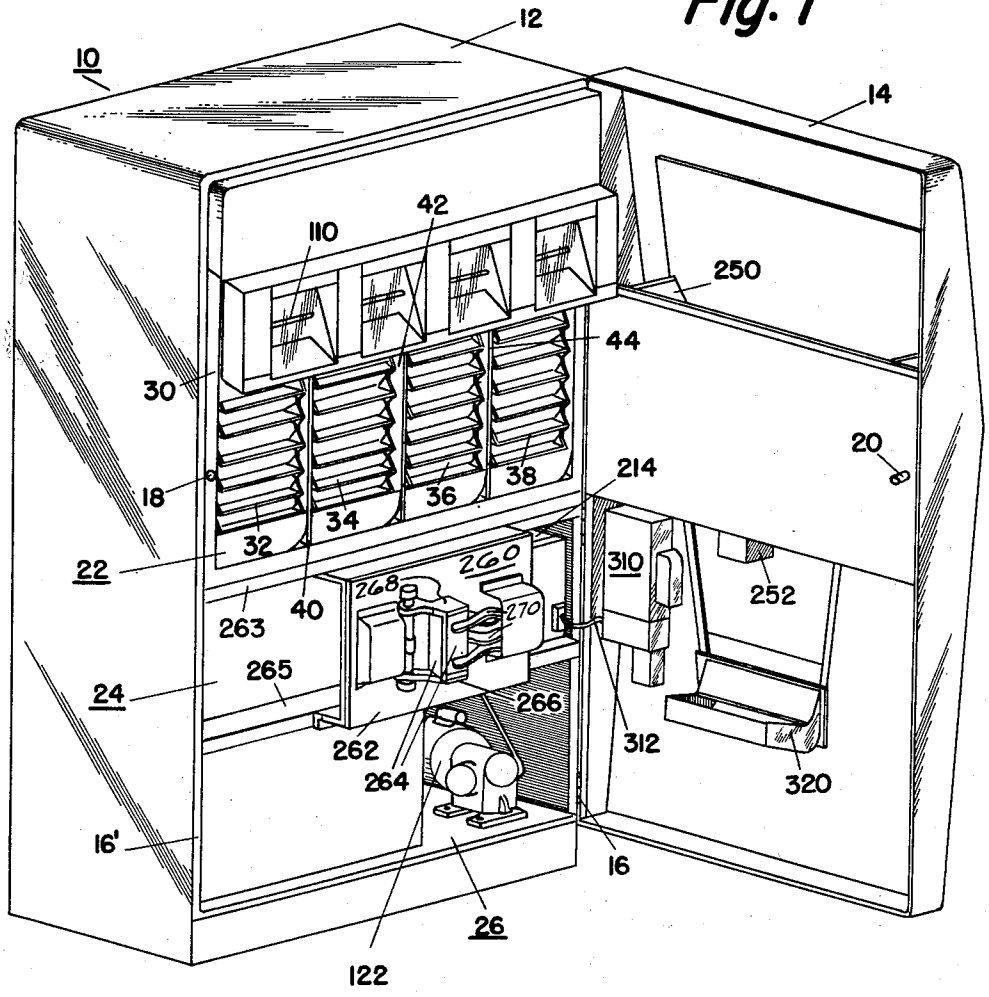
March 29, 1960 J. S. RICHMAN ET AL 2,930,312

