Nov. 22, 1966 A. R. GROSS 3,286,880

DISPENSING DEVICE FOR VENDING MACHINES

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FIG. 1

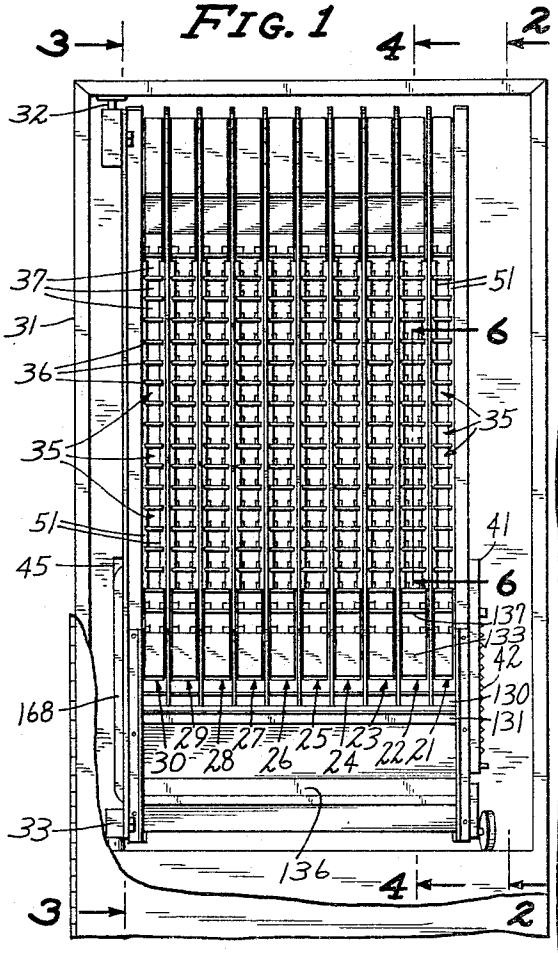


FIG. 6

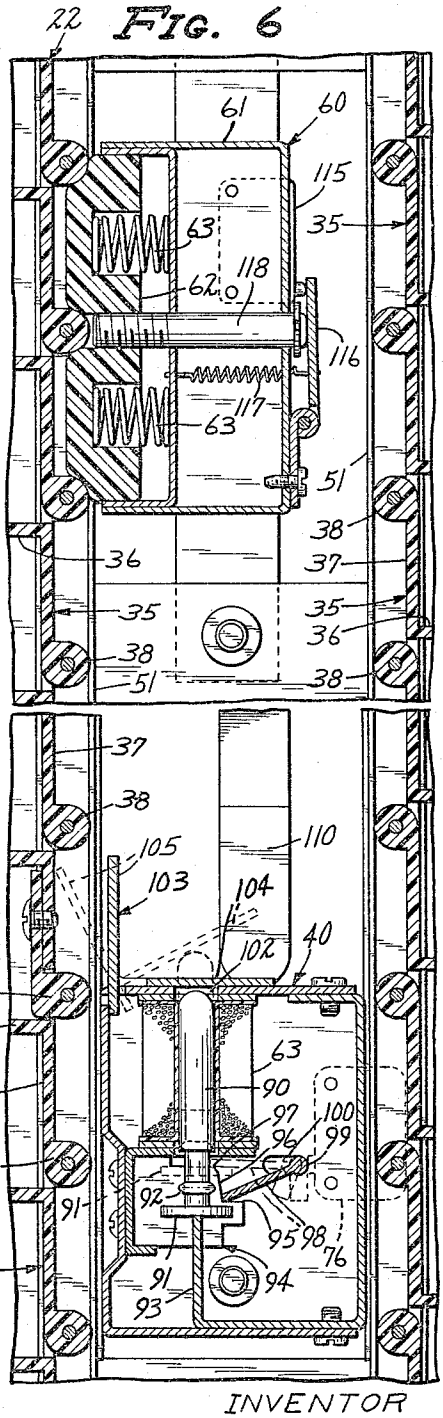
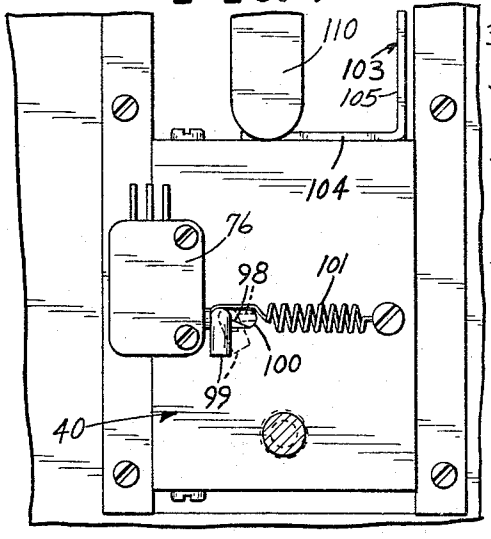


