June 29, 1965 F. N. JAMES, SR., ETAL 3,191,737

VENDING MACHINE

Filed Oct. 31, 1961 11 Sheets-Sheet 1

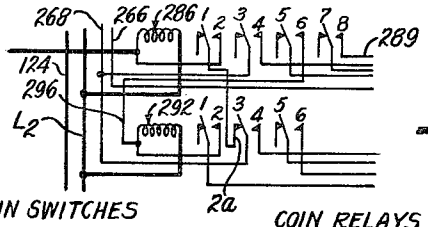


Fig. 1AA.

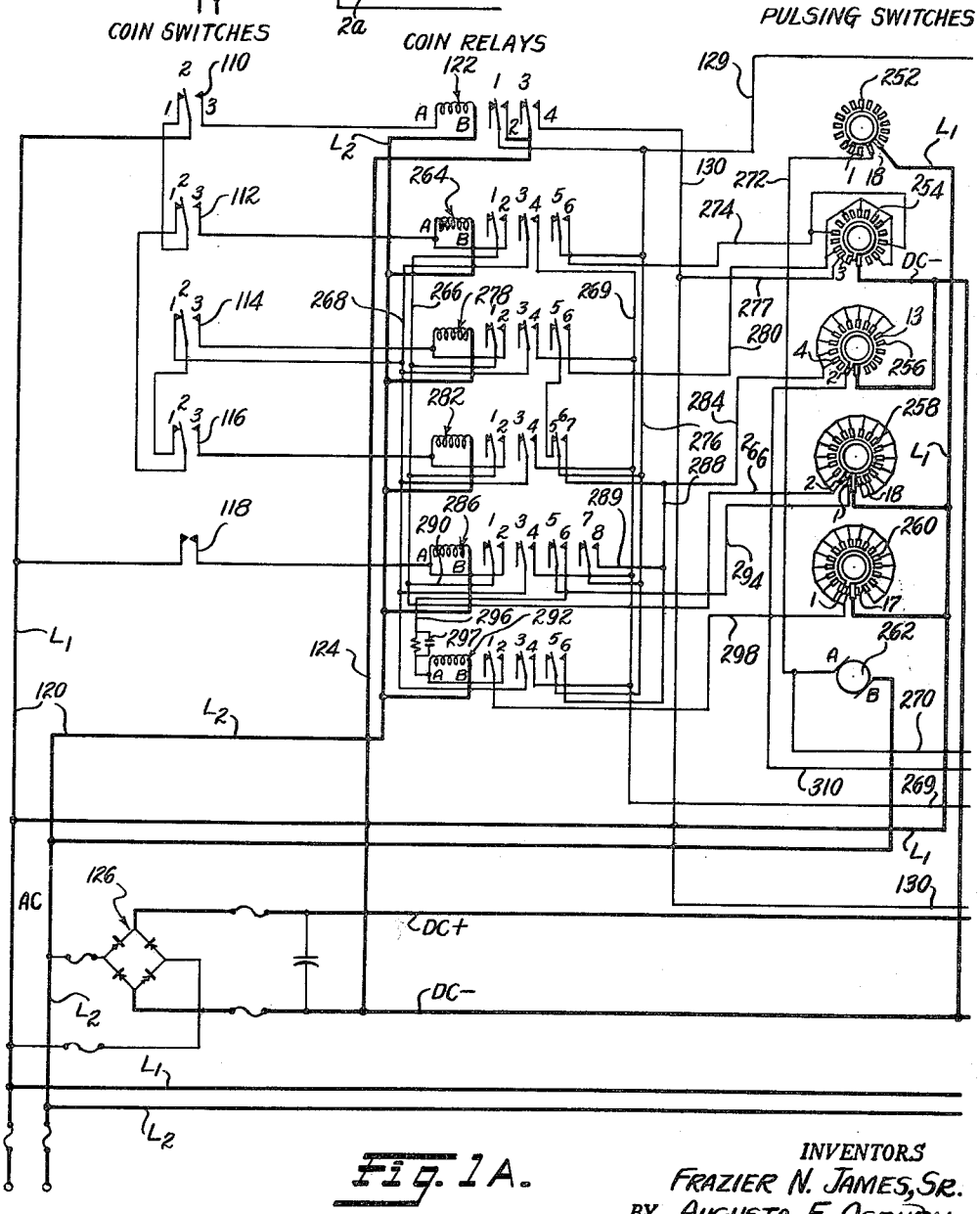


Fig. 1A.

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VENDING MACHINE

Filed Oct. 31, 1961 11 Sheets-Sheet 2

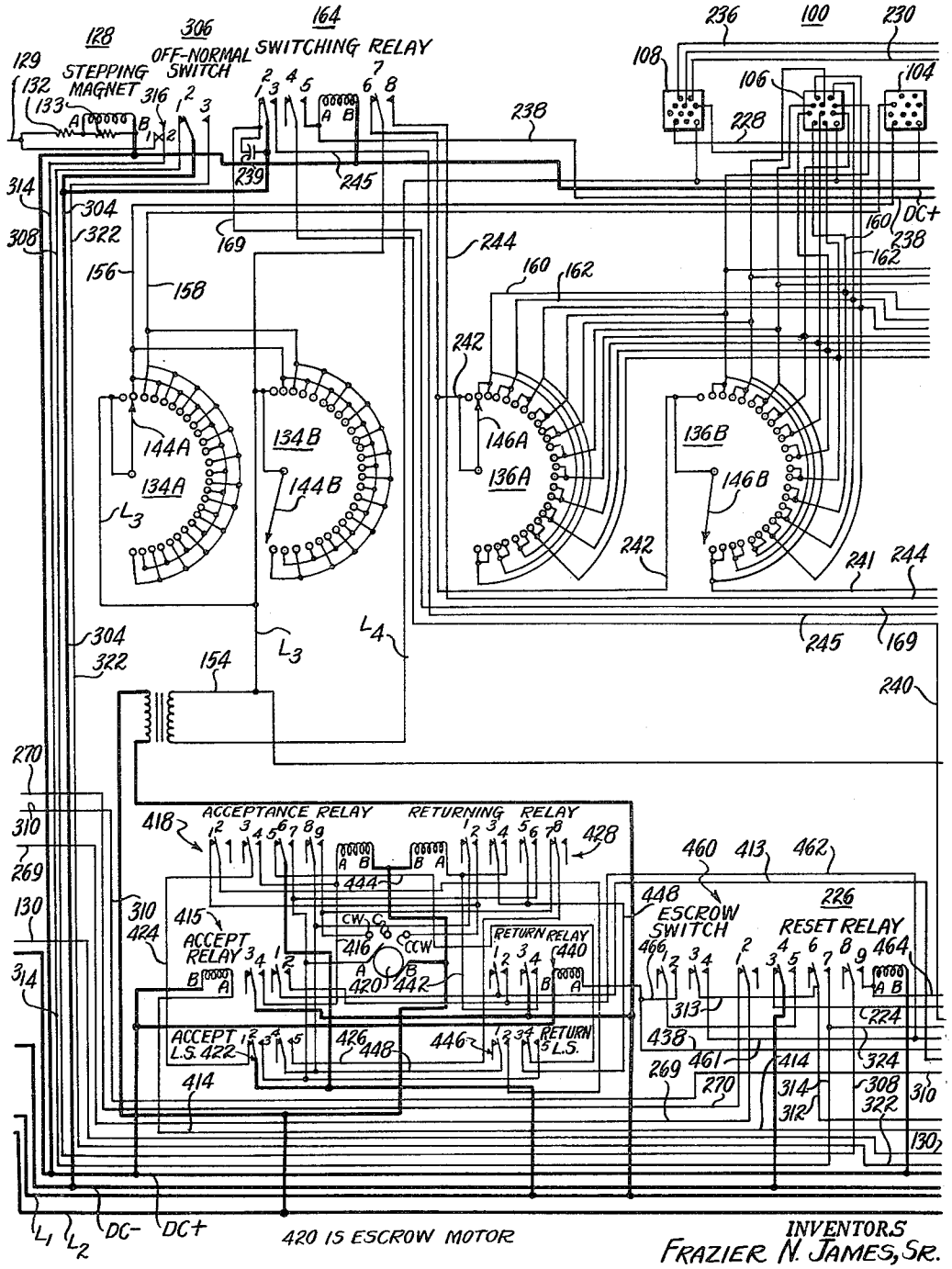


Fig. 1B.