VENDING MACHINE

Filed Oct. 24, 1956 8 Sheets-Sheet 1

Fig. 1



INVENTOR.
JACOB S. RICHMAN
ABRAHAM L. KORR

BY Arthur H. Seidel

ATTORNEY

March 29, 1960 J. S. RICHMAN ET AL 2,930,312

VENDING MACHINE

Filed Oct. 24, 1956 8 Sheets-Sheet 2

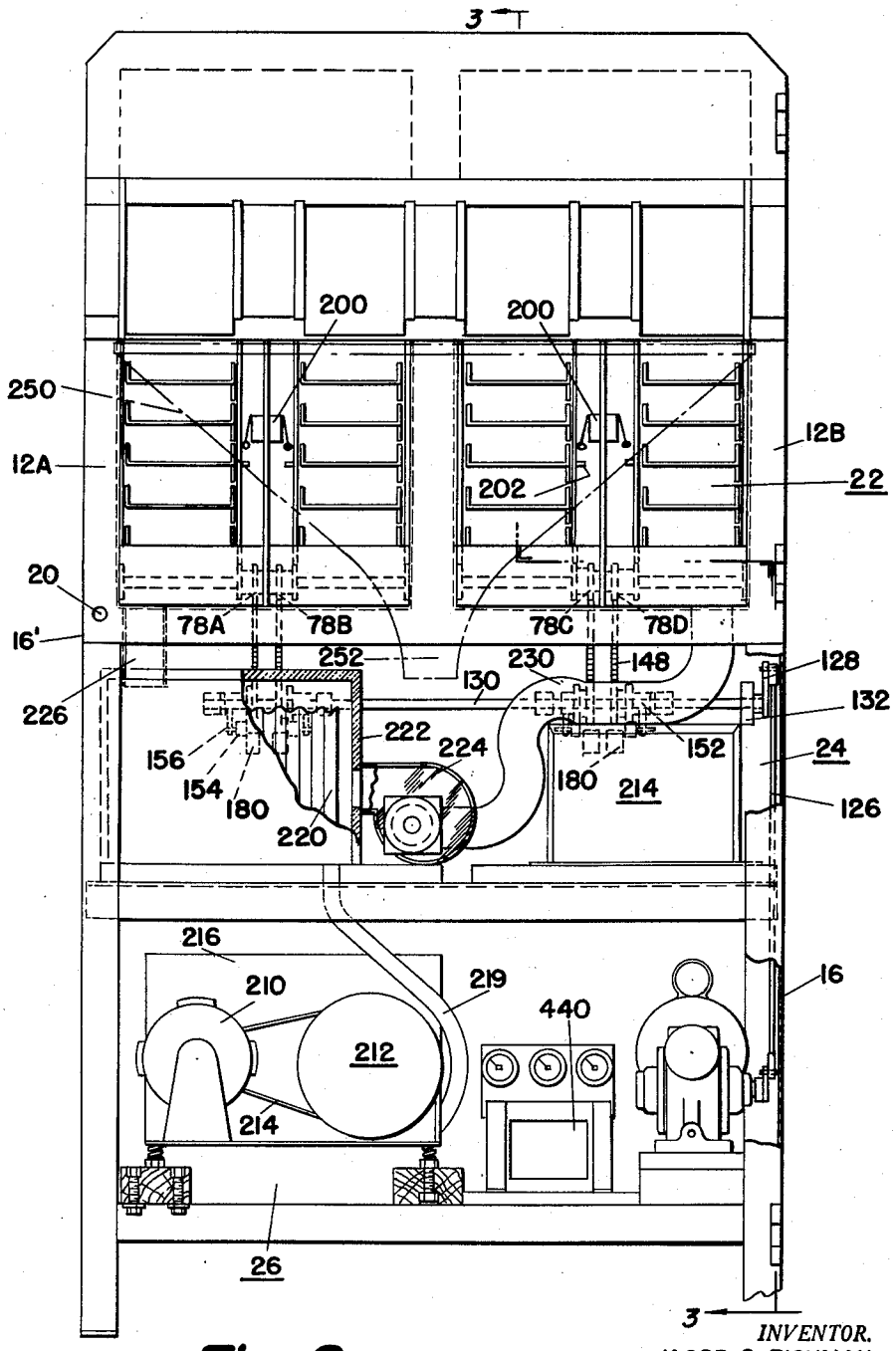


Fig. 2

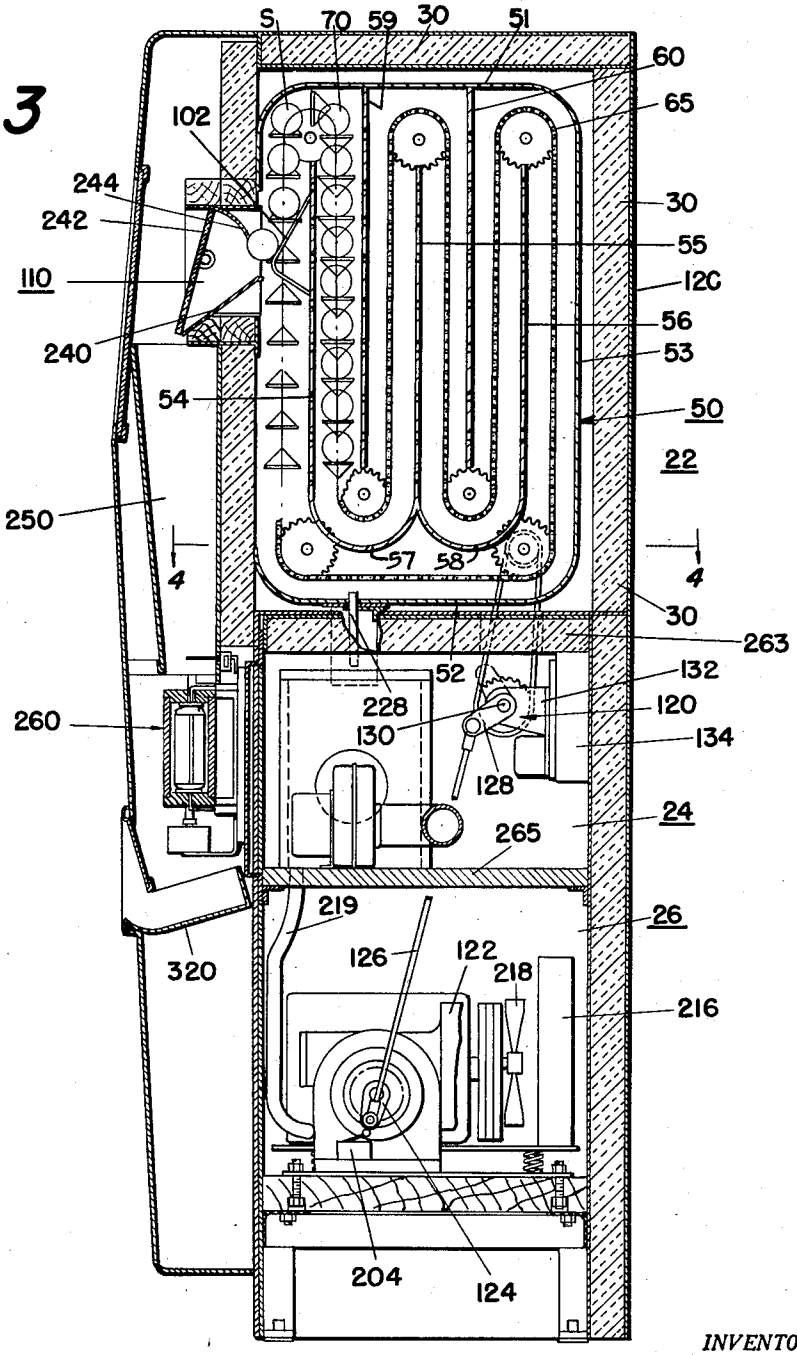
INVENTOR.
JACOB S. RICHMAN
ABRAHAM L. KORR
BY Arthur H. Seidel
ATTORNEY

March 29, 1960 J. S. RICHMAN ET AL 2,930,312

VENDING MACHINE

Filed Oct. 24, 1956 8 Sheets-Sheet 3

Fig. 3



INVENTOR.
JACOB S. RICHMAN
ABRAHAM L. KORR

BY Arthur H. Seidel

ATTORNEY

March 29, 1960 J. S. RICHMAN ET AL 2,930,312

VENDING MACHINE

Filed Oct. 24, 1956 8 Sheets-Sheet 4

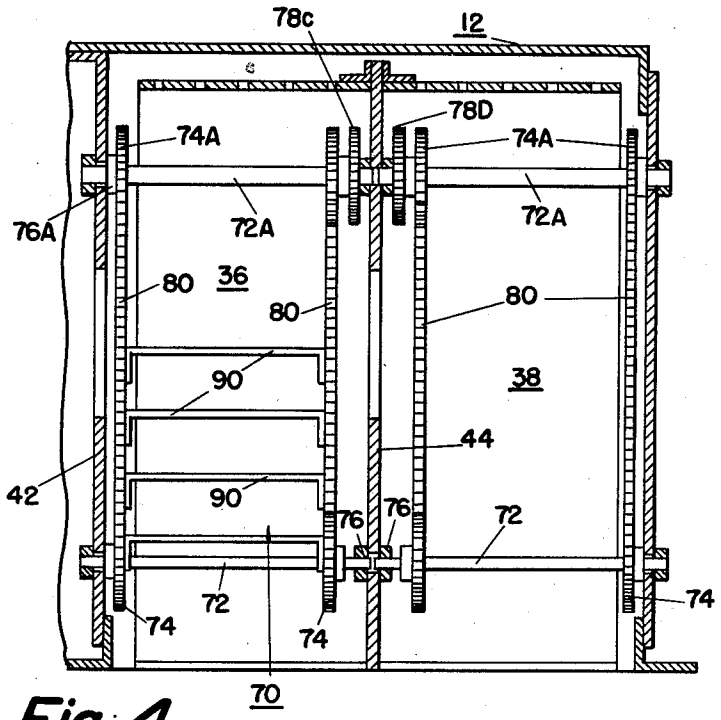


Fig. 4

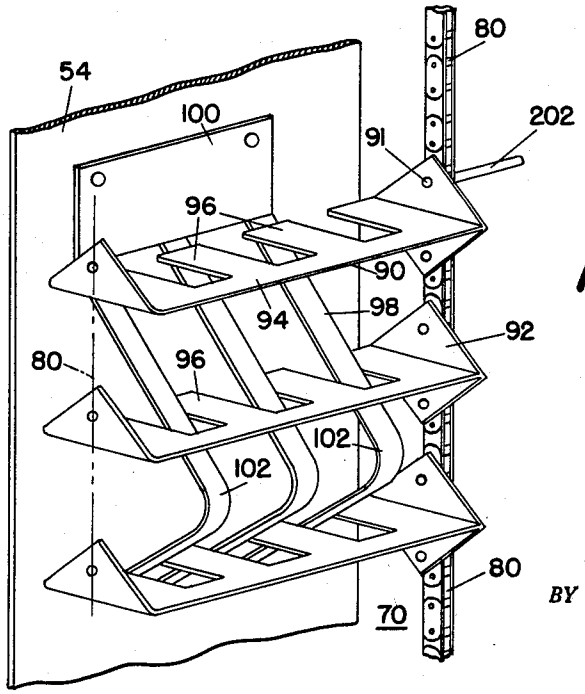


Fig. 5

INVENTOR.
JACOB S. RICHMAN
ABRAHAM L. KORR
BY Arthur H. Seidel
ATTORNEY

March 29, 1960 J. S. RICHMAN ET AL 2,930,312

VENDING MACHINE

Filed Oct. 24, 1956 8 Sheets-Sheet 5

Fig. 6

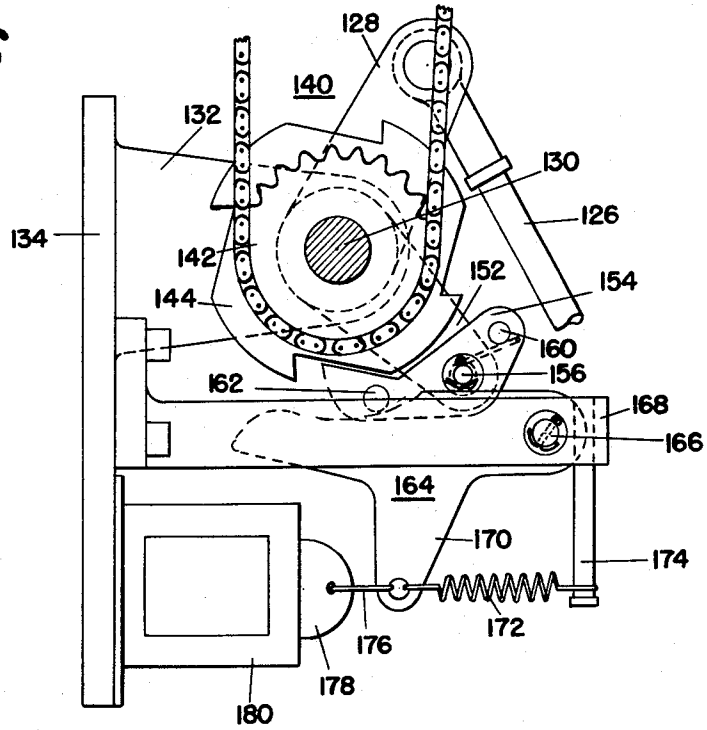
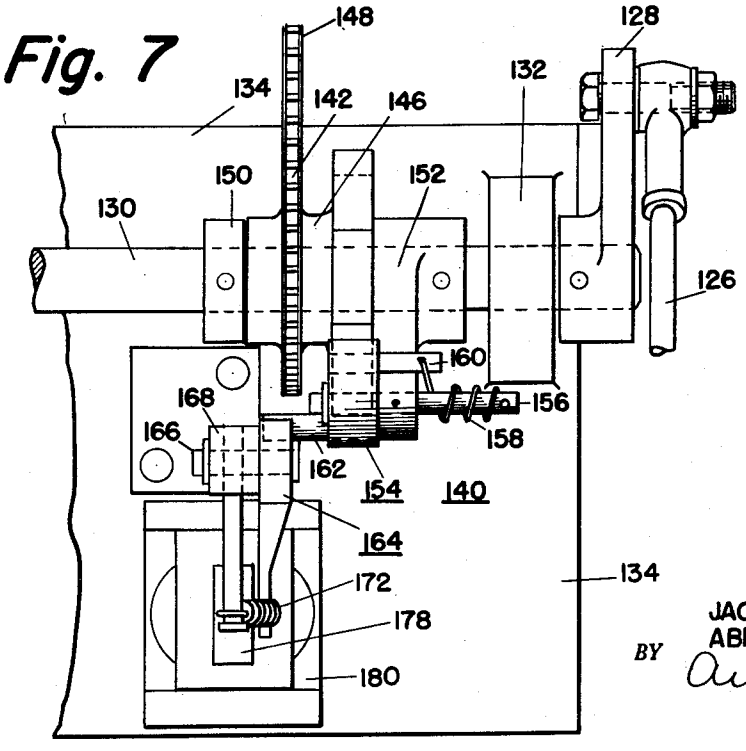