FIG. 7



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FIG. 2

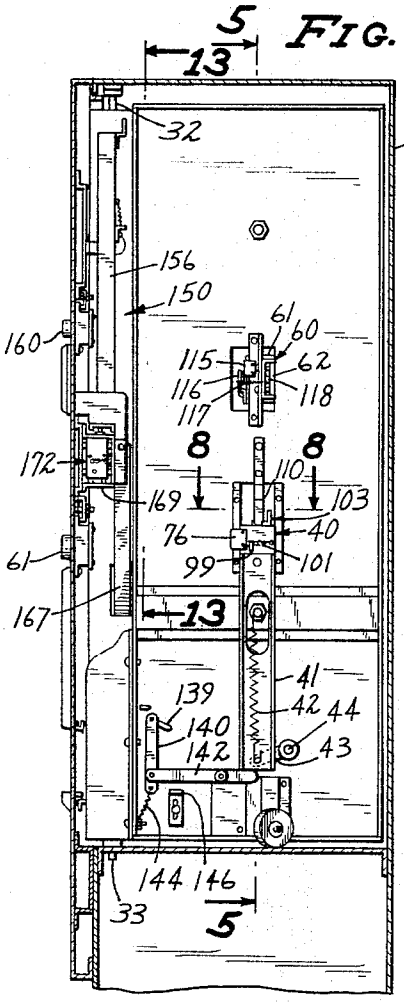


FIG. 3

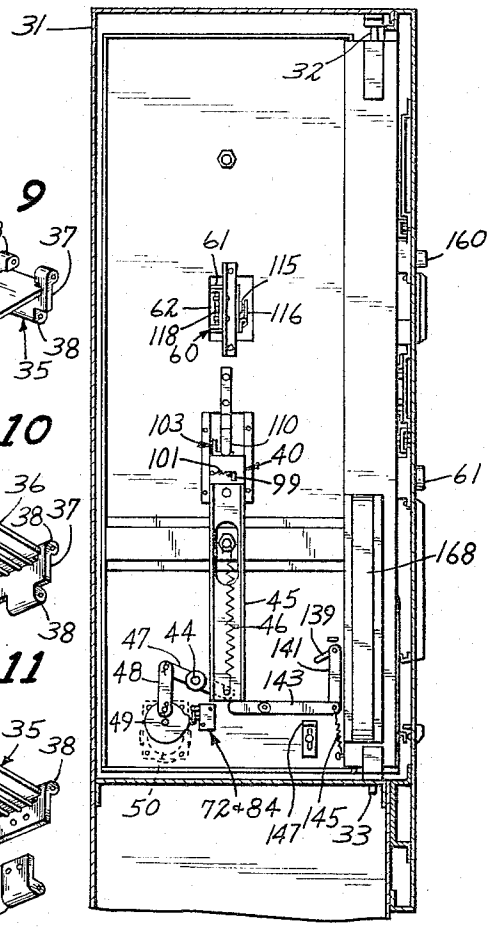


FIG. 9

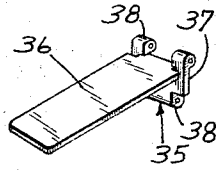


FIG 10

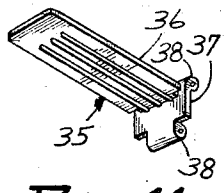


FIG. 11

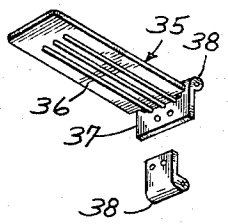
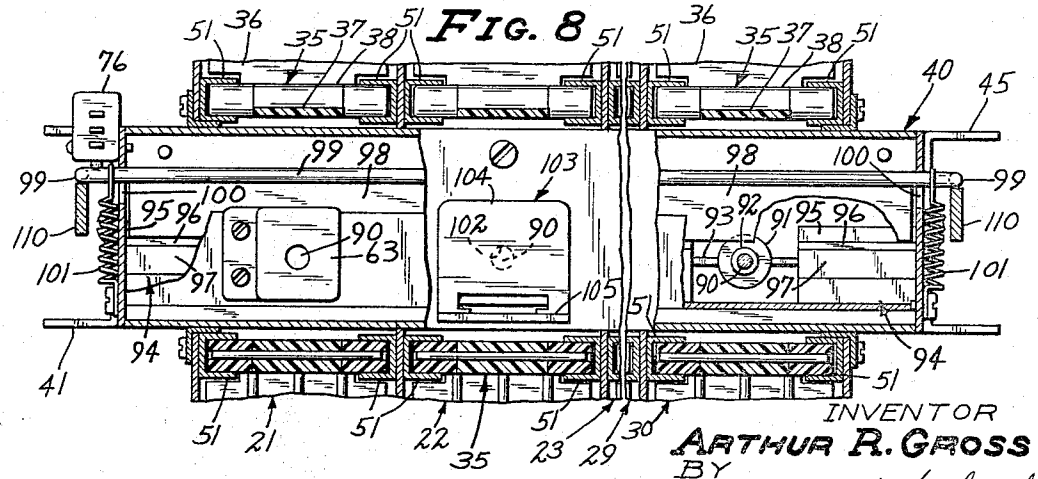


FIG. 8



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FIG. 4

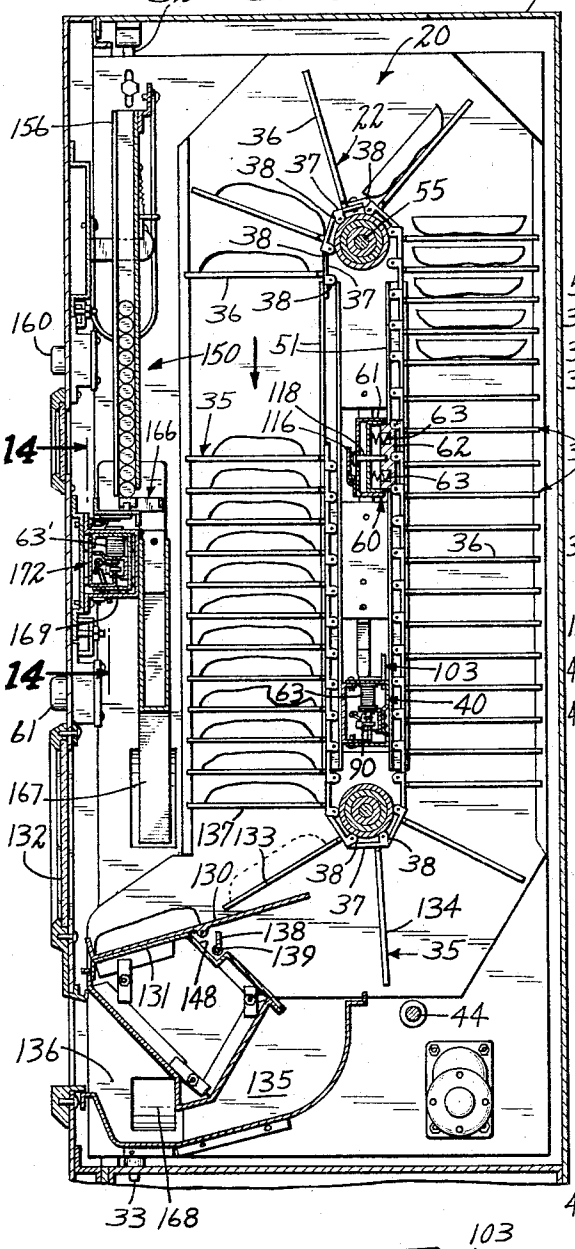


FIG. 5

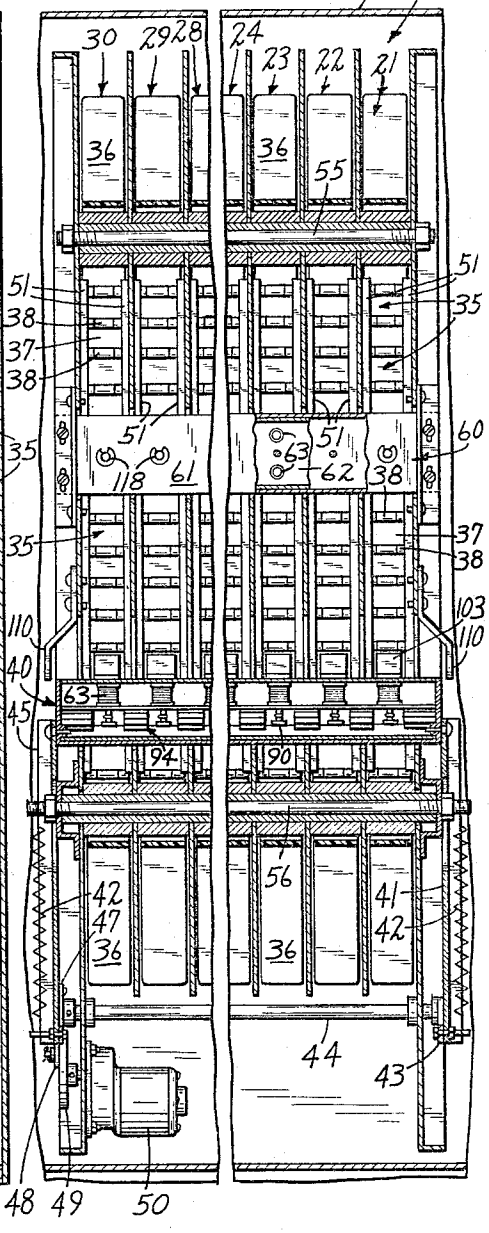
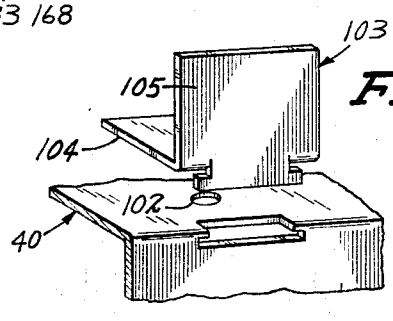


