

June 3, 1958

J. M. STEWART
VENDING MACHINE

2,837,237

Filed April 17, 1951

7 Sheets-Sheet 1

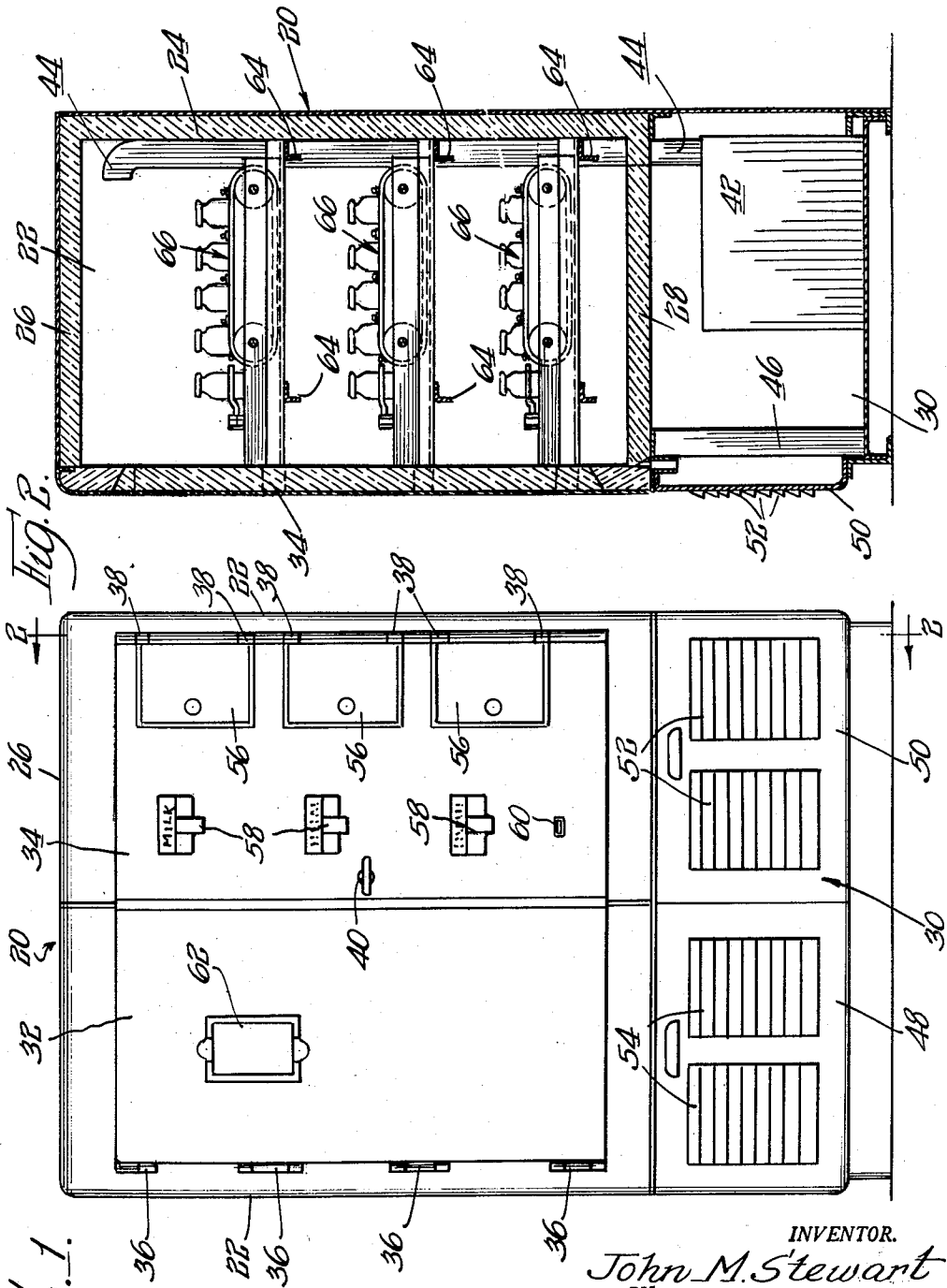


Fig. 1.

INVENTOR.
John M. Stewart
BY
Moore, Olson & Tucker
attys.

June 3, 1958

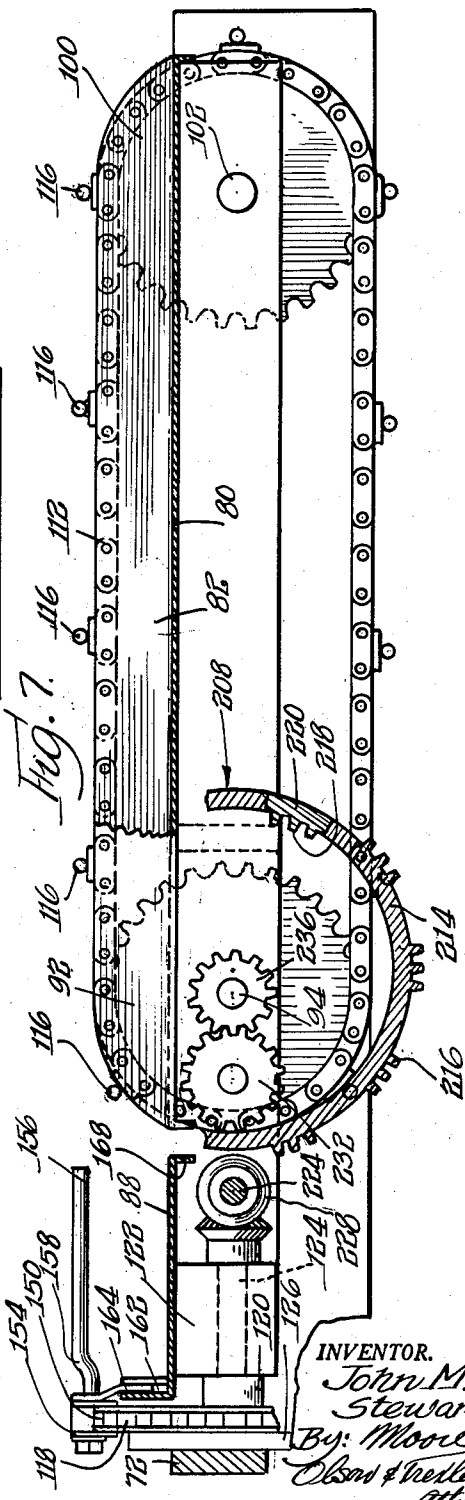
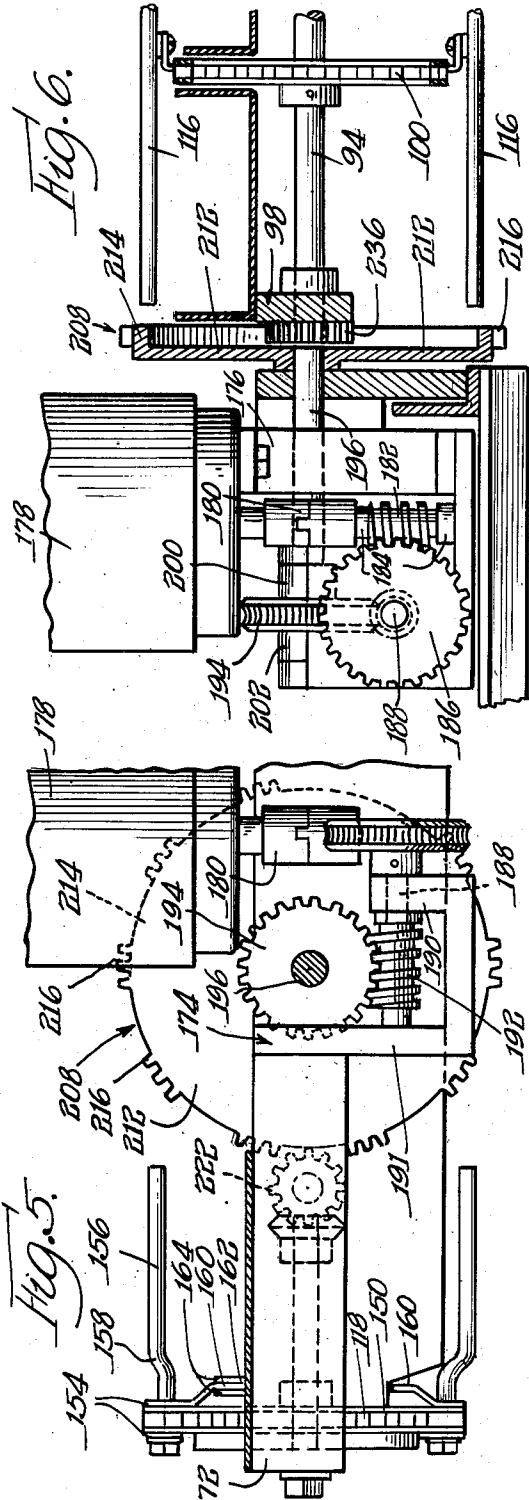
J. M. STEWART