Fig. 7



INVENTOR.
JACOB S. RICHMAN
ABRAHAM L. KORR
BY Arthur H. Seidel
ATTORNEY

March 29, 1960 J. S. RICHMAN ET AL 2,930,312

VENDING MACHINE

Filed Oct. 24, 1956 8 Sheets-Sheet 6

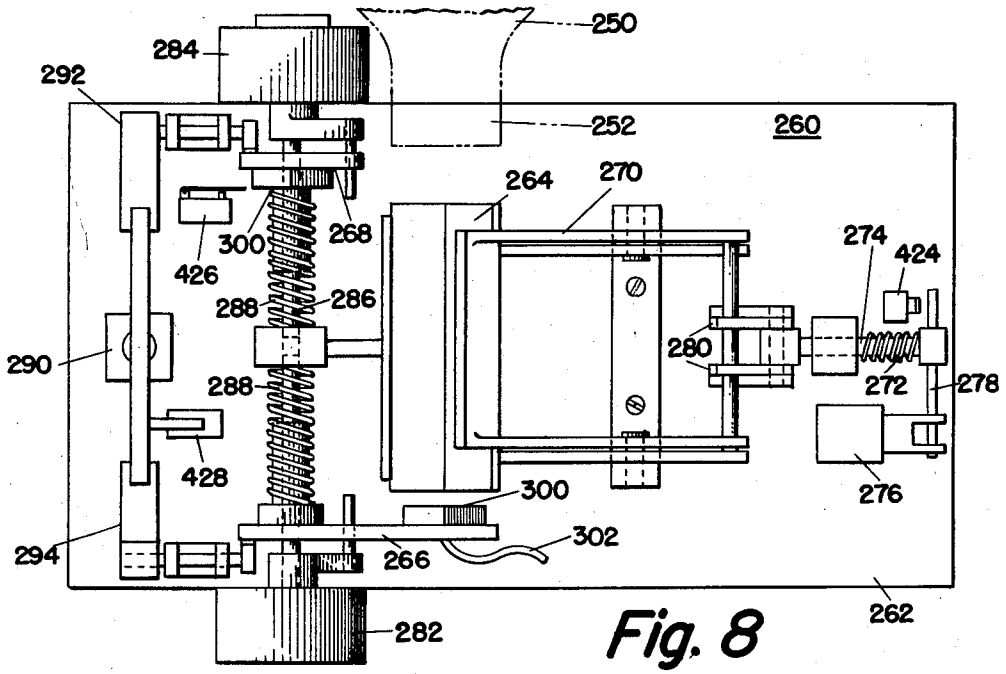


Fig. 8

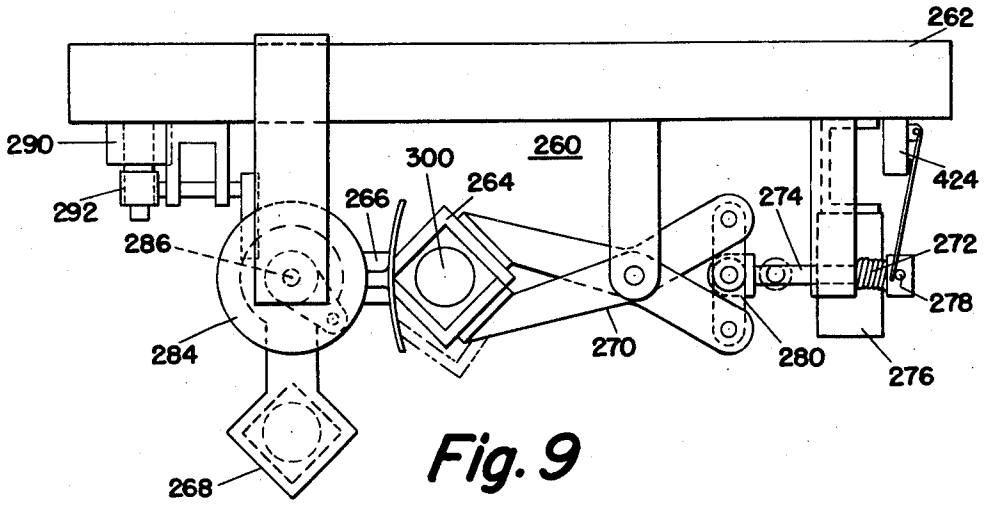


Fig. 9

INVENTOR.
JACOB S. RICHMAN
ABRAHAM L. KORR
BY Arthur H. Seidel
ATTORNEY

March 29, 1960 J. S. RICHMAN ET AL 2,930,312

VENDING MACHINE

Filed Oct. 24, 1956 8 Sheets-Sheet 7

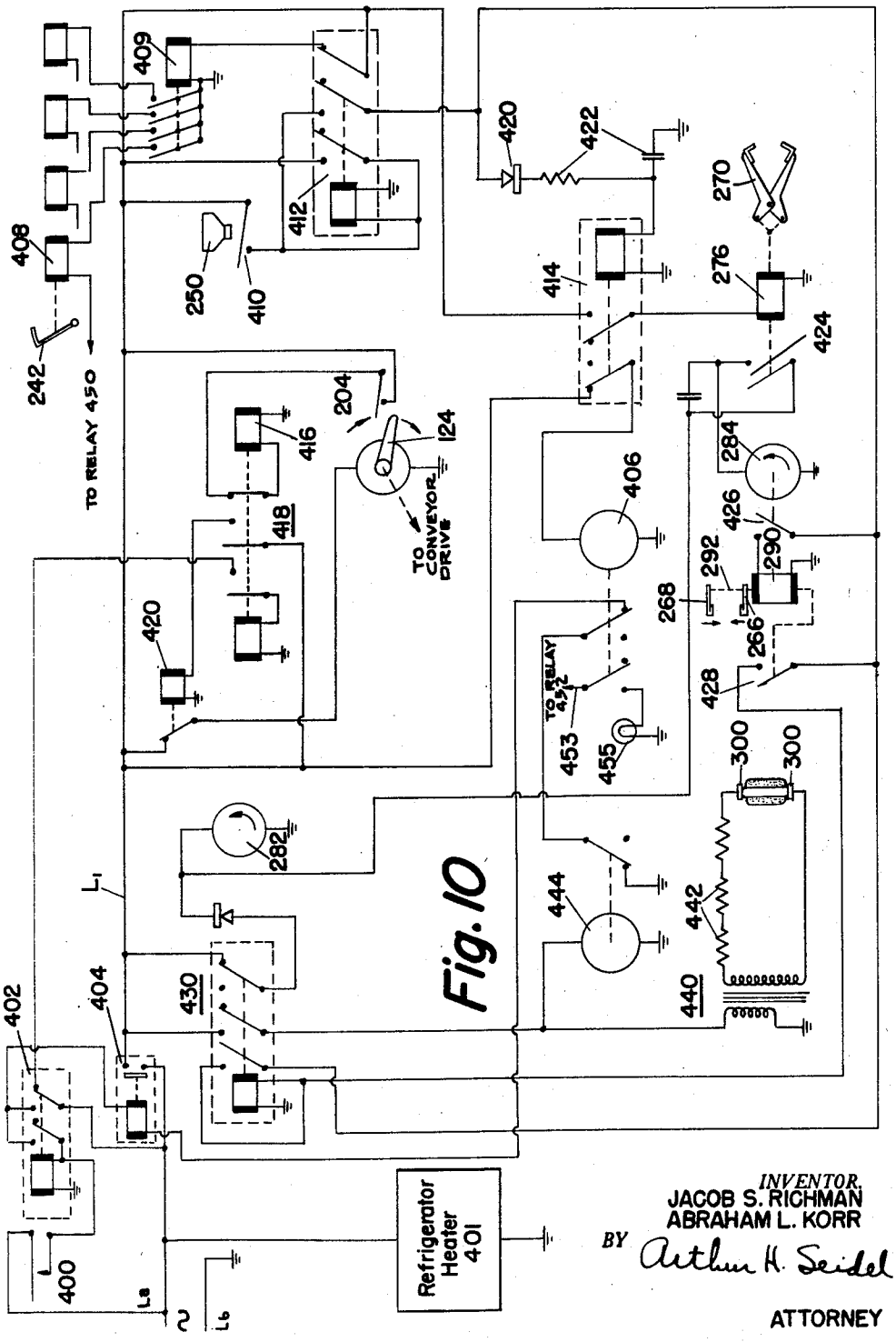


Fig. 10

INVENTOR.
JACOB S. RICHMAN
ABRAHAM L. KORR
BY Arthur H. Seidel
ATTORNEY

March 29, 1960 J. S. RICHMAN ET AL 2,930,312

VENDING MACHINE

Filed Oct. 24, 1956 8 Sheets-Sheet 8

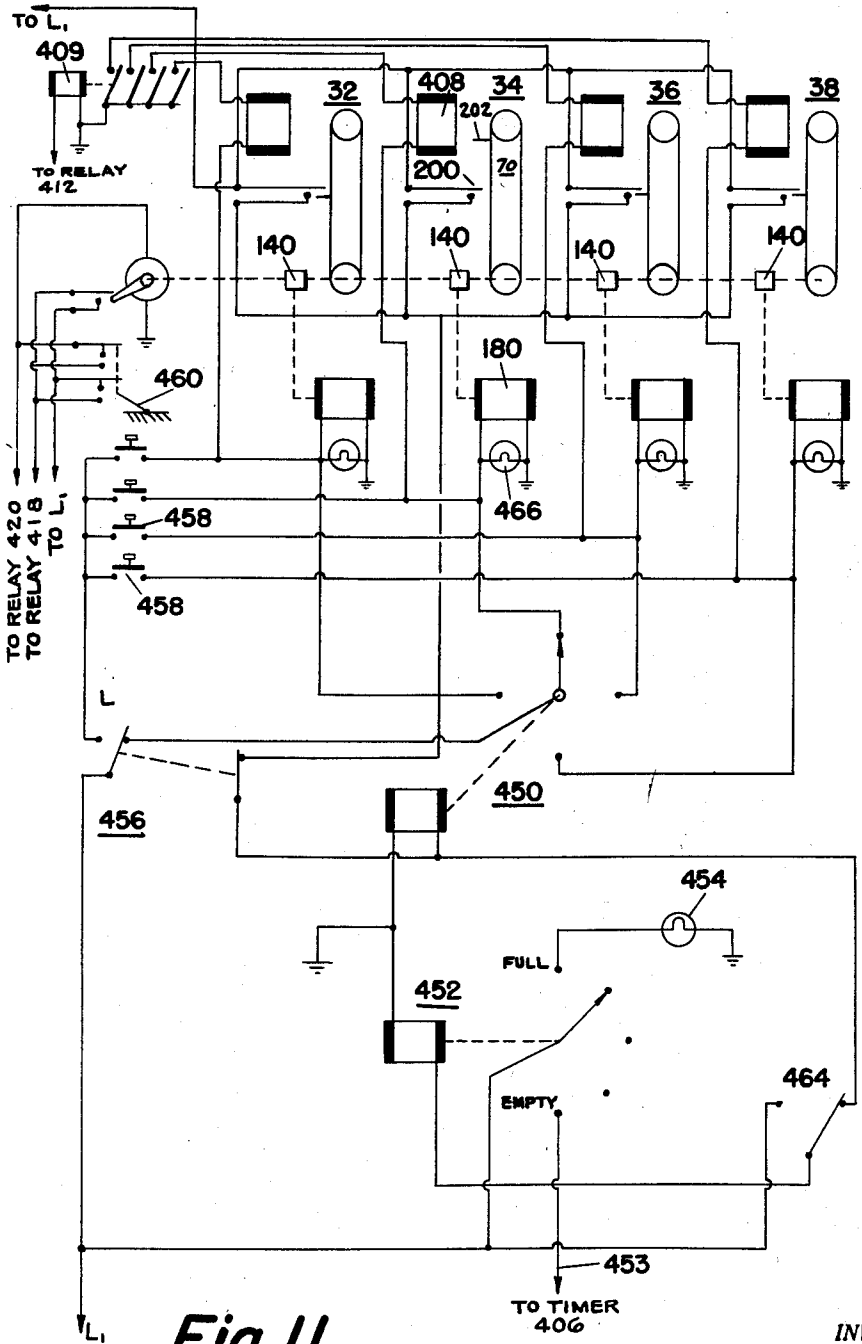


Fig. 11

INVENTOR.
JACOB S. RICHMAN
ABRAHAM L. KORR

BY Arthur H. Seidel

ATTORNEY

United States Patent Office 2,930,312
Patented Mar. 29, 1960

2,930,312

VENDING MACHINE

Jacob S. Richman and Abraham L. Korr, Philadelphia, Pa.; said Korr assignor to said Richman

Application October 24, 1956, Serial No. 618,125

24 Claims. (Cl. 99—357)

This invention relates to a vending machine, and more particularly to a vending machine which dispenses foods such as frankfurters which must be stored at a reduced temperature and which must be heated or cooked prior to being dispensed.

Vending machines for dispensing frankfurters have been suggested, but to date have not proven satisfactory. The problems connected with the dispensing of a frankfurter are serious ones. Thus, it is necessary in a satisfactory commercial frankfurter vending machine that the frankfurters within a roll or bun be brought from a refrigerated condition to a cooked condition within a brief time interval, such as a time interval of the order of fifteen seconds. Furthermore, it is desirable that all parts of the frankfurter be heated to substantially the same temperature.

Not only is the dispensing of a properly heated frankfurter a difficult problem, but the satisfactory storage of frankfurter-bun units and their transmission to the heating section likewise raises difficult problems.

An object of the present invention is to provide a device which will be able to store a large quantity of vendable articles, such as frankfurter-bun units at a controlled reduced temperature which keeps them relatively imperishable, and which on impulse from a coin actuated mechanism, delivers one unit at a time to a cooking or heating zone and thence to the purchaser.

A further object of the present invention is to provide a machine of the type described which is capable of storing and heating or cooking comestibles contained in packages; such comestibles being maintained clean and sanitary at all times.

A still further object of the present invention is to provide a vending machine of the type described which is relatively easy to service and maintain, and which may be readily kept at all times in a clean and sanitary condition.

Another object of the present invention is the provision of a vending machine of the type described in which refilling of the various carriers for holding the frankfurters or other comestibles which are being dispensed may be readily accomplished.

A yet further object of the present invention is the provision of a machine of the type described in which the various component elements comprising the machine are readily accessible at all times.

