical embodiment of the invention constructed according to the best mode so far devised for the practical application of the principles thereof, and in which:

Figure 1 is a perspective view of a bank of merchandise storage shelves constituting the merchandise storage and delivery mechanism of the vending machine of this invention;

Figure 2 is a fragmentary side elevational view of the merchandise storage and delivery mechanism;

Figure 3 is a sectional view taken on the plane of the line 3—3 in Figure 2;

Figure 4 is a fragmentary rear elevational view taken substantially on the plane of the line 4—4 in Figure 2; and

Figure 5 is a schematic diagram of a control mechanism for the vending machine of this invention.

Referring now more particularly to the accompanying drawings, in which like numerals designate like parts throughout the several views, the numeral 5 designates generally the merchandise storage and delivery mechanism of the vending machine of this invention, comprising a bank of vertically spaced apart merchandise storage shelves 6. Each of the shelves is adapted to support an article of merchandise, such as an ice cream bar or the like, and is carried by a holder 7, and all of the holders and the shelves which they carry are pivotally mounted one above the other on a bearer 9 comprising a pair of elongated upright supports or rails 10 and 11. The entire bank of merchandise storage shelves may be located behind an elongated panel of either transparent or opaque material, depending upon whether it is desired to display or conceal the articles to be vended, but in either event it will be understood that the bank of shelves will be housed in a suitable enclosure, which may of course be refrigerated.

Each of the upright rails 10 and 11 is channel shaped, and the two rails are secured between top and bottom frame members 12 and 13, respectively, which hold the rails in spaced apart parallel relationship with their web portions 14 opposing one another and their flanges projecting in opposite directions. The frame members 12 and 13 may support several banks of shelves in side-by-side relationship, to provide for the vending of a variety of products. Mounted between and supported by the rails are the holders 7 by which the shelves are pivotally carried for downward and rearward swinging motion from a forwardly projecting horizontal article supporting attitude to a vertical or tilted attitude in which an article on the shelf is dropped to a delivery position at the bottom of the bank of shelves.

Each of the holders 7 is formed of heavy spring wire and comprises a substantially U-shaped central shelf supporting portion 15 having a pair of coaxial trunnions 16 and 17 extending in opposite directions from the free ends of the legs 18 of the U. One end portion of the spring

wire, at the outer end of one of the trunnions **16**, is bent at right angles to the trunnion to provide a latch arm **19** which projects laterally from the trunnion in the direction opposite to that in which the U-shaped shelf supporting portion projects therefrom, so that the shelf supporting portion and the latch arm may be considered a pair of arms on the holder extending in opposite directions from the trunnion axis. Each holder is tiltably mounted between the rails by having its trunnions **16** and **17** pivotally received in axially aligned bearing holes **20** in the web portions **14** of the two rails, there being a series of such holes at vertically spaced intervals in the web portion of each rail.

Each shelf is made of sheet metal reinforced by lengthwise extending integral ridges **21**, and it flatwise overlies and is supported by the U-shaped shelf supporting portion **15** of a holder **7**. An ear **23** is turned down at each side edge of each shelf, near the rear edge **24** thereof, and through these ears pass the trunnions of the holder, so that each shelf is pivoted upon the trunnions of its holder for flatwise swinging motion with the shelf supporting portion of the holder.

The rear flange **27** of the rail **10** is serrated to provide a plurality of downwardly facing shoulders or abutments **26**, each such abutment being horizontally aligned with one of the bearing holes **20** in the web portion of the rail. At its inner end each abutment joins a downwardly and outwardly inclined upper surface **47**. Each latch arm **19** can be releasably held engaged under one of the abutments **26**, and by its horizontal disposition when so engaged it will of course hold the shelf supporting portion **15** of its holder horizontal, and thus hold the connected shelf **6** in its article supporting position. Each latch arm can be released from beneath the shoulder with which it cooperates when the arm is moved laterally, parallel to the trunnion axis, in the direction to carry the latch arm away from the web portion **14** of rail **10**. Such movement of the latch arm is provided for by reason of the fact that the distance between the inner ends of the trunnions **16** and **17**, where they join the legs **18** of the U-shaped shelf supporting portion of the holder, is less than the distance between the webs of the upright rails **10** and **11**, and the ears **23** on the shelf lie closely adjacent to the inner ends of the trunnions. Each shelf holder is biased in the axial direction to maintain its shelf arm engaged under a cooperating shoulder **26** by means of a coiled compression spring **30** which surrounds the trunnion **16** and reacts between the web portion **14** of the rail **10** and the adjacent ear **23** on the shelf member.