2,837,237

VENDING MACHINE

Filed April 17, 1951

7 Sheets-Sheet 4



INVENTOR.
John M. Stewart
 BY: *Moore*
Osborn & Vredin
Attys

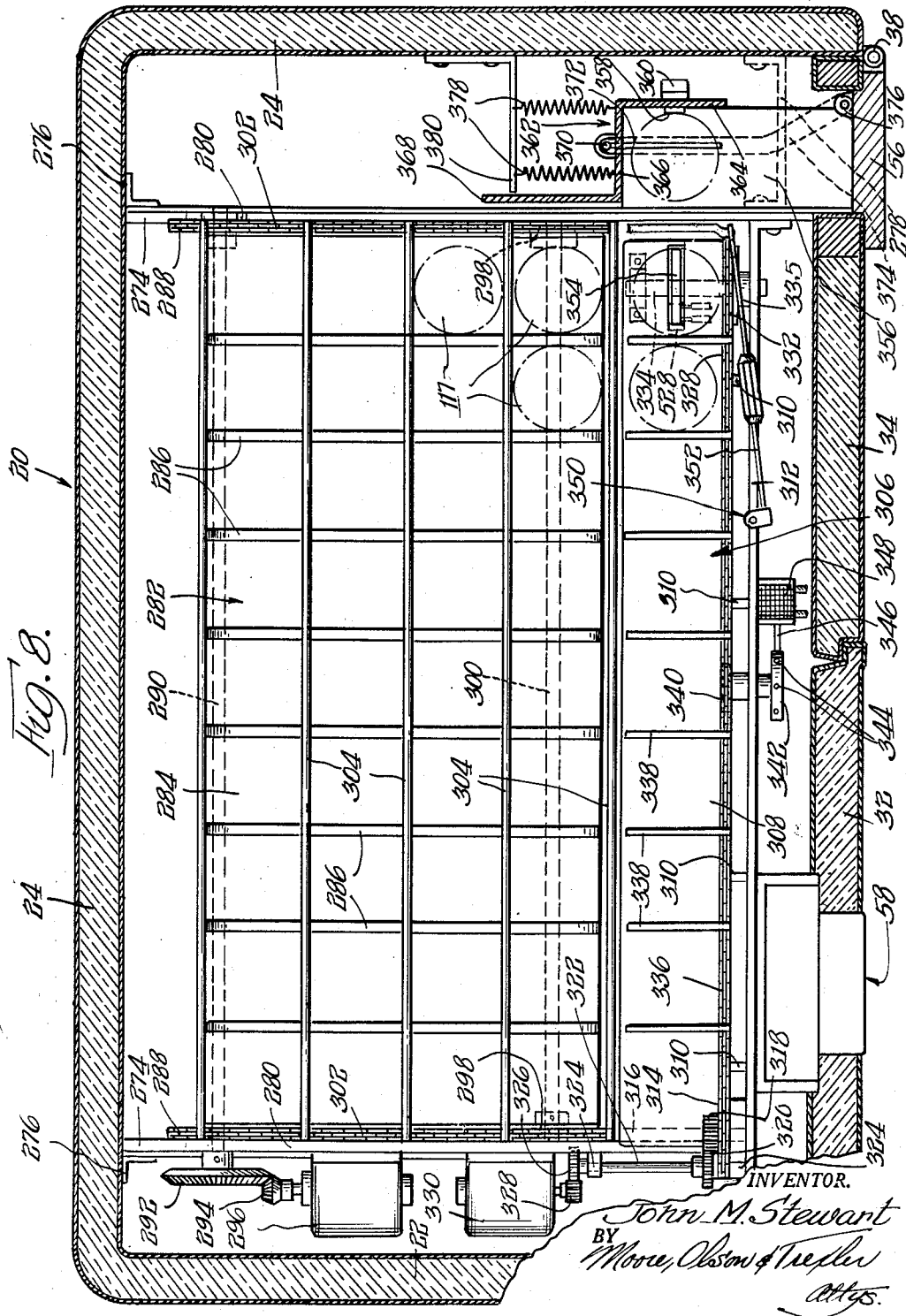
June 3, 1958

J. M. STEWART
VENDING MACHINE

2,837,237

Filed April 17, 1951

7 Sheets-Sheet 5



June 3, 1958

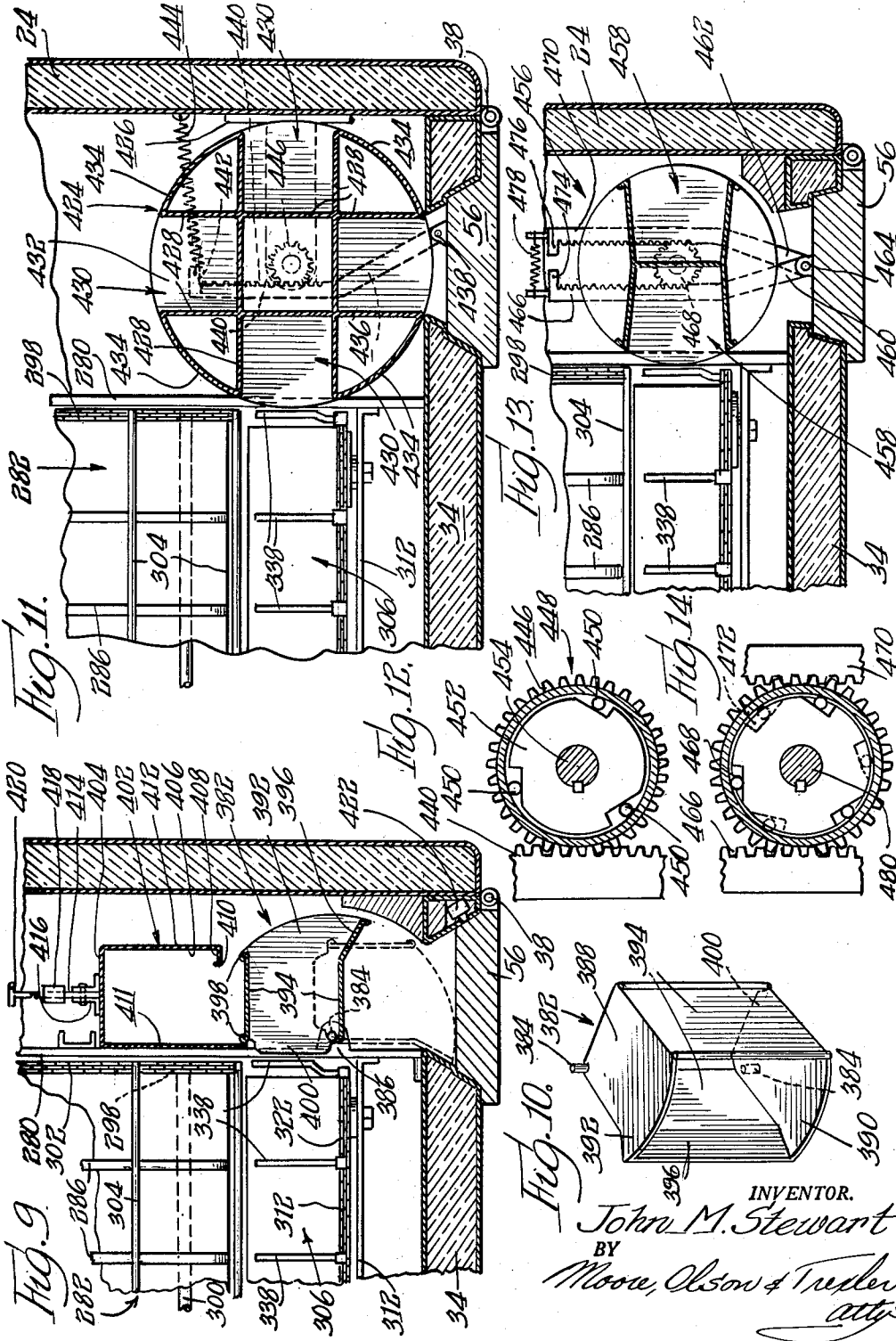
J. M. STEWART

2,837,237

VENDING MACHINE

Filed April 17, 1951

7 Sheets-Sheet 6



INVENTOR.
John M. Stewart
 BY
Moore, Olson & Tredler
attys

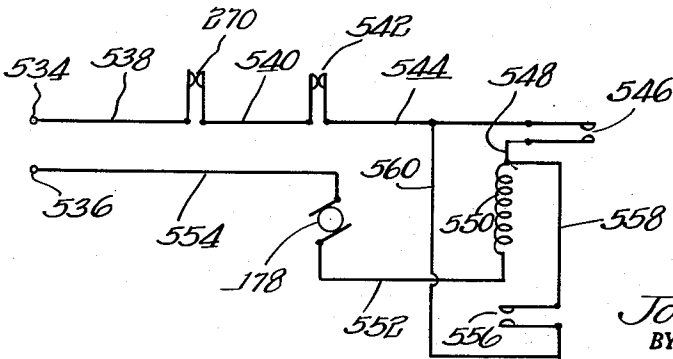
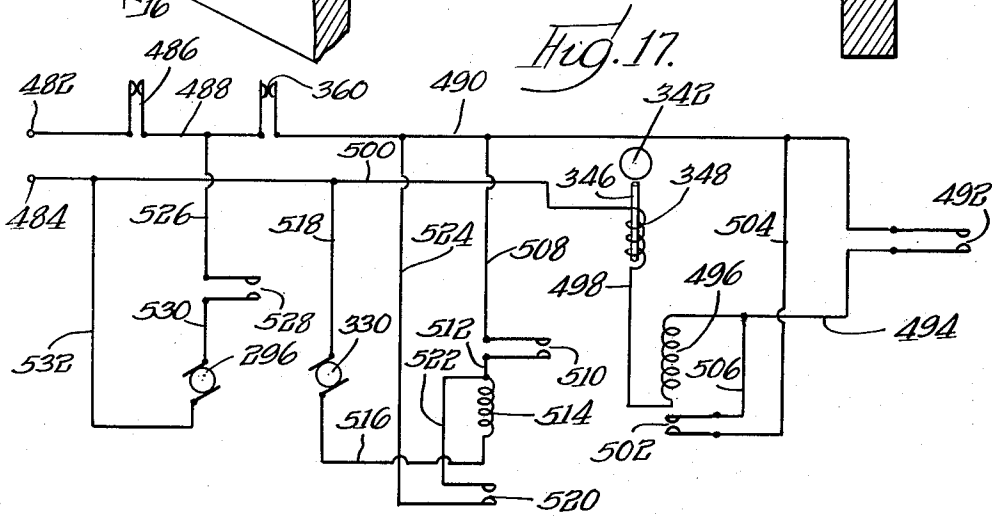
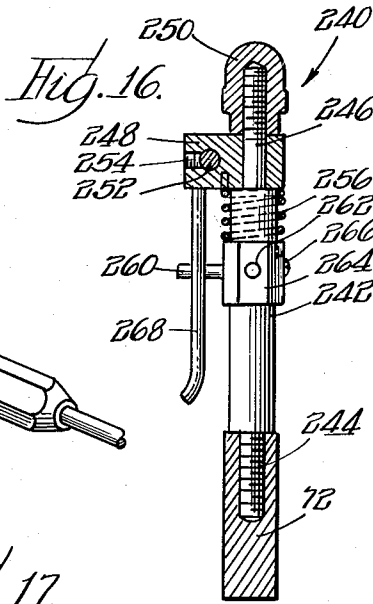
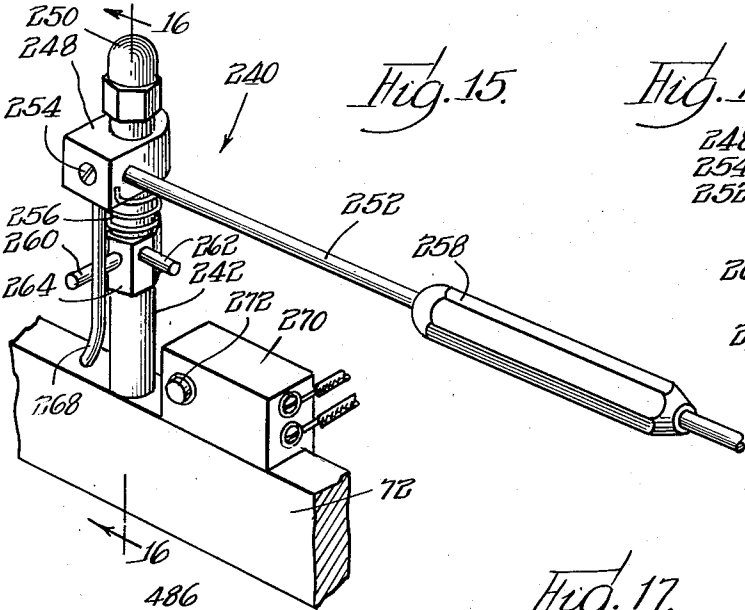
June 3, 1958

J. M. STEWART
VENDING MACHINE

2,837,237

Filed April 17, 1951

7 Sheets-Sheet 7



INVENTOR.
John M. Stewart
BY
Moore, Osborn & Trevelyan
attys.

1

2,837,237

VENDING MACHINE

John M. Stewart, Chicago, Ill.

Application April 17, 1951, Serial No. 221,400

16 Claims. (Cl. 221-11)

This invention is concerned generally with a vending machine, and more particularly with a machine for vending bottles or other compact packaged articles.

The primary object of this invention is to provide a new or improved vending machine.

Another object of this invention is to provide a vending machine having a delivery section and a storage section and means for automatically refilling the delivery section from the storage section upon exhaustion of the supply of articles to be vended in said delivery section, the delivery section including a readily cleanable supporting plate across which articles can be slid onto said delivery section.

A further object of this invention is to provide a vending machine having a plurality of similar vending mechanisms individually operable to increase the capacity and selection wherein each of the vending mechanisms is mounted for partial or complete withdrawal from a cabinet to facilitate reloading, cleaning, and repair.

Yet another object is to provide, in a vending machine having a delivery section and a storage section for replenishing the delivery section, means for operating both the delivery section and the storage section in timed relation by means of a single motor.

A further object of this invention is to provide an intermittent motion mechanism for operating both delivery and storage sections in a vending machine in timed relation by means of a single motor.