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VENDING MACHINE

Filed Oct. 31, 1961 11 Sheets-Sheet 3

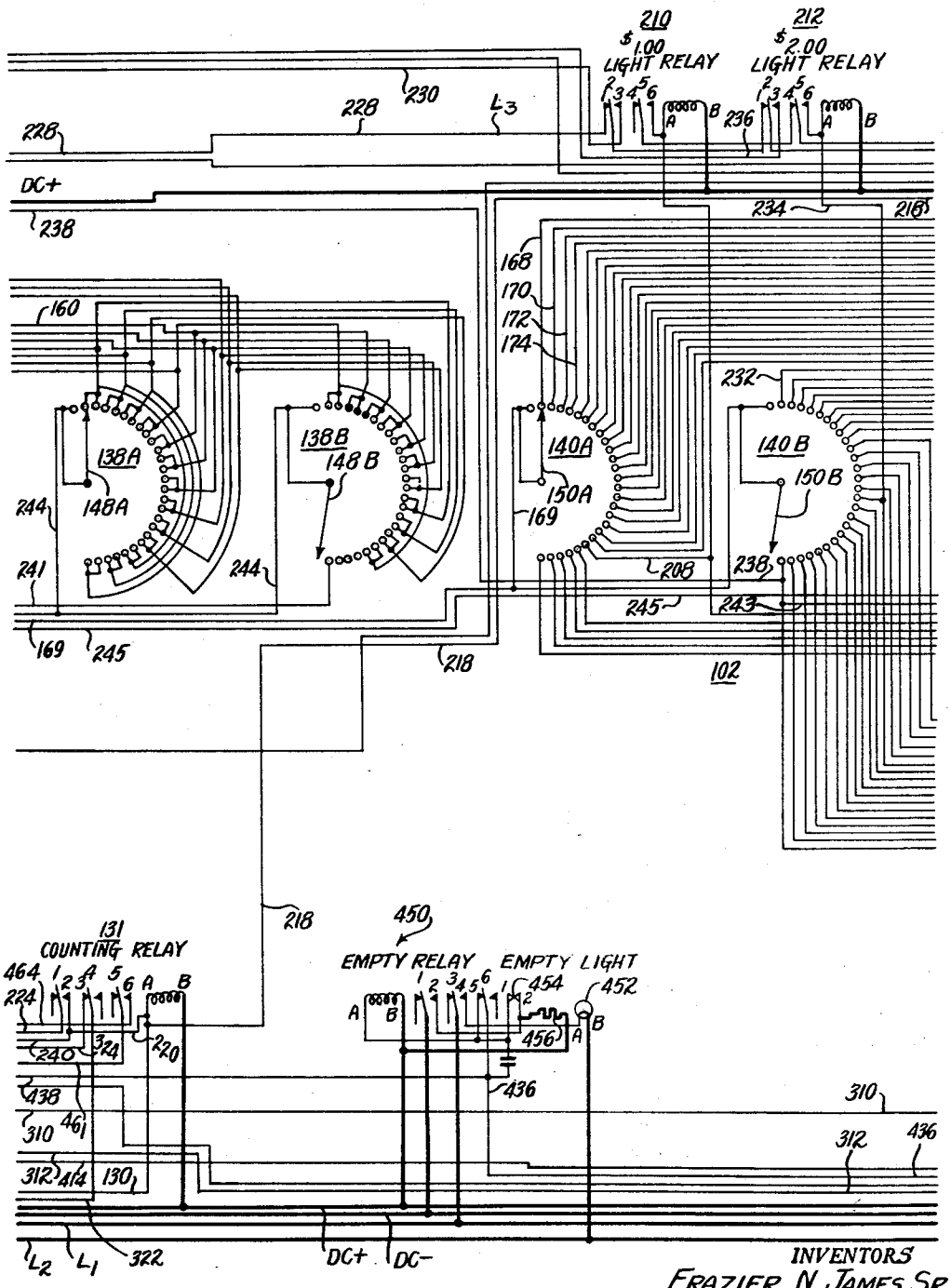


Fig. 1C.

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VENDING MACHINE

Filed Oct. 31, 1961 11 Sheets-Sheet 4

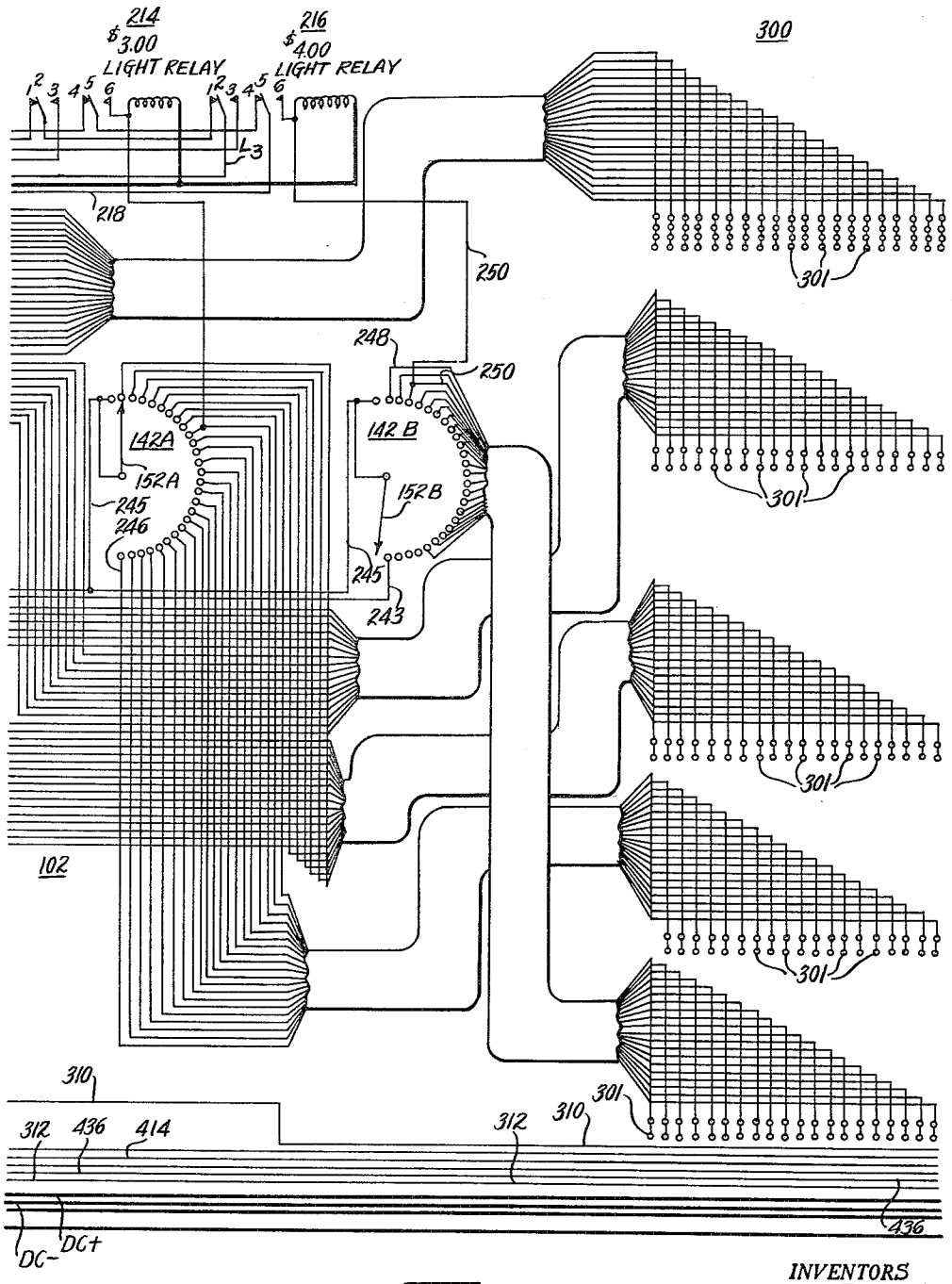


Fig. 1D.