Additional objects will become apparent in reading the following description and specification.

In order to obtain the foregoing desirable features, the machine is designed to include one or a plurality of compartments in a cabinet onto which is hingably mounted a door containing additional apparatus. The various elements are so disposed as to cooperate as a unit when the door is closed but are readily accessible for servicing and maintenance when the door is opened.

The cabinet contains an insulated storage compartment for packaged sandwiches, such as frankfurter-bun units, which are kept at a controlled temperature by

means of refrigeration and heating equipment. A forced draft ventilating system circulates air within the storage cabinet at the desired temperature regardless of outside conditions. Adjustable thermostatic controls are provided to maintain the desired temperature continuously.

The food packages are individually carried by a plurality of endless chain conveyors which may be driven by a single motor. Special regulating means are provided permitting the operation of one conveyor at a time until said conveyor is exhausted of merchandise. At such time, the next conveyor is automatically engaged, and so on successively until all the conveyors have been exhausted.

When the conveyors have been exhausted a signal light or other signal means indicates this fact to prospective purchasers or to the proprietors of the vending machine. The endless chain conveyors for carrying the food packages will dispense such packages in order notwithstanding reloading. Thus, in the preferred embodiment of the machine of the present invention, the machine may be reloaded when but partially empty with the previously undispensed conveyor portion first exhausting its food package units before the reloaded conveyor portion discharges its units. For example, if the machine were three-fourths empty at the time of reloading, the one-fourth portion of the machine containing the food package units would dispense such units prior to the commencement of the dispensing of such units by the three-fourths portion of the machine which had previously discharged its food package units. In this manner, storage of food package units for prolonged time periods is avoided.

The conveyor motor is energized by any suitable coin operated relay mechanism, many of which are commercially available and well known in the vending machine art. The presently preferred coin operated relay mechanism includes change making means and slug and counterfit rejection means as well as so-called anti-jackpot means.

An electro-mechanical control system is provided in the machine of the present invention so that the motor is operated only sufficiently to advance one food package unit on the conveyor past a camming means which dislodges such package unit from the conveyor into a chute.

Switch means associated with a timer mechanism may be contained in the lower part of the chute. After receipt of a coin from a purchaser such switch means must be actuated by a descending package unit within a predetermined period of time, such as five seconds, or the machine will shut down and an appropriate signal light or other signal means will indicate that the machine is not operating properly or is empty.