FIG. 12



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FIG. 13

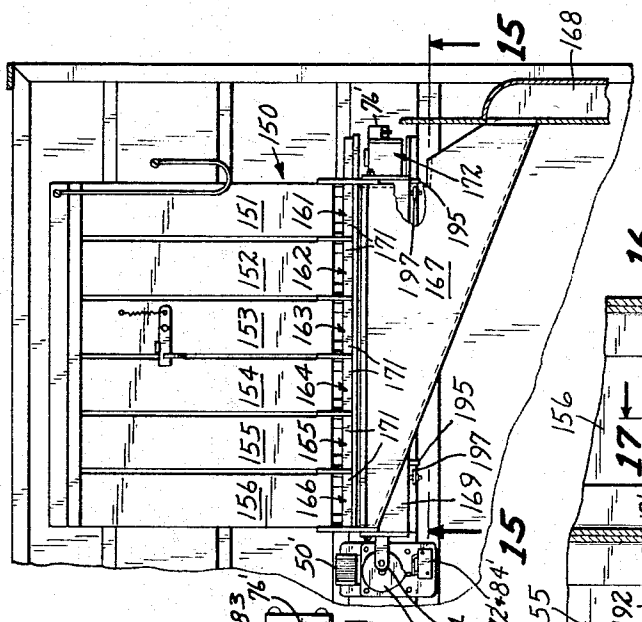


FIG. 14

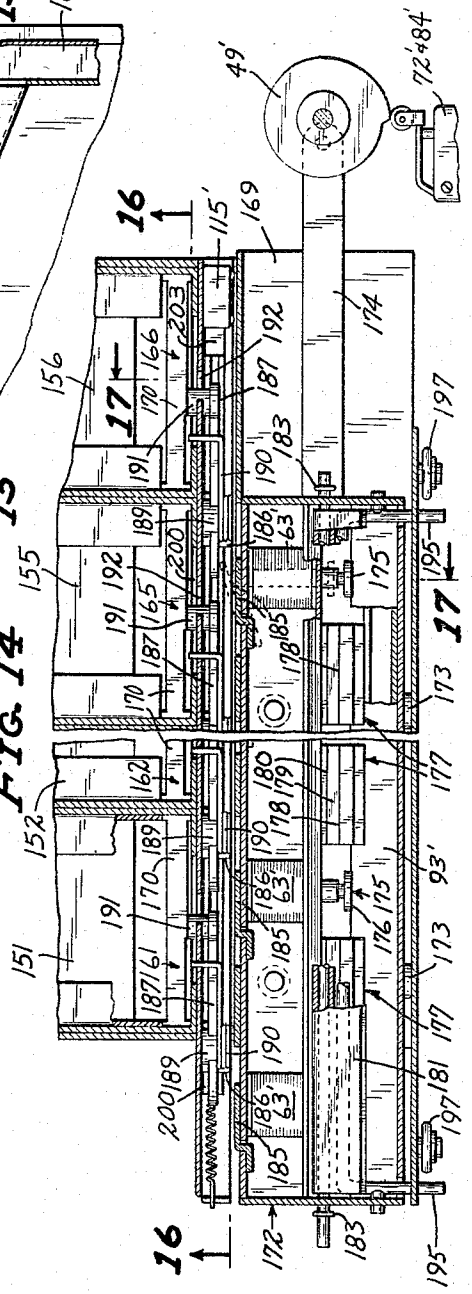
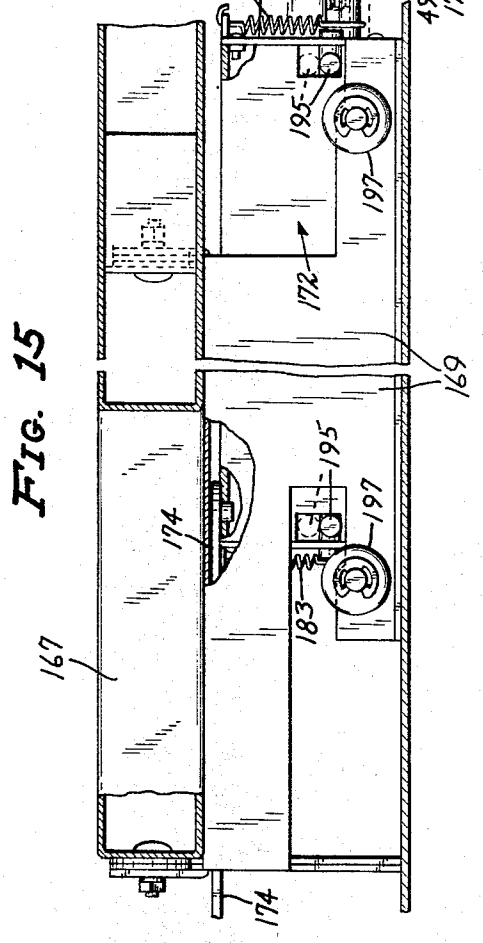


FIG. 15



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FIG. 16

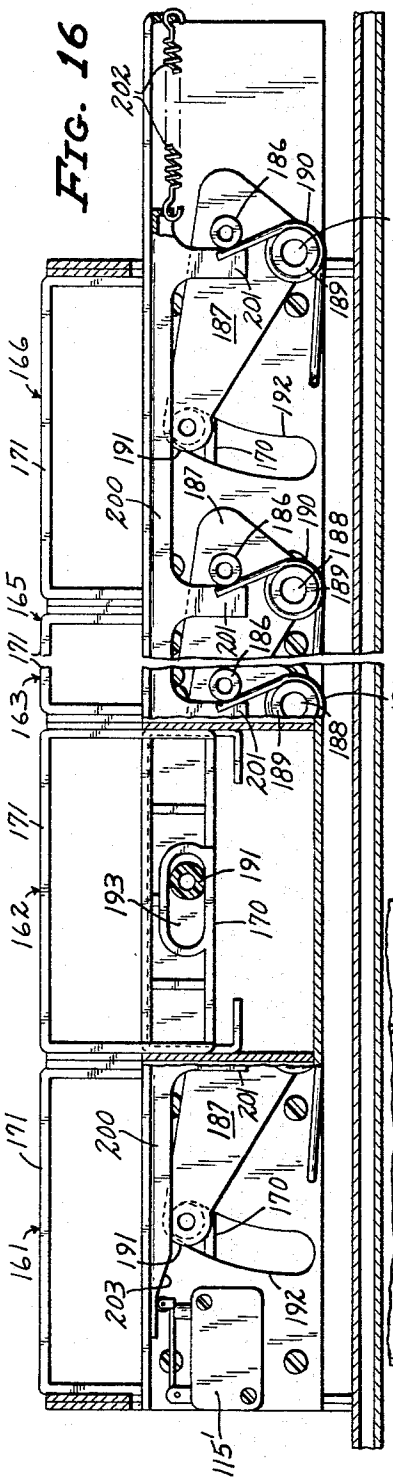


FIG. 18

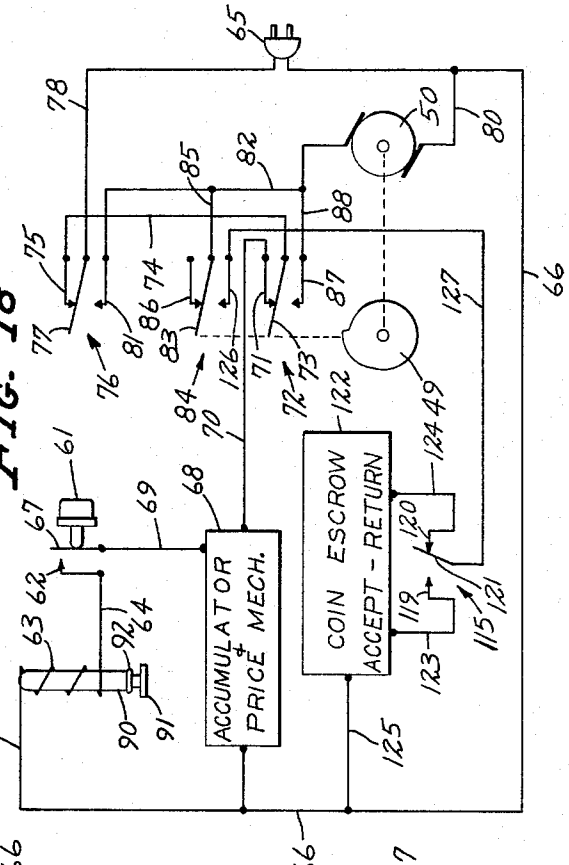
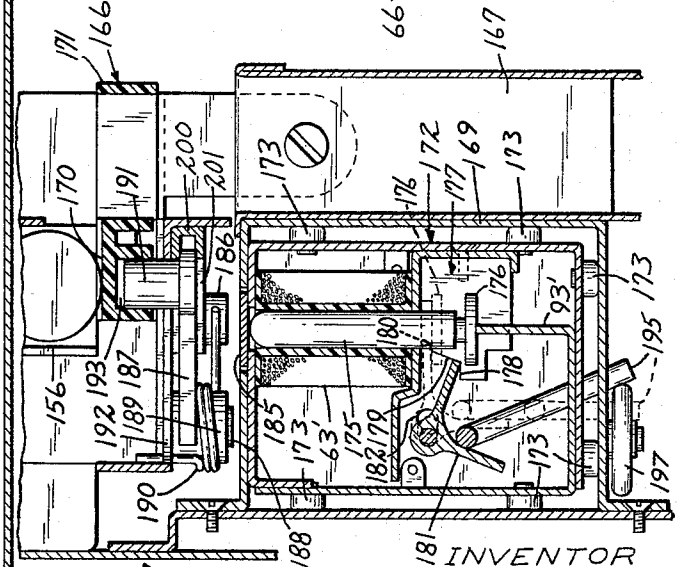


FIG. 17



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United States Patent Office 3,286,880 Patented Nov. 22, 1966

3,286,880

DISPENSING DEVICE FOR VENDING MACHINES

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Filed Nov. 18, 1964, Ser. No. 412,157
7 Claims. (Cl. 221—82)

This invention pertains to an improved dispensing device for vending machines and more particularly to an improved and simplified apparatus for selectively dispensing a unit of merchandise from a plurality of stored units with a maximum of reliability.

In prior art devices the dispensing apparatus for vending machines is either extremely complicated or unreliable. In vending machines it is extremely important that each time a unit of merchandise is selected by a customer a unit is received but no more than that unit is dispensed. In order to provide the degree of reliability required and the assurance that merchandise could not be obtained through tampering rather than purchase, prior art devices are extremely complicated mechanisms with a great many moving parts.