Release of each latch arm to permit the shelf connected with its holder to swing downwardly about the trunnions is effected by means of a latch actuator **34** comprising a wedge-like cam member mounted for upward movement along the rail **10** to have successive engagement with the several latch arms, each in turn. The latch actuator is carried for such motion on an endless drive chain **35** which is trained over a drive sprocket **37** near the top of rail **10** and an idler sheave **38** near the bottom of said rail, and the chain has straight front and rear stretches **39** and **40** extending parallel and adjacent, respectively, to the front and rear flanges **27'** and **27** of said rail. The actuator is secured to one link **41** of the chain, and as it moves upwardly therewith past each latch arm it cammingly wedges the latch arm out from under its cooperating abutment **26**, against the bias of spring **30**, thus releasing the shelf and its holder to swing downwardly of their own weight, about the trunnions, so that any article on the shelf will drop to a delivery position therebeneath. Since the cam actuator trips the shelves in sequence, beginning with the lowermost shelf, and each drops to a substantially vertical position between the rails **10** and **11**, none of the shelves obstructs the fall of an article from a shelf above it.

The rear stretch **40** of the chain, which moves upwardly with the cam actuator, is guidingly confined to linear motion by a vertically elongated guide strip **43** readily detachably secured to the exterior of the web **14** of rail **10** by screws **46**, and having a flange **44** which is spaced from and opposes the rear flange **27** on rail **10**. The two flanges **44** and **27** cooperate to define, in effect, a slot in which the rear stretch of the chain travels and from which it receives guidance. The guide strip also has a flange **45** which extends forwardly parallel to the web **14** of rail **10** and is spaced outwardly therefrom a distance substantially equal to or slightly greater than the distance between the inner end of shoulder **26** and the web **14** of rail **10**. This flange has a series of equispaced notches **45'** in its forward edge in which the outer end portions of the latch arm trunnions **16** are freely received, as shown best in Figure 2. Hence in either position of each latch arm, that is, regardless of whether its shelf is horizontal or tilted downwardly so that its latch arm extends up, the latter will lengthwise bear against the exterior of the guide strip flange **45** to define the axial position of the latch on trunnion in its bearing hole. Accordingly, even though the latch arms are swung to their vertical positions, each will be held by the flange **45** in a position in which it can ride downwardly and outwardly along the outwardly inclined upper surface **47** of the serration having the shoulder **26** with which the latch arm is engageable during resetting of its shelf. The arm will engage under said shoulder with a detent action due to the biasing force of spring **30**.

It will be seen that because of the manner in which the shelves are mounted, each holder and its shelf can be readily removed from the pair of bearing holes **20** in which it is installed and can be moved to a pair of bearing holes at a higher or lower level on the upright bearer **9**. To effect such removal of the holder from the bearer, the guide strip **43** is removed while the latch arms are in their vertical positions, and the legs **18** of the U-shaped portion of the holder are flexed toward one another to withdraw trunnion **17** axially from the web of rail **11**. Thereafter trunnion **16** may be withdrawn from rail **10**, the holder and the shelf being turned bodily to maneuver the latch arm through the bearing hole **16** in rail **10**. Installation of the shelf, in a new location is accomplished by reversing the procedure just described. Each shelf of course may remain assembled with its holder when the latter is removed from the upright bearer **9** by reason of the connection between the trunnions on the holder and the ears **23** on the shelf.

The chain is driven for latch disengaging movement of the actuator by means of an electric motor **48** drivingly connected with the drive sprocket **37** through drive gears **49**. Tension is maintained on the straight stretches of the chain by reason of the fact that the idler sheave **38** is mounted for bodily up and down movement and is biased downwardly by means of a coiled tension spring **51**. To enable the sheave **38** to move in response to tension of spring **51**, the shaft **52** upon which the sheave is rotatably mounted is carried by a carriage plate **53** slidably confined between the flanges **27** and **27'** of rail **10** and held in sliding engagement with the web **14** of said rail by means of studs **54** projecting inwardly from said flanges and overlying the front surface of the carriage plate. The coiled tension spring **51** has its upper end connected to a lug **55** on the carriage plate and its lower end connected to a stud **56** projecting from the web of the rail **10**, at the bottom thereof.

