

March 17, 1959

W. A. PATZER ET AL  
VENDING MACHINE

2,877,928

Filed April 29, 1955

2 Sheets-Sheet 1

FIG. 1

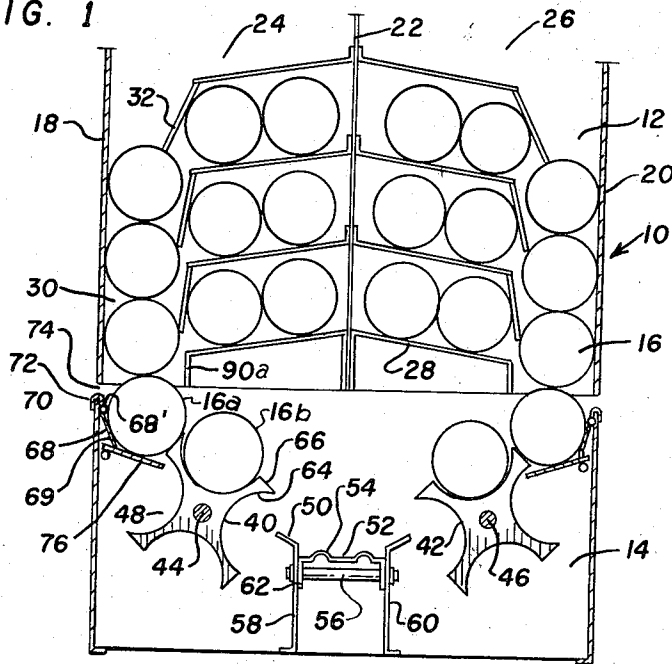


FIG. 2

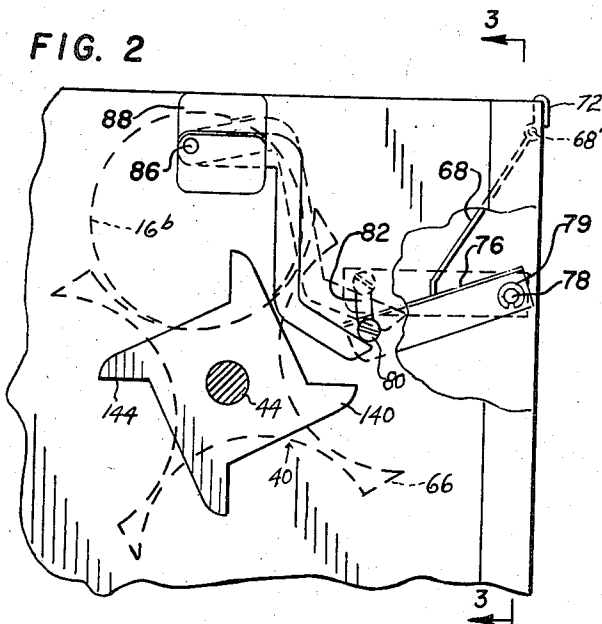
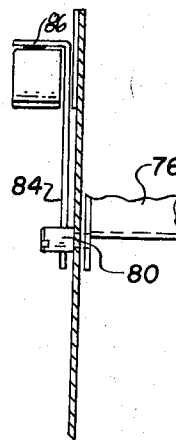


FIG. 3



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2 Sheets-Sheet 2

FIG. 4

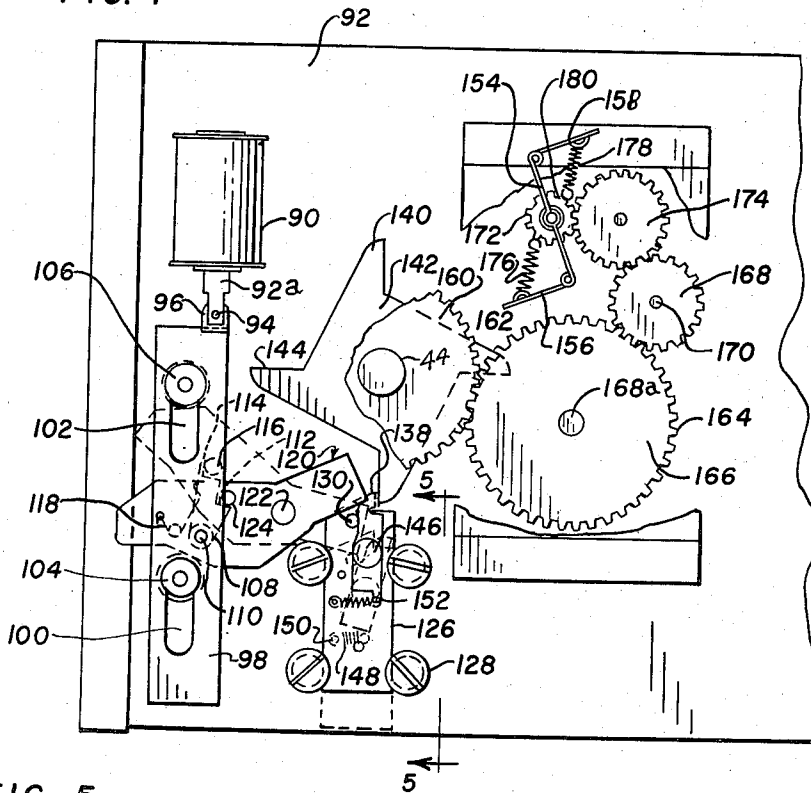


FIG. 5

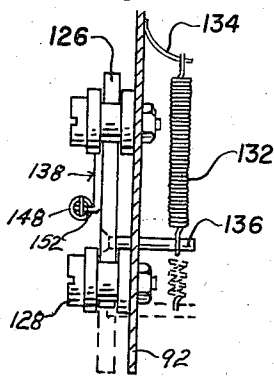
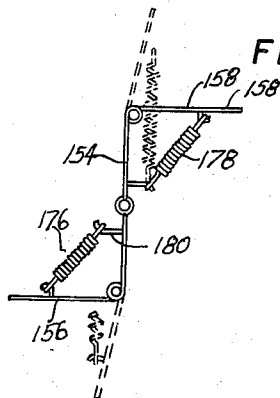


FIG. 6



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2,877,928

VENDING MACHINE

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Application April 29, 1955, Serial No. 504,786

6 Claims. (Cl. 221—295)

This invention relates to a machine for vending articles of merchandise, and it relates more particularly to a bottle-vending machine of the type described which operates automatically through a cycle for dispensing a single article of merchandise from the machine in response to coin control.