Prior art devices also include machines which are strictly mechanical and in which the operator provides the force to actuate the machine. These machines in general are unsatisfactory because they are subject to jamming if the operator does not move the levers far enough and they are subject to excessive wear if the operator moves the levers too far and with too much force. Thus, the present apparatus is actuated by electrical means and the operator simply depresses a buton to obtain the desired merchandise. Because the machine provides its own activation the movement is always uniform and therefore highly reliable and with a minimum of wear.

In the present invention a variety of articles, such as different brands of candy bars, are stored in a plurality of vertical magazines having a dispensing device associated with each one thereof. In one embodiment the magazines each include an endless belt having a plurality of uniformly spaced trays rigidly mounted thereon perpendicular to the belts. Each tray then carries a unit of merchandise which simply slides off the tray as the endless belt moves around a lower pulley and the tray becomes vertical rather than horizontal. Prior to the unit sliding off the tray the preceding tray engages a pivotally mounted receiving tray which already has the unit from the preceding tray lying thereon. Upon engagement of the preceding tray with the receiving tray that tray is tilted to allow the unit thereon to slide into a chute leading to an externally accessible slot in the front of the machine. As the endless belt rotates the preceding tray is disengaged from the receiving tray and subsequently the unit on the next tray slides onto the receiving tray returning it to its normal position.

In a second embodiment all of the units of merchandise are stacked in vertical piles in the various magazines. At the bottom of the magazine with the vertical pile resting on a solid portion thereof is a slidably mounted tray having an opening therein approximately the size of one unit of merchandise. To dispense a unit the tray is slid from its normal position to a second position in which the bottom unit of the vertical stack drops into the opening in the tray. The tray is then returned to its normal position at which time the vertical stack again rests on the solid portion of the tray and the bottom unit, which was in the opening in the tray, is dropped into a chute that connects to an externally accessible slot.

In both embodiments a carriage mounted for reciprocating motion is operatively connected to motive means, such as an electric motor. Electric switches, such as

push buttons, associated with each of the magazines complete an electrical circuit to the electric motor and a connecting means for each of the magazines. The electric motor when energized moves the carriage through a single reciprocation while the connecting means connects the carriage to the dispensing apparatus connected to the magazine associated with the button depressed. As will become apparent from the disclosure the various apparatus is completely reliable and cannot foul or jam.

It is an object of this invention to provide an improved vending machine.

Another object of this invention is to provide a vending machine which is extremely reliable.

Another object of this invention is to provide a vending machine having a minimum of moving parts.

These and other objects of this invention will become apparent to those skilled in the art upon consideration of the accompanying specification, claims, and drawings.

Referring to the drawings, wherein like characters indicate like parts throughout the figures:

FIG. 1 is a view in front elevation of my dispensing device with portions thereof broken away;

FIG. 2 is a view in vertical section as seen from the line **2—2** in FIG. 1;

FIG. 3 is a sectional view as seen from the line **3—3** in FIG. 1;

FIG. 4 is an enlarged sectional view as seen from the line **4—4** in FIG. 1;

FIG. 5 is an enlarged sectional view as seen from the line **5—5** in FIG. 2, portions thereof broken away and shown in section;

FIG. 6 is a greatly enlarged view shown in section as seen from the line **6—6** in FIG. 1;

FIG. 7 is an enlarged fragmentary detailed view of a portion shown in FIG. 2;

FIG. 8 is a greatly enlarged horizontal view in section as seen along the line **8—8** in FIG. 2, portions broken away and shown in section;

FIGS. 9 and 10 are views in perspective of a single link and tray;

FIG. 11 is a perspective view of a connecting link and tray;

FIG. 12 is a fragmentary detailed view in perspective of a portion of the carriage shown in FIG. 8;

FIG. 13 is a fragmentary view in elevation as seen generally from the line **13—13** in FIG. 2 illustrating a modified embodiment of the invention, portions thereof broken away;

FIG. 14 is an enlarged sectional view as seen from the line **14—14** in FIG. 4, portions thereof broken away;

FIG. 15 is a greatly enlarged sectional view as seen from the line **15—15** in FIG. 13, portions thereof broken away and shown in section;

FIG. 16 is an enlarged view in section along the line **16—16** in FIG. 14, portions thereof broken away and shown in section;

FIG. 17 is an enlarged sectional view taken along the irregular line **17—17** in FIG. 14; and

FIG. 18 is a schematic diagram of the electrical circuitry.

In FIG. 1 portions of the machine are broken away so that the subcomponent **20** can be seen. In the present embodiment the subcomponent **20** includes a plurality of magazines **21** through **30** which are utilized to store units of merchandise such as candy bars or the like. Subcomponent **20** is attached to the outer case **31** by means of a pair of hinges **32** and **33** so that the subcomponent is accessible for replenishing with merchandise and/or repairs. Each of the magazines **21** through **30** includes an endless belt having a plurality of trays uniformly spaced thereon and rigidly mounted perpendicular thereto each of which holds a unit of merchandise.

As can be seen in FIGS. 9, 10 and 11 the endless belts are comprised of a plurality of links **35** which are somewhat L-shaped with the long arm **36** of the L forming a paddle-shaped tray while the shorter arm **37** is actually a link in the endless belt. Each of the links **35** are constructed with a knuckle **38** on either end of the shorter arm **37** which interlock with a knuckle on the next link. The knuckles of two adjacent links are joined by a pin therethrough and form a pivotal joint so that once all of the links are connected together they form a flexible belt. The two ends of the belt are joined together by a link such as shown in FIG. 11 which is substantially similar to the other links except that the lower knuckle is separate and adapted to be bolted to the upper knuckle and tray assembly.

FIGS. 2 and 3 are a left side view and a right side view of the subcomponent **20** respectively. The left end and the right end of a carriage **40**, which passes through the subcomponent **20** between the endless belts or magazines **21** through **30** and in a direction parallel to the axis of rotation of said belts shown in FIGS. 2 and 3 respectively. The carriage **40** is slidably mounted in the subcomponent **20** for limited vertical movement. The right end of the carriage **40**, shown in FIG. 2, has rigidly attached thereto one end of a vertical connecting member **41**. Connecting member **41** has a spring **42** attached between it and the case of the subcomponent **20** which tends to bias the connecting member **41** and the carriage **40** upward. The other end of the connecting member **41** is rotatably attached to one end of a crank arm **43** the other end of which is fixedly attached to a rotatably mounted shaft **44**.

The left-hand side of the carriage **40**, shown in FIG. 3, is fixedly attached to one end of a vertical connecting member **45**, which is similar to the connecting member **41** and has a spring **46** attached thereto biasing it upward as previously explained for the spring **42**. The other end of the connecting member **45** is rotatably attached to one end of a bell crank arrangement composed of a first member **47**, which is fixedly attached at its center to the rotatably mounted shaft **44**, and a second or linking member **48**, which has one end rotatably mounted to the other end of the member **47**. The other end of the bell crank, which is the other end of the linking member **48**, is rotatably attached to a cam **49** for eccentric motion. The cam **49** is fixedly attached to the shaft of a motor **50**, shown in dotted lines, and rotates with the motor **50** when the motor is energized.

Thus, when the motor **50** is energized the cam **49** rotates and the bell crank eccentrically attached thereto causes the shaft **44** and the members **47** and **43** to push the connecting members **45** and **41** upwards, thereby moving the carriage **40** upward. As the cam **49** rotates the carriage **40** moves vertically in a reciprocating motion.

FIG. 4 illustrates the relationship of the carriage **40** to the endless belts in the various magazines. The endless belt **22**, shown in FIG. 4, is utilized as an example of typical operation and all of the belts **21** through **30** operate in a similar fashion. A pair of shafts **55** and **56** pass through the subcomponent **20** and have the endless belts **21** through **30** mounted thereon for rotation. It will be noted that each of the belts **21** through **30** are provided with opposed guide channels **51** which receive opposite edges of the short legs **37** and knuckles **38** of that portion of the belts **21** through **30** disposed between the shafts **55, 56**. With this arrangement the paddles **36** associated with the legs **37** and knuckles **38** received in the channels **51** are maintained in an article supporting, horizontal position. The shafts **55** and **56** are free running and a braking system **60** maintains the endless belts **21** through **30** in the desired position when the merchandise thereon causes them to be nonuniformly weighted. The carriage **40** is utilized to selectively advance the endless belts **21** through **30** and the brake **60** then maintains the belts in the new position. The operation of the carriage **40** and the brake **60** can be seen more clearly in FIG. 6.