Another object of this invention is to provide, in a vending machine having an article advancing mechanism operable in only one direction, an indexing mechanism for stopping the article advancing mechanism in proper position.

Yet another object of this invention is to provide a new or improved mechanism for shifting a purchased article from the interior of a vending machine cabinet.

A more specific object of this invention is to provide a mechanism operated by opening a delivery door to shift a purchased article from the interior of a vending machine cabinet.

Another object of this invention is to provide improved means for advancing articles along a delivery section of a vending machine and improved means for advancing articles from a storage section onto said delivery section.

Other and further objects and advantages of the present invention will be apparent from the following description when taken in connection with the accompanying drawings wherein:

Fig. 1 is a front view of the cabinet of a vending machine embodying the principles of my invention;

Fig. 2 is a vertical sectional view taken substantially along the line 2-2 of Fig. 1;

Fig. 3 is a perspective view of one form of the vending mechanism;

Fig. 4 is a top view of the vending mechanism, certain parts being broken away for clarity of illustration and to reduce the size of the drawing;

2

Fig. 5 is a detail view partially in section taken along the line 5-5 of Fig. 4;

Fig. 6 is a detail view partially in section taken along the line 6-6 of Fig. 4;

Fig. 7 is a detail view partially in section and partially broken away, taken along line 7-7 of Fig. 4;

Fig. 8 is a top view showing a modified vending mechanism;

Fig. 9 is a fragmentary top view showing a transfer mechanism differing from that of Fig. 8;

Fig. 10 is a perspective view showing a part of the transfer mechanism of Fig. 9;

Fig. 11 is a modified transfer mechanism;

Fig. 12 shows a part of the actuating means for the transfer mechanism of Fig. 11;

Fig. 13 is a view similar to Figs. 9 and 11 showing yet another transfer mechanism;

Fig. 14 is a view similar to Fig. 12 showing a portion of the transfer mechanism of Fig. 13;

Fig. 15 is a fragmentary perspective view showing a control member;

Fig. 16 is a sectional view taken along the line 16-16 of Fig. 15;

Fig. 17 is a schematic wiring diagram for the vending mechanism shown in Fig. 8; and

Fig. 18 is a wiring diagram for the vending mechanism shown in Fig. 3.

