June 29, 1954 K. H. ROGERS 2,682,440

VENDING MACHINE

Filed May 7, 1951 3 Sheets-Sheet 1

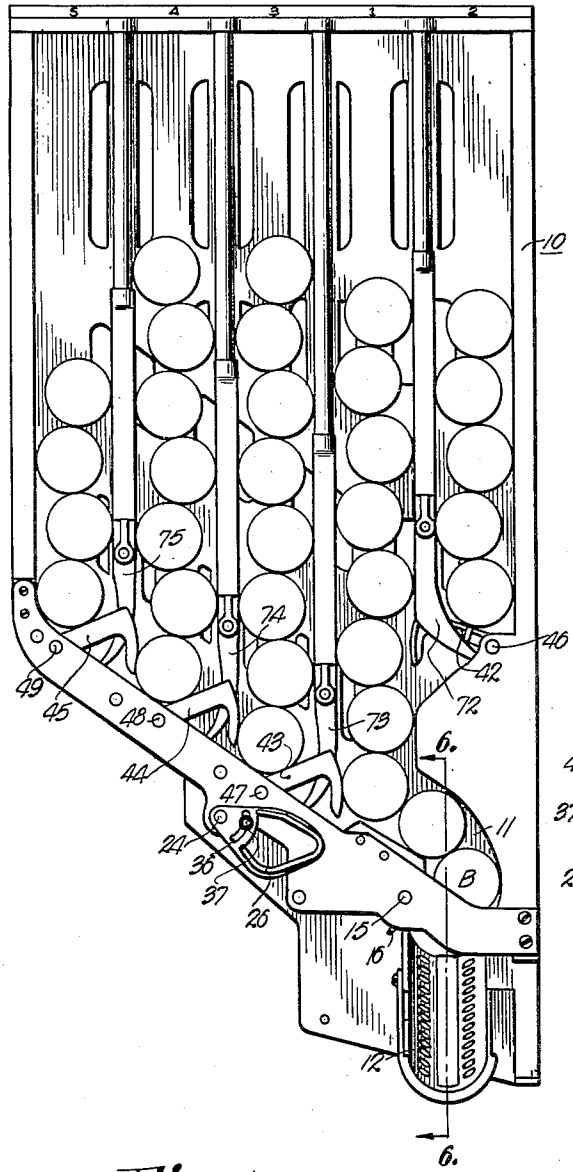


Fig. 1.

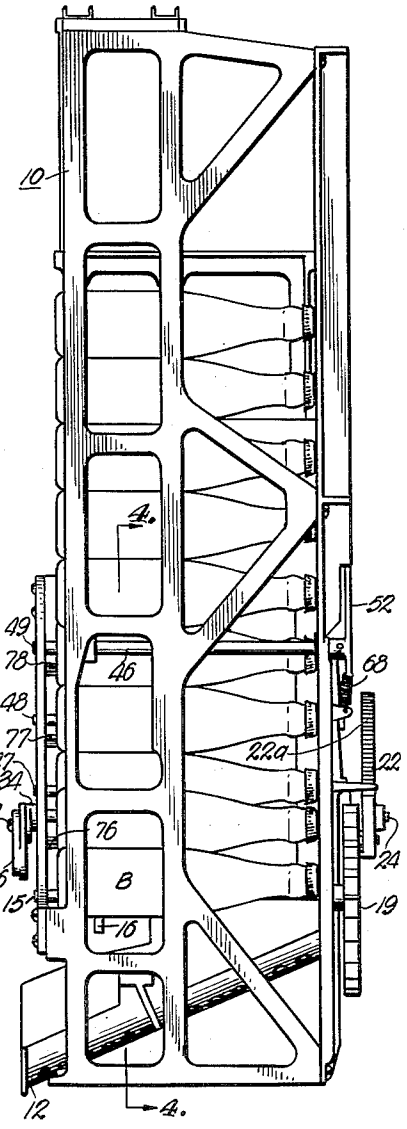


Fig. 2.