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VENDING MACHINE

Filed Oct. 31, 1961 11 Sheets-Sheet 5

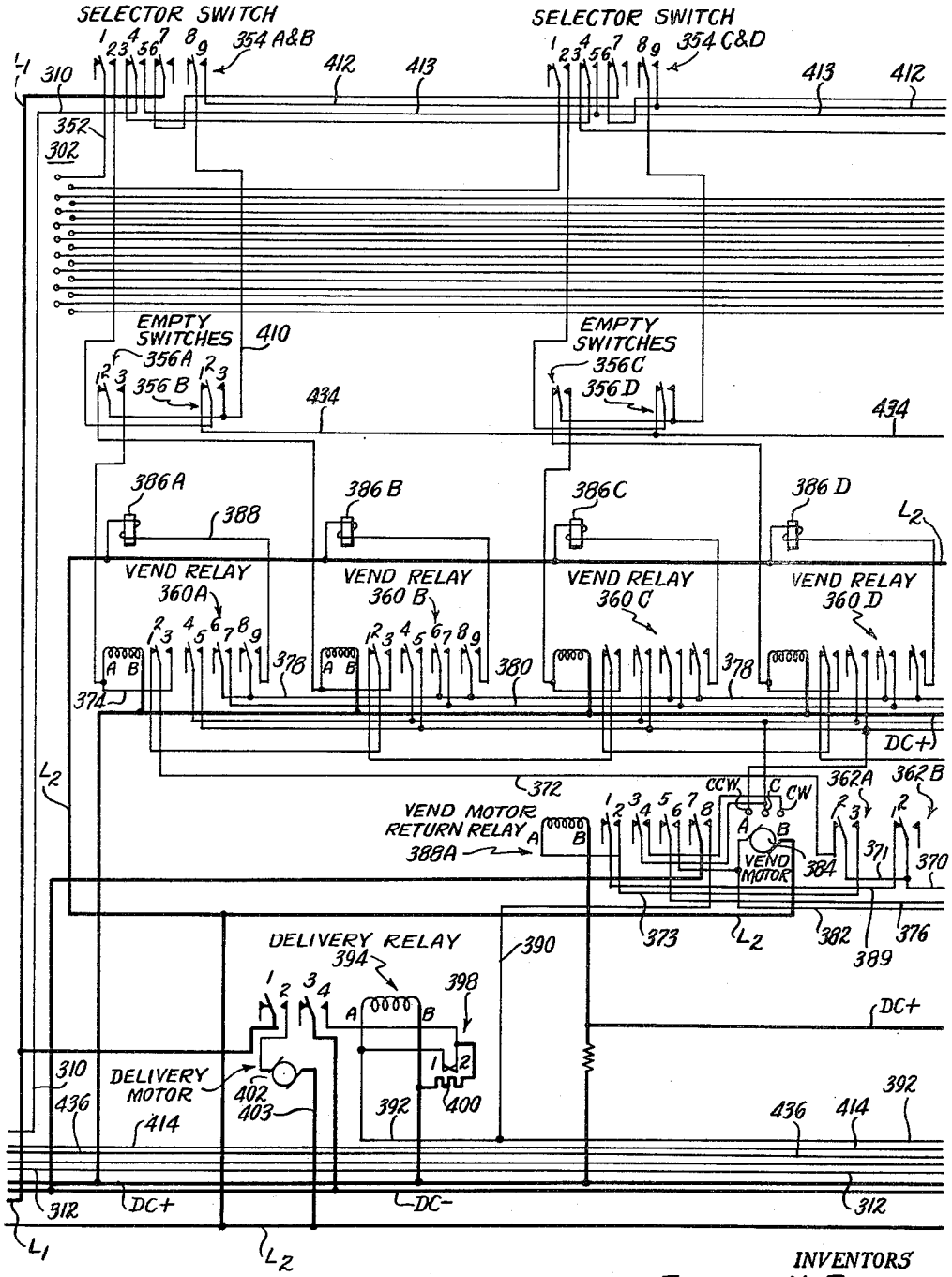


Fig. 1E.

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VENDING MACHINE

Filed Oct. 31, 1961 11 Sheets-Sheet 6

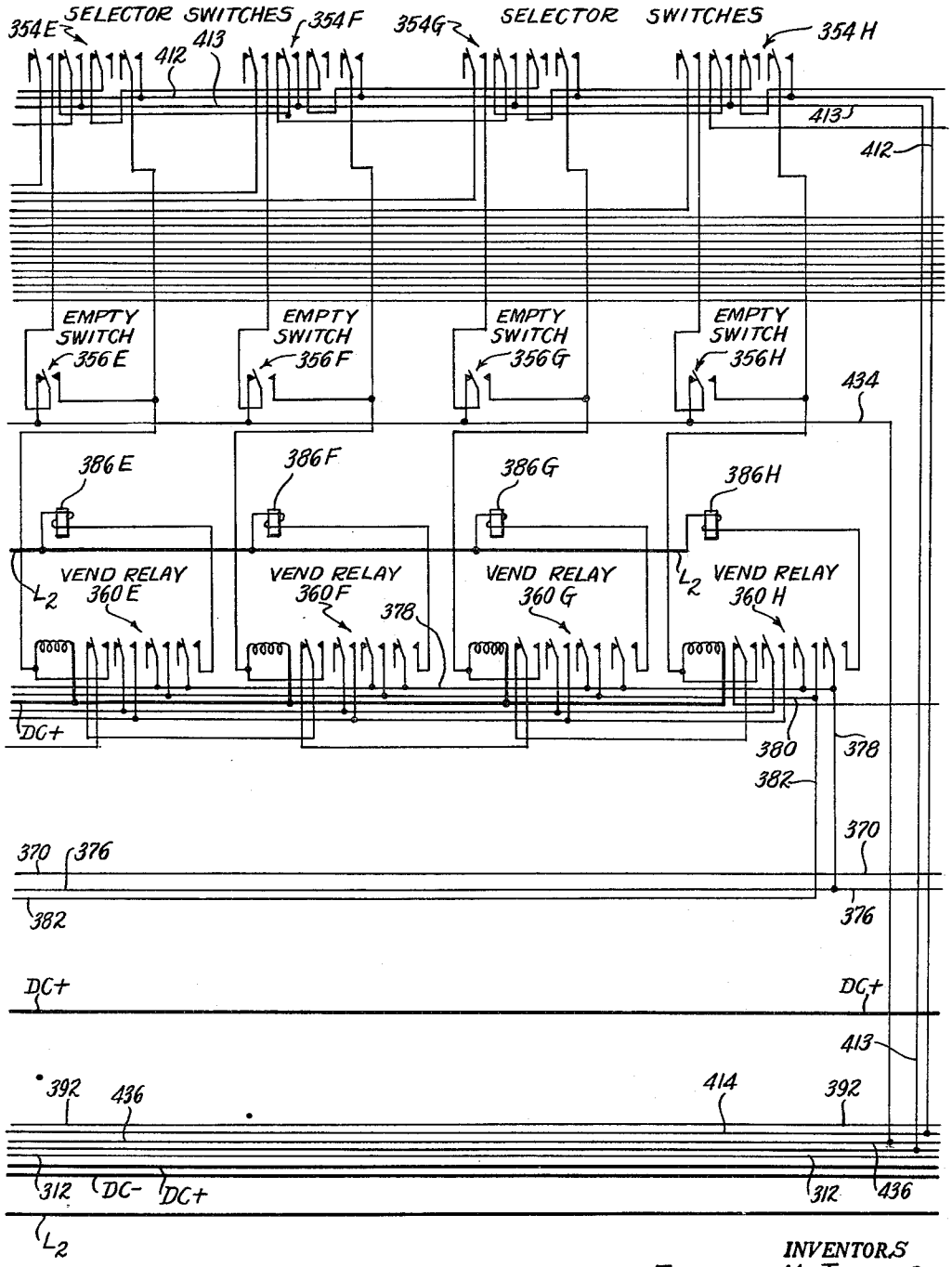


Fig. 1F.