Referring first to Figs. 1 and 2, there is shown a vending machine comprising a cabinet 20 having insulated sidewalls 22, an insulated rear wall 24, an insulated upper wall or ceiling 26, and an insulated floor or bottom wall 28 spaced above a supporting floor or the like by a cabinet under portion 30. The front of the cabinet is provided with a pair of insulated doors 32 and 34 hinged to the cabinet at 36 and 38, respectively. The doors are secured in closed, locked position by any suitable means well known in the art and including a handle 40.

The cabinet under portion or base 30 preferably is divided into two portions, one of which is insulated and open to the upper insulated portion of the cabinet. The other portion of the cabinet is not insulated and is provided with conventional cooling or refrigerating apparatus indicated as mounted within a box-like enclosure 42 as shown in Fig. 2. The enclosure 42 is provided with a duct 44 leading to the upper portion of the cabinet 20 to discharge cold air into the cabinet. A return duct (not shown) leads from the lower portion of the cabinet to the container 42.

The base of the cabinet further includes a box-like frame 46 of angle members and is provided with doors 48 and 50. The door 48 communicates with the insulated portion of the base and is an insulated door. The door 50 communicates with the portion of the base containing the cooling apparatus and is formed of sheet metal. The door 50 is provided with struck-out ventilating louvers 52 and the door 48 is provided with dummy louvers 54 to match the appearance of the door 50.

The exterior of the cabinet is completed by three delivery doors 56, all of which are identical, by labeled coin receiving slots 58, a coin return slot 60, and by a name plate 62. Each of the doors 56 and coin receiving slots 58 cooperates with a single vending level or mechanism, as will be hereinafter apparent. The coin receiving slots 58 open into coin receiving mechanisms of conventional construction including various well known slug rejecting devices.

The interior of the cabinet is provided with three sets of transverse angle members 64, each of which supports a vending mechanism 66. The vending mechanisms best are illustrated by the perspective view in Fig. 3 and reference should be had to Figs. 4-7 for details of the driving mechanism.

VENDING MECHANISM

The transverse angle members 64 have longitudinal angle members 68 secured across their upper surfaces by any desirable means, and the longitudinal angle members slidingly support the vending mechanisms 66. Each vending mechanism 66 includes longitudinal side plates 70 received on the angle members 68. Transverse frame members 72 extend between the plates 70 to which they are secured by any suitable conventional means such as screws or bolts.

A storage shelf 74 includes a flat metal sheet 76 extending from the rear frame member 72 about four-fifths of the way toward the front frame member 72. The metal sheet 76 extends from near one of the frame members 70 about eight-ninths of the way toward the other frame member or longitudinal end plate 70 and is provided at each end with an upturned flange 78. The storage shelf or tray 74 is provided with a second, comparatively narrow, metal sheet 80 spaced slightly from the sheet 76 and provided with upturned flanges 82. Metal straps 84 are secured atop the sheet 76 and are spaced thereabove to form spacers dividing the sheet laterally.

A delivery shelf 86 is spaced forwardly a short distance from the storage shelf 74 and comprises a single metal sheet 88 extending from side to side of the storage shelf and supported by brackets 90 secured to the transverse frame member 72. It will be understood that the storage shelf sheet 76 may be supported solely by the transverse frame members 72 or that additional longitudinal supporting members may be set on or in the transverse frame members for additional strength.

The storage shelf or tray 74 further includes a pair of drive sprocket wheels 92 (see particularly Fig. 7) mounted on a transverse drive shaft 94 journaled in one of the longitudinal end plates 70 and in an additional longitudinal frame member 98 (Fig. 4). The sprocket wheels 92 are located at either end of the metal sheet 76 adjacent the upturned flanges 78 and are formed with integral hubs 96 by means of which they are secured to the drive shaft 94.

Idler sprockets 100 are positioned near the back end of the storage tray or shelf 74 and are mounted on stub shafts 102. The stub shafts 102 are journaled in longitudinally shiftable bearing members 104 having lateral threaded ears 106. Apertured lateral ears 108 are provided on an end plate 70 and the transverse frame member 98 for receiving bolts 110 threaded into the ears 106. Sprocket chains 112 are passed over corresponding drive and idler sprockets and the sprocket chains may be kept taut by means of the bolts 110 and ears 106 and 108. Jam nuts 113 are provided on the bolts 110 to prevent accidental loosening thereof.

Upstanding brackets 114 are provided at spaced intervals along the chains 112 and carry transverse pusher rods 116 spaced slightly from the chains 112 and supported by the flanges 78 and 82 and by the spacers 84. The drive shaft 94 is driven from time to time to rotate the sprockets 92 and drive the chains 112 to cause the pusher bars or rods 116 to shift bottles 117 or other containers from the storage tray or shelf 74 onto the delivery tray or shelf 86. Although my invention is highly adaptable for delivering bottles of milk such as are illustrated, it will be appreciated that other compact packaged articles could be vended with equal facility.

A drive sprocket 118 is secured to a sleeve 120 journaled in a bracket 122 mounted on the front transverse frame member 72. The sleeve 120 fits over a stud bolt 124 fitting through the transverse frame member 72 and secured by means of a nut. The drive sprocket 118 is provided with a plate 126 on one face and the plate is provided with a plurality of indents or recesses 128 in its face (Fig. 4). A hollow cylinder 130 is threaded into the transverse frame member 72 and the inner end of the cylinder opens against the face of the plate 126. The

outer end of the cylinder 130 is closed and a coil spring 132 is compressed between the closed end and a slug 134. The slug presses in turn against a steel ball 136 which fits into any of the recesses 128 to insure stopping of the sprocket 118 in proper position.

An idler sprocket 138 is mounted at the opposite end of the transverse frame member 72 on a stub shaft 140 secured in a shiftable bearing block 142. The bearing block 142 fits in a slot in the transverse frame member 72 and is provided with a laterally extending threaded ear 144. An apertured ear 146 on the frame member 72 receives a bolt 148 threaded into the ear 144. A sprocket chain 150 is passed over the sprockets 118 and 138 and is maintained taut by the bolt 148 and ears 144 and 146. A jam nut 152 is provided on the bolt 148 to prevent accidental loosening thereof.

Upstanding sheet metal brackets 154 are secured to the chain 150 at spaced intervals and carry delivery pusher fingers 156 extending across the delivery tray or shelf 86. The fingers are provided with offset portions 158 in order to clear the ends of the metal sheet 88. Each of the brackets 154 is provided with a depending and offset flange 160. An upstanding channel 162 is defined along one edge of the plate 88 by a pair of spaced apart flanges 164, the flanges being spread apart at one end as at 166 (Fig. 4) to facilitate reception of the bracket flanges 160. The channel 162 prevents twisting of the fingers or rods 156 and also serves to stiffen the sheet or plate 88. Further stiffening of this sheet is provided by a depending flange 168 extending along the other edge.

The sprocket 118 is driven at intermittent intervals to cause the fingers 156 periodically to discharge a bottle or the like 117 from the delivery tray or shelf onto a plate 170. The bottle is passed from this plate to the exterior of the cabinet 20 by a mechanism later to be described with reference to a modified form of vending mechanism.

At this point it should be noted that an indexing mechanism 172 similar to the mechanism 128—136 is secured to the longitudinal end plate 70 for cooperation with the outside drive sprocket 92 of the storage tray or shelf.

The drive mechanism

A box-like mounting bracket 174 is secured on the outer face of the longitudinal end plate 70 adjacent the transfer plate or platform 170 by any suitable means such as screws or bolts. A transverse wall 176 on the bracket supports an electric motor 178 with the shaft of the motor extending vertically downwardly. A clutch 180 (Figs. 5 and 6) couples the motor drive shaft to a worm 182 mounted on a shaft journaled in spaced ears 184 forming a part of the bracket 174. The worm meshes with a worm wheel 186 which is fixed to a shaft 188 journaled in an upstanding ear 190 and a sidewall 191 of the bracket 174. A worm 192 is fixed on the shaft 188 and is in driving engagement with a worm wheel 194. The worm wheel 194 is fixed to a shaft 196 journaled in vertical flanges 198 of the bracket 174. A hub 200 on the worm wheel and a spacer 202 on the other side thereof space the wheel from the flanges 198. The shaft 196 is coupled to a shaft 204 by means of a conventional clutch 206 and this shaft journals in the longitudinal end plate 70 and is fixed to an intermittent motion drive gear 208. The clutch 206 is spaced from the end plate 70 by a spacer 210.

The intermittent motion drive gear 208 comprises a flat plate portion 212 (broken away in Fig. 7 for clarity of illustration) having a circular ring 214 integral with the periphery of the plate 212. The ring 214 is provided about its periphery with groups of three gear teeth 216. There are nine such groups and they are equally spaced as if there were ten such groups. This leaves one space where no teeth are provided on the outside of the ring 214. At the position where teeth are not provided on the outside of the ring, a group of teeth 218 is pro-

vided on the inside of the ring by means of an insert 220 fitted in the ring.