While the invention herein will be described with reference to dispensing bottles of beverages and the like, it should be understood that the concepts are applicable also for use in vending machines to dispense other articles of merchandise, such as canned goods, dairy products, and the like materials packaged preferably in containers of circular cross section.

To the present, bottle dispensers which have been used in vending machines have been designed for operation with containers of a predetermined shape and/or dimension. Whenever it is desired either to change the size of the container or the shape of the container which is dispensed from the machine, it is usually more economical either to replace the vending machine with one designed to be used with bottles or containers of the new dimension or shape, or else to replace the vending mechanism with one capable of handling the new bottles or containers. Such conversion for use with containers having a different shape or dimension is undesirable from the standpoint of the wastage of time, money, and in the inventory of equipment required for effecting such conversion.

Thus it is an object of this invention to produce a vending machine of the type described which makes use of vending mechanism having sufficient flexibility for use interchangeably with bottles of various dimensions and shapes without modification of its construction or operation, and without the necessity for conversion or replacement with a new unit, and it is a related object to produce a vending machine of the type described which operates smoothly and uniformly for dispensing bottles and the like containers independently of their size or shape, and independently of the weight of the bottles or the number of bottles in position in the machine to be dispensed during successive cycles of operation.

Further, the major proportion of the vending machines now in use for dispensing bottles and the like containers make use of electrical motors for driving the dispensing mechanism through a cycle of operation. Such motor-operated means increases the dimensional characteristics of the machine and correspondingly increases the amount of space required for location of the machine in position of use. When the value of the machine is calculated on the basis of the revenue available from the machine per unit space occupied by the machine, it will be apparent that such additional space as is required for the driving motor and the mechanism for connecting the driving motor with the dispensing means represents a premium which makes it uneconomical to locate the machine where traffic is not heavy.

The use of a motor-driven unit not only results in

the requirement for more floor space, but the larger cabinet required to house the motor and its operative connection to the dispenser, and the further cost of the motor itself and the connecting means, adds materially to the cost of the machine. As a result, such power-operated dispensing machines are not practical for use in many locations where an automatic dispensing machine might otherwise economically be employed.

It is an object of this invention to produce a low-cost vending machine of the type described which is of relatively small dimension but which operates automatically in response to the coin control for dispensing a single bottle or the like container during each cycle of operation, and which embodies means for causing the machine to operate through a single cycle in response to the insertion of the necessary amount of coin, and which prevents the machine from operating through more than one cycle for dispensing a single article in response to coin control.

More specifically, it is an object of this invention to produce a bottle-vending machine which operates without the use of an electrical motor for driving the dispensing mechanism through a cycle of operation; which makes use of minimum space for the dispensing mechanism and therefore has more space available for housing a greater number of articles in position to be dispensed during succeeding cycles of operation of the machine; which makes use of gravitational forces resulting from the weight of the bottles to be dispensed for operation of the dispensing mechanism; which embodies means for effecting the desired displacement of the bottles to be vended in a manner to prevent interference with uniform movement of the bottles through the machine to the dispensing unit; which makes use of the bottles in position to be dispensed for assisting in the operation of the vending mechanism through a cycle of operation, yet prevents contact between the bottles during relative movements to minimize chipping and flaking of the glass on the surfaces of the bottles in the machine, thereby to prevent deterioration of the containers, while at the same time minimizing the amount of dust and dirt particles released in the machine where they can interfere with the smooth and continuous operation thereof; which embodies means for insuring the operation of the machine through a cycle for dispensing an article in response to coin control; which limits the operation of the machine through but a single cycle in response to coin control; which provides for operation of the machine at relatively constant speeds independently of the number of bottles housed within the machine in position to be dispensed or independently of the weight of the bottles or other articles being dispensed; which embodies means for smoothly feeding the bottles into position to be dispensed, and which operates automatically to indicate the depletion of articles in the machine in position to be dispensed.

These and other objects and advantages of this invention will hereinafter appear, and for purposes of illustration, but not of limitation, an embodiment of the invention is shown in the accompanying drawing, in which—

Figure 1 is a schematic sectional elevational view of the interior of a vending machine embodying features of this invention;

Fig. 2 is a fragmentary elevational view of an exterior portion of the dispensing unit illustrating the arrangement of parts during a dispensing cycle;

Fig. 3 is a sectional view taken substantially along the line 3—3 of Fig. 2;

Fig. 4 is a fragmentary elevational view of an exterior portion of the dispensing machine illustrating the arrangement of parts for controlling the operation of the machine through a dispensing cycle;

Fig. 5 is a sectional view taken substantially along the line 5—5 of Fig. 4; and

Fig. 6 is a top plan view of the governor mechanism employed in combination with the dispensing means for equalizing the speed of operation of the machine through a dispensing cycle.

Referring now to Figs. 1—3 of the drawing, the numeral 10 represents a portion of the housing of a dispensing machine divided into an upper compartment 12 and a lower dispensing compartment 14 which is located immediately below the upper compartment and in communication therewith for receiving bottles 16 from the upper compartment for dispensing one at a time during each operation of the machine through a cycle.

The upper compartment 12, which is kept cold by suitable refrigeration means, is formed with a pair of side walls 18 and 20 and a wall 22 extending upwardly through the central portion of the compartment for dividing the compartment into adjacent housings 24 and 26. A plurality of shelf plates 28 extend outwardly at a downward incline of about 8 to 20 degrees from the central wall 22. The shelf plates 28 are spaced apart vertically by an amount slightly greater than the maximum dimension of the bottles 16 adapted to be dispensed from the machine. In the illustrated modification, the shelves 28 are dimensioned to have a length for supporting two bottles 16 in side-by-side relation on the surface thereof. However, the length of the shelves may be suitably dimensioned to support a greater number of bottles, such as four or more, and the number of shelves 28 may be built up, depending upon the head room available for the machine.