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VENDING MACHINE

Filed Oct. 31, 1961 11 Sheets-Sheet 7

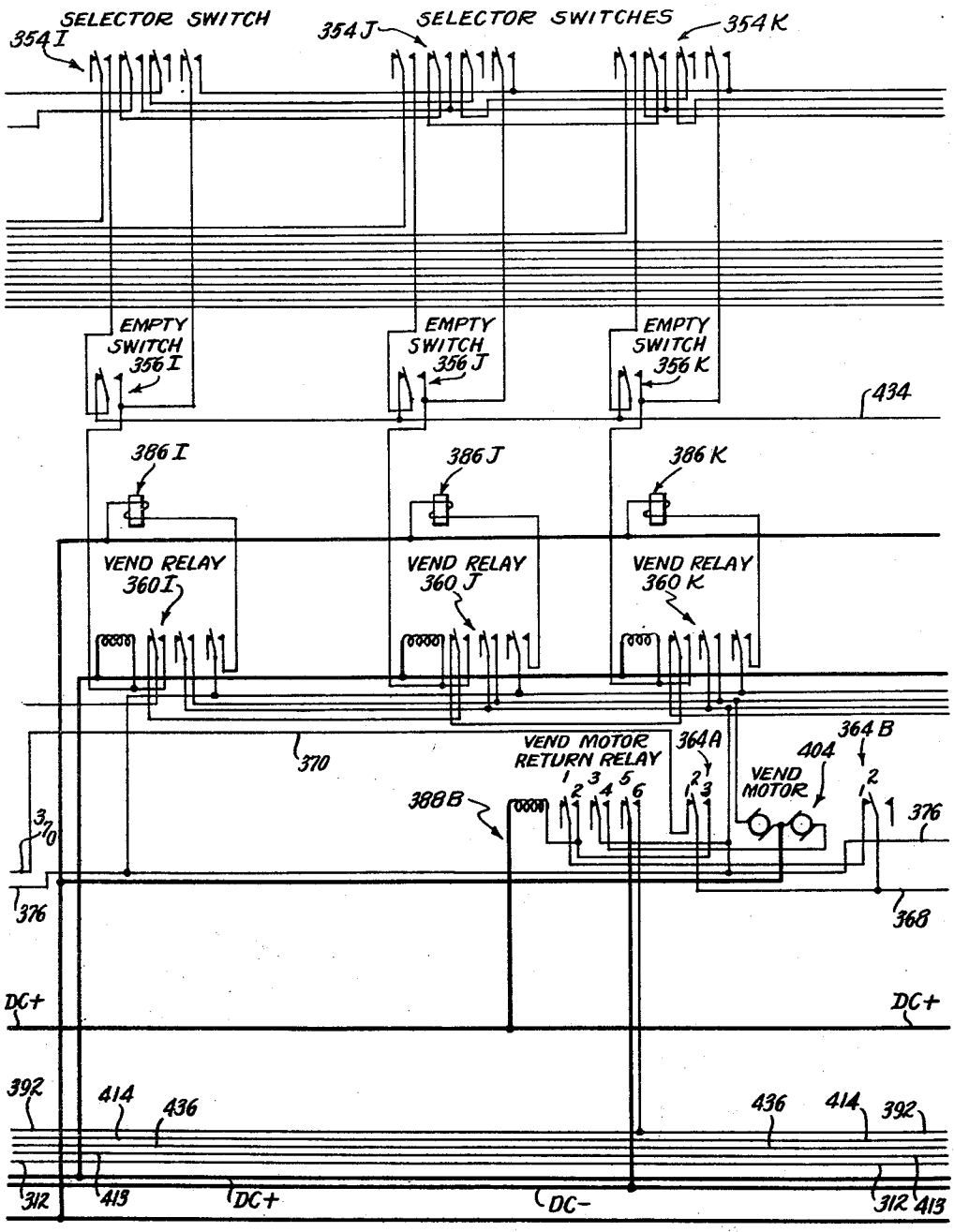


Fig. 1G.

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VENDING MACHINE

Filed Oct. 31, 1961 11 Sheets-Sheet 8

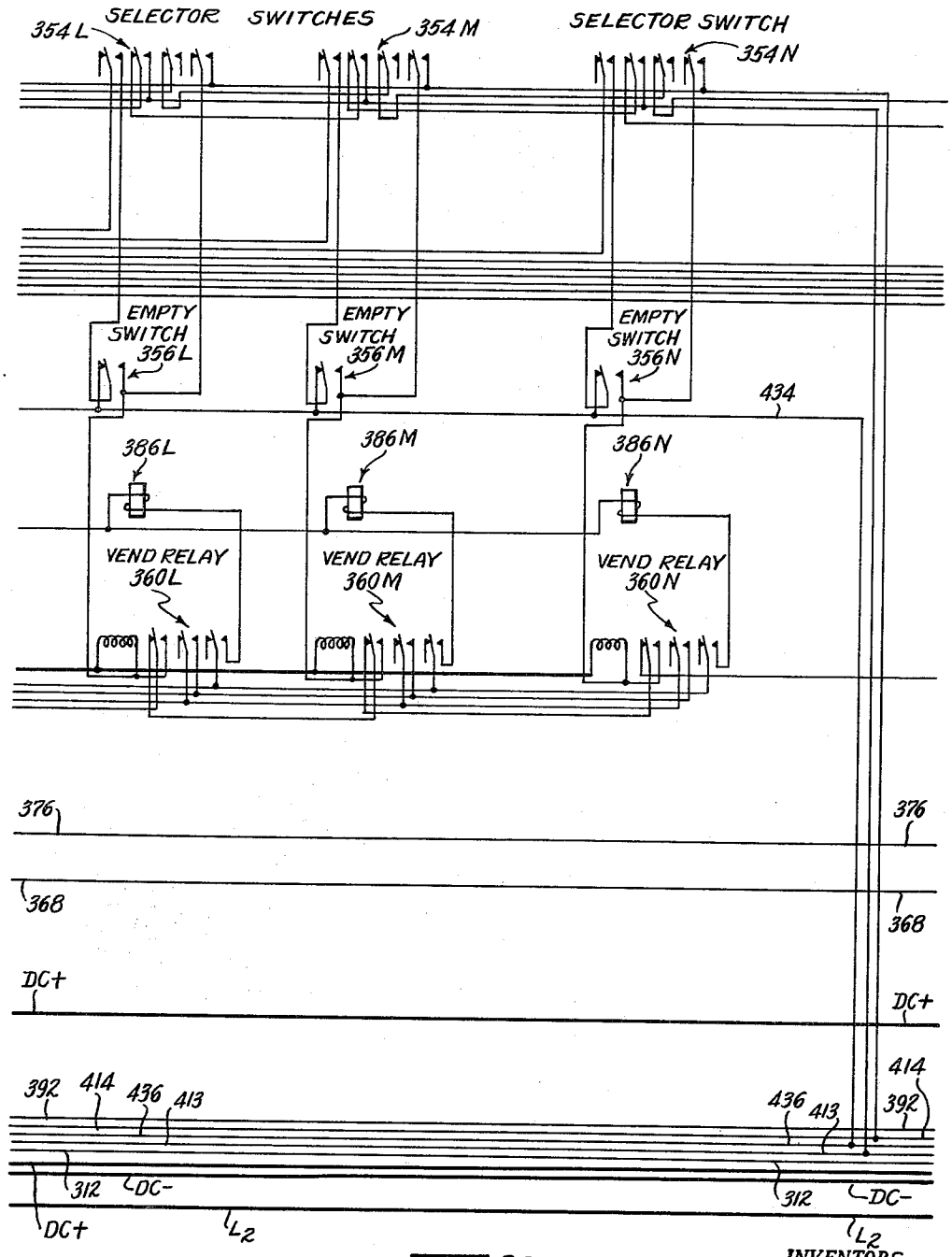


Fig. 1H.