The groups of external teeth 216 are adapted to engage intermittently the teeth of a spur gear 222 (Fig. 4) fixed to a shaft 224 journaled in the frame member 98 and in an extending arm 226 of the aforementioned bracket 122. A bevel gear 228 is fixed to the shaft 224 and engages a bevel gear 230 which is fixed to the sleeve 120 driving the drive sprocket 118 of the delivery tray or shelf. The gear ratio is such that the engagement of a group of three teeth 216 with the gear 222 causes the delivery pusher fingers to move a distance equal to the spacing between them.

The internal gear teeth 218 are adapted periodically to engage with the teeth of an idler gear 232 rotatably mounted on a stub shaft 234 carried by the frame member 98. The idler gear 232 meshes with a spur gear 236 pinned to the sprocket drive shaft 94. A collar 238 is fixed to the shaft 94 on the inner face of the frame member 98 to aid in preventing axial shifting of the shaft 94. The gear ratio is such that each time the internal gear teeth 218 pass through driving engagement with the idler gear 232, the drive sprockets 92 are rotated a sufficient distance to shift the storage pusher rods or bars 116 a distance equal to the spacing between them.

It may be seen that for each nine times the delivery pusher fingers 156 are advanced, the storage pusher bars 116 will be advanced once.

A switch mechanism 240 is mounted on the front transverse frame member 72 as shown generally in Figs. 3 and 4 and in detail in Figs. 15 and 16. The switch mechanism 240 includes a vertical post 242 having a reduced, threaded lower end 244 threaded into an aperture in the top of the frame member 72. The post 242 is provided with a reduced upper end 246 on which a block 248 is pivotally mounted. A cap member 250 is threaded on to the upper end of the reduced portion 246 to maintain the block 248 in position. A control lever 252 is secured in a bore in the block 248 by means of a set screw 254 and is adapted to swing over the delivery tray or shelf 86 and also over the storage tray or shelf 74.

A coil spring 256 encircles the post 242 and engages the block 248 normally to urge the arm 252 out over the delivery and storage tray or shelves. Such movement is prevented by engagement of the arm with one of the bottles 117 or other articles to be vended. The arm is provided with a weight 258 imparting sufficient inertia to the arm to prevent it from swinging needlessly back and forth each time a new bottle or row of bottles is brought into position. The extreme limits of movement of the arm 252 are determined by a pair of stop studs 260 and 262 threaded into a hexagonal sleeve 264 rotatably mounted on the post 242. A set screw 266 locks the hexagonal sleeve 264 in any desirable adjusted position. A depending stop arm 268 is welded or otherwise suitably fixed in the block 248 and is adapted to engage the stop 260 and 262.

A switch 270 is mounted on top of the transverse frame member 72 by any suitable means and is provided with a switch actuating plunger or button 272. The plunger or button is adapted to be contacted by the stop arm 268 just before the stop arm encounters the stop 262 so that the normally closed switch 270 will be opened by movement of the control arm 252 above the storage tray or shelf 74 in the absence of bottles or other articles on it and on the delivery tray or shelf.

Modification of vending mechanism

A modified form of vending mechanism is shown in Fig. 8. Many details of construction are similar to those shown and described heretofore and these details are not all shown in Fig. 8. The cabinet 20 remains as described previously and similar numerals are utilized to indicate similar parts thereof. One change that will be noted is

that the coin receptacles and associated mechanisms 58 have been shifted from the door 34 to the door 32.

Longitudinal angle members 274 forming slidable mounts for the vending mechanisms may be supported by transverse angle members as disclosed heretofore or may be supported as shown by angle brackets 276 secured to the rear cabinet wall 24 and by brackets 278 extending from the side walls 24. Longitudinal end plates 280 of the vending mechanism slidably rest on the longitudinal angle members 274.

The storage shelf or tray 282 of the modified vending mechanism comprises a metal sheet 284 extending from one end plate 280 to the other and about $\frac{1}{2}$ of the way from the front to the back of the mechanism. The sheet 284 is supported from below by any suitable framework connected to the end plates 280. Upstanding spacers 286 similar to the spacers 84 heretofore described extend longitudinally of the storage tray or shelf and divide the shelf laterally into nine sections.

Drive sprocket wheels 288 are mounted adjacent the rear corners of the vending mechanism on a drive shaft 290 journaled in stub bearings in the end plates 280. The sprocket wheels 288 are spaced inwardly of the end plates 280 and in recesses formed in the sheet 284. A large bevel gear 292 is secured on an outer end of the drive shaft 290 and is in driving engagement with a small bevel gear 294 mounted on the drive shaft of an electric motor 296. The electric motor 296 is mounted on one of the end plates 280. Idler sprocket wheels 298 are mounted on an idler shaft 300 extending between the end plates 280 or may be mounted on stub shafts mounted on these end plates. Sprocket chains 302 pass over corresponding driving and idler sprocket wheels and the idler sprocket wheels may be adjustably mounted as described heretofore to maintain the chains taut. Storage pusher rods 304 are mounted on brackets carried by the chains 302 in the same manner as disclosed heretofore.

The delivery shelf or tray 306 of the vending mechanism shown in Fig. 8 includes an elongated metal strip or plate 308 mounted along the discharge end of the storage shelf 282 and supported on suitable brackets 310 secured to a front transverse frame member 312 which, in turn, is bolted or otherwise suitably secured to the end plates 280. A drive sprocket wheel 314 is fixed on a stub shaft 316 suitably journaled in bearings secured to the front transverse frame member 312 and to the end plate 280. A spur gear 318 on the shaft 316 meshes with a gear 320 fixed on a jack shaft 322 journaled in bearings 324 on the front frame member 312 and the end plate 280. A gear 326 on the other end of the jack shaft is meshed with a driving gear 328 fixed on the shaft of an electric delivery motor 330.

An idler sprocket 332 is rotatably mounted on a shaft 334 at the discharge end of the delivery shelf or tray and journaled in suitable bearings 335 on the front frame member 312 and secured to a supporting member or frame (not shown) beneath the metal strip 308. A sprocket chain 336 is passed over the sprocket wheels 314 and 332 and the latter may be slidably mounted to maintain the sprocket chain taut. A plurality of delivery pusher fingers 338 is secured to the chain 336 as explained heretofore and the fingers are secured against twisting by means heretofore set forth.

An idler sprocket wheel 340 is mounted on a shaft journaled in suitable bearings carried by the frame member 312 intermediate the ends of the delivery tray or shelf and the sprocket wheel 340 engages the upper reach of the chain 336 at this point. An indexing wheel 342 having apertures 344 spaced about its periphery is secured on the other end of the shaft carrying the sprocket wheel 340. A locking finger 346 is mounted within a solenoid 348 carried by the front frame member 312, and a spring normally urges the finger into engagement with one of the apertures 344 to insure stopping of the delivery mechanism in a proper predetermined position.

The vending mechanism further is provided with a control switch mechanism 350 similar to that heretofore described and including a control lever 352. An elongated switch actuating plunger 354 fits in a slot adjacent the discharge end of the delivery tray or shelf 306 and normally is held down in open position by a bottle 117 or other article about to be vended. The plunger 354 is spring urged upwardly and acts to close the switch with which it is associated when not held down by a bottle. It should be noted that the length of the plunger 354 is sufficient that it will be contacted by a bottle being moved into the last position on the delivery shelf as the bottle previously in that position is shifted from the delivery shelf.

The transfer mechanism

A transfer mechanism is provided for receiving a bottle from the delivery mechanism and shifting it to a position accessible to a purchaser upon opening of the delivery door 56. The construction of the transfer mechanism in the form of the invention shown in Figs. 3-7 and in the form of the invention shown in Fig. 8 is the same and I therefore have shown the transfer mechanism but once, namely in Fig. 8.

As a bottle or other article is pushed from the end of the delivery shelf or tray by one of the fingers 338, it is received on a transfer plate or platform 356 similar to that shown in the previous embodiment of the invention and extending forwardly to the inside of the delivery door 56. As a bottle passes on to the platform 356 it encounters a switch arm 358 which acts to open a switch 360 to stop the delivery motor as will be apparent hereinafter.