In normal operation, the machine is constructed and arranged so that as a package passes through the chute it is received in a cooking device which graspingly encompasses the package, applying a slight pressure to its ends. When this has been effected, an associated circuit is closed inducing a raised voltage from a suitable transformer to pass a current through the package unit which may be provided with conductive metal foil ends and thence through the contained product using the cooker's end pressure means as electrodes. The resistance of the food component in the package unit is such as to produce very rapid heating and in the case of a refrigerated frankfurter, may be used to heat such frankfurter to a temperature of more than 160° F. within 15 seconds or less. A second time control is energized by the closing of the cooker arms to regulate this necessary cooking time.

When the second-mentioned time control has completed its cycle the current is shut off, the cooker mechanism opens, dropping the package unit into a service tray

accessible from the outside of the machine where the customer may receive it. At this time all circuits in the device are open and the machine is ready to recycle upon the deposit of another coin.

The previously mentioned regulating means connecting the conveyors and the conveyor motor is also provided with an electromechanical control. This control consists of a step switch relay, such as is used in simple telephone dialing systems, which directs the energy of the motor to one conveyor at a time. When one conveyor is exhausted a switch adjacent the conveyor is closed by a pin or special link in the conveyor chain. The closing of said switch energizes the step relay causing it to direct the energy of the motor to the next conveyor and so on successively until all the conveyors are exhausted.

For the purpose of illustrating the invention there is shown in the drawings a form which is presently preferred; it being understood, however, that this invention is not limited to the precise arrangements and instrumentalities shown.

Referring to the drawings wherein like reference characters refer to like parts:

Figure 1 is a perspective view of the vending machine with its door ajar to reveal some of the internal structure.

Figure 2 is a front elevation with the door and cooker mechanism removed and parts broken away for the sake of clarity.

Figure 3 is a sectional view taken substantially on line 3—3 of Figure 2 but with the door included in closed operating position.

Figure 4 is a cross-section taken on line 4—4 of Figure 3.

Figure 5 is a perspective of a fragment of one conveyor and its associated discharge cam.

Figure 6 is a side elevation partly in section of one of the transmission units.

Figure 7 is a front elevation of the unit of Figure 6.

Figure 8 is a front elevation of the cooker panel with the cooker in open disposition.

Figure 9 is a top plan view of the cooker panel with the cooker in closed disposition.

Figure 10 illustrates the electrical elements and associated mechanical parts which cooperate to produce a normal vending cycle.

Figure 11 shows an electrical relay system for shifting the drive transmission from a conveyor which has been exhausted of vendibles to the next full conveyor, and so on successively until the last conveyor is exhausted, whereupon a signal light is energized indicating that the machine is empty and in need of service. At this time the machine automatically rejects coins inserted for a purchase. Figure 11 also illustrates a system of manual bypass switches which provide power to the conveyors to facilitate loading of the machine by a serviceman. The term L_1 is used to show the relationship of Figure 11 to Figure 10.

Referring initially to Figures 1, 2 and 3 the vending machine designated generally as **10** comprises a main housing or cabinet **12** and a door **14** hingedly connected along one edge **16** of the cabinet **12**. Suitable mating locking means **18** and **20** are cooperatively placed on the door **14** and on the edge **16'** of the cabinet **12** opposite to edge **16**.

The housing **12** is divided into three principal compartments, the storage compartment designated generally as **22**, the transmission compartment designated generally as **24** and the power compartment designated generally as **26**.

The storage compartment **22** is lined with slabs of insulating material **30**, and is further subdivided into four vertical conveyor chambers **32**, **34**, **36**, and **38**, by means of perforated partition walls **40**, **42**, and **44**. Chambers **32** and **38** are defined on one side each by side walls **12A** and **12B** respectively of cabinet **12**. The rear wall **12C** of cabinet **12** is common to each of chambers **32**, **34**, **36**, and **38**.

Since each of the vertical chambers **32**, **34**, **36** and **38** are substantially the same, the chamber **36** shown in Figure 3 will be described as typical, and the structure of the remaining chambers **32**, **34** and **38** may be readily understood.

Within chamber **36** a labyrinth is produced by a continuous perforate sheet designated generally as **50** which is bent to form a top **51**, a bottom **52**, and a back **53**. The sheet **50** extends for the full width of chamber **36** and is secured to the partitions **42** and **44**.

Three perforate plates **54**, **55**, and **56** having interconnected round bottoms **57** and **58** are secured to the partitions **42** and **44**. The said plates with their interconnected bottoms form a configuration generally resembling a letter W when viewed in section as in Figure 3, such letter W having its top and bottom in spaced relationship from the top **51** and bottom **52** of sheet **50**.

Perforate plates **59** and **60** are dependent from top **51** and are uniformly interspaced between plates **54**, **55**, and **56** in front-to-back relationship. The plates **59** and **60** are also secured to the side partitions **42** and **44**.

The net result of this construction is a serpentine passageway **65** through which a conveyor **70** may pass in the manner to be described below.

Referring now particularly to Figures 3 and 4, it will be seen that a plurality of shafts **72**, each carrying a pair of sprockets **74** are journaled in bearings **76** on the partitions **42** and **44**.

Each shaft **72** is so positioned that its associated sprockets **74** have their principal diameters in a plane parallel to the plane of partitions **42** and **44**.

A shaft **72A**, journaled in bearings **76A**, is provided as the driven element of the conveyor **70**. Sprockets **74A** are fastened to the shaft **72A** as is a driven sprocket **78***c*. The manner of driving sprocket **78***c* and similar sprockets **78A**, **78B**, and **78D** for chambers **32**, **34** and **38** will be described below.

A pair of sprocket chains **80** are operatively laced under and over the sprockets **74** and the sprockets **74A** following the serpentine path of passageway **65**.

Referring particularly to Figure 5, the conveyor or carrier elements generally designated as **90** are horizontally disposed between the chains **80** and are secured to opposite links thereof by rivets **91** in flanges **92**. The horizontal center portion **94** of carrier elements **90** has sufficient width and depth to partition or block the cross-sectional area of passageway **65** so that anything interposed between them, such as a package unit comprising a frankfurter and a bun, will be lifted, pushed or otherwise conveyed by them.

The center portion **94** of each carrier element **90** is notched on one edge to form a plurality of spaced parallel tines **96**. As is apparent from Figure 5, each of the carrier elements **90** is similarly notched so that all of the carrier elements **90** have the same shape.

A discharge cam **98** is secured to the inner surface of the front face of perforate plate **54**. Discharge cam **98** consists of a flat base portion **100** secured by rivets or other securement means to perforate plate **54**. Discharge cam **98** has several downwardly and forwardly depending fingers **102** which are so spaced as to pass between the tines **96** of the conveyor elements **90**, when the conveyor elements **90** are juxtaposed thereto.

Reference to Figures 3 and 5 will reveal that any object such as a frankfurter and bun unit resting on a conveyor element **90** will be pushed forward and off said conveyor element **90** when it passes the cam fingers **102** of cam **98**.

In the illustrated embodiment of the machine **10**, the conveyor **70** moves downwardly while passing the discharge cam **98**. A short chute **110** is provided in front of each conveyor **70**, juxtaposed to and spaced from dis-

charge cam 98. A short chute 110 is provided in front which receives the ejected object "S" in the manner set forth below. The object "S" may be illustratively taken as representing a frankfurter and bun package unit. The constructions of chute 110 will be described in greater detail hereinafter.

As heretofore noted, the foregoing description is directed to but a single conveyor, with such single conveyor being positioned in chamber 36, and that similar conveyors having associated details of similar construction are provided in each of the other chambers 32, 34 and 38.

In order to operate the conveyors in each of the chambers 32, 34, 36 and 38 in orderly sequence, namely one at a time until each conveyor is successively exhausted of its vendible objects, a special regulator or transmission means designated 120 is provided. Transmission 120 is mounted at the rear of compartment 24 and is powered by a gear reduction motor 122 located in the lower compartment 26.

The output shaft of the gear reduction motor 122 has secured thereto a crank 124 to which a connecting rod 126 is pivotally fastened. The opposite end of connecting rod 126 is pivotally connected to a lever arm 128 which is secured to a jackshaft 130. Crank 124 and lever arm 128 are relatively proportioned so that one full revolution of the crank 124 causes the lever arm 128 to oscillate through about 95° of arc. The jackshaft 130 is rotatably supported by a plurality of bearing members 132 mounted on a base 134 which in turn is fastened to the rear wall of housing 12 in the compartment 24.

Four drive mechanisms 140 are provided on the jackshaft 130, one for each of the conveyors in each of the chambers 32, 34, 36 and 38. The drive mechanisms 140 are constructed and arranged as two pairs of right and left handed units adjacent their corresponding chambers 32, 34, 36 and 38, as shown in Figure 2 whereby a minimum of space adjacent the conveyors 70 is used. Except for their right and left handed relationships, the drive mechanisms are otherwise identical in every respect.