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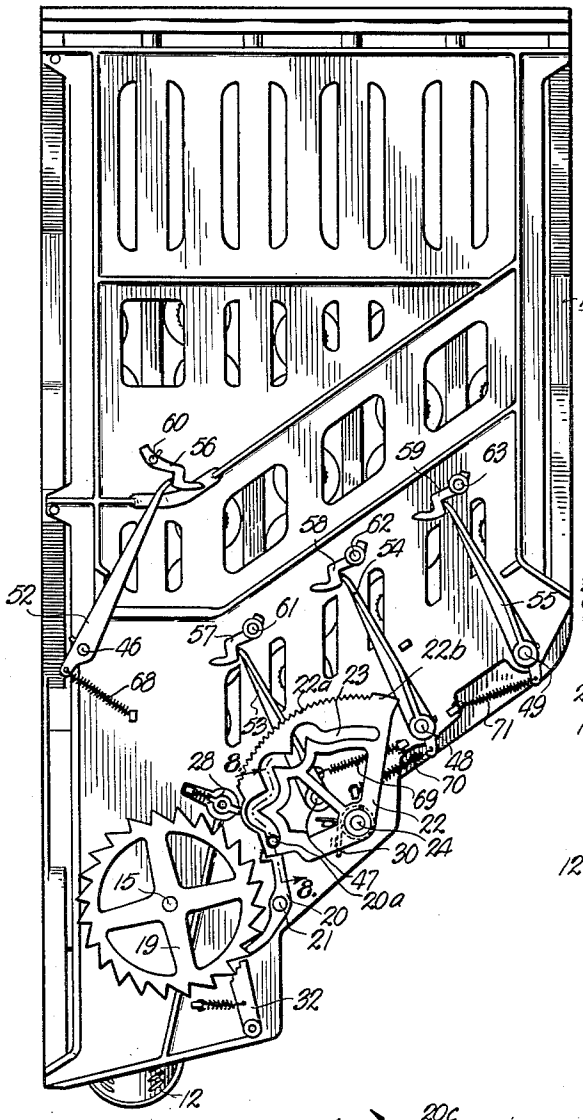


Fig. 3.

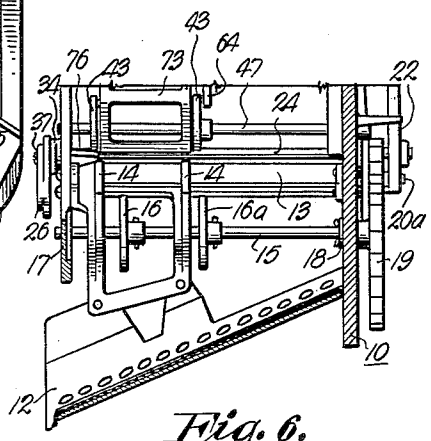


Fig. 6.

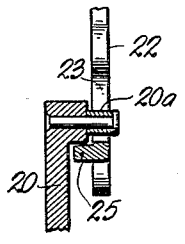


Fig. 8.

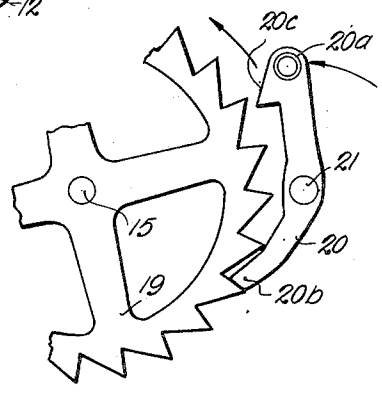


Fig. 7.