Each shelf 28 terminates short of the side walls 18 and 20 by an amount slightly greater than the maximum dimension of the bottles 16 to be dispensed so as to enable the bottles to pass downwardly through the passage 30 formed between the ends of the shelves 28 and the side walls 18 and 20. Each shelf 28 above the first is provided with a swinging door 32 which is hingedly mounted at its upper end to the outer end portion of the shelves 28 to depend into the space of the shelf beneath to block the opening in a manner to prevent bottles 16 from being displaced from the underlying shelf outwardly into the vertical passage 30, so long as a bottle 16 is located within the passage in position to block rocking movement of the door 32 to raised position. When the portion of the passage in the path of the door 32 is free of bottles, the gravitational force of the bottles 16 located on the respective shelves is sufficient to rock the door about its pivot to open position so as to enable the bottles on the shelf to roll outwardly over the shelf into the vertical passage 30 and onto the bottle which is uppermost in the passage when the door becomes clear. Thus each shelf is emptied in consecutive order, beginning with the top and ending with the bottom without any of the bottles in the underlying shelves being permitted to become displaced into the path of other bottles passing downwardly through the machine in response to delivery of a bottle from the machine during dispensing operations.

The principal concepts of this invention reside (1) in the means for dispensing such bottles from the machine without the use of a motor-operated means, thereby to conserve on the space required for location of the machine and the cost for manufacture of the machine, (2) in the means for controlling the operation of the dispensing unit to release the dispensing means for operation through a single cycle, but not more than one cycle, in response to the insertion of proper coins, (3) in the means to control the speed of operation of the dispensing means where operation at nearly uniform speed is achieved independently of the load of bottles in the machine and independently of the size, weight, or shape of the bottles being dispensed, and (4) in the means for controlling the movements of the bottles to the dispens-

ing means for preventing blocking and to make most efficient use of the weight of the bottles in the machine for effecting operation of the dispensing mechanism without excessive wear on the bottles or the machine parts. These and other advantages of the machine will hereinafter be described in greater detail.

In the practice of this invention, use is made of gravitational force for effecting operation of the dispensing mechanism. Such gravitational force is made available exclusively from the weight of the bottles being dispensed, and principally from the weight of the single bottle in position to be delivered by the machine. For this purpose, use is made of a pair of star wheels 40 and 42, each of which is fixed onto an elongate shaft 44 and 46 respectively extending crosswise of the dispensing housing for free rotational movement in suitable journals mounted in the end walls of the housing in alignment but offset inwardly from the respective vertical passages 30 down which the bottles pass through the upper compartment to the dispensing unit.

The star wheels which are journaled for rotational movement in spaced relation with the side walls of the housing are of substantially identical construction, and thus description will hereinafter be made with reference to the one located to the left in Fig. 1 of the drawing, it being understood that the other star wheel will be of substantially the same construction with the exception that the elements described will extend in the opposite direction to effect rotational movement in the counter-clockwise direction as distinguished from the rotational movement of the star wheel 40 in the clockwise direction, as will hereinafter be described. It will be understood that the dispenser may make use of a single wheel or a plurality of wheels for dispensing since operation is not dependent upon use of the walls of the cabinet or the like. The star wheel is formed with a plurality of equally spaced apart grooves equidistantly arranged in the periphery thereof and aligned axially when the wheel is formed of a plurality of axially spaced apart disc sections. The grooves, such as the four grooves 48 arranged 90° apart in the illustration, are formed preferably with their centers in radial alignment with the axis of the wheel but the wheel is set for rotation at the completion of a cycle of operation so that the uppermost groove in which the bottle is seated for dispensing is offset in the direction of turning movement so that the article seated in the groove will have its center of gravity offset in the clockwise direction or inwardly of the axis of the wheel, thereby to urge the wheel to rotate in the clockwise direction. Such rotational movement as results from the gravitational force of the article carried by the wheel will cause the wheel to carry the article from the position at which it is received across the housing and downwardly until the leading edge of the groove extends downwardly into substantial alignment with a downwardly inclined platform 50, whereby the bottle rolls in response to gravitational force out of the groove and onto the platform 50 and over the downwardly inclined platform onto an elongate slide plate 52. The plate is pivotally mounted at one end for rocking movement in the vertical direction between normal or raised position of adjustment for receiving the bottle delivered by the star wheel to lowered or delivery position in which the slide plate is inclined downwardly from its pivot at an angle to cause the bottle to slide over the surface of the plate to a delivery opening of the dispensing machine.

For this purpose, the plate is formed with two or more elongate ribs 54 extending upwardly substantially throughout its length to center the bottle. While various conventional means may be employed for pivotally mounting the plate for rocking movement between normal and delivery position, in the illustrated embodiment, use is made of a shaft 56 which is journaled in the laterally spaced side walls 58 and 60 which support the plat-

5

forms 50 and between which the slide plate 52 is located with flanges 62 extending downwardly integrally from the lateral edges of the plate. The flanges have aligned openings for receiving the horizontally disposed shaft 56 which pivotally mounts the plate in the machine. Resilient means, such as tension springs (not shown) are employed constantly to urge the slide plate to its raised position of adjustment for receiving the bottle, but with a force insufficient to prevent tilting of the plate upon location of an article to be dispensed upon the surface thereof.

In addition to the construction to rotate the wheel until upon completion of a cycle of operation to locate the article in the groove with its center of gravity preferably about  $\frac{1}{4}$  to  $\frac{1}{2}$  inch beyond the axis of the star wheel for employing gravitational force of the article in effecting rotational movement, the outwardly extending arms 64 of the star wheel, which define the grooves, are formed with an end wall 66 disposed at an incline along a line extending from the trailing edge of one groove to the leading edge of the next but in which the arm portion defining the trailing edge of the first extends outwardly for a slightly greater distance than the leading edge of the next to provide a cam surface against which the bottle 16<sup>a</sup> next to the one 16<sup>b</sup> in the groove rests for the purpose of making use of its weight as well as the weights of the bottles stacked thereon in the passage towards urging the star wheel to turn in the desired direction, as distinguished from the competition to turning movement which would otherwise exist if the operative engagement between the oncoming bottle and the star wheel were otherwise disposed.

In addition, the construction of the outwardly extending arm portions 64 of the star wheel causes the leading edge of the cam to project, as illustrated in Fig. 1, between the bottle seated within the uppermost grooves and the oncoming bottle at the base of the stack which bears upon the cam edge with the result that a slight spaced relation is maintained between the bottles to prevent interference between the bottles which might otherwise conflict with the free rotational movement of the star wheel and to minimize rubbing contact between the bottles during relative movement such as would cause wear of the bottles and marring of the surfaces thereof.