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VENDING MACHINE

Filed Oct. 31, 1961 11 Sheets-Sheet 9

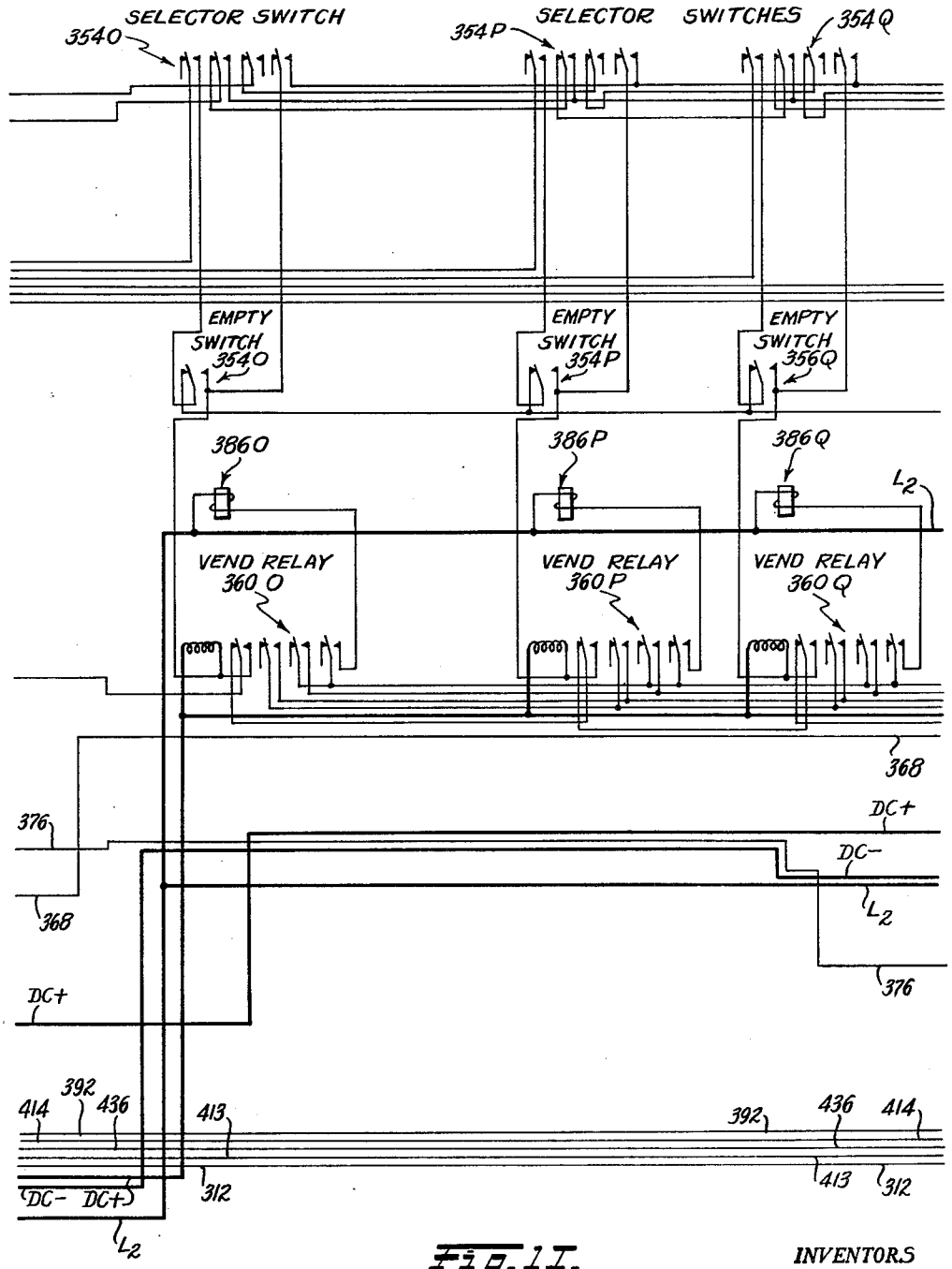


Fig. 11.

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VENDING MACHINE

Filed Oct. 31, 1961 11 Sheets-Sheet 10

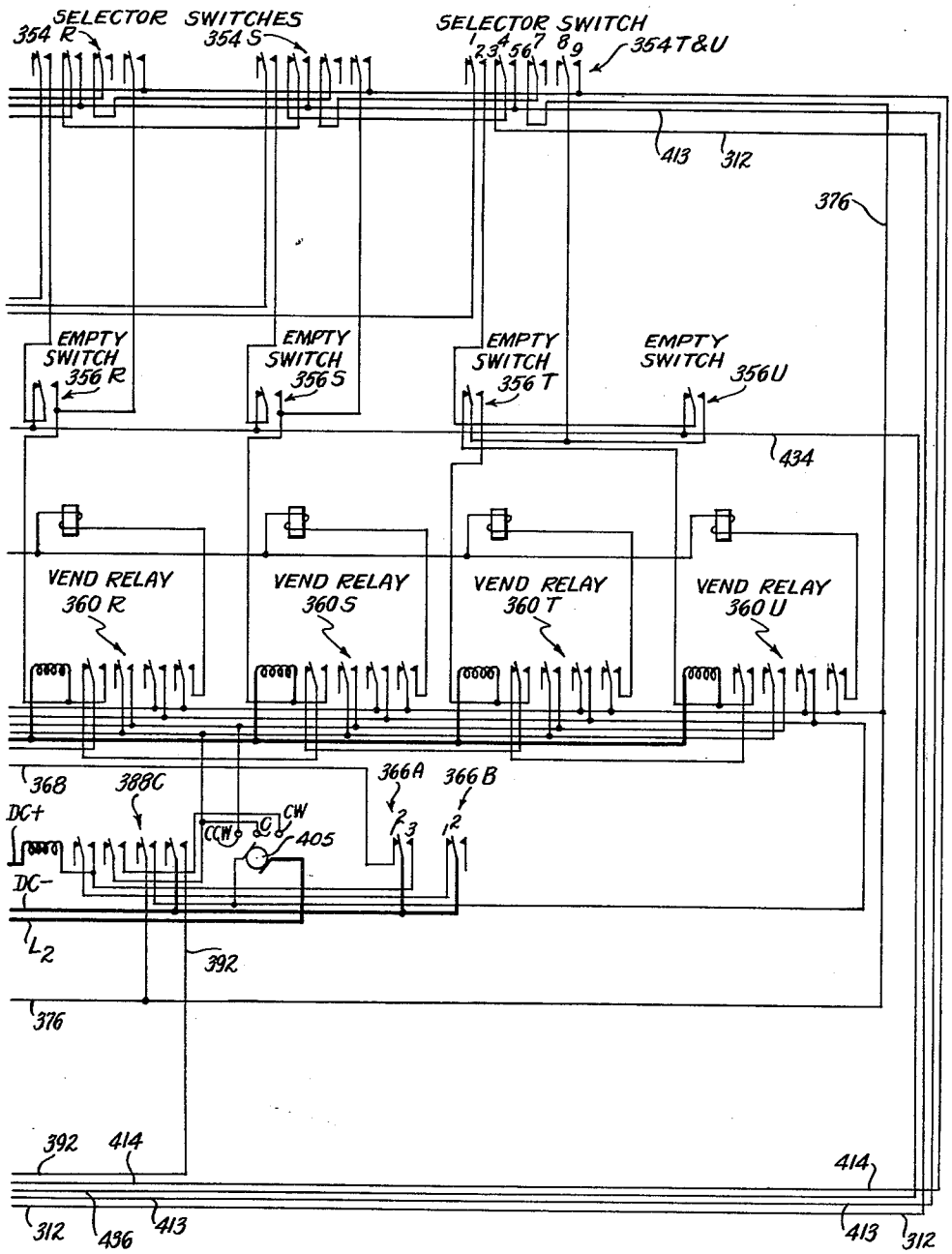


Fig. 1J.

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VENDING MACHINE

Filed Oct. 31, 1961 11 Sheets-Sheet 11

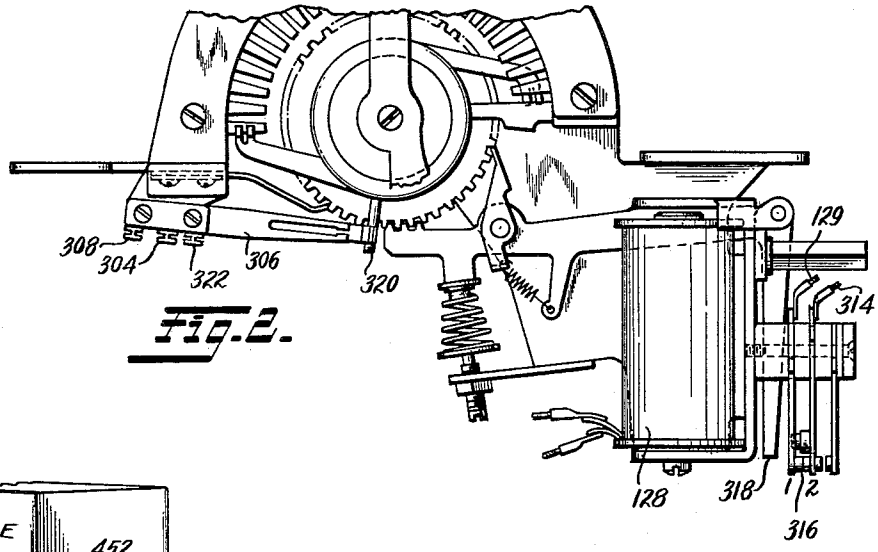


Fig. 2.

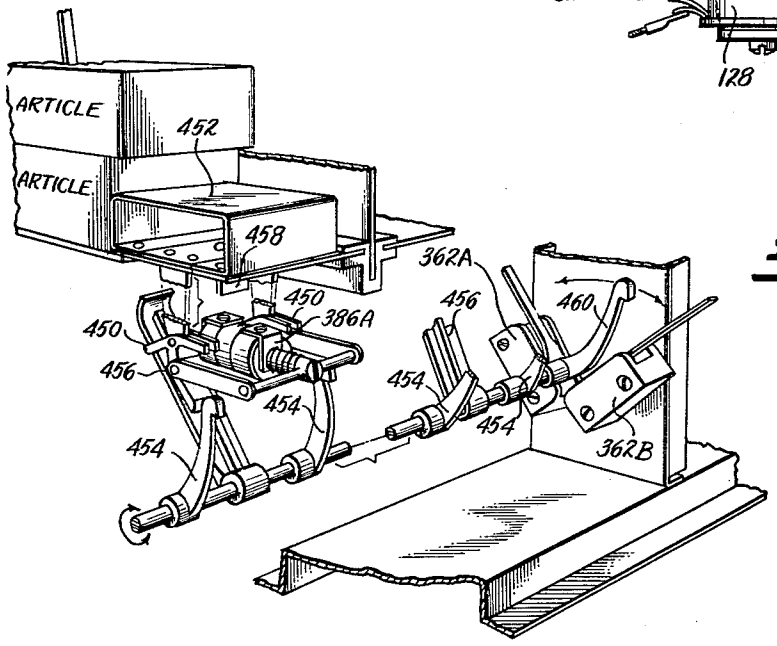


Fig. 3.