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VENDING MACHINE

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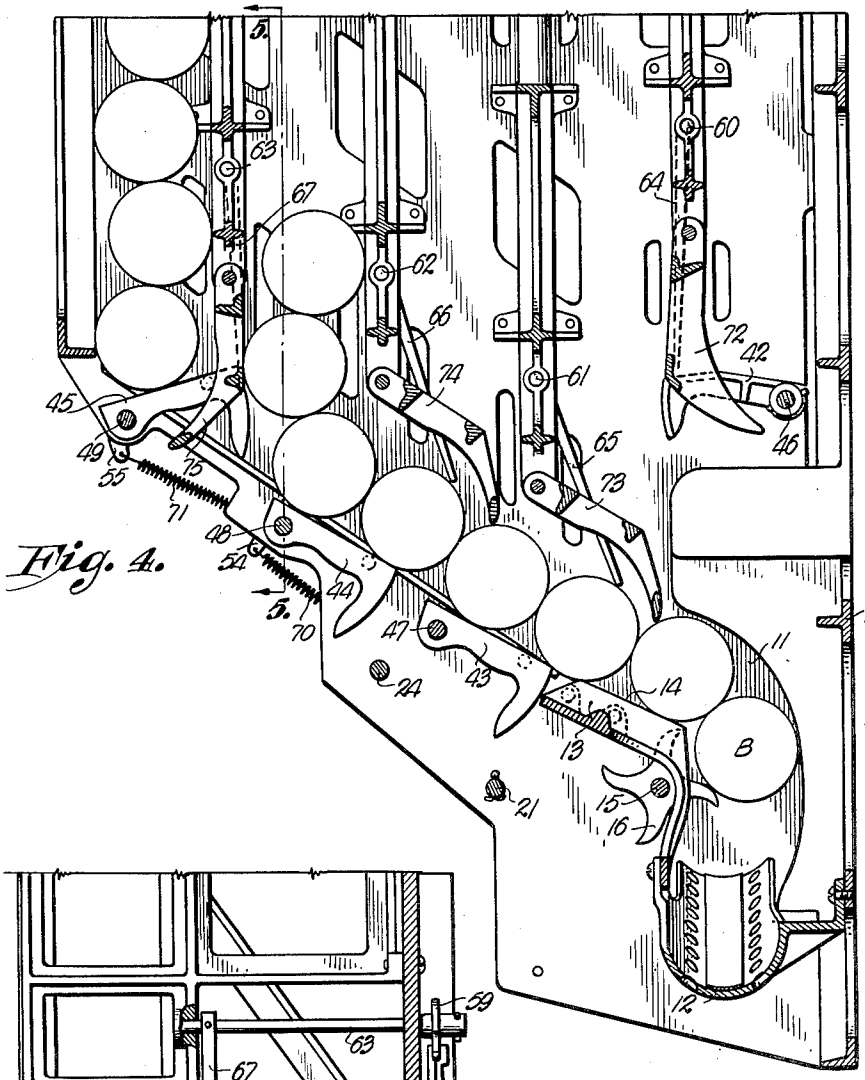


Fig. 4.

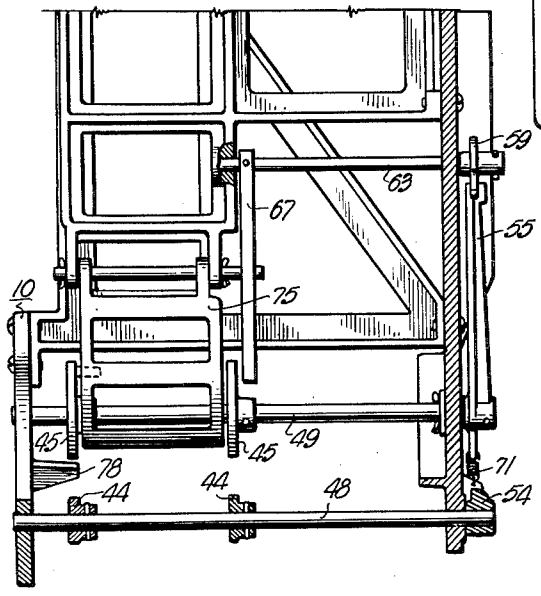


Fig. 5.

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Patented June 29, 1954

2,682,440

UNITED STATES PATENT OFFICE

2,682,440

VENDING MACHINE

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Application May 7, 1951, Serial No. 224,921

9 Claims. (Cl. 312—48)

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The present invention relates to vending machinery and more particularly to improvements in vending apparatus of the type designed to dispense bottled beverages in successive bottle units in response to the successive operation of coin controlled delivery mechanism.

Bottle vending machines are generally well known and usually comprise a refrigerated storage compartment together with some form of coin controlled delivery mechanism. The patent to J. R. Donaldson, No. 2,399,105, issued April 23, 1946, discloses one form of bottle vending machine in which the bottles are stored in generally vertical racks and are delivered by the force of gravity under the selective control of a star-wheel gate operated by the coin controlled mechanism.

A principal object of the present invention is to provide a bottle vending machine having an improved form of rotary dispensing gate and associated ratchet escapement mechanism to permit a controlled stepwise gravity feed of bottles to the discharge chute.

Another object of the present invention is to provide an improved form of bottle vending machine in which the bottles are stored in a plurality of vertical racks connecting with a single discharge chute and having improved selector gates and trip mechanism for feeding bottles under the influence of gravity from successive vertical racks as each rack is exhausted of its supply of bottles.

Yet another object of the present invention is to provide an improved star-wheel delivery gate and associated escapement mechanism for gently feeding a selected bottle under the influence of gravity in a continuously controlled manner to the delivery chute.