In effecting the described relationship for utilization of the weight of the bottles in the stack for aiding the dispensing operation by rotational movement of the star wheel, as distinguished from conflicting with the rotational movement thereof and for preventing interferences between the bottles due to contact while the bottle being dispensed is carried crosswise in the wheel, it is important properly to displace the bottles in the stack in the direction for delivery to the grooves of the star wheel during rotational movement.

For this purpose, the side walls of the cabinet or housing are provided with a deflector plate 68 having its lower end portion 69 extending inwardly from the side wall into the path of the bottles moving downwardly through the passage 30 to engage the lowermost bottle as it issues from the passage and to deflect the bottle inwardly a short distance into the dispensing housing toward the star wheel. Such deflector means are desirable in use of machines for dispensing bottles of predetermined size and shape but the importance thereof is increased when a standardized machine is employed for use with bottles of various shapes and sizes. Without the deflector plate, bottles of smaller dimension may become stacked in the passage in a staggered relation with the lowermost bottle offset in the direction towards the wall of the cabinet with the result that lateral displacement of the bottle for entrance into the grooves of the star wheel will be resisted and the machine will no longer be able to effect its dispensing operations without repair or adjustment.

Instead of making use of a separate deflector plate, the

6

corresponding side wall portion of the cabinet, in the area immediately above the star wheel, may be struck from the remainder and bent inwardly into the path of the bottles for effecting the desired displacement. It is preferred, however, to make use of a separate plate 68 having the inwardly turned portion hingedly mounted as at 68' to depend from a vertically disposed bracket 70 mounted in place by one or more hook portions 72 on the upper end which extend through suitable slots 74 in the side wall of the cabinet. When separable members of the type described are employed, the plates may be replaced, if desired, one with another for providing a greater or lesser offset portion in use with bottles of different dimension.

Immediately below the deflector plate and in advance of the star wheel, a shelf plate 76 is provided for support of the lowermost bottle in the stack until it is displaced by gravitational force into a receiving groove of the star wheel. The lower end portion of the deflector plate 68—69 rests on an intermediate portion of the top surface of the shelf for cooperation therewith in guiding the lowermost bottle into the oncoming groove of the star wheel during rotational movement thereof.

As illustrated in Fig. 2, the shelf plate 76 is pivotally mounted at its outer end upon a suitable pin 78 fixed to the side wall of the cabinet for enabling rocking movement of the shelf plate vertically about its axis between raised and depressed positions of adjustment. Means are provided, such as springs 79, constantly to urge the shelf plate toward raised position but with a force insufficient to overcome the load of a bottle supported by the shelf whereby the shelf is rocked downwardly by the weight of the bottle to its depressed position of adjustment, indicated by solid lines in Fig. 2. When no more bottles are available for dispensing from the shelf, the plate is automatically returned to raised position. Such condition indicating that the machine is empty is adapted to be signalled in response to the return of the shelf to its normally raised position.

For this purpose, the forward end portion of the shelf 76 is provided with a stud 80 which extends laterally through a curvilinear slot 82 in the adjacent end wall of the cabinet. The slot is formed with the pin 78 as its axis. Resiliently engaging the underside of the arm portion extending outwardly beyond the wall of the cabinet is one end of a lever arm 84 which is pivoted at its other end on a pin 86 extending outwardly from a bracket 88. The arm is urged with the shelf for rocking movement about its pivot in a direction to displace the shelf upwardly to its normal position of adjustment with a force insufficient to overcome the gravitational load of a bottle resting upon the shelf. Responsive to return of the shelf to raised position, the lever arm makes electrical contact which illuminates a bulb or other signalling means for indicating that the shelf is empty. When the shelf 76 is deflected, the lever arm 84 is returned by the switch pin which is spring urged to normal position.

When in tilted position, the shelf plate 76 functions in combination with the deflector plate 68 resting thereon and the vertically disposed end wall 90<sup>a</sup> defining the lower end portion of the passage 30 to displace the lowermost bottle in the stack in the direction toward the star wheel and to avoid the possibility of other bottles in the stack from being displaced inwardly beyond the bottle on the shelf, otherwise the bottle would have a tendency to slide off center away from the wheel where it could be locked by the weight of the other bottles against the wall of the cabinet to prevent displacement into the star wheel during subsequent cycles of operation. The tilted shelf plate 76 is inclined with a bottle on the surface thereof in a direction toward the star wheel at an angle to effect the desired displacement of the lowermost bottle in the stack and at a level for alignment of the shelf with a position parallel with the star wheel and offset upwardly a short distance from the axis thereof. When

in this position, the tilted shelf locates the lowermost bottle in position to engage the cam edge with a force vector extending above the axis of the wheel thereby to make use of the load of the bottles to effect turning movement of the star wheel until the latter is positively stopped by the hereinafter described control means.

The star wheel may be composed of a solid cylindrical member having the grooves cut into the surfaces thereof, but it is preferred to make use of a star wheel that is formed of a plurality of axially spaced apart disc members so as to accommodate bottles of different dimensions and shape and to provide open spaces in between into which the portions of the shelf 76 may extend properly to feed the bottles into the receiving grooves of the wheel during rotational movement.

Release of the star wheel for rotational movement through a cycle of operation is effected through a latch mechanism which is operated by a solenoid 90 in response to the insertion of proper coins for purchase of an article to be vended. The latch mechanism which embodies important features of this invention employs means that insure movement of the star wheel through a cycle of operation in response to operation of the solenoid and other means which prevent rotational movement of the wheel through additional cycles without subsequent insertion of the proper coins even though the solenoid may remain in its operated position due to the coin or solenoid becoming stuck.

As illustrated in Figs. 4 and 5 of the drawings, the solenoid 90 is fixed to a panel 92 on the front wall of the machine. A shaft 92<sup>a</sup>, fixed to the core of the solenoid, is attached, as by means of the pin 94, to a bracket 96 fixed to the upper end of an actuator plate 98. The actuator plate, which is in the form of an elongate strip of metal or other rigid material, has a pair of vertically spaced elongate slots 100 and 102 in the central portion thereof through which studs 104 and 106 fixed to the panel 92 extend for guiding the actuator plate in vertical shifting movement in response to operation of the solenoid 90.