Prior to the explanation of the mechanism for selectively connecting the carriage **40** to the various belts **21** through **30** the electrical circuitry shown in FIG. 18 will be described. Each of the magazines **21** through **30** has a selector switch associated therewith. The various selector switches are located in a row across the front of the vending machine and a side view thereof can be seen in particular at **61** in FIG. 4. In FIG. 18 only one selector switch, which is a push-button switch designated **61** is illustrated but it should be understood that each of the magazines has a switch associated therewith and all of these switches would be connected in parallel with the illustrative switch **61** and the electrical circut would operate exactly the same for each of them.

A stationary contact **62** of selector switch **61** is connected to one side of a solenoid coil **63** by means of a lead **64**. The other side of the solenoid coil **63** is connected to one side of a plug **65** by means of a lead **66**. Plug **65** is adapted to be connected to some convenient source of power such as, for example, 115 volts 60 cycle. A movable contact **67** of selector switch **61** is connected to one contact of an accumulator and price mechanism **68** by means of a lead **69**. The accumulator and price mechanism **68** is a standard unit and will not be explained further in this invention except to state that an internal circuit is closed connecting lead **69** to a lead **70** when the correct amount of change is inserted therein. Lead **70** is connected to a fixed contact **71** of a motor hold switch **72**. Motor hold switch **72** has a movable contact **73**, which is normally in engagement with fixed contact **71**, connected by means of a lead **74** to a fixed contact **75** of a carriage switch **76**. Motor hold switch **72** can be seen pictorially in FIG. 3 mounted in juxtaposition to cam **49**. Cam **49** is illustrated in FIG. 18 and is connected to motor hold switch **72** by dotted lines to indicate that the motor hold switch **72** is operated by cam **49**. When cam **49** is in its normal position, as shown in FIG. 3, the motor hold switch is in the position shown schematically in FIG. 18. The carriage switch **76** is shown pictorially in FIG. 2, mounted on the left end of the carriage **40**. The carriage switch **76** is shown in dotted lines in FIG. 6 and the operation thereof will be explained more fully in conjunction with that figure. A movable contact **77** of carriage switch **76** is connected to the other side of plug **65** by a lead **78**.

One side of the motor **50** is connected to the lead **66** by means of a lead **80**. The other side of the motor **50** is connected to a second fixed contact **81** of carriage switch **76** by means of a lead **82**. Movable contact **77** of carriage switch **76** is normally engaged with the fixed contact **75** but engages the fixed contact **81** when the carriage switch is operated. A movable contact **83** of a motor cam switch **84** is connected to the lead **82** by means of a lead **85**. The movable contact **83** is normally in engagement with a fixed contact **86** which has no connection thereto. A second fixed contact **87** of motor hold switch **72** is connected to the lead **82** by means of a lead **88**. When the motor **50** is energized the cam **49** rotates and as the cam **49** rotates slightly the switch **72** is operated thereby disengaging the movable arm **73** from the fixed contact **71** and engaging it with the fixed contact **87**.

Assuming the machine is in its normal position and the plug **65** is connected to a suitable source of power, once the correct amount of money is inserted in the accumulator and price mechanism **68** the circuit between leads **69** and **70** is closed. The operator then selects the desired unit of merchandise and pushes the associated selector switch. As shown in FIG. 18 when the selector switch **61** is pushed the movable contact **67** engages the fixed contact **62** and a circuit is completed through the solenoid coil **63** by means of the following components in series: lead **78**, movable contact **77**, fixed contact **75**, lead **74**, movable contact **73**, fixed contact **71**, lead **70**, lead **69**, movable contact **67**, fixed contact **62**, lead **64**, solenoid coil **63** and lead **66**. Once the solenoid **63** is energized the

solenoid operates and the carriage switch **76** is operated. The operation of the solenoid and the carriage switch can be seen more clearly by referring to FIG. 6.

FIG. 6 is a sectional view of portions of the magazine **22** taken along the line **6—6** in FIG. 1 and, as previously explained, all of the magazines **21** through **30** operate in a similar fashion. The solenoid coil **63** is fixedly attached to the lower surface of the upper wall of the carriage **40**. A solenoid core **90** is mounted in the coil **63** for vertical movement and has fixedly attached to the lower end thereof a collar **91** which has a diameter substantially larger than the diameter of the remainder of the core. A second collar **92** is axially displaced from the collar **91** and has a substantially smaller radius than collar **91**. In the normal position of the core **90**, when the coil **63** is de-energized, the bottom of the core rests against a portion **93** of the frame of the carriage **40**, which acts as a stop for the core.

A cam block **94** is fixedly mounted to the frame of the carriage **40** and has an exposed surface having a first or normal stop **95**, a cam surface **96** and a second stop or dwell area **97** thereon. A flat plate **98**, which extends the length of the carriage **40**, has a rod **99** fixedly attached along one edge thereof. The rod **99** passes through a slot-shaped opening **100** at either end of the carriage **40** and is bent over on the external sides of the carriage so that the plate **98** is rotatably mounted along its longitudinal axis by the rod **99** and it is maintained in position by the bent over end of the rod **99**. In addition the plate **98** and the rod **99** are mounted for limited horizontal movement in the opening **100**. The edge of the plate **98**, opposite the edge of the plate fixedly attached to the rod **99**, normally rests against the stop **95** on the cam block **94**. However, the cam block **94** is so mounted with respect to the solenoid core **90** that when the coil **63** is energized and the core **90** moves vertically upward the collar **91** of the core **90** engages the plate **98** pulling it upward over the cam surface **96** to the dwell area **97**.

When the plate **98** is in its normal position against the stop **95**, the rod **99** is pushed to the far right edge of the horizontal slot **100**, thereby, holding the carriage switch **76** in the normal position, the movable contact **77** in engagement with the stationary contact **75** in FIG. 18. When the solenoid coil **63** is energized and the core **90** moves vertically upward in FIG. 6 the collar **91** pulls the plate **98** into the dwell area **97** and the rod **99** is pulled to the left-hand edge of the slot **100** by springs **101** (seen in FIGS. 2, 3, 7 and 8) operating the carriage switch **76** from its normal position to its operate position, movable contact **77** in engagement with fixed contact **81** in FIG. 18.

The upper wall of the carriage **40** has a hole **102** therein through which the solenoid core **90** protrudes when the coil **63** is energized. A connecting member **103** having an L-shaped cross section is rotatably mounted (a simple example of a mounting means is shown in FIG. 12) so that an arm **104** is horizontal and covers the hole **102** when the coil **63** is de-energized. The other arm **105** is vertical and in juxtaposition to the rear vertical portion of the belt **22**. When the correct change is inserted in the accumulator and price mechanism **68** and the selector switch **61** is depressed the solenoid coil **63** is energized and the core **90** moves vertically upward through the hole **102** in the carriage **40**. As the core **90** moves through the hole **102** in the carriage **40** the connecting member **103** is rotated counterclockwise until the arm **105** rests against a link **37** in the endless belt **22**, as shown in dotted lines of FIG. 6. A portion of the plate **98**, which is pulled into the dwell area **97** of the cam block **94** by the collar **91** engages the smaller collar **92** and holds the core **90** in the energized position even though the button **61** is no longer depressed and the coil **63** is not energized.

As can be seen in FIG. 18 when the carriage switch **76** is operated by the movement of the plate **98** and the rod **99** the movable contact **77** engages the fixed contact **81** and completes a circuit through lead **82**, motor **50**, lead **80**, lead **66**, the power source connected to plug **65** and lead **78**. Therefore, motor **50** is energized and begins to rotate, rotating cam **49**. As previously explained, when cam **49** rotates a reciprocating motion is imposed upon the carriage **40**. As the carriage **40** rises vertically the arm **105** of the connecting member **103** bears against the knuckle **38** of the link **35** in the endless belt **22**. Thus, as the carriage **40** rises the rear portion of the endless belt **22** is carried with it and the front portion of the belt **22** moves downward.

As the carriage **40** approaches the upper limit of a single reciprocation a pair of blocks numbered **110** and fixedly attached to either side of the case of the subcomponent **20** (seen in FIGS. 2, 3, 6 and 7) and having a cam-shaped surface directly in the line of movement of the bent over end portions of the rod **99**, forces the rod **99** to the right against the carriage switch **76**, thereby, placing the carriage switch **76** in its normal position. Thus, the movable contact **77** is in engagement with the fixed contact **75** of the carriage switch **76** and the previous circuit through which the motor **50** was energized is broken. However, since the cam **49** has rotated from its normal position the motor hold switch **72** is in its operate position and the movable contact **73** is in engagement with the fixed contact **87** thereby completing an energization circuit for the motor **50** through the following components: lead **78**, movable contact **77**, fixed contact **75**, lead **74**, movable contact **73**, fixed contact **87**, lead **88**, motor **50**, lead **80** and lead **66**. Thus, the motor **50** is still energized and continues to rotate moving the carriage **40** to the upper limit of a single reciprocation.