Another important object of the present invention in relation to the general type of bottle vending machine such as shown in the Donaldson patent referred to above is to provide for a positive interaction between the star-wheel gate and its associated ratchet control mechanism such that the ratchet mechanism is inoperable when the star-wheel is immovable and vice versa.

Still another object of the present invention is to provide an improved ratchet escapement mechanism for positively controlling the movement of a star-wheel bottle delivery gate element and having means to positively prevent the improper actuation of the ratchet mechanism in such manner as would jam the machinery or deliver more than a single bottle for a single actuation of the coin controlled mechanism.

In a preferred embodiment of the invention,

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the ratchet escapement controlled star-wheel rotary gate is provided with four bottle separating blades positioned equi-angularly at 90° intervals so that a 90° angular rotation of the star-wheel is effective to deliver one bottle to the discharge chute. Connected to rotate with the star-wheel is a ratchet wheel having a determined number of ratchet teeth within each arcuate 90° segment. An associated escapement pawl is connected to be actuated or rocked a number of times for each actuation of the coin controlled mechanism such that the determined number of teeth are disengaged successively for a stepwise controlled movement of the star-wheel through 90° of angular rotation. The design of the escapement pawl and ratchet gear teeth is such that the pawl is prevented from rocking or moving when the star-wheel and ratchet gear are immovable, i. e. under jamming conditions, and similarly the star-wheel is prevented from moving when the escapement pawl is locked against rocking movement.

Further objects and advantages of the present invention will be apparent with reference to the following specification and drawings in which,

Fig. 1 is a front elevational view of the bottle vending machinery removed from its refrigerated enclosure;

Fig. 2 is a side elevation of the machinery shown in Fig. 1 as seen from the delivery chute side;

Fig. 3 is a rear elevation similar to Fig. 1;

Fig. 4 is a section on the line 4—4 of Fig. 2 to show detail of the star-wheel delivery gate element, the vertical bottle racks, and their associated gate and trip mechanisms;

Fig. 5 is a detail section on the line 5—5 of Fig. 4;

Fig. 6 is a detail section on the line 6—6 of Fig. 1;

Fig. 7 is an enlarged fragmentary detail view of the ratchet wheel and escapement pawl; and

Fig. 8 is a fragmentary enlarged detail of the escapement pawl and associated pawl operating cam.

Referring to the drawings, as shown in Figs. 1 and 2, the bottle vending machinery is removed from its refrigerated housing which is not part of this invention. The coin controlled operating mechanism which is also a part of the refrigerated housing is likewise not shown in the interest of clarity since it is well known and conventional and does not form a part of the invention. A framework 10 of metal or the like is formed as shown to provide a rackwork which

may consist of a plurality of vertical bottle storage racks identified in Fig. 1 as racks 1 through 5 in the order of their delivery of bottles to the bottle vending discharge chute 12. Each of the vertical bottle storage racks 1 through 5 feed into the delivery channel 11 wherein is positioned the bottle delivery controlling star-wheel rotary gate 16 as shown more clearly in Fig. 4. The feeding of the bottles from each of the vertical racks 1 through 5 is controlled by trip and gate mechanisms to be later described in detail and is operated in a manner to feed the bottles from rack 1 before transferring the feed to rack 2 and thereafter rack 3 in regular order through to rack 5.

With reference to Fig. 4 of the drawings, all of the bottles, in feeding to the delivery trough 12 and passing through the channel 11, are caused to move over the member 13 having upstanding ribs 14 providing a floor-like bottle support. The member 13 is preferably a metal casting secured to the frame 10 in any suitable manner. The star-wheel rotary delivery gates 16 and 16*a* are fixed to a rotatable shaft 15 mounted beneath the member 13 at its delivery end in a position to enable the ribs of the star-wheels to project horizontally into the channel 11 and to interrupt the bottle feed and prevent the passage of bottle B downward into the delivery chute 12. Since, in the preferred embodiment of the invention, the star-wheel gates 16 and 16*a* are provided with four ribs equi-angular spaced at approximately 90° to each other, it should be apparent that a 90° angular rotation of the shaft 15 and star-wheels 16 and 16*a* from the position shown in Fig. 4 will be effective to feed bottle B to the delivery chute 12. As shown in Fig. 6 of the drawings, the shaft 15 is journalled at 17 and 18 on the framework 10 and a ratchet wheel 19 is fixed to one end of the shaft 15 outside of the framework 10.