A sector 108, pivoted at one end on a pin 110, fixed to an intermediate portion of the actuator plate 98, is formed with an abutment 112, such as a ledge which extends outwardly from an intermediate portion of the inner edge of the sector and it is further formed with a finger 114 which extends upwardly from the outer end of the sector in position to be engaged by a stop pin 116 extending outwardly from the actuator plate to prevent further rocking movement of the sector in a clockwise direction responsive to actuation by the leaf spring 118.

An operating lever 120 pivoted intermediate its ends on a pin 122 fixed to the panel 92 has a stud 124 which, in the normal position of adjustment, lies in the path of the abutment 112 whereby the operating lever 120 is rotated about its pivot in the clockwise direction responsive to upward displacement of the actuator plate 98 by the solenoid 90.

A latching plate 126 independently mounted on the panel 92, for sliding movement vertically between guide members 128 between normal or latching position of adjustment and depressed or unlatching position, is formed with a stud 130 extending outwardly from an upper end portion thereof into the path of the inner free end portion of the operating lever 120. The latching plate 126 is thus displaced by the sliding lever from latching to unlatching position responsive to rocking movement of the operating lever about its pivot upon operation of the solenoid. The latching plate is constantly urged toward latching position as by means of a coil spring 132 having one end portion anchored onto an ear 134 struck from the panel while the other end portion is anchored on a pin 136 fixed to a lower end portion of the latching plate 126.

A pawl 138 is adapted to lie in the path to engage the projections 140 extending outwardly from a control plate 142 which is fixed onto the end of the shaft 44 for rota-

tional movement of the control plate with the star wheel. The extensions 140 corresponding in number with the grooves in the star wheel and in corresponding spaced relation are formed with flat front walls 144 for positive engagement by the pawl when the wheel is rotated to bring the uppermost groove in the wheel to the desired offset position whereby the center of gravity of the article seated therein is about  $\frac{1}{4}$  to  $\frac{1}{2}$  inch beyond the axis of the wheel to cause rotational movement of the wheel by gravitational force when the pawl is retracted from the path of the extension.

In order to make certain that the star wheel rotates through a cycle before return of the pawl to position to block the extensions upon displacement of the latching plate to unlatching position and back, means are provided to cause displacement of the pawl 138 upon shifting movement of the latching plate from latching to unlatching position thereby to free the control plate for rotational movement through a cycle. For this purpose, the pawl 138 is provided as an independent member pivoted intermediate its ends on a pin 146 fixed to a central portion of the latching plate. The pawl is constantly urged to rock a short distance in the clockwise direction by means of a tension spring 148 anchored at one end on a pin 150 rigid with the actuator plate while the forward end portion of the spring is hooked about an arm 152 extending downwardly from the pawl. Thus, as the actuator plate is displaced from latching to unlatching position to retract the pawl from the path of the control plate, the spring 148 becomes effective to rock the pawl forwardly about its pivot beyond the front wall 144 of the extension so that immediate return of the actuator plate to latching position will find the pawl displaced forwardly beyond the wall 144 thereby to permit the wheel to turn. As the next extension approaches its position at the end of the cycle, it engages the pawl lying in the path thereof with sufficient force to rock the pawl rearwardly about its pivot in opposition to the spring 148 until engaged by the stud 130 for stopping the pawl in normal position to prevent further rotational movement of the wheel.

As previously pointed out, one of the major difficulties in reliance upon gravitational force for operation of a dispensing machine of the type described is the effect which variation in load may have upon the speed of operation of the dispensing means. When, for example, only one or two bottles remain in the machine in position to be dispensed, the resultant load on the star wheel is such that rotational movement is relatively slow. On the other hand, when the passage 30 is substantially completely filled with containers and when the containers are of substantial weight, the load operating to effect rotational movement of the wheel will be relatively great with the result that the wheel will tend to be rotated at relatively high speed and thereby introduce dangers with respect to damage to the machine and articles to be dispensed therefrom.

Various means have been investigated to make the speed of operation substantially independent of load. It has been found that an effective speed control for use with a mechanism of the type described can be achieved by the use of a governor in the form of a flat plate 154 having a pair of extensions 156 and 158 in the form of butterfly members which are adapted to spread to increase resistance to turning movement in proportion to the speed of rotation of the governor which is directly connected through a series of gears for rotational movement at high speed with the star wheel.

More specifically, the governor means comprises a driving gear 160 fixed for rotational movement with the shaft 44 and having its teeth 162 in meshing engagement with the gear teeth 164 on a gear wheel 166 which is mounted for free rotational movement on shaft 168<sup>a</sup>. The driven gear 166 drives a smaller gear 168 mounted for free rotational movement on pin 170 and rotational movement

of the latter gear is imparted to a gear 172 on which the butterfly plates are mounted by means of an interconnecting gear 174.

The governor constitutes a flat plate 154 having its flat faces extending parallel with the axis of the gear 172. Extension or wing plates 156 and 158 of similar width are pivotally mounted on the ends of plate 154 for rocking movement between normal position in which the wing plates extend perpendicularly from the plate in the direction of rotational movement to an extended position in which the wing plates are aligned radially with the main plate 154 to increase the effective length thereof. The wing plates are each urged towards their normal position by means of coil springs 176 and 178 which are anchored at one end on an ear struck inwardly from the end portion of the wing plates and hooked at their other end upon brackets 180 fixed to the main plate and offset from the center thereof in the direction towards the extensions.

During rotational movement, the centrifugal forces coupled with the wheel reactions on the extensions during rotational movement cause the extensions to rock outwardly about their pivots by an amount corresponding to the speed of rotational movement of the main plate thereby to increase the resistance towards turning movement in response to the increase in the rate thereof. The speed of rotation tends to be proportional to the load driving the star wheel but variation in load is offset in part by the fact that the extensions of the wings from normal toward aligned position tend to increase in a manner to resist more rapid turning movement. The greater the effective length of the governor plate, the greater is the resistance to rotational movement with the result that one force tends to compensate for the other to the end that the speed of the rotation of the star wheel tends to remain relatively uniform independently of the effective load.

#### Operation of machine

At the start, the elements are in the position shown by the solid lines in each of the figures with the shelf 76 tilted to its operated position by the bottles 16 supported thereon in the stack and the star wheel 40 is blocked against rotational movement by the pawl 138 with the bottle 16<sup>b</sup> to be dispensed from the uppermost groove having its center of gravity offset preferably about  $\frac{3}{8}$  to  $\frac{1}{2}$  inch from the axis of the wheel.