An angular transfer member 362 is slidably mounted on top of the transfer plate 356 by any desirable means. The shiftable transfer member 362 includes an upstanding wall 364 arranged along the edge of the plate or platform 356 longitudinally of the vending machine and carrying the switch 360, an upstanding wall 366 arranged transversely of the machine, and an upstanding wall 368 parallel to the wall 364 and offset therefrom. A pin 370 extends downwardly from the rear of the wall 366 through a slot 372 arranged longitudinally of the plate 356. The pin is pivotally received by the end of a link 374. The other end of the link is pivotally connected to an ear 376 near the bottom of the delivery door 56. The delivery door 56 is hingedly mounted on the same hinge members 38 as hinge the door 34 to the cabinet.

A pair of springs 378 extends rearwardly from the upstanding wall 366 of the transfer member 362. The springs are connected to a bracket 380 secured to a side wall 24 of the cabinet or to any other suitable fixed position, normally to maintain the transfer member in retracted position as shown in Fig. 8. It is apparent that opening of the door 56 will act through the link 374 to shift the transfer member 362 forwardly and thus push a delivered bottle immediately inside the delivery door 56 where it readily may be grasped by a purchaser. At this time the upstanding plate 368 is positioned in front of the delivery shelf to guard against the stealing of bottles by a person reaching into the interior of the cabinet through the delivery door. Preferably a switch is provided to prevent energization of the delivery motor with the delivery door 56 open, but such switch would be entirely conventional and it therefore has not been illustrated.

The limit of opening movement of the door 56 is determined by the pin 370 in the slot 372. The hinging of the delivery door 56 and the cabinet door 34 on the same hinge members allows the door 34 to be opened a sufficient distance for withdrawal of the vending mechanism with no tendency to pull the transfer member 362 too far forwardly.

Modifications of the transfer mechanism

Three modified transfer mechanisms are shown in Figs. 75

9-14. In these figures parts which are identical with those shown in Fig. 8 are identified by the same numerals as in that figure.

In Fig. 9, the transfer plate 356 is omitted and a swinging pocket 382 is pivoted on the vending mechanism by means of studs 384 received in suitable brackets 386 carried by the vending mechanism. The swinging pocket comprises a box-like structure having substantially square top and bottom walls 388 and 390, the square shape being modified slightly by an arcuate extension 392. The top and bottom walls are joined together by rectangular side walls 394, one of the side walls having an extending flange 396 cooperating with the arcuate extensions 392. The front and back of the swinging pocket 382 are open. Additional parts to be found on the swinging pocket include beads 398 formed by curving over the edges of one of the side walls 394 and a rearwardly extending flange 400 on the bottom wall 390 adapted for close positioning to the fingers 338 as they pass about the idler sprocket wheel 332. The pocket normally is held in the position shown in solid lines in Fig. 9 by coil springs on the pivot studs or by other suitable spring means.

The pocket 382 is adapted to swing about its pivot by a ram 402 comprising an upstanding, rear transverse plate 404, an upstanding, longitudinal side plate 406 having a transverse flange 408 with a rolled over bead 410 along its edge, and a second longitudinal plate 411. The ram is secured against vertical movement by suitable means such as a plate 412 suitably secured to the vending mechanism. The ram is provided on the rear of the transverse plate 404 with a plunger 414 mounted by means of a suitable bracket 416. The plunger is surrounded by a solenoid 418 and is provided at its end with a stop 420. The solenoid is adapted to be energized by a switch 422 carried in the door 34 adjacent the delivery door 56 and closed by opening of the door 56. Energization of solenoid 418 moves the ram 402 forwardly and the flange 408 and bead 410 engage one of the beads 398 and the side wall 394 of the swinging pocket to swing the pocket about its pivotal connections from the position shown in solid lines in Fig. 9 to that shown in dashed lines. The bottle of milk or other article then is positioned immediately inside the aperture of the delivery door 56 where it may be grasped by the purchaser. At the same time the side plate 411 of the ram seals off the end of the delivery tray and the back of the swinging pocket is closed by the ram 402 positively to preclude admission of a hand or the like to the delivery shelf. It will be appreciated that the ram 402 could be moved by a link rather than by the solenoid mechanism shown.

A further modified form of transfer mechanism is shown in Figs. 11 and 12. The transfer mechanism in this modification comprises a rotatable drum 424 rotatably mounted on suitable brackets 426 extending from the side wall 24 of the cabinet. The drum comprises a series of vertical walls 428 defining four bottle receiving pockets 430. The drum is provided with a top wall (not shown) and a bottom wall 432 secured to the vertical walls 428 by any suitable means. The pockets are spaced 90° from one another and the spaces between the pockets are closed in by arcuate wall sections 434. A bottle or other container shifted from the end of the delivery shelf or tray 306 by a finger 338 is received in one of the pockets 430 and it then is necessary to rotate the drum through 90° to bring a bottle into accessible position adjacent the delivery door 56.

Rotation of the drum is effected by opening of the delivery door 56. A link 436 is pivotally connected to an ear 438 on the inside of the door and is provided adjacent its other end with a rack 440. The rack 440 is provided at its outer end with a stop member 442, and a spring 444 is connected between this stop and the side wall 24 to maintain the rack in engagement with gear teeth 446 formed on the periphery of the outer element of a one-way clutch 448. The clutch has been shown as

being of the type having balls 450 which wedge into driving position between the outer clutch element 446 and the inner clutch element 452 when the outer element is driven in one direction and thereby to drive the inner element. When the outer element is driven in the other direction, it moves freely. The inner clutch element 452 is keyed to a shaft 454 extending from the bottom of the drum 424.

Opening of the door 56 causes the rack 440 to rotate the outer clutch element in the proper direction to rotate the drum through 90° to present the bottle to the purchaser. Movement of the rack along the gear teeth 446 is limited by the stop member 442 and this also limits the degree of opening movement of the door 56. It may be found desirable to provide a pawl and ratchet mechanism on the drum and a fixed point adjacent the drum to prevent retrograde movement of the drum through internal friction of the clutch when the delivery door is closed.

Another modification of the transfer mechanism is shown in Figs. 13 and 14 and comprises a drum 456 having two pockets 458 spaced from one another by 180°. Two links 460 and 462 are pivoted to an ear 464 on the door 56. The link 460 is provided with a rack 466 engaging the external teeth of a one-way clutch 468 similar to that described with regard to Figs. 11 and 12 for rotating the drum through 90° as the door 56 is opened. The link 462 is provided with a rack 470 engaging the external teeth of a one-way clutch 472 adapted to rotate the drum through another 90° as the door 56 is closed. The links are provided with stop members 474 and 476, and a spring 478 is stretched between the racks in engagement with the teeth of the one-way clutches. It will be obvious that the inner elements of the clutches 468 and 472 are fixed to the drum shaft 480.

THE ELECTRICAL CIRCUIT

An electrical circuit for use with the modified form of my invention as shown in Fig. 8 is illustrated in Fig. 17. The usual alternating current input connections are illustrated at 482 and 484. From the input connection 482 a line leads to an empty switch 486 forming a portion of the control switch mechanism 350. This switch is held closed by abutment of the switch control or actuating arm or lever 352 against bottles on either the delivery shelf or tray 306 or bottles on the storage shelf or tray 282 and opens when no bottles are encountered by this arm. A wire 488 leads from the switch 486 to the switch 360 adjacent the transfer mechanism.

A wire 490 leads from the switch 360 to a first coin switch 492 and a wire 494 leads from this switch to a relay coil 496. A wire 498 leads from the relay coil 496 to the coil of the solenoid 348 controlling the indexing of the delivery fingers. The other end of the solenoid 348 is connected to a wire 500 leading to the input connection 484.

Relay contacts 502 are connected in parallel with the first coin switch 492 by means of wires 504 and 506. These contacts normally are open and are closed by energization of the relay coil 496.

A wire 508 leads from the wire 490 to a second coin switch 510. Both the first and second coin switches are of the type closed momentarily by passage of a coin through the coin switch mechanism 58 after the coin has passed all of the various slug rejecting devices. A wire 512 connects the second coin switch 510 to a relay coil 514 and a wire 516 runs from the relay coil to the delivery motor 330. The other side of the delivery motor is connected to the wire 500 by wire 518.

Relay contacts 520 are connected in parallel with the second coin switch 510 by means of wires 522 and 524. The contacts 520 normally are open and are closed by energization of the relay coil 514.

The circuit of Fig. 17 is completed by a wire 526 leading from the wire 488 to a switch 528 actuated by

the switch plunger 354 at the discharge end of the delivery shelf or tray. A wire 530 leads from the switch 528 to the storage motor 296 and the circuit to the storage motor is completed by the wire 532 leading to the wire 506.

Another form of electrical circuit for use with the embodiment of the vending mechanism shown in Figs. 3-7 is illustrated in Fig. 18.