Since the shaft 15, star-wheels 16 and 16*a*, which, as shown in Fig. 6, may be spaced dual units, and ratchet wheel 19 are all connected to rotate as a unit in accordance with this invention, a pawl mechanism to control the rotation of ratchet wheel 19 and star-wheels 16, 16*a* and limit their rotation to 90° angular movement for each coin controlled bottle delivery operation is provided. Such novel ratchet and pawl mechanism of this invention will now be described with particular reference to Figs. 3, 6, 7 and 8 of the drawings. The pawl 20 is provided with a central pivot at 21 to the framework 10 and is shaped with two ratchet teeth engaging portions at its opposite ends so arranged as to provide a step-by-step escapement of the ratchet wheel 19 as the pawl 20 is rocked back-and-forth on its pivot 21. It will be noted that there are six ratchet teeth for each 90° segment of the ratchet wheel 19 so that a controlled movement of the pawl 20 to be rocked successively back-and-forth a total of six times will be effective to permit the controlled escapement of the ratchet wheel 19 and star-wheel gates 16, 16*a* and thus permit their rotation through 90° of angular movement in the direction of the arrow under the influence of gravity as provided by the weight of the bottle B. Thus, under such conditions the bottle B can be gently lowered and fed by gravity to the delivery chute 12. As shown in Fig. 7 of the drawings, the pawl 20 is so shaped that its complete rocking movement would be prevented in the event that the rotation of the ratchet wheel 19 is prevented through some inadvertence. For example, as the pawl 20 is rocked in the direction of the arrow, and should the ratchet wheel 19 fail to rotate in the direction of the arrow upon disengagement with the pawl end 20*b*, the pawl surface 20*c* would engage the upper end of the adjacent ratchet tooth, thus preventing further rocking movement of the pawl. In other words, the shaping of pawl ends 20*b* and 20*c* is such that complete rocking movement of the pawl in either direction can be obtained only when the ratchet wheel rotates to permit the pawl ends to move into the maximum depths of the ratchet teeth.

A spring loaded pawl 32 is pivoted to the framework 10 to engage the ratchet teeth of the ratchet wheel 19 and prevent any rotation of the wheel in a direction opposite to the arrow such as might be attempted by forcing an object up through the delivery chute against the star-wheel in an effort to obtain unauthorized delivery of the bottle goods.

In order to impart a controlled rocking of the pawl 20 for each operation of the coin controlled mechanism, a cam plate 22 is fixed to the shaft 24 journalled in framework 10. The shaft 24 is provided with a handle connection 26 at its other end for connection to the coin controlled operating handle (not shown). The cam plate 22 is provided with a sinuous cam groove 23 in which is received the roller 20*a* on the upper end of the pawl 20. Since the sinuous groove 23 is provided with only three undulations, it should be apparent that the cam plate 22 and operating shaft 24 must be moved counter-clockwise from the position shown in Fig. 3 until the roller 20*a* travels the full extent of the cam groove 23 and thereafter moved clockwise to return the parts to the position shown in order to rock the pawl six times and permit the ratchet and star-wheel to move 90° of rotation and deliver a bottle. The counter-clockwise movement of the cam plate 22 is obtained by depressing the operating handle connection 26 while the return clockwise movement is provided for by the torsional spring 30, encircling the shaft 24.

Once the operating handle is unlocked by the coin controlled mechanism (not shown), it is necessary that the movement of the handle connection 26, shaft 24 and cam plate 22 be restrained to one continuous counter-clockwise movement followed by one continuous clockwise return movement as described above. To this end, ratchet teeth 22*a* are provided on the cam plate 22 and a spring loaded and pivoted ratchet pawl 28 is mounted on the framework 10 to engage the teeth 22*a* to prevent retrograde movement of the cam. At the start of the counter-clockwise movement of cam plate 22 when the operating handle is unlocked by the coin controlled mechanism, the ratchet pawl 28 is pivoted in such manner as to engage the ratchet teeth 22*a* and prevent any retrograde clockwise movement until the intended end of the counter-clockwise movement is reached at which time the pivoted ratchet pawl is adjacent the smooth surface 22*b*. Thereafter, the return or clockwise movement of the cam plate 22 under the influence of the torsion spring 30, when the operating handle is released, can be started to pivot the ratchet pawl 28 in the opposite direction and prevent any retrograde movement of the cam plate during its return clockwise movement until the operating handle is again locked by the coin controlled mechanism. It should now be apparent that the cooperation of the

pivoted pawl 28, ratchet teeth 22a, and smooth surface 22b is very important to prevent unauthorized reciprocation of the operating handle between the coin controlled unlocked and locked positions in such manner as to obtain delivery of more than the single bottle B.