When coins are inserted in the machine to effect a purchase, the solenoid 90 is energized to retract the arm 92 whereby the actuator plate is shifted upwardly from its normal to operated position.

Responsive to upward movement of the actuator plate, the abutment 112 engages the stud 124 on the operating lever 120 to rotate the operating lever in the clockwise direction about its pivot 122. If the operating lever is rocked about its pivot, the stud 124 shifts laterally out of the path of the abutment 112 with the result that the operating lever becomes free for immediate return to its normal position independently of the movements of the actuator plate. By this escapement reaction, it is possible to make the operating lever independent of the solenoid and actuator plate to prevent operation of the machine through more than one cycle even though the solenoid or actuator plate might be held in operated position. Upon return movement of the actuator plate to starting position, the stud 124 on the operating lever, which lies in the path of the sector, engages the side wall to cam the sector for rocking movement about its pivot in the direction opposed by the spring 118. As the stud 124 clears the abutment 112, the sector is returned by the spring 118 to normal position in which it is stopped by engagement between the stud 116 and the finger 114 on the sector to again position the stud 124 in the path of the abutment 112 for actuation of the operating lever upon subsequent actuation of the solenoid.

When the operating lever 120 is rocked to operated position, the outer free end of the lever engages the stud

130 on the latching plate 126 to cause displacement of the latching plate from latching to unlatching position whereby the pawl 138 is retracted from the path of the arm 140 of the control member. Upon clearance, the spring 148 rocks the pawl forwardly about its pivot so that the pawl is incapable of return into the path of the released arm of the control plate when the latching member is returned by the spring member 132 to its original position of adjustment.

When the pawl 138 is retracted from the path of the arm 140 of the control plate, the star wheel is free to turn about its axis. The load of the bottle in an offset position in the wheel coupled with the force vector transmitted from the bottle on the shelf in contact with the wheel operate to cause the star wheel to rotate about its axis. As the wheel rotates through an angle of about 90° to displace the upper groove in which the bottle is seated to a laterally extending position, gravitational forces become effective to cause the bottle to roll out of the star wheel onto the platform and onto the horizontally disposed slide shelf 52. The weight of the bottle delivered from the wheel causes the shelf to tilt downwardly about its pivot 56 so that the bottle slides endwise from the dispenser compartment to the delivery opening of the cabinet from which it may be removed.

Rotational movement of the star wheel is transmitted through the gear train to effect rotational movement at considerably higher speed of the flywheel to the extent that the flaps become extended in proportion to the speed of rotation whereby the rotational movement of the flywheel is governed to compensate for differences in loads operating thereon.

As the top groove in the star wheel is displaced for delivery of the bottle onto the platform, the following groove rises into position for receiving the bottle which is supported on the tilted shelf. By the time that the first bottle is released, the next bottle on the shelf is seated within the groove and the inertia of the wheel coupled with the load available from the stack of bottles, as previously described, is sufficient to cause the star wheel to continue in its rotational movement until the groove carrying the bottle is in the position of the previous groove with the center of gravity of the bottle offset from the axis of the wheel to provide force vectors which enable the use of gravity for operation.

The wheel is stopped at the described position by the pawl 138 which, though rocked forwardly about its pivot by the spring members 148, upon movement of the latching plate to unlatching position, still lies in the path of the next arm of the control wheel when the plate returns to latching position so that the pawl is engaged by the arm and returned to its normal position for conditioning the machine for its next cycle of operation.

By reason of the fact that the star wheel operates to carry the bottle over from the shelf to the delivery slide without the reliance for cooperation with the side walls or any other parts of the cabinet, a dispensing mechanism of the type described can be employed singly or in pairs, as illustrated in the drawings, or a plurality of such dispensing units may be provided in a single cabinet in proper alignment with the passages for receiving different bottles of beverages from the storage cabinet for dispensing. By the same token, because the star wheel operates independently of any fixed spaced relation with the walls of the cabinet to carry the bottles crosswise of the shelf at one side to the delivery chute at the other, the unit can be employed for use with bottles of different sizes and shapes capable of being received within the grooves of the star wheel with the limitation that the location of the shelf beneath the downward passage for the bottles from the storage compartments should support the lowermost bottle in the stack in position to block the exit opening of the passage. This condition is required to prevent the bottles from cascading uncontrolled from the passage into the dispenser cabinet. In addition, the star wheel

should be in a position to block the end of the shelf sufficiently to prevent the bottle on the shelf from rolling over the wheel rather than bearing against the wheel in a manner to slide into the groove whereby the bottle is carried from the shelf to its position of rest in the groove prior to operation for dispensing the bottle from the cabinet. It is preferred to have the shelf terminate closer to the axis than the upper edge of the wheel and it is preferred also to make use of curvilinear grooves having a depth which is greater than one-half the cross section of the bottles to be dispensed therein.

By way of modification, a dispensing mechanism of the type described may be located centrally of the cabinet offset a short distance from a central passage with a deflector plate fixed in the cabinet in the path of the bottles for displacing the lowermost bottle in the stack onto the shelf in the direction of the wheel and with the shelf spaced below the opposite edge of the exit opening from the passage by an amount greater than the maximum cross-sectional dimension of the bottles to be dispensed but less than twice the width of the maximum dimension of any of the bottles to be dispensed whereby the bottle supported on the shelf blocks the exit opening to prevent passage of other bottles therethrough.

It will be understood that the shelf may be rigidly mounted in the housing in the desired inclined position, especially when other means are employed for indicating when the machine is empty. It will be further understood that the shelf may constitute a single plate which is slotted to permit the arms of the star wheel to pass therethrough during rotational movement or that the shelf may be formed of one or more short interconnected lengths of rigid material dimensioned to fit between the axially spaced disc members forming the star wheel for supporting the lowermost bottle in position to aid rotational movement of the wheel and to be received in the rising groove of the wheel during rotational movement.

Instead of a solenoid for use in operating the actuator plate, other means may be employed such as a manual handle or crank for shifting the actuator plate from normal to operated position. It is desirable, however, to make use of an escapement for releasing the operating lever whereby the operating lever can return for enabling return of the latching plate to latching position even though the actuator plate may be held in its operated position.