The usual input contacts are identified as 534 and 536. A wire 538 leads from the contact 534 to the empty switch 270. A wire 540 leads from the empty switch 270 to a switch 542 opened by a bottle shifted on to the transfer mechanism. The switch 542 may be similar to the switch 360 illustrated with regard to the modified form of the vending mechanism.

A wire 544 leads from the switch 542 to a coin switch 546 and the switch is connected by means of a wire 548 to a relay coil 550. A wire 552 leads from the relay coil to the motor 178 and the other side of the motor is connected by a wire 554 to the input connection or contact 536.

Switch contacts 556 are connected in parallel with the relay coil 550 by means of wires 558 and 560. These switch contacts normally are open and are closed by energization of the coil 550.

Operation

Operation of the embodiment of the invention shown in Figs. 3-7 and the schematic wiring diagram of Fig. 18 will be explained first.

Before the vending mechanism shown in Fig. 3 is operated, the storage tray or shelf 66 and the delivery tray or shelf 86 will be completely filled with bottles 117, some of these bottles being indicated in Fig. 3 in dashed lines. The storage shelf holds four transverse rows of bottles arranged in nine longitudinal columns, making 36 bottles in all. The delivery shelf holds one row of nine bottles, the vending mechanism thus holding 45 bottles when full.

A coin dropped in one of the coin mechanisms 58 and clearing the various slug rejectors closes the coin switch 546 momentarily before dropping into a coin storage box. This completes the following circuit: from lead-in connection 534 through wire 538 to empty switch 270, through wire 540 and switch 542 to wire 544, through coin switch 546 and relay coil 550, through wire 552 to motor 178 and through wire 554 to lead-in connection 536. Energization of the relay coil 550 closes switch contacts 556 and the circuit is continued as set forth above with the substitution of relay contacts 556 and wires 558 and 560 for the coin switch 546, the latter opening after passage of the coin.

The motor then runs and acts through the gear train set forth in detail heretofore to drive the driving gear or wheel 208. The first set of external teeth 216 engages the spur gear 222 and acts through the gear train set forth heretofore to advance the delivery pusher fingers 156 a distance equal to the spacing between them and thereby to shift the first bottle 117 from the delivery tray or shelf 86 on to the transfer plate or platform 170. Movement of the bottle 117 all of the way on to the transfer plate or platform 170 causes the bottle to engage a proper switch actuating means (such as the switch arm 358 in the embodiment shown in Fig. 8) to open the switch 542. This de-energizes the motor and the relay coil 550 and the de-energization of the latter allows the relay contacts 556 to open. The spring urged indexing mechanism 130 causes the pusher fingers 156 to stop in the proper position after de-energization of the motor 178. Opening of the delivery door 56 causes the bottle 117 to be shifted forwardly or to be rotated into position (depending upon which embodiment of the transfer mechanism is utilized) where it readily may be grasped by the hand of the purchaser. The door is spring urged into closed position

when released by the purchaser and another vending operation can be carried out as just described.

After all of the nine bottles on the delivery tray or shelf have been vended and the particular vending lever or mechanism again is actuated, the internal gear teeth 218 of the driving plate or gear 208 will engage the gear 232 to drive it a sufficient distance to act through the gear 236 to shift the storage pusher rods 116 a distance equal to the spacing between them and thereby to shift another row of nine bottles on to the delivery tray or shelf 86. The motor continues to run and the first set of external gear teeth 216 engages the gear 222 to drive the pusher fingers 156 and thereby to shift a bottle on to transfer plate 170 as described heretofore, operation of the motor being terminated by opening of the switch 542 by the bottle delivered.

After all of the bottles on the storage shelf have been shifted on to the delivery shelf and vended, the control arm 252 is freed from the restraining influence of the bottles and swings out past the delivery shelf and over the storage shelf a sufficient distance for the stop arm 268 to engage the switch actuating button or plunger 272 and thereby to open the switch 270. The vending mechanism then cannot be actuated again until it is refilled. It will be appreciated that the capacity of the vending mechanism is sufficiently high that the mechanism generally will be refilled before it is completely empty. The refilling generally will be carried out by transferring bottles from the refrigerated portion of the cabinet under portion or base 30 on to the vending mechanism, such transferring being materially aided by sliding the mechanism forward on its slidable mount, and then placing fresh bottles in the refrigerated portion of the base.

Reference next should be had to Figs. 8 and 17 for a description of the operation of the modified form of my invention.

Before the first vending operation the storage shelf 282 and delivery shelf 306 are filled with bottles, the combined capacity being 45 bottles as in the first embodiment. Acceptance of a coin by the coin receiving mechanism 58 causes the first coin switch 494 to be closed momentarily. This completes a circuit as follows: from the input contact or connection to the empty switch 486, through the wire 488 and switch 360 to wire 490, through the first coin switch 492 and wire 494 to relay coil 496, through wire 498 and solenoid 348 and through wire 500 back to the input connection or contact 484. Energization of the relay coil 496 closes the relay contacts 502 and substitutes the contacts 502 and wires 504 and 506 for the coin switch 492 as the coin passes on and the coin switch opens. Energization of the solenoid 348 retracts the indexing finger 346 from the indexing wheel 342 and the delivery pusher fingers 338 then are free to be advanced as long as the solenoid 348 remains energized.

After the coin leaves the first coin switch 492 it momentarily closes the second coin switch 510. This completes the following circuit: from input contact or connection 482 through empty switch 486 to wire 488, through switch 360 and wires 490 and 508 to the second coin switch 510, through relay coil 514 and wire 516 to the delivery motor 330, and through wires 518 and 500 back to the input contact or connection 484. Energization of relay coil 514 closes switch contacts 520 and these contacts and wires 522 and 524 are substituted in the foregoing circuit for wire 508 and the second coin switch 510 as the latter opens following passage of the coin.

The delivery motor 330 then runs to shift the delivery pusher fingers 338 and thereby to shift the first bottle 117 from the delivery shelf on to the transfer plate or platform 356 where the bottle encounters the switch arm 358 to open the switch 360. Opening of the switch 360 de-energizes the delivery motor 330 and also de-energizes the indexing solenoid 348. The indexing finger 346 then

is spring urged forwardly into one of the apertures 344 spaced about the periphery of the indexing wheel 442 to stop the pusher fingers 338 in proper position without coasting. It will be noted that the switch actuating plunger 354 set in the metal sheet 308 of the delivery shelf is long enough to be held depressed by the next succeeding bottle before the bottle being vended passes from it so that the switch 528 remains open.

The switch contacts 528 are closed as the plunger 554 moves upwardly under the impetus of its spring following vending of the ninth and last bottle on the delivery shelf. A circuit then is completed from the input connection or contact 482 through empty switch 486 and wires 488 and 526 to the switch contacts 528, through the wire 530 to storage motor 296, and through wires 532 and 500 to the input connection or contact 484. The storage motor then runs to shift the first row of bottles from the storage shelf on to the delivery shelf. The plunger 354 is depressed by one of the bottles in this row to open the switch contacts 528, and the vending mechanism again is ready to deliver a bottle upon receipt of a coin.

A suitable indexing mechanism such as the solenoid mechanism shown in Fig. 8 or a spring pressed ball as shown in Fig. 4 could be used to stop the storage mechanism without coasting, but the storage mechanism generally works against a relatively heavy load and will stop by itself without undue coasting.

It will be appreciated that a second set of switch contacts could be actuated by the rising of plunger 354 to prevent the coin mechanism from accepting a coin until the next row of bottles has been moved into proper position. The connections would vary slightly depending upon the specific coin mechanism employed and are well within the scope of a skilled mechanic. When both the delivery shelf and storage shelf are emptied, the switch arm 352 is free to swing out past the delivery shelf and over the storage shelf. This opens the empty switch 486 and the vending mechanism cannot again be energized until it has been refilled. Preferably, the coin receiving mechanism is of the type adapted to reject a coin and the mechanism is conditioned to reject a coin upon opening of the empty switch 486. The details of the rejecting mechanism and wiring therefor will vary with the specific coin mechanism used and are within the scope of a skilled mechanic.

It will be apparent that the objects of this invention have been attained. A new or improved vending machine having greatly increased capacity has been shown. The machine is particularly adapted to dispense bottles of milk or the like, but readily may be used to dispense other relatively compact packaged articles. The plurality of similar vending mechanisms provides a choice of bottles filled with various milk products such as whole milk, buttermilk, or chocolate flavored milk drink. Several new or improved mechanisms have been disclosed for transferring bottles or other articles from the interior of a vending machine cabinet and primarily usable with the vending mechanisms disclosed, but having utility in themselves.