As shown by Fig. 8 of the drawings, the return movement of the cam plate 22 is stopped when a shoulder of the pawl 20 engages the projection 25 on the cam plate 22, thus preventing damage to the roller 20a as the cam 22 is rotated in the clockwise direction by the torsion spring 30. It will also be noted, as seen in Figs. 1 and 2 of the drawings that the operating handle connection 26 is adjustably fixed to the shaft 24 by means of the arcuate slot 36 and set-screw 37 to the plate 34 carried by the shaft 24. Such arrangement enables the locked position of the operating handle (not shown) to be adjusted to the position of shaft 24 corresponding to a locked position of ratchet wheel 19 and shaft 15 with the ribs of the star-wheel gates 16, 16a extending horizontally into channel 11 in bottle intercepting position.

The gate and trip mechanism for controlling the feed of bottles from the vertical magazines 1 through 5 will now be described in detail. Referring in particular to Figs. 3, 4 and 5 of the drawings, vertical racks 2 through 5 are each provided with lower bottle supporting gate members 42, 43, 44 and 45 respectively. Each of the gates 42—45 are secured to shafts 46, 47, 48 and 49 respectively, rotatably journalled on the framework 10 and the weight of the bottles normally tends to rotate each of the gates 42—45 downwardly. When the vending machine is full of bottles, all of the gates 42—45 are held and locked in the upward position as shown in Fig. 1 thus preventing delivery of bottles from racks 2 through 5. As may best be appreciated from Fig. 3, the locked position of gates 42—45 is obtained by reason of upwardly extending latch arms 52, 53, 54 and 55 which are secured respectively to shafts 46—49, the free ends of the latch arms being engaged by latch members 56—59. These latch members are in turn secured respectively to rotatable shafts 60—63 journalled in the framework, and depending from the latterly described shafts intermediate the bottle columns are bottle sensing fingers 64—67 (see Figs. 4 and 5). Tension springs 68—71 are connected to latch arms 52—55 to return the lower gates 42—45 to the raised and latched position when the machine is empty of bottles. Freely swinging pivotal upper gates 72—75 are also provided to facilitate the channelized movement of the bottles as should be evident.

The gate and trip mechanism described in the foregoing paragraph operates as follows: With all vertical racks 1—5 containing a plurality of bottles as shown in Fig. 1, bottles are fed from vertical rack 1 until the vertical trip finger 64 is free to move inward of rack 1 and shaft 60 is thus freed for rotation. The weight of the bottles in rack 2 acting on gate 42 causes latch arm 52 to force latch member 56 out of engagement, and gate 42 moves downwardly until it strikes the framework to allow the bottles to feed from rack 2. The feed from rack 2 continues until trip finger 65 is released to move inward of rack 1, and latch member 57 is disengaged from latch arm 53 to permit the lower gate 43 to move downward and feed bottles from rack 3. The feed from vertical racks 4 and 5 continues in similar fashion upon the proper sequential freeing of trip fingers 66 and 67 together with their associated latching mechanisms. The downward movement of gates 43—45 is limited by stop lugs 76—78 (Figs. 2, 5 and 6), preferably cast integral with the inner face of the rackwork 10, and so located that the upper edges of the gates lie in a common plane with ribs 14 to provide an inclined ramp over which the bottles travel.

The operation of the entire vending machine has been described concurrently with the description of the structural details and should need no further elaboration. However, it is desired to emphasize that the described arrangement of the ratchet pawl escapement for the star-wheel in accordance with this invention provides for a positive control of the delivery of only a single bottle for each operation of the coin-controlled mechanism together with safeguards against improper operation of the mechanism either by jamming of the machine or by deliberate interference with the intended operation. While a particular form of cam plate and pawl for enabling the stepwise escapement of the ratchet wheel and star-wheel about a desired amount of angular rotation sufficient to gently deliver one bottle has been described, it will be understood that variations of escapement structure such as a solenoid controlled pawl may be substituted for the cam plate without departing from the spirit and scope of the invention as defined in the appended claims. As another example, it should be pointed out that a three or five ribbed star-wheel gate could be substituted for the four rib gate shown together with suitable modifications of the pawl and ratchet escapement mechanism to limit the angular movement of the star-wheel gate to an amount equal to the equi-angular spacing between the star-wheel ribs.