One typical drive mechanism 140 is shown in detail in Figures 2, 3, 6 and 7. Referring to these figures, a sprocket 142 and a four-toothed ratchet wheel 144 are united on a common hub 146. Hub 146 is non-securedly mounted on the jackshaft 130. Each sprocket 142 is aligned axially with one of the driven sprockets 78 on the shafts 72A, and sprocket chain 148 interconnects them as shown in Figures 2 and 7. The sprocket 142 is retained in axial alignment by means of a collar 150 secured to shaft 130 on one side of sprocket 142. The hub of a pawl carrying arm 152 is also fastened to shaft 130 adjacent the ratchet wheel 144 on hub 146.

A pawl 154 is pivotally mounted on pin 156 at the end of arm 152 so that it lies in the same plane as ratchet wheel 144. The pawl 154 is biased away from and out of engagement with the ratchet wheel 144 against a cam member 164, by means of a torsion spring 158 which is anchored at one end to the pivot pin 156 on which it is coiled. Its free end bears against a pin 160 at one end of pawl 154. At the other end of pawl 154 is a pin 162 which projects into the plane of the cam member 164 and may be operatively engaged therewith. The cam member 164 is pivotally secured at pin 166 which is carried on bracket 168. Bracket 168 is engaged with base 134. The cam member 164 has a downwardly projecting ear 170 to which is fastened a tension spring 172. Spring 172 is anchored to a stud 174 which depends from bracket 168, and urges cam member 164 to rotate about pivot 166 in a counter-clockwise direction as viewed in Figure 6.

A link 176 is also fastened to the ear 170 of cam member 164 and to the plunger 178 of solenoid 180 fastened to the base 134. Link 176 limits the effect of spring 172. When the solenoid 180 is energized, the plunger 178 is urged to the left as viewed in Figure 6, opposing and overcoming the force of spring 172 and causing a clockwise rotation of cam member 164 about its pivot 166. This clockwise rotation of cam member 164 lifts pin 162 and associated pawl 154 into engaging relationship with ratchet wheel 144. Since the pawl 154 is carried on an arm 152 which is fastened to the shaft 130, motion of shaft 130 is transmitted by pawl 154 to the ratchet wheel 144 during the clockwise portion of its oscillatory movement. Rotation of the ratchet wheel 144 rotates the integrally formed sprocket wheel 142 driving sprocket chain 148 and the associated sprocket 78 such as sprocket 78c on shaft 72A.

The rotation of shaft 72A rotates the drive sprockets 74A of conveyor 70 advancing conveyor 70 so that one of the conveyor carriers 90 thereof is moved past the discharge cam 98 effecting the displacement of a frankfurter and bun unit "S" from the carrier 90 into the chute 110.

Referring to Figure 2, it will be seen that a small electric switch 200 is provided adjacent each conveyor 70. A small pin 202 (see Figure 5) is fastened to one of the chains 80 of each conveyor 70 and is adapted to contact the adjacent switch 200 when it is moved past it. The pin 202 is located on conveyor 70 adjacent what may be considered the last carrier 90 of each of said conveyors 70 (that is the last carrier 90 to pass the discharge cam 98 in one complete cycle of a conveyor 70).

A switch 204 is associated with the crank arm 124 which limits it to one revolution per cycle of the machine, thus assuring the discharge of only one frankfurter and bun unit "S" per cycle. A fuller understanding of the operation of the switches above referred to will be had from the wiring diagrams which will be hereinafter described.

Referring primarily to Figures 2 and 3 it will be seen that the compartment 26 contains a motor 210 connected to a refrigeration compressor 212 by means of belts 214. In back of motor 210 is a condenser unit 216 cooled by the fan 218 also driven by motor 210. Suitable piping 219 connects condenser 216 with an evaporating coil 220 located in the intermediate portion of transmission compartment 24. The evaporating coil 220 is enclosed in an insulated box 222 to which is connected a blower 224. An outlet duct 226 communicates with the insulated upper storage compartment 22, through which cooled air impelled by blower 224 is circulated. An air heater 228 may be located in the duct 226 so that under extremely cold ambient atmospheric conditions the circulating air can be warmed. A temperature of about 40° F. is considered desirable for frankfurter bun package units and a thermostat (not shown) can be located at any convenient place to control the equipment and maintain this temperature. A return air duct 230 is provided to recirculate the air thus reducing the load requirements of the temperature system.

The chute 110, of each of the chambers 32, 34, 36 and 38, projects into the door 14 and comprises an inclined bottom plate 240 and a pivotally hung door 242. Each door 242 is provided with an inwardly curving plate 244 which acts as a guard or deflecting shield permitting only one package unit "S" to pass through the chute 110 at a time. The door 242 serves to seal off the storage compartment from outside contamination and also to retain the circulating cool air within the storage compartment. To assure opening of the door 242 at the precise time of ejection of a package unit "S," a solenoid 408 (see Figure 10) is energized to open it. It is closed as soon as the sensing switch 410 in a funnel-shaped plenum duct 250 is closed by a falling package unit.

The funnel-shaped plenum duct 250 is located in the door 14 under the chutes 110, as shown in Figures 1, 2 and 3.

Centered under the lower narrow end 252 of plenum duct 250 is a high resistance type cooking device designated generally as 260. This is mounted on a base plate 262, which in turn is fastened to the upper and lower partitions 263 and 265 which form compartment 24,

Cooking device 260 comprises a pair of angle shaped clamping members 264, a lower rotatable support 266 and an upper rotatable cover 268. Support 266 and cover 268 serve as electrodes during the cooking operations. The angular clamping members 264 are supported at the ends of a pair of scissors-like members 270 which are normally spring-urgedly held apart by spring 272 which embraces connecting rod 274. A solenoid 276 biases clamping members 264 together through the connection 278 with connecting rod 274 and the toggle linkage 280.

The lower support 266 is rotated into and out of operating position by the rotary solenoid 282. Likewise the upper cover 268 is rotated by means of rotary solenoid 284. The members 266 and 268 are pivotally mounted on the shaft 286 and are normally biased apart by the springs 288, which embrace shaft 286. A solenoid 290 urges members 266 and 268 towards one another, as seen particularly in Figure 8, through the linkages 292 and 294 which are oppositely joined to the solenoid 290, and which are linked to the members 268 and 266, respectively.

The timing and sequence of the foregoing motions are controlled by the electrical circuitry which will be hereinafter described.

As previously stated the members 266 and 268 serve as electrodes during the cooking operations and therefore have insulated inserts 300 on the working surfaces thereof and suitable flexible conductors 302 which lead to a high voltage transformer 440 located in the compartment 26. A coin operated relay box 310 of any suitable sort is shown secured to the inner face of door 14. A conductor 312 connects it with an electric control box 214 (see Figure 1). A serving tray 320 is positioned in the door 14 below the end 252 of funnel 250, and projecting rearwardly from the door 14 so as to lie directly beneath cooker 260 when the door is closed (see Figures 1 and 3).

Referring to Figure 10, a source of standard 110 volt alternating current is indicated by the symbol ~, one side L_a of which is connected to the coin switch 400, coin relay 402, and power relay 404. The other side L_b serves as the return side of the line for completing the various circuits. To simplify Figure 10, wire connections between the various circuits and L_b are not shown, and the ground symbol is used to represent such connections.

The refrigerator-heater equipment is continuously energized under control of a theromstat, all of which is indicated diagrammatically by the block 401.

Assuming that the machine is fully loaded with merchandise, when the proper coin or coins are inserted, the switch 400 sends a momentary pulse of current to the multiple contact relay 402 energizing it. One set of contacts in the relay 402 is used as a holding circuit to maintain it energized for a full cycle of operation. A second set of contacts in relay 402 supplies energy to the power relay 404. Upon closing the contacts of power relay 404 the following elements are immediately energized:

The bottom rotary arm 266 is swung into position directly beneath chute 250 by means of rotary solenoid 282. Conveyor motor 122 is energized and drives one of the conveyors 70 as previously described. A five second timing multiple contact switch 406 is also started, which maintains its contacts in the position shown in the drawing to permit the machine to complete its cycle if merchandise is delivered to the cooking mechanism 260 within the limited specified time. Simultaneously, a gate 242 in one of the conveyor chutes 110 is opened by means of a solenoid 408 which receives energy from a single contact relay 409 which in turn is energized by a normally closed contact in the relay 412. The return course of current to ground is through the stepping relay 450 of Figure 11, which will be described in detail below.

The opening of gate 242 permits merchandise to be delivered from the operating conveyor 70 into the chute 250 for delivery to the cooker 260. Merchandise falling through chute 250 momentarily closes the switch 410, energizing relay 412. This relay is provided with multiple contacts including a self holding contact and thus remains energized while a second contact interrupts current to solenoid 409 closing the gate 242 and at the same time completing the circuit to a relay 414 through a half wave selenium rectifier 420 and a resistor-condenser network 422 so designed that a quarter-second time delay is provided in the flow of current to the relay 414. This time lag is important to allow falling merchandise to come to rest on the arm 266 of the cooker 260 before relay 414 assumes control.