The motor **48** by which the latch actuator is driven may be controlled through a circuit like that shown in Figure 5, whereby the motor is caused to start when a coin **58** is inserted into a coin slot **59** in the machine and to stop after it has moved the latch actuator through a distance substantially equal to the distance between latch arms, thus assuring that only one shelf will be tripped each time a coin is put into the machine. The

coin slot conducts the coin to a conventional mechanism of the type that includes a coin actuated momentary contact switch **60**, and said switch closes a circuit which connects a current source, represented by mains **61** and **62**, with the solenoid **64** of a relay having two sets of contacts **65** and **66**. The contacts **66** are connected with one lead **61** of the current source through a conductor **67** and with the motor through another conductor **68**. The other lead **62** of the current source is connected with the motor through one set of contacts **69** of a double throw switch **70**, which contacts remain closed so long as the uppermost shelf in the bank is in its horizontal article supporting position, a conductor **72** providing the connection between contacts **69** and the motor, and another conductor **73** connecting contacts **69** with lead **62**. Thus closure of the coin actuated switch **60** effects closure of the relay contacts **65** and **66** and energizes the motor **48**.

In addition to driving the sprocket **37**, the motor rotatingly drives a pair of switch actuating cams **74** and **75**, both of which make one full revolution as the latch actuator moves through a distance equal to the spacing between adjacent latch arms. The switch **76**, which is actuated by cam **74**, is connected in series with the contacts **65** of the relay by means of a conductor **78**, and is also connected, through a conductor **79**, with one side of the relay solenoid **64**, the other side of said solenoid being connected directly with the current supply lead **62** through a conductor **80**. Thus the cam actuated switch **76** is connected in parallel with the coin actuated switch **60**, through relay contacts **65**, to provide a holding circuit whereby the relay, once closed through switch **60**, is maintained closed by the cam actuated switch **76** so long as the latter remains closed.

The cam **74** opens its associated switch **76** only after the cam has passed through a substantial part of its rotation cycle, and thus switch **76** is closed whenever the latch actuator is stopped in one of its normal inoperative positions between latch arms. Hence the relay holds itself closed through switch **76** as soon as a coin is dropped into the coin slot, and the motor is therefore energized through the contacts **66**; but after the motor has driven the chain through a part of the distance between two adjacent latch arms, the cam **74** opens switch **76** to stop the flow of energizing current to the relay and thus reopen the contacts **65** and **66** to prepare the apparatus for the next coin initiated operation. However, the motor continues to be energized until it has driven the cams **74** and **75** through a full cycle and has carried the latch actuator through a full space between latch arms. A switch **82**, actuated by cam **75**, provides for such continued operation of the motor after the relay opens and for stopping the motor at the end of the cycle. A conductor **84** connects cam actuated switch **82** with power lead **61**, and another conductor **85** connects said switch with the conductor **68** which connects with the motor. When the latch actuator has been driven the full distance between adjacent latch arms, cam **75** opens switch **82** and breaks the flow of energizing current to the motor. Since cam **74** has at this point been rotated to a position in which it has closed switch **76**, deposit of another coin in the coin slot will restart the cycle, causing the motor to drive the latch actuator through engagement with another latch arm.

When the uppermost shelf in the bank drops down to its vertical position, it actuates the double throw switch **70** connected between the motor conductor **72** and power lead **62**, thus preventing any further energization of the motor. At the same time contacts **87** of the double throw switch energize a signal light **88**, which burns to indicate that the bank of shelves must be replenished with merchandise.

To service the machine, each of the shelves is manually raised to its horizontal position, thereby cammingly swinging the latch arm along the downwardly and outwardly inclined upper surface **47** of the adjacent serration of flange **27**, and when the latch arm reaches horizontal alignment with its abutment **26** it will move laterally into engagement thereunder with a substantially detent action.