From the foregoing it will be seen this invention is one well adapted to attain all of the ends and objects hereinabove set forth together with other advantages which are obvious and which are inherent to the invention.

It will be understood that certain features and subcombinations are of utility and may be employed without reference to other features and subcombinations. This is contemplated by and is within the scope of the claims.

As many possible embodiments may be made of the invention without departing from the scope thereof, it is to be understood that all matter herein set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

I claim:

1. In a dispensing mechanism for vending machines having a gravity feed delivery channel, a rotary star wheel gate having a plurality of equi-angularly spaced ribs, said gate being disposed with a rib extending laterally into said channel to interrupt the feeding of bottles therethrough, an escapement including an escape wheel connected for rotation with said gate, said wheel having a plurality of teeth divided in equal amounts for each angular segment corresponding to the angular spacing between said ribs, a double pawl pallet for controlling the rotation of said escape wheel, said pallet having one pawl normally engaging one of said ratchet teeth to prevent rotation of said escape wheel and gate from the position interrupting the bottle feed, and means operable to rock said pallet a predetermined number of times thereby to cause the two pawls to act alternately on said teeth and permit

step by step advance of the escape wheel for an angular distance corresponding to the number of teeth in said divided amount and consequently permit stepwise rotation of said gate in the direction to feed by gravity a bottle through said channel.

2. In a dispensing mechanism for vending machines having a gravity feed bottle delivery channel, a rotary star wheel gate having a plurality of equi-angularly spaced ribs, said gate being disposed with a rib extending laterally into said channel to interrupt the feeding of bottles therethrough, a ratchet wheel connected for rotation with said gate, said ratchet wheel having a plurality of ratchet teeth divided in equal amounts for each angular segment corresponding to the angular spacing between said ribs, a pawl normally engaging one of said ratchet teeth to prevent rotation of said ratchet wheel and gate from the position interrupting the bottle feed, a cam plate associated with said pawl and operable to rock said pawl and disengage a plurality of ratchet teeth equal to the divided amount in each angular segment of the ratchet wheel, and means for actuating said cam plate to permit rotation of said wheel and gate to feed by gravity a bottle through said channel.

3. In a dispensing mechanism for vending machines having a gravity feed bottle delivery channel, a rotary star wheel gate having a plurality of equi-angularly spaced ribs, said gate being disposed with a rib extending laterally into said channel to interrupt the feeding of bottles therethrough, a ratchet wheel connected for rotation with said gate, said ratchet wheel having a plurality of ratchet teeth divided in equal amounts for each angular segment corresponding to the angular spacing between said ribs, a pawl normally engaging one of said ratchet teeth to prevent rotation of said ratchet wheel and gate from the position interrupting the bottle feed, said pawl being centrally pivoted and having ratchet teeth engaging portions at each end, and means operable to rock said pawl to disengage successively a plurality of ratchet teeth equal to the divided amount in each angular segment of the ratchet wheel to permit rotation of said wheel and gate in the direction to feed by gravity a bottle through said channel.

4. In a dispensing mechanism for vending machines having a gravity feed bottle delivery channel, a rotary star wheel gate having a plurality of equi-angularly spaced ribs, said gate being disposed with a rib extending laterally into said channel to interrupt the feed of bottles therethrough, a ratchet wheel connected for rotation with said gate, said ratchet wheel having a plurality of ratchet teeth divided in equal amounts for each angular segment corresponding to the angular spacing between said ribs, a pawl normally engaging one of said ratchet teeth to prevent rotation of said ratchet wheel and gate from the position interrupting the bottle feed, said pawl being centrally pivoted and having ratchet teeth engaging portions at each end, a cam plate associated with said pawl and operable to rock said pawl to disengage successively a plurality of ratchet teeth to permit rotation of said wheel and gate in a direction to feed by gravity a bottle through said channel, and means operable to actuate said cam plate and pawl to disengage in any single operation only a number of teeth equal to the divided amount in each angular segment of the ratchet wheel.