In delivering merchandise from the conveyor 70, motor 122 completes its cycle with one revolution of the crank 124 and shuts itself off by closing the switch 204. This momentarily energizes the latch coil 416 of multiple contact relay 418. One of the contacts of relay 418 thus energizes the motor relay and interrupts the flow of current to the motor.

At this time the five second timer 406 is still running and relay 412 remains energized. At the completion of the quarter-second delay, the relay 414 is energized interrupting the flow of current to the five second timer and at the same time energizing the solenoid 276 thereby closing the clamping jaws 270 about the merchandise. The closing of the jaws 270 also operates a switch 424 which energizes the rotary solenoid 284 of upper arm 268 swinging it into position for cooking. Rotation of arm 268 closes a switch 426 energizing the solenoid 290 applying a squeezing movement to the merchandise. Energizing coil 290 also closes the switch 428 thus energizing relay 430.

Multiple contact relay 430, when energized, interrupts the flow of current to the rotary solenoids 282 and 284, which are no longer needed while solenoid 290 holds them in cooking position. Multiple contact relay 430 also completes a circuit to the cooking transformer 440, the output sides of said transformer lead to electrodes 300 mounted in insulation in the rotary arms 266 and 268. To minimize the effect of the variable resistance set up by the merchandise as the cooking process progresses, a plurality of relatively high resistors 442 are provided in one of the transformer output lines. A fifteen second timing switch 444 is energized at the same time by the same means as transformer 440 and maintains its normally closed contact in the position shown in the drawings for the duration of the cooking period. The power relay 404 is dependent on this closed contact for energy and therefore the cooking cycle is controlled by this timing device. At the end of the fifteen second interval the entire cooking cycle is brought to completion when the timer 444 opens its contact interrupting the flow of current to relay 404 and thus to the various described elements of the machine.

When the bottom rotary arm 266 is released and swings back to its normal position the merchandise is dropped into the delivery tray 320 where it may be picked up by the purchaser.

Figure 11 illustrates the manner by which the conveyors 70 are successively operated until each is exhausted of merchandise. This arrangement as will be shown below also lends itself to relatively quick and easy loading by a service man. The figure illustrates the conveyor 70 disposed within chamber 34 connected for operation. This is due to the position indicated by the stepping relay 450. This switch directs energy to a solenoid 180 operating a drive transmission 140 associated with the conveyor 70 of chamber 34. Therefore, each time the motor 122 is operated, the conveyor 70 in chamber 34 will be advanced one space in the manner previously described. When the pin 202 of conveyor 70 strikes and closes the switch 200 energy is directed to the coil of stepping relay 450 advancing the contactor to the next position and thus transferring the enegy to the next conveyor in chamber 36. At the same time that stepping relay 450 is energized a second stepping

relay 452 is also operated. This relay serves to indicate by means of signal lights 454 when the machine is full and by means of a conductor 453 which leads to the five second timing device 406 of Figure 10, also indicates when the machine is empty by lighting lamp 455. Referring back to Figure 10, it will be noted that the lamp 455 is not lit until the timing mechanism 406 has "timed out," thus closing the contact which lights lamp 455 and breaking the circuit upon which the machine is initially dependent to operate. Therefore, the lamp 455 will also indicate that the machine is out of order by lighting the empty lamp if merchandise does not pass through the chute 250 closing sensing switch 410 before the five second interval has elapsed. This might occur if for some unpredictable reason merchandise should jam at the conveyor or conveyor gate, etc.

Referring again to Figure 11, when the machine is opened for loading, a switch 456 is available to the service man which may be turned to the position indicated as L in the drawing which disconnects stepping relay 450 from the drive circuit, in effect by-passing it. In this position switches 458 may be manually operated to advance their associated conveyors by closing the foot switch 460. This makes it possible for an operator to reload the machine before it is completely exhausted without disturbing the sequence of conveyor operation when the machine is again put back into service. When the machine is fully loaded the service man must pulse the switch 464 a sufficient number of times to advance the stepping relay 452 to the full indicating position. By virtue of this arrangement, after the service man has reloaded the machine, stepping relay 450 may direct current to the last conveyor of the machine which has not been exhausted and then because of the rotary character of switch 450 it will automatically transfer its energy to the first conveyor and continue to operate. Signal lamps 466 are provided in the transmission actuating coil circuit to indicate to the service man which conveyor is currently in operation.

The present invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof and, accordingly, reference should be made to the appended claims, rather than to the foregoing specification as indicating the scope of the invention.

We claim:

1. In a vending machine for vending individual articles comprising comestibles, the combination which comprises a housing, a plurality of vertically movable conveyors spaced side by side, each of said conveyors comprising a plurality of article carriers substantially evenly spaced along the entire length thereof, a common discharge hopper operatively juxtaposed to each of said conveyors, ejection means comprising a fixedly secured immovable projection for ejecting articles carried by said article carriers juxtaposed to each of said conveyors and spaced from said discharge hopper, means for conduction heating individual articles disposed beneath said discharge hopper comprising spaced electrodes, means for energizing said spaced electrodes, an article delivery hopper spaced beneath said heating means, and control means responsive to a coin receiver and relay for sequentially moving one of said movable conveyors a distance sufficient to advance a carrier into engagement with said ejection means and then actuating the means for energizing the heating means.

2. A vending machine in accordance with claim 1 in which each of said conveyors has signal means connected thereto adjacent the last of the article carriers in said conveyor, said signal means constructed and arranged to engage switch means fixedly positioned within the housing after the contents of each of the carriers in the conveyor with which such signal means is associated have been exhausted, and means connected to said switch means for actuating a different conveyor means responsive to the engagement of said signal means and switch means.

3. A vending machine in accordance with claim 1 in which each of the article carriers comprises a slotted base, and the ejection means is fixedly positioned within the housing and comprises at least one finger disposed to pass through the slot in the carrier base dislodging an article disposed on the carrier base into the discharge hopper on the movement of the carrier.

4. A vending machine in accordance with claim 1 in which each conveyor comprises an endless chain sinuously mounted on sprockets, a single driving means engaged with each of said conveyors, and means for selectively engaging but one of said conveyors.

5. A vending machine in accordance with claim 4 in which each conveyor comprises a pair of substantially parallel chains, with each carrier disposed intermediate said pair of chains, and a signal means comprising an outwardly projecting finger on the side of one of said chains constructed and arranged to engage switch means fixedly positioned within the housing after the contents of each of the carriers in the conveyor have been exhausted.

6. A vending machine in accordance with claim 1 in which the heating means includes a pair of vertically spaced separately pivotable electrodes, means for first pivoting the lowermost of said electrodes into a position juxtaposed to the bottom mouth of the discharge hopper for obstructing the further descent of an article passing through said discharge hopper, and means for subsequently pivoting the uppermost electrode into a disposition wherein it is juxtaposed to the lowermost electrode.

7. A vending machine in accordance with claim 6 in which the heating means also includes a pair of upright jaws operatively positioned intermediate the vertically spaced electrodes, means for separately opening and closing said upright jaws, and sensing means responsive to the movement of an article ejected from a conveyor for controlling said last-mentioned means.

8. A vending machine in accordance with claim 6 in which means are provided for urging the vertically spaced electrodes towards each other after they have been separately pivoted into juxtaposed disposition.

9. In a vending machine for vending individual articles comprising comestibles, the combination which comprises a housing, a plurality of vertically movable conveyors spaced side by side within a chamber, each of said conveyors comprising a plurality of article carriers substantially evenly spaced along the entire length thereof, refrigeration means in communication with the chamber containing said conveyors for maintaining articles positioned on the carriers at a predetermined temperature, a common discharge hopper operatively juxtaposed to each of said conveyors, ejection means comprising a fixedly secured immovable projection which is alignable with said article carriers for ejecting articles carried by said article carriers juxtaposed to each of said conveyors and spaced from said discharge hopper, means for conduction heating individual articles disposed beneath said discharge hopper comprising spaced electrodes, means for energizing said spaced electrodes, an article delivery hopper spaced beneath said heating means and control means responsive to a coin receiver and relay for sequentially moving one of said movable conveyors a distance sufficient to advance a carrier into alignment with said ejection means and then actuating the means for energizing the heating means.

10. A vending machine in accordance with claim 9 in which the machine comprises thermostatic means connected to said refrigeration means, said thermostatic means being responsive to ambient temperatures for selectively controlling the operation of said refrigeration means.

11. In a vending machine for vending individual articles comprising comestibles, the combination which comprises a housing, a plurality of vertically movable conveyors spaced side by side, each of said conveyors com-

prising a plurality of article carriers substantially evenly spaced along the entire length thereof, a common discharge hopper operatively juxtaposed to each of said conveyors, ejection means comprising a fixedly secured immovable projection for ejecting articles carried by said article carriers juxtaposed to each of said conveyors and spaced from said discharge hopper, means for conduction heating individual articles disposed beneath said discharge hopper comprising spaced electrodes, means for energizing said spaced electrodes, an article delivery hopper spaced beneath said heating means, control means responsive to a coin receiver and relay for sequentially moving one of said movable conveyors a distance sufficient to advance a carrier into engagement with said ejection means and then actuating the means for energizing the heating means, and bypass means for disengaging said control means and simultaneously operating each of said conveyors.