When the machine here illustrated is serviced, the chain must be moved orbitally through a sufficient distance to carry the latch actuator around the drive sprocket **37**, down the front stretch, and around the sheave **38**, in order to place the actuator in position for immediate engagement with the latch arm of the bottom shelf. In practice the necessity for this substantial movement of the chain during servicing can be avoided by providing a second latch actuator, located at half the length of the chain from the first, and which can be moved into position for actuating the lowermost shelf with only a relatively short travel.

To aid in adjusting the cyclical positions of the cams, a small signal shelf **6'** may be installed in the bearing holes **20** directly below the lowermost shelf, and the cams **74** and **75** are set so that the motor stops immediately after dropping the signal shelf. In this way assurance will be had that each shelf will be dropped early in the operating cycle of the motor so that there will be a minimum delay between deposit of a coin in the machine and delivery of the merchandise; and the remaining latch actuator travel will take place after the shelf has dropped to its delivery position.

It will be understood that the shelves must be arranged on the upright bearer at equispaced intervals, in order that motion of the latch actuator from shelf to shelf may be accurately controlled by the cam **75**; and it will also be understood that if the spacing between shelves is changed, there will have to be a corresponding change in the rate at which the cams **74** and **75** rotate, relative to the rate of linear travel of the cam actuator.

The control system shown in Figure 5 is intended to be merely illustrative, showing one means of obtaining a step-by-step advance of the chain and the cam actuator carried thereby through distances corresponding to the spacing between latch arms each time the coin actuated switch is closed. In practice, other and possible more elaborate systems would be employed, providing for selection among any one of several banks of shelves and for tripping of one shelf in the proper bank only when the correct value in coins for the merchandise selected has been placed in the machine.

From the foregoing description, taken together with the accompanying drawings, it will be apparent that this invention provides a simple and very efficient vending machine apparatus which is readily adjustable to accommodate different sized articles of merchandise, which is readily serviced to replenish the supply of mechandise and which, if desired, provides for an attractive display of merchandise to be vended therefrom. It will also be apparent that the vending apparatus of this invention has a sturdy mechanism which does not involve close tolerances or accurately fitting parts, so that the apparatus of this invention is not only low in cost but is well adapted for use with merchandise which must be stored in a refrigerated cabinet.

What is claimed as our invention is:

1. In a vending machine: a support including a pair of upright spaced apart rails providing parallel opposing walls with vertically equispaced holes therein, each hole in one wall being transversely opposite a hole in the other wall and cooperating therewith to provide a pair of horizontally coaxial bearings; a plurality of vertically equispaced shelves between and supported from said walls with the spacing between shelves equal to a multiple of the spacing between vertically adjacent bearing holes; means mounting said shelves for flatwise tilting motion out of horizontal merchandise supporting positions to merchandise dropping positions, comprising a pair of coaxial trunnions connected with each shelf and extending away from one another, beyond opposite sides of the

shelf, and pivotally and axially slidably received in holes providing one pair of coaxial bearings, said trunnions being successively axially displaceable from their bearing holes to provide for detachment of the shelves and reinstallation of the shelves at different uniformly spaced levels on the support; abutment means on one of said walls having surfaces facing in a common direction; a latch arm connected to one trunnion of each shelf and normally engaging said abutment means to hold the shelves in their horizontal positions, the latch arms being disengageable from said abutment means upon sliding of their trunnions in one axial direction in their bearing holes to free the shelves for tilting motion to their dropping positions; spring means reacting upon said last named trunnions to yieldingly resist such disengagement of their latch arms from said abutment means; an actuating cam; means mounting the cam on said one wall for vertical movement therealong; and means on each of said latch arm trunnions transiently engageable by the cam during vertical movement thereof, for imparting latch arm disengaging motion to said trunnions.

2. The vending machine of claim 1, further characterized by the provision of drive means for advancing said cam stepwise vertically along said one wall, in increments equal to the spacing between vertically adjacent bearing holes.

3. The vending machine of claim 1, wherein said disengaging motion is imparted to the trunnions having the latch arms connected thereto by engagement of the cam with the latch arms themselves.