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United States Patent Office 3,191,737 Patented June 29, 1965

3,191,737

VENDING MACHINE

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Filed Oct. 31, 1961, Ser. No. 148,900
19 Claims. (Cl. 194—4)

This invention relates to a check controlled vending machine adapted to receive money of various denominations and including coins and paper money, and to vend an article from a number of different priced articles stored within the machine, the article vended corresponding in value to the money deposited in and accepted by the machine.

It is an object of this invention to provide circuitry in coin receiving machines to prevent the operation of certain stepping mechanism in the machine in the event that more than one coin at a time is inserted within the machine.

It is also an object of the invention to incorporate therein interconnected mechanisms to prevent the vending of an article in the event a coin deposited in a coin chute should fail to pass beyond vending control switches positioned in the path of movement of the coin and actuated by the passage of said coin.

It is a further object of the invention to provide a novel means for effecting the totalization of money deposited in the machine and involving for a certain denomination of money, the use of repeat cycling of a pulsing switch.

It is still another object of the invention to provide a novel control for an indicator which shall display the amount of money deposited within the vending machine.

Yet another object of the invention is to provide a check operated means with a resettable stepping switch operative to totalize the value of the checks inserted into the machine and with mechanism to disable the totalizing action of the stepping switch during resetting thereof.

And yet another object of the invention is to provide a system of intercontrols between a single totalizer and a number of different vending selector buttons to prevent the dispensing of more than one article from the machine for a value on the totalizer and then only of an article corresponding to the value.

And another object of the invention is to provide intercontrols between check accept and check return mechanism to prevent fraudulent attempts to obtain articles from the machine.

Other objects will become apparent after a reading of the following specification when taken in conjection with the accompanying drawings in which:

FIGURES 1A to 1J together constitute a wiring diagram of the vending machine, the wiring proceeding from a sheet with one alphabetical designation to a sheet having an adjacent letter of the alphabet;

FIGURE 1AA shows a modification relating to dollar relay control circuits;

FIGURE 2 is a fragmentary plan view of a bank of switches together with a stepping magnet arrangement for the bank of switches and an off-normal switch controlled by the stepping of the bank of switches, and

FIGURE 3 is a fragmentary perspective view of solenoid controlled mechanism, to enable drive of motor driven parts to be effective to remove an article from a stack of such articles, associated parts also being shown.

The indicator and totalizer

The vending machine is adapted to receive coins of the denominations of 5¢, 10¢, 25¢, and 50¢, and also one dollar bills, to a maximum amount of $4.95, the receipt of this money, at times designated as checks, being indicated on a three part indicator 100, FIG. 1B. At the same time the increments of deposits are accumulated on a four part stepping totalizer 102, FIGS. 1C and 1D.

The indicator is divided into units comprising a units order 104, a tens order 106, and a hundreds order 108. Each of the units has within it a series of electric lamps and associated masks to project a number onto a projection screen on the face of the unit when an appropriate lamp is energized. Since pennies are not received by the vending machine, the units order has only a 0 and a 5 cent lamp wired into the circuit of the machine. The tens order has all lamps 0 to 9 wired into the circuit while the hundreds order has only the 0 to 4 lamps wired into the circuit. The indicator, apart from its association in the circuit, forms no part of the invention and is therefore not further described.

The vending machine is provided with conventional chutes and testing devices for the receipt of nickels, dimes, quarters and half dollars via respective paths and is further provided with a compartment for receipt and testing the genuineness of dollar bills.

In the nickel chute is a single pole, double throw switch 110, FIG. 1A, while like switches 112, 114 and 116 are located in the dime, quarter and half dollar chutes. The holder of the dollar bill, after the bill has been tested and found to be genuine, is operative to close a single pole switch 118.

When a nickel has been tested and found acceptable, it passes beyond the switch 110, momentarily closing the 2 and 3 contacts thereof, after which the switch moves back for contact of common contact 2 with contact 1. Momentary closing of contacts 2 and 3 of the nickel switch connects A.C. line 120, and specifically line L_1 thereof, via contacts 2 and 3 to terminal A of the coil of a nickel relay 122. The opposite terminal B of the coil is permanently connected with line L_2 of the A.C. line. As a result of energization of the coil, its contact 2 is engaged with contact 1 to transmit a pulse through the contacts. Contact 2 is permanently connected with a direct current line 124 and specifically to the negative leg thereof, and designated as D.C.—, the direct current being furnished by a full wave rectifier 126 fed from the A.C. lines. The closing of contacts 2 and 1 of relay 122 transmits a D.C.— pulse to one end of a stepping magnet 128, FIG. 1B, via a line 129, the other end of the coil being permanently connected to the other or the D.C.+ side of the direct current source. A pulse is also transmitted via contacts 3 and 4 of relay 122 and line 130 to the coil terminal A of a counting relay 131, FIG. 1C, to lock it in, as will be described, the terminal B of the coil being permanently connected to D.C.+. Series and shunt resistors 132 and 133 may be employed to reduce the current flow through the coil of the stepping magnet 128 to a suitable value.

The stepping magnet, through conventional pawl and ratchet drive, rotates the common shaft of a bank of switches indicated in FIGS. 1B, 1C and 1D as 134A, 134B; 136A, 136B; 138A, 138B; 140A, 140B; and 142A, 142B. Each switch is of the wafer type with contacts on the upper face indicated with the A designation and with contacts on the lower face designated as the B contacts. The stepping of the shaft causes wiper arms 144A, 144B, 146A, 146B, etc., electrically connected with the first of the contacts of the switches to wipe over the contacts on the wafers, there being twenty-seven contacts in all for each arm. The arms 144A and 144B are always connected via the switch contacts 1 to one leg L_3 of an A.C. 6.3 volt line 154. On switch wafer face 134A all of the even contacts from 2 to 26 are connected together and by a line 156 are connected to the zero cents pole of the indicator unit 104. The odd contacts 3 to 27 are connected by a line 158 with the five cents pole on the indicator unit 104. Line L_4 of the 6.3 volt line is connected to

the common terminal of all the lamps in the indicator units **104**, **106** and **108**. As a result, for every pulse transmitted from the 5¢ switch **110**, the lowest order unit will show the digits 0 and 5, in alternation. The under face **134B** of the wafer has 27 contacts, 26 of which are tied together into two groups in the same way as the contacts in the upper face, and the wiper arms **144A** and **144B** are so angularly related to one another that as the upper arm **144A** leaves the twenty-seventh contact on the upper face of the switch, arm **144B** engages contact **2** of the under face **134B**. Thus as successive nickels are accepted by the machine, the lowest order unit will alternately show the digits 0 and 5.

As the shaft of the bank of switches is indexed by action of the stepping magnet **128**, the wiper arms **146A**, **146B**, **148A** and **148B** are also indexed. These arms control the appearance of characters 0 to 9 on the tens order unit **106**. Each of the upper and lower decks of the wafer switches **136A**, **136B**; **138A**, **138B** has adjacent pairs of contacts coupled together so that it takes two pulses to change the indication on the tens indicator. Thus contacts **2** and **3** on deck **136A** are tied to the zero light in tens indicator unit **106** by a line **160**, the contacts **4** and **5** are tied to the #1 light on the tens indicator unit by a line **162**, etc. Since there are interconnections between the contacts, as shown, and there are twenty-seven contacts on the switch, the last pair of contacts will represent the tens digit 2. On under deck **136B**, the first tied together pair of contacts, contacts **2** and **3**, will be the next digit, digit 3. In like fashion the first tied together pair of contacts on deck **138A** is connected with the digit 6 and, on the under face **138B** of the wafer switch, the first tied together pair of contacts is connected to the digit 9. The wiper arms **146A**, **146B**, **148A** and **148B** are so angularly related as to obtain this result. The wiper arms **146A** and **146B** receive L_3, 6.3 volt power via normally closed switch contacts **7** and **6** on a switching relay **164**, FIG. 1B, and contact **1** of the stepping switches, while the arms **148A** and **148B** receive L_3 power via contacts **7** and **8** on the same relay and contacts **1** of the associated stepping switches. The operation of this relay **164** will be explained hereafter. Since there are forty-nine pairs of tied together contacts in decks **136A** through **138B**, it is possible for the tens indicator to go through four cycles of digits from 0 to 9 and then on to the digit 9.