As the carriage continues to move upward the cam surface of the block **110** forces the bent over portion of the rod **99** into a vertical position, shown in full lines in FIG. 7 and in dotted lines in FIG. 6, thereby forcing the plate **98** into its normal position against the stop **95** on the cam block **94**. Once the plate **98** is returned to its normal position it no longer bears against the collar **92** but against collar **91** and the core **90** is moved to its normal position against the stop **93**. Since the core **90** is no longer holding the connecting member **103** in engagement with the endless belt **22** as the carriage **40** reaches its upper limit and starts downward, the arm **105** of the connecting member **103** is not forced against the knuckle **38** and the connecting member **103** drops back into its normal position. After the carriage **40** completes a single reciprocation and the cam **49** completes a full rotation the motor hold switch **72** is returned to the normal position, i.e. movable contact **73** in engagement with fixed contact **71**, by the cam action of cam **49** thereby breaking the energization circuit to motor **50** and stopping the motor.

As previously mentioned a braking system **60** is required to maintain the endless belt **22** in the desired position. The braking system **60** can be seen particularly in the upper portion of FIG. 6. A frame **61**, fixedly attached to the side of the magazine has a block **62** slidably mounted in an opening therein. The block **62** has one surface constructed so that it engages two links **35** and the associated knuckles **38**. In the present embodiment the block **62** is constructed to have a central groove for receiving a knuckle **38** between two links **35** and a groove at the upper and lower end thereof for receiving the knuckles **38** at either end of the links **35**. A pair of springs **63** bear against the back side of the block **62** and the front side of the frame **61** to force the block **62** into locking engagement with the rear portion of the endless belt **22**. Thus, as the rear portion of the endless belt **22** is forced upward by the carriage **40** the knuckles **38** slide out of the grooves in the block **62** compressing the spring **63** and forcing the block **62** to the right. When the carriage **40** reaches its upper limit of movement the next adjacent knuckle in the endless belt **22** slips into the groove in the block **62** just

vacated by the preceding knuckle and the spring **63** forces the block **62** back into locking engagement with the endless belt **22**.

A switch **115** is fixedly attached to the frame **61** of the brake system **60** and a lever **116** is rotatably mounted on the frame **61** and biased by a spring **117** to hold the switch **115** in a normal position. A bolt **118** which is threaded into the movable block **62** protrudes through a hole in the frame **61** beneath the lever **116**. When the carriage **40** forces the rear portion of the endless belt **22** upward and the block **62** is pushed inward by the knuckles **38** the bolt **118** is also pushed inward forcing the lever **116** away from the switch **115** and allowing the switch **115** to go to the operate position.

In FIG. 18 the switch **115** is schematically shown and consists of a stationary contact **119**, a stationary contact **120**, and a movable contact **121** which is in engagement with the stationary contact **120** when the switch **115** is in the normal position. The stationary contact **119** is connected to an accept terminal of a coin escrow mechanism **122** by means of a lead **123**. The stationary contact **120** is connected to a return contact of the coin escrow mechanism **122** by a lead **124**, the coin escrow mechanism **122** has a further contact connected to the lead **66** by means of a lead **125**. The movable contact **121** of the switch **115** is connected to a stationary contact **126** of the motor cam switch **84** by means of a lead **127**.

In the electrical operation of this circuitry one side of the coin escrow mechanism **122** is connected to the plug **65** through the leads **66** and **125**. The return contact of the coin escrow mechanism **122** is normally connected to the other side of the plug **65** by the following components: lead **124**, fixed contact **120**, movable contact **121**, lead **127**, fixed contact **126**, movable contact **83** (The motor cam switch **84** is operated by cam **49** simultaneous with the motor hold switch **72**.), lead **85**, lead **82**, lead **88**, fixed contact **87**, movable contact **73**, lead **74**, fixed contact **75**, movable contact **77** and lead **78**. If the carriage **40** fails to advance the endless belt **22** one position the block **62** and the bolt **118** connected thereto are not depressed and the switch **115** remains in the normal position. Thus, the return contact of the coin escrow mechanism **122** remains connected in the circuit and the money is returned. However, if the carriage **40** advances the endless belt **22** one position the block **62** and the bolt **118** of the brake system **60** are depressed moving the lever **116** and allowing the switch **115** to operate. When the switch **115** operates the movable contact **121** engages the fixed contact **119** placing the accept contact of the coin escrow mechanism **122** in the electrical circuit just described. Once the accept contact of the coin escrow mechanism **122** is energized the money drops into a storage container, not shown, and is not returned. The internal operation of the coin escrow mechanism **122** will not be discussed further since this is a standard unit and not part of the present invention.

Referring to FIG. 4 the dispensing means can be seen in the lower left-hand corner. A receiving tray **130** is pivotally mounted at approximately its center for rotation about an axis in the plane of said receiving tray and perpendicular to the longitudinal axis of said receiving tray. A member **131** fixedly attached to the side of each of the magazines limits the rotation of the member **130** to approximately 90°. The receiving tray **130** has a first or normal position in which it slants downward toward the front of the vending machine at an angle of approximately 70° with the front of the vending machine, as shown in FIG. 4. In this position a unit of merchandise has normally slid from the tray, for example **133**, on the endless belt and is resting on the receiving tray **130**. The receiving tray **130** has a slightly turned up portion so that the unit of merchandise will not slide off. When the receiving tray **130** is in the first position the unit of merchandise thereon can be viewed externally through a viewing window **132**.

As the carriage **40** rotates the endless belt **22** the tray designated **133**, for convenience in this explanation, engages the receiving tray **130** and rotates it in a clockwise direction approximately 60°. As the carriage **40** continues to move and the endless belt **22** continues to rotate the tray **133** moves to the position at which tray **134** is shown and the unit of merchandise on the receiving tray **130** slides downward off the tray into a chute **135** and from there into an external receiving slot **136**. The tray **137** on the endless belt **22** has now moved to the position previously filled by the tray **133** and the unit of merchandise thereon slides off onto the receiving tray **130** rotating the receiving tray **130** counterclockwise back to its normal position.

A locking bar **138** mounted beneath the receiving tray **130** prevents the receiving tray **130** from rotating when in its locked position, as shown in FIG. 4. It should be noted that there is a receiving tray and a locking bar associated with each of the magazines **21** through **30** and locking bar **138** associated with receiving tray **130** is typical of the operation of each of these. The locking bar **138** is fixedly attached to a rotatably mounted shaft **139** which passes through the subcomponent **20** and is fixedly attached to one end of a connecting bar **140** at the left-hand side of the subcomponent **20** and to a similar connecting bar **141** at the right-hand side of the subcomponent **20**. The other end of the connecting bar **140** is rotatably attached to one end of a lever **142** and the other end of the connecting bar **141** is rotatably attached to one end of a lever **143**. The levers **142** and **143** are rotatably mounted to the sides of the subcomponent **20**. When the carriage **40** and the connecting members **41** and **45** are in their normal position the levers **142** and **143** are approximately horizontal, the connecting bars **140** and **141** are approximately vertical and the locking bar **138** for the receiving tray **130** is in the locked position.

A spring **144** which is normally under tension has one end connected to the junction of the connecting bar **140** and the lever **142** and the other end fixedly attached to the case of the subcomponent **20**. A second spring **145** is similarly placed with respect to the connecting bar **141** and the lever **143**. As the carriage **40** and its connecting members **41** and **45** move upward the levers **142** and **143** are no longer engaged therewith and the springs **144** and **145** pull the connecting bars **140** and **141** downward into engagement with stops **146** and **147** respectively thereby causing the locking bar **138** to rotate counterclockwise and move out of the locked position. Thus, as the carriage begins to rotate one of the endless belts **21** through **30** the associated locking bar **138** is moved from its locked position of FIG. 4 into a recess **148** formed in the member **131** and the associated receiving tray **130** is allowed to rotate thereby sliding the unit of merchandise thereon into the chute **135** and out to the external receiving slot **136**.

In the upper left-hand corner of FIG. 4 a second possible embodiment of the present invention designated generally with the numeral **150** is utilized for dispensing units of merchandise such as gum or mint rolls. The electrical circuitry of this embodiment is identical with the electrical circuitry previously explained. However, some of the mechanical embodiment is different, in particular the dispensing means, and this will be explained in conjunction with FIGS. 4 and 13 through 17.