4. The vending machine of claim 1, wherein the trunnions for each shelf are part of a holder upon which the shelf rests, said holder having opposite resilient legs disposed substantially crosswise of the trunnions, and the trunnions being on the free ends of said legs; and each shelf having ears on its opposite side edges with apertures therein through which the trunnions project to connect the shelf to the holder.

5. The vending machine of claim 4 wherein the shelves have a transverse dimension which is less than the spacing between said walls, and wherein the junctions of the trunnions with the legs of each holder define shoulders which bear against the inner surfaces of the shelf ears; and further characterized by the fact that said spring means are coiled compression springs encircling the latch arm trunnions and confined between said one wall of the support and the adjacent ears of the shelves to yieldingly urge the shelves away from said one wall and toward engagement with the other wall.

6. The vending machine of claim 1, further characterized by the provision of flange means fixed with respect to said wall having the abutment means thereon, and positioned to be engaged by the latch arms under the influence of said spring means to define the axial positions of the latch arm trunnions when the latch arms are engaged with said abutment means and also when the latch arms are disengaged from the abutment means.

7. The vending machine of claim 6, wherein said flange means and the latch arms cooperate to preclude axial displacement of the latch arm trunnions from their bearing holes; and further characterized by the provision of means readily detachably mounting said flange means on said one wall of the support so that it may be removed therefrom whenever adjustment of the levels of the shelves becomes necessary.

8. In an automatic vending machine, the combination of: an elongated bearer; a plurality of shelves pivotally mounted on the bearer at equi-spaced locations along its length and each swingable flatwise from a horizontal article supporting position to a tilted dropping position to which it is biased; cooperating parts carried by the bearer and each shelf for relative movement from an operative position of interengagement releasably holding the shelf in its article supporting position, to a disengaged position at which the shelf is released for tilting motion to its dropping position; a movable actuator to effect relative disengaging motion of said parts for each shelf and release of the shelf held thereby; carrier means on the bearer mounting said actuator for movement in one direction lengthwise along the bearer to positions effecting relative disengaging motion of said parts for each shelf; and automatically operable means for carrying out an operating cycle of the machine during which one of the shelves is released for motion to its dropping position, comprising an electric motor having a rotatable shaft that is operatively connected with the carrier means to drive the carrier means and the actuator thereon in said one direction, motor starting means operable in consequence of a manual act to the motor and thereby effect initiation of an operating cycle of the machine, and motor controlled means operable to effect stopping of the motor and termination of an operating cycle after the motor has produced travel of the carrier means and the actuator thereon a predetermined distance substantially equal to the spacing of the shelves, so that with each such operating cycle of the automatically operable means the actuator will effect relative disengaging motion of the cooperating parts for another shelf to cause the same to tilt to dropping position.

9. In an automatic vending machine, the combination of: an elongated bearer; a plurality of shelves pivotally mounted on the bearer at equi-spaced locations along its length and each swingable flatwise from a horizontal article supporting position to a tilted dropping position to which it is biased; cooperating parts carried by the bearer and each shelf for relative movement from an operative position for interengagement releasably holding the shelf in its article supporting position, to a disengaged position at which the shelf is released for tilting motion to its dropping position; a movable actuator to effect relative disengaging motion of said parts for each shelf and release of the shelf held thereby; carrier means on the bearer mounting said actuator for movement in one direction lengthwise along the bearer to positions effecting relative disengaging motion of said parts for each shelf; an electric drive motor having a rotatable shaft; transmission means drivingly connecting said shaft of the motor with the carrier means for the actuator; and control means for the motor, including first switch means actuatable in consequence of a manual act to effect starting of the motor and initiation of automatic operation of the machine, and second switch means controlled by the motor to effect stopping thereof after said actuator has been moved by the motor driven carrier means a predetermined distance substantially equal to the spacing of the shelves and to a position effecting relative disengaging motion of said parts for one of the shelves, so that each actuation of said first switch means effects disengagement of the cooperating parts for another shelf and release thereof for tilting motion to its dropping position.

10. The vending machine of claim 9, wherein said cooperating parts comprise latch means connected with each shelf, and cooperating abutments on the bearer engaged by said latch means to hold the shelves in article supporting position; and further characterized by the fact that said actuator is engageable with the latch means for the shelves to effect disengagement of said latch means from their cooperating abutments and tilting of the shelves to dropping positions.

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