The next pair of wafer switches with the four faces **140A**, **140B**, **142A** and **142B**, FIGS. 1C and 1D, constitute the totalizer and also control the indicator, as will be pointed out.

As the shaft carrying all of the wiper arms is indexed by the stepping magnet **128**, the arms **150A** to **152B** move step by step over the contacts on these switches. The wiper arms of switches **140A** and **140B** are connected via long contact **1** of these switches and via normally closed number **1** and **2** contacts of the switching relay **164** to D.C.—. On the other hand, long contacts **1** of switches **142A** and **142B** which feed the wiper arms **152A** and **152B** are connectable via normally open contacts **3** and **2** of the switching relay to the D.C.— line. For each nickel accepted by the machine the arms **150A** to **152B** will move one step and apply D.C.—potential to successive contacts.

In the normal rest position of all of the wiper arms, they are in the positions shown. The arm **150A** is on a wire **168** indicative of a zero deposit of money in the machine. As the arm is stepped around, it progressively marks the wires **170**, **172**, **174**, etc., connected to the switch contacts, with a D.C.— potential derived from the normally closed **2** and **1** contacts of the switching relay **164** and wire **169**. If sufficient nickels are accepted to bring the arm **150A** to wire **208** representing twenty nickels or one dollar, a D.C.— potential is transmitted to terminal A of the coil of a $1.00 light relay **210**, FIG. 1C, whose other terminal B is always connected to D.C.+. This causes the $1.00 relay coil to be pulsed, closing contacts **5** and **6** and contacts **2** and **3**. Contacts **5** and **6** of this relay and similar contacts of a $2.00 light relay **212**, a $3.00 light relay **214**, and a $4.00 light relay **216**, constitute holding contacts for the particular relay coil energized from a line coming from the totalizer. Upon closure of contacts **5** and **6**, D.C.— potential is applied to the energized coil via all of the numbers **4** and **5** contacts of the succeeding relays, a line **218** connected to contact **5** of relay **216**, this line connecting with a line **220** leading to contact **2** of the counting relay **131** which is energized by acceptance of any money within the machine and which relay is locked in as soon as energized until a reset operation, to be described, takes place. From contact **2** of the counting relay, when the counting relay is energized, the connection is via its contact **1** to line **224**, thence to normally closed contacts **3** and **4** of a reset relay **226**, FIG. 1B, to D.C.—.

Thus the $1.00 light relay **210**, once energized, will be locked in until later released, as by operation of the reset relay **226** breaking the circuit through its contacts **3** and **4**, or by operation of the $2.00 relay **212**. When the relay **210** is unenergized, contact **2** rests against contact **1** applying L_3, 6.3 voltage via all the **2** and **1** contacts of relays **216**, **214**, **212**, in that order, and via line **228** to the zero digit light in the indicator unit **108**. When the relay **210** is energized, contacts **2** and **3** are brought into engagement, whereby L_3 voltage is fed via a line **230** to the one digit lamp of the unit **108**. The common number **2** contact of each light relay has 6.3 volt L_3 voltage applied to it at all times via the contacts **1** and **2** of higher dollar light relays only as long as there is not a higher dollar light relay energized. When none of the dollar light relays are energized, the zero dollar light will burn.

The $1 indication on the unit **108** will remain until resetting of the machine takes place, as will be described, or until the stepping switch counts $2.00. As the wiper arm **150A** leaves the last contact **27** on switch deck **140A**, the arm **150B** on the under switch deck **140B** will engage contact **2** to mark the line **232**, this mark representing $1.30. For each additional accepted five cent piece, the wiper arm **150B** will mark successive lines with D.C.— potential until the sixteenth contact is closed. At this time D.C.— current will be transmitted to the A coil terminal of the $2.00 light relay **212** via line **234** which relay will then lock in via relay contacts **5** and **6**, in the same manner as the relay **210** did. However, contacts **4** and **5** of relay **212** are opened, breaking the holding circuit to the coil of relay **210** thereby releasing the $1 indication from off the indicator unit **108**. The zero indication on that unit will not reappear since contacts **1** and **2** of relay **212** are opened. Instead, via contacts **2** and **3** of relay **212** and line **236** leading to the $2.00 lamp, that lamp will be illuminated.

When wiper arm **150B** reaches the last contact on deck **140B**, D.C.— potential, via line **238**, is applied to the A coil terminal of switching relay **164**, FIG. 1B, the B terminal of which is connected to D.C.+. The energization of this coil closes holding contacts **4** and **5**, D.C.— potential then being applied to the coil via normally closed contacts **4** and **3** of switching and counting reset relay **226**, line **224**, now closed contacts **1** and **2** of counting relay **131**, FIG. 1C, line **240** and now closed contacts **4** and **5** of switching relay **164**, FIG. 1B, to terminal A of its coil. In order to give a pulse of longer duration to assure that the switching relay will be energized long enough to close its contacts completely and hold in through the normally open contacts **4** and **5**, a capacitor **239** is connected across its normally closed **1** and **2** contacts. So that power is supplied to the light connected to terminal **27** of deck **136B** after its switching over of A.C. line L_3 from wiper arm **146B** to arm **148B**, the two last terminals **27** on decks **136B** and **138B** are interconnected by a line **241**. For a similar reason to keep the line representing $2.55 energized with D.C.— potential, the last contacts **27** on the decks **140B** and **142B** are intercon-

nected by a line 243. The energization of the coil of the switching relay 164, breaks contacts 6 and 7 of the relay to remove L_3, 6.3 volts potential via line 242 from wiper arms 146A and 146B and transfers this L_3 potential, via line 244, to wiper arms 148A and 148B. The energization of the coil of switching relay 164 also causes contacts 1 and 2 of the relay to be disengaged thereby breaking the D.C.— potential connection to wiper arms 150A and 150B via line 169 and instead applies D.C.— potential, via line 245, to wiper arms 152A and 152B on the totalizer.

As the totalizer arms 152A and 152B step around, due to acceptance of nickels, wiper arms 152A will contact the number 10 contact on deck 142A, representative of $3.00 and energize relay 214. This relay has connections and control contacts like relay 212 and will cause the $2 indication on indicator unit 108 to be replaced by the $3 indication. When wiper arm 152A reaches contact 27 on deck 142A, the line 246 is marked with D.C.— potential, this line corresponding to the acceptance of $3.85 by the machine. The next step of the totalizer brings arm 152B on the #2 contact of deck 142B, marking line 248 connected to this contact with a D.C.— potential representative of $3.90. Two steps farther brings the arm 152B in connection with line 250 which is the $4.00 line and which has connection with the $4.00 relay 216 to operate it like the previous relay 214 and to replace the $3 indication on the indicator unit 108 by a $4 indication. The lines connected to the totalizer contacts are sufficient in number to be able to mark them with D.C.— potentials corresponding to every nickel variation up to $4.95.

While the passage of a nickel past the coin operated switch 110 will pass a single pulse to the stepping magnet 128, other denominations of money will, through the intermediary of pulse wafer switches 252, 254, 256, 258 and 260, a pulse switch operator motor 262 and associated circuitry, pulse the stepping magnet 128 an appropriate number of times, with the same subsequent results as with the deposit of nickels.