A plurality of magazines **151** through **156**, seen in FIGS. 4 and 13, store a vertical stack of the units of merchandise. Each of the magazines **151** through **156** has a slidably mounted tray **161** through **166** mounted thereunder. The trays are rectangular shaped having a length approximately the width of the magazine and a depth approximately twice the depth of the magazine. This can be seen more clearly by referring to FIG. 17

where the units of merchandise are seen resting on a solid portion **170** of the tray **161**. A second portion **171** of the tray **161** has an opening therethrough which is capable of receiving a single unit of merchandise.

In the basic operation of the magazine **151** through **156** and the trays **161** through **166**, referring to FIGS. 4 and 17 for example, the tray **166** is normally situated with the solid portion **170** under the stack of merchandise in the magazine **156**, thereby, normally maintaining the vertical stack of merchandise in position. When the machine is actuated by depressing one of the selector switches associated with each of the magazines, for example button **160**, the tray **166** is slid to the left, by apparatus to be explained presently, and one unit of merchandise falls into the opening **171**. The tray **166** is then slid back to the right, the position shown, and the unit of merchandise falls through the opening in the tray and into the chute **167** from which it slides into a second connecting chute **168** and into the receiving slot **136**.

Throughout the following description the electrical components have the same numbers as the previous embodiment with a prime added to denote the different embodiment. A carriage **172** is slidably mounted in a channel like frame **169** by means, such as the plastic buttons **173**, and receives a reciprocating motion from the operation of the motor **50'**, cam **49'** and a connecting member **174**. Connecting member **174** is pivotally attached to the carriage **172** as shown in the broken away portion of FIG. 15. Mounted on the carriage **172** are a plurality of electrical solenoids each of which are associated with a magazine **151** through **156**. The action of all of the solenoids can be explained by the use of illustrative example in FIG. 17, since all of the solenoids operate identically.

In FIG. 17 a solenoid coil **63'** causes a core **175** to move vertically upward when energized. The core **175** has a collar **176** with a slightly larger diameter fixedly attached to the bottom end thereof which normally rests on a protrusion **93'** of the carriage wall when the solenoid coil **63'** is de-energized. A cam block **177** is fixedly mounted to the frame of the carriage **172** and has an exposed surface having a first or normal stop **178**, a cam surface **179** and a second stop or dwell area **180**. A locking member or damper **181**, having an L-shaped cross section, has opposite ends rotatably mounted in slots **182** one of which is shown in FIG. 17 and further mounted for limited horizontal movement in the slots **182**. One arm of the damper **181** is in engagement with the cam block **177** and normally against the stop **178**, as shown in FIG. 17. The cam block **177** and damper **181** are further mounted in juxtaposition to the solenoid core **175** so that the collar **176** engages the arm of the damper **181** as the solenoid core **175** moves vertically upward, thereby, pulling the arm from the stop **178** across the cam surface **179** to the dwell area **180**. The damper **181** has a pair of springs **183** that maintain it in the dwell area **180** once the collar **176** moves it there. The damper **181** has areas which bear against a groove in the core **175** to maintain it in its vertically upward position as long as the damper **181** remains in the dwell area **180**. One end of the rod mounting the damper **181** engages a carriage switch **76'** when the damper **181** moves into the dwell area **180**. The carriage switch **76'** performs the same functions that the carriage switch **76** in the first embodiment performed except that for convenience of mounting the operation is reversed and therefore the electrical connections would have to be reversed.

When the solenoid core **175** moves vertically upward it protrudes through a hole in the top of the carriage **172** and causes a connecting member **185** having a Z-shaped cross section, which is rotatably mounted on the carriage **172**, to rotate counterclockwise as shown in dotted lines in FIG. 14.

A bell crank **187** is mounted below the tray **161** for rotation about an axis perpendicular to the plane of the tray **161**. A boss **186** on bell crank **187** is located for engagement with connecting member **185** when it is rotated counterclockwise to its operate position. Referring to FIG. 16, bell crank **187** is rotatably mounted by means of a shaft **188** which passes through a hole in a second boss **189**. Boss **189** has a torsion spring **190** thereon one end of which bears against a portion of the machine **150** and the other end of which bears against the boss **186** imparting a normally clockwise bias to bell crank **187**. Bell crank **187** has a shaft or boss **191** which protrudes through an arcuate slot **192** in the other side of the frame or the machine **150** and slidably engages a slot **193** in the underside of the tray **161**. The spring **190** normally holds the bell crank **187** in the far clockwise position. The solid portion **170** of the tray **161** is under the stack of merchandise in the magazine **151** when the bell crank **187** is in its normal position.

When the connecting member **185** is rotated counterclockwise and the carriage **172** is moved horizontally to the right in FIG. 14 the connecting member **185** engages the boss **186** on bell crank **187** thereby rotating bell crank **187** counterclockwise in FIG. 16. The counterclockwise rotation of bell crank **187** causes the tray **161** to move to a position wherein when the carriage **172** has completed one-half of a single reciprocation the open portion **171** of the tray **161** has moved under the stack of merchandise and one unit has dropped into said portion.

The carriage **172** has thereon a U-shaped rod **195**, the bight of which runs the length of the carriage **172** and which is rotatably mounted by means of pivots **196** located approximately centrally in either leg. The U-shaped rod **195** engages a pair of cam-shaped members **197**, fixedly mounted to the frame of the machine **150**, with the ends of both its arms when the carriage **172** is in the extreme right hand position in FIG. 14. The U-shaped member **195** is mounted so that its bight engages the arm of the damper **181** not engaged with the cam block **177**. When the damper **181** is rotated by the upward movement of the solenoid core **175** the U-shaped member **195** is rotated clockwise to the vertical position as shown in dotted lines in FIG. 17.

When the carriage moves approximately one-half a reciprocation the ends of the U-shaped member **195** engage the cams **197**, the U-shaped member **195** is rotated counterclockwise to its normal full line position of FIG. 17 and the damper **181** is moved from the dwell area **180** across the cam surface **179** to the normal stop **178**. Since the damper **181** is moved from engagement with the solenoid core **175** into engagement with collar **176** the solenoid core is forced to drop vertically to its normal position against the protruding portion **93'** of the frame **169**. The U-shaped member **195** is shown in its normal position in full lines in FIG. 17.

When the solenoid core **175** drops back to its normal position the connecting member **185** is allowed to rotate clockwise back to its normal position and disengage the boss **186** on the bell crank **187**. The bell crank **187** is then rotated clockwise back to its normal position by the spring **190** and the tray **161** is moved upward in FIG. 16 or to the right in FIG. 17 to the position shown. The unit of merchandise in the open portion **171** of tray **161** then drops through the opening into the chute **167** and slides down through the connecting chute **168**, to the exterior receiving slot **136**.

A member **200** having a protruding portion thereon **201** which engages with the boss **186** on the bell crank **187** and similar protruding portions to engage with each of the other bell cranks associated with each of the magazines **152** through **156**, is slidably mounted for horizontal travel and normally biased by a spring **202** to the right-hand position in FIG. 16. As one of the bell cranks is rotated counterclockwise by its associated connecting

member and the carriage **172**, the boss **186** pushes the protruding member **201** and, consequently, the member **200** to the left in FIG. 16. The extreme left end of the member **200** has a cam surface thereon **203** with the actuating portion of a switch **115'** engaged therewith. As the member **200** is forced to the left the actuating portion of switch **115'** is moved by the cam surface **203** causing the switch to be closed. Switch **115'** serves the same function in the schematic diagram of FIG. 18 as switch **115**. Thus, as member **200** slides to the left and the cam surface **203** causes switch **115'** to be closed the accept circuit in the coin escrew mechanism **122** is energized and the coin drops into a storage chamber.

Thus, an electrical vending machine has been described which operates under a uniform impetus and therefore has a minimum of wear and mechanical interferences while having a maximum reliability. In addition the present invention has a minimum of moving parts and is therefore simple to construct and maintain.

While I have shown and described two specific embodiments of this invention, further modifications and improvements will occur to those skilled in the art. I desire it to be understood, therefore, that this invention is not limited to the particular form shown and I intend in the appended claims to cover all modifications which do not depart from the spirit and scope of this invention.