It will be apparent from the foregoing that we have provided a simple and inexpensive machine capable of being constructed to occupy minimum space, yet provide high storage capacity for containers to dispense such containers singly from the machine in response to coin control. It will be apparent further that the dispensing mechanism of the type described operates efficiently without the use of any power operated means and in a manner which controls the rate of movement of the bottles through the machine for dispensing independently of their size, weight or shape, and that means are provided for preventing congestion within the machine which would block the movement of bottles in a manner that would interfere with the desired dispensing operations.

In accordance with the practice of this invention, the control mechanism employed for regulating the dispensing operations operates positively to enable the machine to operate through a cycle without enabling the machine to be operated continuously without the necessary insertion of coins to effect each purchase.

It will be understood that changes may be made in the details of construction, arrangement and operation without departing from the spirit of the invention, especially as defined in the following claims.

What is claimed is:

1. In a machine for dispensing bottles or similar articles, the combination comprising star wheel means rotatable about a horizontal axis and having a plurality of equally spaced generally radial arms with curvilinear

grooves therebetween for receiving the successive articles to be dispensed, a magazine for holding a supply of the articles, a ramp for receiving the articles from the magazine and delivering the articles successively to said star wheel means, said ramp being inclined downwardly toward said star wheel means and having a lower end disposed substantially above the highest level reached by the lower extremities of said grooves during the rotation of said star wheel means, said lower end of said ramp being disposed substantially below the highest level reached by said arms during rotation of said star wheel means, said lower end of said ramp projecting substantially within the circular locus described by said arms of said star wheel means, latching means for stopping said star wheel means with each of said grooves successively uppermost, but displaced laterally from the axis of said star wheel means and away from said ramp and with each of said arms of said star wheel means projecting upwardly above and along said ramp, the next article to be dispensed being receivable in the uppermost groove; means for releasing said latching means to initiate rotation of said star wheel means under the weight of the article received in the uppermost groove to discharge the article by gravity from said star wheel means, said star wheel means being rotatable to move the next groove in said star wheel means across the lower end of said ramp and into said uppermost position for receiving the next article from said ramp by gravity, the arm on said star wheel means in trailing relation to said next groove thereby being movable across said lower end of said ramp and between the article received in said uppermost groove and the following article on said ramp, each of said arms having an outer portion with a leading edge portion extending outwardly beyond the trailing edge portion thereof with a generally diagonal surface extending between said edge portions for engagement by the following article so that the weight of the following article will tend to rotate said star wheel means away from said ramp, said leading edge portion of each arm being movable between the article received in the uppermost groove and the following article on said ramp so that the article in the uppermost groove will be supported on said star wheel means entirely out of engagement with the following article.

2. In a machine for dispensing bottles or similar articles, the combination comprising star wheel means rotatable in a predetermined direction about a horizontal axis and having a plurality of equally spaced generally radial arms with curvilinear grooves therebetween for receiving the successive articles to be dispensed, a magazine for holding a supply of the articles, an inclined ramp for receiving the articles in a horizontal position from the magazine for rolling movement in single file down the ramp and for successive delivery from the ramp to said star wheel means, said ramp being inclined downwardly from said magazine toward said star wheel means and having a lower end disposed substantially above the highest level reached by the inner extremities of said grooves during the rotation of said star wheel means, said lower end of said ramp being disposed substantially below the highest level reached by said arms during rotation of said star wheel means, said lower end of said ramp projecting substantially within the circular locus described by said arms of said star wheel means but being outside the circular locus described by the inner extremities of said grooves, said ramp extending downwardly toward the upper portion of said star wheel means in the direction of movement of said upper portion corresponding to rotation of said star wheel means in said predetermined direction, means spaced above said ramp for preventing the passage of more than one article down said ramp, each of the articles being movable in turn by gravity from said ramp into the uppermost groove on said star wheel means in response to rotation thereof, the arm in trailing relation



to the uppermost groove thereupon being movable between the article therein and the following article on said ramp so that the article in the uppermost groove will be supported on said star wheel means entirely out of engagement with the following article, latching means for stopping said star wheel means with each of said grooves successively uppermost but displaced laterally from the vertical plane of the axis of said star wheel means in said direction of rotation and away from said ramp and with the arm in trailing relation to the uppermost groove projecting upwardly above and along said ramp, means for releasing said latching means to initiate rotation of said star wheel means under the weight of the article received in the uppermost groove to discharge the article by gravity from said star wheel means, each of said arms having an outer portion with a leading edge portion extending outwardly beyond the trailing edge portion thereof for movement between the foremost and the following articles and with a generally diagonal surface extending between said edge portions for engagement by the following article so that the weight of the following article will tend to rotate said star wheel means in said predetermined direction.

3. In a machine for dispensing bottles or similar articles, the combination comprising star wheel means rotatable in a predetermined direction about a horizontal axis and having a plurality of equally spaced generally radial arms with curvilinear grooves therebetween for receiving the successive articles to be dispensed, a magazine for holding a supply of the articles, said magazine having a vertical exit passage for discharging the articles in a horizontal position and in single file, an inclined ramp extending downwardly and laterally from the lower end of said vertical exit passage for receiving the articles therefrom for rolling movement down the ramp in single file and for successive delivery from said ramp to said star wheel means, said ramp being inclined downwardly from said magazine toward said star wheel means and having a lower end disposed substantially above the highest level reached by the inner extremities of said grooves during the rotation of said star wheel means, said lower end of said ramp being disposed substantially below the highest level reached by said arms during rotation of said star wheel means, said lower end of said ramp projecting substantially within the circular locus described by said arms of said star wheel means but being outside the circular locus described by the inner extremities of said grooves, said ramp extending downwardly toward the upper portion of said star wheel means in the direction of movement of said upper portion corresponding to rotation of said star wheel means in said predetermined direction, means spaced above said ramp for preventing the passage of more than one article down said ramp, each of the articles being movable in turn by gravity from said ramp into the uppermost groove on said star wheel means in response to rotation thereof, the arm in trailing relation to the uppermost groove thereupon being movable between the article therein and the following article on said ramp so that the article in the uppermost groove will be supported on said star wheel means entirely out of engagement with the following article, latching means for stopping said star wheel means with each of said grooves successively uppermost but displaced laterally from the vertical plane of the axis of said star wheel means in said direction of rotation and away from said ramp and with the arm in trailing relation to the uppermost groove projecting upwardly above and along said ramp, means for releasing said latching means to initiate rotation of said star wheel means under the weight of the article received in the uppermost groove to discharge the article by gravity from said star wheel means, each of said arms having an outer portion with a leading edge portion extending outwardly beyond the trailing edge portion thereof for movement between the foremost and the following articles and with a generally diagonal

surface extending between said edge portions for engagement by the following article so that the weight of the following article will tend to rotate said star wheel means in said predetermined direction.