12. A vending machine in accordance with claim 11 in which the bypass means comprises means for disengaging said means for energizing said heating means.

13. In a vending machine for vending individual units comprising comestibles, the combination which comprises a housing, a plurality of vertically moving conveyors spaced side by side, each of said conveyors comprising a plurality of carriers, said carriers including a slotted base, a discharge hopper operatively juxtaposed to said conveyors, at least one ejection finger fixedly positioned within said machine and spaced above said discharge hopper, said ejection finger positioned to be matingly aligned with the slot in each of the carriers, whereby when a carrier is operatively positioned juxtaposed to said ejection finger the ejection finger passes through the slot in said carrier and dislodges the article supported thereon on the subsequent movement of said carrier, means for heating articles discharged from said conveyors positioned beneath said discharge hopper, and refrigeration means for retaining articles positioned on said conveyors at a predetermined temperature.

14. In a vending machine the combination comprising a plurality of side by side conveyors, each of said conveyors comprising a plurality of article carriers supported upon an endless chain, a single drive shaft operatively connected to each of said conveyors, engagement means connected to each of said conveyors for engaging and operatively disengaging said conveyors in respect to said drive shaft whereby said conveyors are advanced and their article contents dislodged therefrom, means for selectively engaging one of said engagement means, sensing means on each of said conveyors for detecting when the article content of each of said conveyors is exhausted, and means associated with said means for selectively engaging one of said engagement means for successively selectively engaging the engagement means of successive conveyors until the contents of all of said conveyors are exhausted, and means for indicating the exhaustion of the article content of all of said conveyors.

15. In a vending machine the combination comprising a plurality of side by side conveyors, each of said conveyors comprising a plurality of article carriers supported upon an endless chain, a common discharge hopper operatively juxtaposed to each of said conveyors, a single drive shaft operatively connected to each of said conveyors, engagement means connected to each of said conveyors for operatively engaging and operatively disengaging said conveyors in respect to said drive shaft whereby said conveyors are advanced and their article contents dislodged therefrom, means for selectively engaging one of said engagement means, sensing means on each of said conveyors for detecting when the article content of each of said conveyors is exhausted, means associated with said means for selectively engaging one of said engagement means successively selectively engaging the engagement means of successive conveyors until the contents of all of said conveyors are exhausted, and means for indicating the exhaustion of the article content of all of said conveyors.

16. In a vending machine the combination comprising a plurality of side by side conveyors disposed within a chamber, refrigeration means in communication with said chamber for maintaining articles positioned within said chamber at a predetermined temperature, each of said conveyors comprising a plurality of article carriers supported upon an endless chain, a common discharge hopper operatively juxtaposed to each of said conveyors, means for conduction heating individual articles disposed beneath said discharge hopper comprising spaced electrodes, a single drive shaft operatively connected to each of said conveyors, engagement means connected to each of said conveyors for operatively engaging and disengaging said conveyors in respect to said drive shaft whereby said conveyors are advanced and their article contents dislodged therefrom, means for selectively engaging one of said engagement means, sensing means on each of said conveyors for detecting when the article content of each of said conveyors is exhausted, means associated with said means for selectively engaging one of said engagement means for successively selectively engaging the engagement means of successive conveyors until the contents of all of said conveyors are exhausted, and means for indicating the exhaustion of the article content of all of said conveyors.

17. A heater for edible articles comprising a pair of vertically spaced separately pivotable electrodes normally disposed in a non-heating position, control means connected to both of said electrodes for pivoting the lower of said electrodes from said non-heating position to a predetermined cooking position and subsequently pivoting the upper of said electrodes from said non-heating position to a predetermined cooking position in which it is juxtaposed to the lower electrode, means for urging said electrodes towards each other when they are disposed in cooking position and means for applying an electric potential between said electrodes when they are in cooking position.

18. A heater for edible articles in accordance with claim 17 including a pair of upright jaws operatively positioned intermediate the electrodes in their cooking position, and separate means for opening and closing said upright jaws.

19. A heater for edible articles comprising a pair of separately pivotable jaws, a first sensing means connected to at least one of said jaws for detecting the movement of an article towards said jaws, a second pair of separately pivotable jaws positioned generally normal to said first pair of jaws, a second sensing means for regulating said second pair of jaws responsive to the movement of an article, means connected to said first pair of jaws for furnishing an electrical potential between said first pair of jaws, means for urging said first pair of jaws inwardly and outwardly, and means for urging said second pair of jaws inwardly and outwardly.

20. In a vending machine for vending individual articles comprising comestibles, the combination which comprises a housing, conveyor means for said comestibles comprising a plurality of article carriers substantially evenly spaced along the entire length thereof, a discharge hopper operatively juxtaposed to said conveyor means, ejection means comprising a fixedly secured immovable projection for ejecting articles carried by said article carriers juxtaposed to said conveyor means and spaced from said discharge hopper, means for conduction heating individual articles disposed beneath said discharge hopper comprising spaced electrodes, means for energizing said spaced electrodes, an article delivery hopper spaced beneath said heating means, and control means responsive to a coin receiver and relay for moving said conveyor means a distance sufficient to advance a carrier into engagement with said ejection means and then actuating the means for energizing the heating means.

21. In a vending machine for vending individual articles comprising comestibles, the combination which comprises a housing, conveyor means spaced within a chamber in said housing, said conveyor means comprising a plurality of article carriers substantially evenly spaced along the entire length thereof, refrigeration means in communication with the chamber containing said conveyor means for maintaining articles positioned on the carriers at a predetermined temperature, a discharge hopper operatively juxtaposed to said conveyor means, ejection means comprising a fixedly secured immovable projection for ejecting articles carried by said article carriers juxtaposed to said conveyor means and spaced along said discharge hopper, means for conduction heating individual articles disposed beneath said discharge hopper comprising spaced electrodes, means for energizing said spaced electrodes, an article delivery hopper spaced beneath said heating means and control means responsive to a coin receiver and relay for sequentially moving said conveyor means a distance sufficient to advance a carrier thereof into engagement with said ejection means and then actuating the means for energizing the heating means.

22. In a vending machine for vending individual articles comprising comestibles, the combination which comprises a housing, conveyor means comprising a plurality of article carriers substantially evenly spaced along the entire length thereof within said housing, a discharge hopper operatively juxtaposed to said conveyor means, ejection means comprising a fixedly secured immovable projection for ejecting articles carried by said article carriers juxtaposed to said conveyor means and spaced from said discharge hopper, means for conduction heating individual articles disposed beneath said discharge hopper comprising spaced electrodes, means for energizing said spaced electrodes, an article delivery hopper spaced beneath said heating means, control means responsive to a coin receiver and relay for moving said conveyor means a distance sufficient to advance a carrier into engagement with said ejection means and then actuating the means for energizing the heating means, and by-pass means for disengaging said control means and simultaneously operating each of said conveyors.

23. In a vending machine for vending individual units comprising comestibles, the combination which comprises a housing, conveyor means comprising a plurality of carriers within said housing, said carriers including a slotted base, a discharge hopper operatively juxtaposed to said conveyor means, at least one ejection finger fixedly positioned within said housing and spaced above said discharge hopper, said ejection finger positioned to be matingly aligned with the slot in each of the carriers, whereby when a carrier is operatively positioned juxtaposed to said ejection finger the ejection finger passes through the slot in said carrier and dislodges the article supported thereon on the subsequent movement of said carrier, means for heating articles discharged from said conveyor means positioned beneath said discharge hopper, and refrigeration means for retaining articles positioned on said conveyor means at a predetermined temperature.

24. A heater for edible articles comprising a pair of vertically spaced separately pivotable electrodes normally disposed in a non-heating position, control means connected to both of said electrodes for pivoting the lower of said electrodes from said non-heating position to a predetermined cooking position and subsequently pivoting the upper of said electrodes from said non-heating position to a predetermined cooking position in which it is juxtaposed to the lower electrode, a pair of upright jaws operatively positioned intermediate the electrodes in their cooking position, said jaws including contoured faces which embrace the edible article undergoing heating, separate means for opening and closing said upright jaws, means for urging said electrodes towards each other when they are disposed in cooking position and means for applying an electric potential between said electrodes when they are in cooking position.

References Cited in the file of this patent

UNITED STATES PATENTS

561,782	Fry	June 9, 1896
1,292,039	Phillips	Jan. 21, 1919
1,849,145	Illig	Mar. 15, 1932
2,012,733	Smith et al.	Aug. 27, 1935
2,285,435	Holcomb	June 9, 1942
2,337,117	Lloyd	Dec. 21, 1943
2,392,511	Thompson et al.	Jan. 8, 1946
2,586,351	Larimore	Feb. 19, 1952
2,614,480	Elmer	Oct. 21, 1952
2,794,384	Sierk	June 4, 1957