Although certain specific embodiments of my invention have been shown and described, it will be apparent that the embodiments are for illustrative purposes only and that my invention includes all that falls within the spirit and scope of the appended claims.

I claim:

1. A vending machine comprising elongated delivery means, storage means arranged laterally of said elongated delivery means and adapted to support a plurality of articles to be vended, means for shifting a predetermined number of articles from said storage means on to said elongated delivery means, means for shifting articles along said elongated delivery means to vend the articles, means including first operable means for driving said first

named article shifting means, means including second operable means for driving said second article shifting means, a power source, an angularly turnable means driven by said power source, and a first set of actuators on said angularly turnable means for engaging said first operable means and a second set of actuators on said angularly turnable means for engaging said second operable means, said sets of actuators engaging the associated operable means in predetermined sequence to effect shifting of articles from said delivery means and a shifting of articles from said storage means on to said delivery means to refill said delivery means.

2. A vending machine comprising elongated delivery means, storage means arranged laterally of said elongated delivery means and adapted to support a plurality of articles to be vended, means for shifting a predetermined number of articles from said storage means on to said elongated delivery means, means for shifting articles along said elongated delivery means to vend the articles, means including a first gear for driving said first named article shifting means, means including a second gear for driving said second article shifting means, a driving motor, a rotary drive member driven by said motor, a plurality of spaced groups of gear teeth positioned about the periphery of said drive member and adapted periodically to mesh with the second gear to drive the same through a predetermined rotative movement to shift articles from said elongated delivery means, and a group of gear teeth positioned interiorly of the drive member and adapted periodically to mesh with said first gear to drive the same through a predetermined rotative movement to shift articles from said storage means on to said elongated delivery means.

3. A vending machine comprising storage means, delivery means, means for shifting articles from said storage means to said delivery means, means for shifting articles from said delivery means to vend said articles, a single member positioned adjacent said delivery means and said storage means and movable to a position thereover in the concurrent absence of articles therefrom to detect the concurrent absence of articles from both said delivery means and said storage means, and means responsive to said single member upon detection of such absence to render both of said article shifting means inoperative.

4. In a vending machine, the combination of a delivery plate, a plurality of delivery pusher fingers adapted to be moved periodically along said delivery plate while oriented crosswise thereof, means for stopping said delivery pusher fingers in predetermined positions, a storage feed plate, a plurality of members extending transversely across said storage plate and shiftable longitudinally of said plate to slide a plurality of articles therealong and on to said delivery plate, and a plurality of spacer members aligned with the predetermined stopping positions of said delivery pusher fingers for properly aligning articles with the spaces between said delivery pusher fingers, said spacer members extending longitudinally of said storage plate and spaced thereabove to support said transversely extending members.

5. A vending machine as set forth in claim 4 wherein the means for stopping the delivery pusher fingers in predetermined position includes a spring urged indexing mechanism.

6. A vending machine as set forth in claim 4 wherein the means for stopping the delivery pusher fingers in predetermined position includes an electro-magnetically operated indexing mechanism.

7. In a vending machine, the combination of delivery means adapted to support a plurality of articles to be vended, means for shifting articles along said delivery means to vend said articles, a motor for operating said last named means, an indexing mechanism including an electro-magnetically retractable member, a first coin actuated switch, a second coin actuated switch, circuit means interconnecting said first coin actuated switch and

said indexing mechanism to retract said retractable mechanism upon operation of said first switch by a coin, and circuit means interconnecting said second coin switch and said motor to actuate said motor upon operation of said second coin actuated switch by said coin.

8. In a vending machine, the combination comprising elongated delivery means, means for shifting articles along said delivery means to vend said articles, a motor for operating said last named means, an indexing mechanism including an electro-magnetically retractable member, a first coin actuated switch, a second coin actuated switch, circuit means interconnecting said first coin actuated switch and said indexing mechanism to retract said retractable mechanism upon operation of said first switch by a coin, and circuit means interconnecting said second coin switch and said motor to actuate said motor upon operation of said second coin actuated switch by said coin.

9. A vending machine comprising an elongated delivery plate, means defining a channel extending longitudinally along one edge of said delivery plate, endless flexible means having a reach spaced above said plate and arranged longitudinally of said delivery plate in close proximity thereto, a plurality of article advancing fingers each secured at one end to said endless flexible means and extending over said delivery plate to advance articles therealong, means for periodically driving said endless flexible means to advance said articles, and flange means extending transversely of said fingers and fitting within said channel to guide said fingers and maintain proper orientation thereof.

10. A vending machine comprising a casing having a delivery aperture, a closure member over said aperture, means for supporting a plurality of articles within said casing, means for transferring an article to be vended from said supporting means to said aperture, said transferring means including a supporting plate and an article pusher member slidable over said plate, and means for shifting said pusher member in response to opening movement of said closure member, said pusher member including a portion shielding said supporting means from said aperture when said closure means is opened.

11. In a vending machine, the combination of a casing, a horizontally disposed storage member within the casing adapted to support a plurality of articles, a horizontally extending delivery member within said casing substantially in the same horizontal plane as the storage member and at right angles thereto, means for shifting rows of articles from said storage member onto said delivery member, and a rotatable drum positioned adjacent said delivery member for receiving articles therefrom, and means for rotating said drum to shift a received article to a position accessible to a purchaser.

12. In a vending machine, the combination of a casing having a delivery aperture therein, storage means within said casing adapted to support a plurality of articles, delivery means within said casing, means for shifting rows of articles from said storage means onto said delivery means, a delivery drum rotatably mounted adjacent said delivery means and the aperture in said casing, said drum having a plurality of article receiving recesses, and means for rotating said drum to shift a recess from article receiving position adjacent said delivery means to a position adjacent said aperture accessible to a purchaser.

13. A vending machine comprising elongated delivery means, storage means arranged laterally of said elongated delivery means and adapted to support a plurality of articles to be vended, means for shifting a predetermined number of articles to be vended from said storage means onto said elongated delivery means, means for shifting articles along said elongated delivery means to vend the articles, a drive motor, and a plurality of disconnectable drive means interconnecting said drive motor and both of said article shifting means, only one of said discon-

15

nectable driving means being in driving engagement at any one time to drive either of the article shifting means for sequentially delivering articles to be vended from said delivery shelf and shifting articles from said storage shelf onto said delivery shelf.

14. A conveying mechanism comprising a first conveyor means adapted to support a plurality of articles, second conveyor means adapted to support a plurality of articles and positioned to shift articles on to said first conveyor means, means including first operable means for driving said first conveyor means, means including second operable means for driving said second conveyor means, a power source, angularly turnable means driven by said power source, and a first set of actuators carried by said angularly turnable means for sequentially operating said first operable means a plurality of times to advance said first conveyor means a predetermined number of steps and a second set of actuators carried by said angularly turnable means thereafter engaging said second operable means to operate said second operable means to advance said second conveyor means to shift articles on to said first conveyor means.

15. A vending machine comprising a casing having a delivery aperture, a closure member for said aperture, means for supporting a plurality of articles within said casing, a rotatable mechanism for transferring articles one by one from said supporting means to said aperture to vend said articles, said rotatable mechanism including a rectangular pocket open on two sides to receive and discharge an article, and means for rotating said rotatable mechanism in response to opening of said closure member including reciprocable means abutting said pocket

16

and having a portion guarding said supporting means from said aperture.

16. A vending machine comprising a casing having a delivery aperture, a closure member for said aperture, means for supporting a plurality of articles within said casing, a rotatable mechanism for transferring articles one by one from said supporting means to said aperture to vend said articles, said rotatable mechanism including a cylindrical drum having a plurality of article receiving apertures, and means for rotating said drum in response to opening of said closure member including means for shifting one of the drum apertures from adjacent the supporting means to a position adjacent the delivery aperture and shifting another drum aperture into article receiving position adjacent said supporting means.

References Cited in the file of this patent

UNITED STATES PATENTS

20	Re. 18,059	Cope	May 5, 1931
	1,200,244	Sears	Oct. 3, 1916
	1,200,508	Lister	Oct. 10, 1916
	1,264,180	Harris	Apr. 30, 1918
25	1,355,488	McKenney	Oct. 12, 1920
	1,572,263	Ash	Feb. 9, 1926
	1,949,040	Clausen	Feb. 27, 1934
	1,994,745	Baker	Mar. 19, 1935
	2,233,379	Cope	Feb. 25, 1941
30	2,280,323	Tone	Apr. 21, 1942
	2,436,223	Newcomer	Feb. 17, 1948
	2,632,681	Newcomer	Mar. 24, 1953