4. In a machine for dispensing bottles or similar articles, the combination comprising star wheel means rotatable in a predetermined direction about a horizontal axis and having a plurality of equally spaced generally radial arms with curvilinear grooves therebetween for receiving the successive articles to be dispensed, a magazine for holding a supply of the articles, an inclined ramp for receiving the articles in a horizontal position from the magazine for rolling movement in single file down the ramp and for successive delivery from the ramp to said star wheel means, said ramp being inclined downwardly from said magazine toward said star wheel means and having a lower end disposed substantially above the highest level reached by the inner extremities of said grooves during the rotation of said star wheel means, said lower end of said ramp being disposed substantially below the highest level reached by said arms during rotation of said star wheel means, said lower end of said ramp projecting substantially within the circular locus described by said arms of said star wheel means, said ramp extending downwardly toward the upper portion of said star wheel means in the direction of movement of said upper portion corresponding to rotation of said star wheel means in said predetermined direction, each of the articles being movable in turn by gravity from said ramp into the uppermost groove on said star wheel means in response to rotation thereof, the arm in trailing relation to the uppermost groove thereupon being movable between the article therein and the following article on said ramp so that the article in the uppermost groove will be supported on said star wheel means entirely out of engagement with the following article, arresting means for stopping said star wheel means with each of said grooves successively uppermost but displaced laterally from the vertical plane of the axis of said star wheel means in said direction of rotation and away from said ramp and with the arm in trailing relation to the uppermost groove projecting upwardly above and along said ramp, means for releasing said arresting means to initiate rotation of said star wheel means under the weight of the article received in the uppermost groove to discharge the article by gravity from said star wheel means.

5. In a machine for dispensing bottles or similar articles, the combination comprising star wheel means having a plurality of equally spaced generally radial arms with grooves therebetween for receiving the successive articles to be dispensed, a magazine for holding a supply of the articles and having means for delivering the successive articles to said star wheel means by gravity in offset relation to the axis of said star wheel means whereby the weight of the articles tends to rotate said star wheel means in a predetermined direction, control means for cyclically releasing and stopping said star wheel means for discharging the successive articles from said star wheel means by gravity and for moving each groove in turn into position for receiving an article from said magazine, said control means comprising a control member secured to said star wheel means for rotation therewith, said control member having a plurality of generally radial abutments equally spaced therearound and corresponding in number and spacing to said grooves, a latching member mounted for movement toward and away from said control member between latching and unlatching positions, a pawl movably mounted on said latching member for movement between first and second positions, said pawl being movable between said first and second positions in a direction opposite to the direction of movement of said control member past said latching member, first means yieldably biasing said pawl toward said second position, means yieldably biasing said latching member toward said latching position, each of said abutments on said control mem-

ber being movable in turn against said pawl with said latching member in said latching position and being effective to displace said pawl between said second and first positions, stop means on said pawl and said latching member preventing movement of said pawl beyond said first position, said pawl thereby being effective to arrest rotation of said control member and said star wheel means, operating means for moving said latching member away from said control member to said unlatching position for releasing said control member and star wheel means for rotation, said first biasing means thereupon being effective to move said pawl to said second position, said operating means being operative to release said latching member for return movement to said latching position with said pawl in said second position, said pawl thereby being engageable with said control member at a point in trailing relation to the abutment from which said pawl was just disengaged so as to be positively displaced out of the path of said abutment but in the path of the next following abutment.

6. In a machine for dispensing bottles or similar articles, the combination comprising star wheel means having a plurality of equally spaced generally radial arms with grooves therebetween for receiving the successive articles to be dispensed, a magazine for holding a supply of the articles and having means for delivering the successive articles to said star wheel means by gravity in offset relation to the axis of said star wheel means whereby the weight of the articles tends to rotate said star wheel means in a predetermined direction, control means for cyclically releasing and stopping said star wheel means for discharging the successive articles from said star wheel means by gravity and for moving each groove in turn into position for receiving an article from said magazine, said control means comprising a control member secured to said star wheel means for rotation therewith, said control member having a plurality of generally radial abutments equally spaced therearound and corresponding in number and spacing to said grooves, a latching member mounted for movement toward and away from said control member between latching and unlatching positions, a pawl movably mounted on said latching member for movement between first and second positions, said pawl being movable between said first and second positions in a direction opposite to the direction of movement of said control member past said latching member, first means yieldably biasing said pawl toward said second position, means yieldably biasing said latching member toward said latching position, each of said abutments on said control member being movable in turn against said pawl with said latching member in said latching position and being effective to displace said pawl between said second and first positions, stop means on said pawl and said latching member preventing movement of said pawl beyond said first position, said pawl thereby being effective to arrest rotation of said control member and said star wheel means, operating means for

moving said latching member away from said control member to said unlatching position for releasing said control member and star wheel means for rotation, said first biasing means thereupon being effective to move said pawl to said second position, said operating means being operative to release said latching member for return movement to said latching position with said pawl in said second position, said pawl thereby being engageable with said control member at a point in trailing relation to the abutment from which said pawl was just disengaged so as to be positively displaced out of the path of said abutment but in the path of the next following abutment, said operating means comprising a lever swingable between first and second positions for engaging and moving said latching member between latching and unlatching positions, said lever having a trip element thereon, an actuating member movable between first and second positions and having a second pawl thereon movable therewith along a path intersecting with and then departing from the path of said trip element, movement of said actuating member between said first and second positions thereby being effective to engage said second pawl with said trip element so as to shift said lever to said second position and then being effective to disengage said pawl from said trip element to release said lever for return movement to said first position, said second pawl being yieldably mounted on said actuating member to provide for free passage of said second pawl around said trip element during return movement of said actuating member between said second and first positions thereof.

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