5. In a dispensing mechanism for vending machines having a gravity feed bottle delivery channel, a rotary star wheel gate having a plurality of equi-angularly spaced ribs, said gate being disposed with a rib extending laterally into said channel to interrupt the feeding of bottles therethrough, a ratchet wheel connected for rotation with said gate, said ratchet wheel having a plurality of ratchet teeth divided in equal amounts for each angular segment corresponding to the angular spacing between said ribs, a pawl normally engaging one of said ratchet teeth to prevent rotation of said ratchet wheel and gate from the position interrupting the bottle feed, said pawl being centrally pivoted and having ratchet teeth engaging portions at each end, and means operable to rock said pawl to disengage successively a plurality of ratchet teeth equal to the divided amount in each angular segment of the ratchet wheel to permit rotation of said wheel and gate in the direction to feed by gravity a bottle through said channel, the teeth engaging portions of said pawl being shaped to engage all corresponding portions of the ratchet teeth except when in register with the maximum depth between the teeth for each rocking movement of the pawl whereby rocking movement of the pawl is prevented when rotation of the ratchet wheel is prevented.

6. In a dispensing mechanism for vending machines having a gravity feed bottle delivery channel, a rotary star wheel gate having a plurality of equi-angularly spaced ribs, said gate being disposed with a rib extending laterally into said channel to interrupt the feeding of bottles therethrough, a ratchet wheel connected for rotation with said gate, said ratchet wheel having a plurality of ratchet teeth divided in equal amounts for each angular segment corresponding to the angular spacing between said ribs, a pawl normally engaging one of said ratchet teeth to prevent rotation of said ratchet wheel and gate from the position interrupting the bottle feed, a dispensing lever having a dispensing stroke and return stroke, and mechanism operatively associating said lever with said pawl, said mechanism operating responsive to the dispensing stroke to rock said pawl and disengage successively a plurality of ratchet teeth equal to the divided amount in each angular segment of the ratchet wheel to permit rotation of said wheel and gate in the direction to feed by gravity a bottle through said channel.

7. In a dispensing mechanism for vending machines having a gravity feed bottle delivery channel, a rotary star wheel gate having a plurality of equally angularly spaced ribs, said gate being disposed with a rib extending laterally into said channel to interrupt the feeding of bottles therethrough, a ratchet wheel connected for rotation with said gate, said ratchet wheel having a plurality of ratchet teeth divided in equal amounts for each angular segment corresponding to the angular spacing between said ribs, a pawl normally engaging one of said ratchet teeth to prevent rotation of said ratchet wheel and gate from the position interrupting the bottle feed, a dispensing lever having a dispensing stroke and return stroke, and a cam plate driven by said lever and having a camming surface adapted to rock said pawl on the dispensing stroke of said lever to disengage successively a plurality of ratchet teeth equal to the divided amount in each angular segment of the ratchet wheel to permit rotation of said

wheel and gate in the direction to feed by gravity the bottle through said channel.

8. Mechanism for positively controlling the rotational displacement of a rotary shaft on which a constant rotational force is being applied to a predetermined angular value in a series of stepwise increments comprising a ratchet wheel connected for rotation with said shaft, said ratchet wheel being provided with a plurality of ratchet teeth divided in equal amounts for each angular segment corresponding to the predetermined angular value of the rotational displacement of the shaft, a pawl normally engaging one of said ratchet teeth to prevent rotation of said ratchet wheel and shaft, a movable cam plate having a camming surface adapted to engage said pawl and rock same to disengage in succession said ratchet teeth, and means for actuating said cam plate through a predetermined displacement, said camming surface being constructed and arranged to have effective engagement with said pawl during said displacement to disengage successively only the ratchet teeth of one angular segment of the ratchet wheel.

9. Mechanism for positively controlling the rotational displacement of a rotary shaft on which a constant rotational force is being applied to a predetermined angular value in a series of stepwise increments comprising a ratchet wheel connected for rotation with said shaft,

said ratchet wheel being provided with a plurality of ratchet teeth divided in equal amounts for each angular segment corresponding to the predetermined angular value of the rotational displacement of the shaft, a pawl normally engaging one of said ratchet teeth to prevent rotation of said ratchet wheel and shaft, said pawl being centrally pivoted and having ratchet teeth engaging portions at each end, a movable cam plate associated with said pawl and operable to rock said pawl to disengage successively a plurality of ratchet teeth to permit rotation of said ratchet wheel and shaft in increments equal to the spacing of said teeth, and means for actuating said cam plate through a predetermined displacement whereby the number of teeth released by said pawl is equal to the number of teeth in any one angular segment of the ratchet wheel.

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