I claim:

1. A vending machine comprising:

(a) a plurality of magazines for storing units to be selectively dispensed, each magazine including an endless belt having a plurality of trays uniformly spaced thereon and rigidly mounted perpendicular thereto;

(b) motive means;

(c) a carriage mounted for reciprocating motion in the direction of movement of an adjacent portion of each of said endless belts and operatively connected to said motive means for executing a single reciprocation upon said motive means being energized;

(d) means mounted on said carriage including a plurality of connecting members one each engageable with said portion of one of said endless belt and selectively connecting said carriage to a selected one of said endless belts for advancing said selected endless belt to a new position during each reciprocation of said carriage;

(e) an electric switch associated with each of said magazines for selecting the desired unit to be dispensed; and

(f) electrical means adapted to be connected to a source of power and operatively connecting said switches, said motive means, and said connecting means in circuit for energizing said motive means and one of said connecting means when said associated switch is closed, whereby said motive means advances said selected endless belt to a new position.

2. A vending machine comprising:

(a) a plurality of magazines for storing units to be selectively dispensed, each magazine including an endless belt having a plurality of trays uniformly spaced thereon and rigidly mounted perpendicular thereto;

(b) motive means;

(c) a carriage mounted for reciprocating motion and operatively connected to said motive means for executing a single reciprocation upon said motive means being energized;

(d) means associated with each endless belt selectively connecting said carriage to said associated endless belt for advancing said associated endless belt to a new position during each reciprocation of said carriage including an L-shaped member mounted on said carriage in juxtaposition to said associated endless belt normally in a first position and having a second position in which an arm is in engagement with said associated belt and an electrical solenoid operatively connected to said L-shaped member for moving said member to said second position upon energization of said solenoid;

(e) an electric switch associated with each of said magazines for selecting the desired unit to be dispensed; and

(f) electrical means adapted to be connected to a source of power and operatively connecting said switches, said motive means, and said connecting means in circuit for energizing said motive means and one of said solenoids of said connecting means when said associated switch is closed, whereby said motive means advances said associated endless belt to a new position.

3. A vending machine comprising:

(a) a plurality of magazines for storing units to be selectively dispensed, each magazine including an endless belt having a plurality of trays uniformly spaced thereon and rigidly mounted perpendicular thereto;

(b) motive means;

(c) a carriage mounted for reciprocating motion and operatively connected to said motive means for executing a single reciprocation upon said motive means being energized;

(d) means associated with each endless belt selectively connecting said carriage to said associated endless belt for advancing said associated endless belt to a new position during each reciprocation of said carriage including

(1) an L-shaped member mounted on said carriage in juxtaposition to said associated endless belt normally in a first position and having a second position in which an arm is in engagement with said associated belt,

(2) an electrical solenoid operatively connected to said L-shaped member for moving said member to said second position upon energization of said solenoid, and

(3) damping means operatively connected to said solenoid and said carriage for maintaining said solenoid in the operate position and said L-shaped member in the second position for approximately one-half a single reciprocation of said carriage;

(e) an electric switch associated with each of said magazines for selecting the desired unit to be dispensed; and

(f) electrical means adapted to be connected to a source of power and operatively connecting said switches, said motive means, and said connecting means in circuit for energizing said motive means and one of said solenoids of said connecting means when said associated switch is closed, whereby said motive means advances said associated endless belt to a new position.

4. A vending machine comprising:

(a) a plurality of magazines for storing units to be selectively dispensed, each magazine including an endless belt having a plurality of trays uniformly spaced thereon and rigidly mounted perpendicular thereto;

(b) motive means for selectively advancing said endless belts one position;

(c) a receiving tray, associated with each of said magazines, pivotally mounted at approximately the center of said receiving tray for rotation about an axis parallel to the plane of said receiving tray and perpendicular to the longitudinal axis of said receiving tray and further mounted for engagement with an

adjacent one of the trays attached to said endless belt when said endless belt is advanced one position;

(d) means limiting the rotation of each of said receiving trays to a first and a second position;

(e) locking means mounted in juxtaposition to said receiving trays and operable with said motive means for locking said receiving trays in said first position and allowing said receiving trays to rotate to said second position when said associated endless belt is advanced one position;

(f) an external unit receiving slot and attached chutes mounted in receiving relationship to each of said receiving trays for receiving a unit from said receiving tray when said endless belt is advanced one position and an adjacent one of the trays attached to said endless belt engages said receiving tray rotating said receiving tray to its second position, a second unit subsequently dropping off the next adjacent tray onto said receiving tray and returning said receiving tray to its first position.

5. A vending machine comprising:

(a) a plurality of magazines for storing units to be selectively dispensed, each magazine including an endless belt having a plurality of trays uniformly spaced thereon and rigidly mounted perpendicular thereto;

(b) motive means for selectively advancing said endless belts one position;

(c) a receiving tray, associated with each of said magazines, pivotally mounted at approximately the center of said receiving tray for rotation about an axis parallel to the plane of said receiving tray and perpendicular to the longitudinal axis of said receiving tray and further mounted for engagement with an adjacent one of the trays attached to said endless belt when said endless belt is advanced one position;

(d) means limiting the rotation of each of said receiving trays to a first and a second position;

(e) locking means mounted in juxtaposition to said receiving trays and operable with said motive means for locking said receiving trays in said first position and allowing said receiving trays to rotate to said second position when said associated endless belt is advanced one position;

(f) means for externally viewing at least a portion of said receiving trays when said receiving trays are in said first position; and

(g) an external unit receiving slot and attached chutes mounted in receiving relationship to each of said receiving trays for receiving a unit from said receiving tray when said endless belt is advanced one position and an adjacent one of the trays attached to said endless belt engages said receiving tray rotating said receiving tray to its second position, a second unit subsequently dropping off the next adjacent tray onto said receiving tray and returning said receiving tray to its first position.

6. A vending machine comprising:

(a) a plurality of magazines for storing units to be selectively dispensed, each magazine including an endless belt having a plurality of trays uniformly spaced thereon and rigidly mounted perpendicular thereto;

(b) motive means;

(c) a carriage mounted for reciprocating motion and operatively connected to said motive means for executing a single reciprocation upon said motive means being energized;

(d) means mounted on said carriage and associated with each endless belt selectively connecting said carriage to said associated endless belt for advancing said associated belt to a new position during each reciprocation of said carriage;

(e) an electric switch associated with each of said magazines for selecting the desired unit to be dispensed;

(f) electrical means adapted to be connected to a source of power and operatively connecting said switches, said motive means, and said connecting means in circuit for energizing said motive means and one of said connecting means when said associated switch is closed, whereby said motive means advances said associated endless belt to a new position;

(g) a receiving tray, associated with each of said magazines, pivotally mounted at approximately the center of said receiving tray for rotation about an axis parallel to the plane of said receiving tray and perpendicular to the longitudinal axis of said receiving tray and further mounted for engagement with an adjacent one of the trays attached to said endless belt when said endless belt is advanced one position;

(h) means limiting the rotation of each of said receiving trays to a first and a second position;

(i) locking means mounted in juxtaposition to said receiving trays and operable with said motive means for locking said receiving trays in said first position and allowing said receiving trays to rotate to said second position when said associated endless belt is advanced one position;

(j) means for externally viewing at least a portion of said receiving trays when said receiving trays are in said first position; and

(k) an external unit receiving slot and attached chutes mounted in receiving relationship to each of said receiving trays for receiving a unit from said receiving tray when said endless belt is advanced one position and an adjacent one of the trays attached to said endless belt engages said receiving tray rotating said receiving tray to its second position, a second unit subsequently dropping off the next adjacent tray onto said receiving tray and returning said receiving tray to its first position.

7. A vending machine comprising:

(a) a plurality of magazines for storing units to be selectively dispensed, each magazine including an endless belt having a plurality of trays uniformly spaced thereon and rigidly mounted perpendicular thereto;

(b) motive means for selectively advancing said endless belts one position;

(c) a receiving tray, associated with each of said magazines, pivotally mounted at approximately the center of said receiving tray for rotation about an axis parallel to the plane of said receiving tray and perpendicular to the longitudinal axis of said receiving tray and further mounted for engagement with an adjacent one of the trays attached to said endless belt when said endless belt is advanced one position;

(d) means limiting the rotation of each of said receiving trays to a first and a second position; and

(e) an external unit receiving slot and attached chutes mounted in receiving relationship to each of said receiving trays for receiving a unit from said receiving tray when said endless belt is advanced one position and an adjacent one of the trays attached to said endless belt engages said receiving tray rotating said receiving tray to its second position, a second unit subsequently dropping off the next adjacent tray onto said receiving tray and returning said receiving tray to its first position.

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