When a dime is accepted by the machine, see FIG. 1A, it will first momentarily open normally closed contacts 1 and 1 and then momentarily close contacts 2 and 3 of coin operated switch 112. The closure of contacts 2 and 3 transmits an A.C. line L_1 current via normally closed contacts 1 and 2 of the nickel switch 110 and temporarily closed contacts 2 and 3 of the dime switch 112 to the A terminal of the coil of a dime relay 264, the B terminal of which coil is permanently connected to A.C. line L_2. The relay 264 then locks itself up via its contacts 2 and 1, line 266, contact 2 on wafer switch 258, thence through its wiper arm to the long contact of wafer switch 258 and A.C. line L_1. The switch 258 has eighteen contacts with contact numbers 2 to 18 shorted together and with the contact of the wiper arm of a size to bridge two contacts on the wafer 258 during rotation. As a result, the dime relay 264 will be held locked in until the wiper arm of switch 258 wipes over contact 1 which is disconnected from the coil of relay 264. Then the relay 264 is deenergized. During the time that the relay 264 is energized, the motor 262, pole B of which is always connected to line L_2, is energized as follows: from A.C. line L_1, via normally closed contacts 2 and 1 of switch 110, contacts 2 and 1 of switch 112, closed immediately after the coin has gone by, contacts 2 and 1 of switch 116, contacts 2 and 1 of switch 114 to line 268, thence to contacts 3 and 4 of the now locked-in relay 264 and line 269 to the normally closed contacts 2 and 1 of reset relay 226, FIG. 1B, and back via line 270 to the motor terminal A. The purpose of opening contacts 1 and 2 of any of the coin operated switches is to prevent the motor from running continuously should a coin be stuck at the switch. The motor will run to one contact position short of a complete rotation of 360°. To complete the 360° rotation of the pulsing switches, the upper

wafer switch 252 has a wiper arm which is connected to A.C. line L_1 and which bridges contacts 1 and 2 when the wiper arm of switch 258 is bridging contacts numbers 18 and 1. Since contacts 18 and 1 on switch 252 are connected via line 272 to the motor terminal A, the motor will continue to rotate one additional step whereupon the wiper arm of switch 252 leaves contact 1 and comes to rest on dead contacts 2 and 3. The wiper arm of switch 258 comes to rest bridging contacts 1 and 2 ready to receive pulses from line 266, when another dime is accepted by the machine.

During the 360° rotation of the shaft carrying the wafer switches 262, 254, 256, 258 and 260, the wiper arm switch 254, which is always connected to D.C.—, first wipes over contact 3 to send a D.C.— pulse to the terminal A of the counting coil via lines 277 and 130. The arm in its rotation wipes over contacts 6 and 15 which are tied together to a line 274 which connects with contact 6 of the now locked-in dime relay 264. The D.C.— pulses then pass through the cooperating #5 contact of the relay, and via a line 276 to line 129 and the terminal A of the stepping magnet to pulse it twice for every dime passing by switch 112.

When a quarter is accepted by the machine, the momentary closing of contacts 2 and 3 of the coin operated switch 114 will lock in the quarter relay 278 in the same fashion as described in connection with dime relay 264. Then on the return of the coin switch 114 to normal position with contacts 1 and 2 in engagement, the motor 262 will be energized and finally effect one revolution of the shaft of the wafer switches, rotating the wiper arms as before, the wiper arm of the pulsing switch 254 traveling over the contacts on the wafer. Since at this time the dime relay 264 is deenergized and the relay contacts connected with line 274 are open, no D.C.— pulses will be transmitted over line 274. However, contacts 4, 8, 10, 13, and 17 are connected to line 280 transmitting five D.C.— pulses to the stepping magnet 128 via line 280, now closed contacts 6 and 5 of quarter relay 278, normally closed contacts 5 and 6 of a half dollar relay 282 to lines 276 and 129, and the stepping magnet 128 to pulse it five times for every quarter passing by switch 114.

When a half dollar is accepted by the machine, contacts 2 and 3 of the half dollar switch 116 will be momentarily closed, applying L_1 potential to the A terminal of the coil of half dollar relay 282, causing locking up of the relay as in the case of previous relays. On the passage of the half dollar past the switch 116, contacts 1 and 2 will close, starting the motor 262. All of the number 1 and 2 contacts of the coin operated switches are in series to prevent the motor 262 from starting unless all the other coin operated switches have been cleared of coins. At this time the other coin relays are deenergized and no pulses can be passed through their contacts. However, during rotation of the motor, the wiper arm of switch 256 will wipe over tied together contacts 4 to 13 of the wafer switch 256 transmitting ten pulses to the stepping magnet 128 via line 284, now closed contacts 7 and 6 of relay 282, and lines 276 and 129. The wiper arm comes to rest on the #2 contact of the wafer to apply D.C.— potential to a contact on the reset relay 226, as will be explained later.

When a dollar bill is accepted by the currency accepter switch 118, the $1.00 relay 286 is momentarily energized, via A.C. line L_1, switch 118, and coil terminal A, the B terminal of the coil always being connected to A.C. line L_2. The energization of the coil starts the motor 262, since A.C. line L_1 is connected to the motor terminal A via the normally closed 1 and 2 contacts of the switches 110 to 116, line 268, contact 3 of relay 286, now closed contact 4 of the relay, line 269 to normally closed contacts 2 and 1 of reset relay 226, FIG. 1B, and line 270. The motor 262 in its rotation will rotate the wiper arm of wafer switch 258 to progressively bridge contacts 2 to 18 thereby holding the relay 286 energized by reason of A.C.

line L_1 current being connected to relay 286 via A.C. line L_1, the wiper arm of wafer switch 258, contacts 2 to 18 of the switch, line 266, line 290 to contact 1 of relay 286, now closed contact 2 of the relay and terminal A of the relay coil, the B terminal of the coil being permanently connected to A.C. line L_2. As previously explained, the motor will cause a complete 360° rotation of the wafer switch shaft to occur, whereupon the wiper arm of switch 258 will engage contact 1 of the wafer switch before it leaves contact 18. A.C. line L_1 will now be connected with the last of the money relays 292, via line L_1, wiper arm of wafer switch 258, line 294, contact 5 of relay 286, now closed contact 6 of that relay, and line 296 to terminal A of the coil of the relay 292, the B terminal thereof being permanently connected to A.C. line L_2. If desired, line 296 may have inserted therein a capacitor bypassed resistor 297. The described circuit will energize the coil of relay 292 closing its holding contacts 1 and 2. Holding current for the coil will now be furnished via A.C. line L_1, wafer switch 260 whose wiper arm bridges contacts and whose contacts 1 to 17 are all tied together, line 298, now closed contacts 1 and 2 of relay 292 and coil terminal A of relay 292. In a modification shown in FIG. 1AA, the holding circuit for the coil of relay 286 is established from terminal A of the coil via contacts 2*a* and 3 of relay 292, line 268 and contacts 1 and 2 of the coin switches to line L_1.

For each revolution of the motor, 10 pulses will be transmitted to the stepping magnet 128. The first ten pulses will be from D.C.—, via wafer switch 256, lines 284, 286, and 289, contacts 8 and 7 of the then closed relay 286 to line 129 and to the coil of the magnet 128; and the second ten pulses will be transmitted from D.C.— via switch 256, lines 284 and 288 to contact 6 of relay 292, thence via its now closed contact 5 to line 129 and to the stepping magnet coil 128. Contacts 1 and 2 on the coin operated switches, and contacts 3 and 4 of all of the coin relays, when the relays are energized, in conjunction with contacts 1 and 2 of the reset relay, establish a series path for the current to the motor 262, which motor will cease running on any series connection being opened. The motor will run to turn the shaft and through an angle to have the wiper arm of wafer switch 252 bridge over onto the eighteenth segment at which time the coin relays drop out and the motor would cease running except for the connections between contacts 18 and 1 of the wafer switch 252 and the motor pole A. The coin operated switch contacts 1 and 2 are made to close and start and maintain operation of the motor only after a coin has passed therebeyond to prevent a coin stuck in the chutes and engaging the coin switches maintaining the coin relay coils and the motor energized continuously.

Each contact on the totalizer has a line connected thereto the ends 301 of which are permanently connected in appropriate ascending order of value to jacks in a pricing panel 300. The line selected depends upon the money accepted by the machine, no matter in what order the coins or dollar bills were inserted therein.

Resetting of indicator and totalizer

The jacks on the pricing panel interchangeably receive plugs 302 which connect with selector or vend switches on the vending machine. The vending machine includes mechanism to dispense a variety of articles or, in the alternative, refund the money, either in the event the machine is out of a selected article or the prospective purchaser desires a refund of his money prior to initiating selection of the article. In either of the latter events or upon the delivery of an article to a customer, the reset relay 226, FIG. 1B, is momentarily energized and thereby the holding circuit to the counting relay is opened allowing the counting relay to assume its unenergized condition. When this reset relay is energized, its 8 and 9 contacts close, establishing a holding circuit for the relay via the D.C.— line, line 304, to normally closed contacts 2 and 1 of an off-normal switch 306, line 308 to holding contact 8 of now closed reset relay 226, to contact 9 thereof and terminal A of the coil, terminal B of the coil being permanently connected with the D.C.+ line. This locks in the reset relay until the totalizer wipers or arms reach their home positions shown in the drawings, as will be explained.

After the reset relay has been energized, a circuit is completed for stepping all the stepping switches forward toward their initial positions, this circuit including all of the selector switches in their unoperated positions. The circuit is from D.C.— to wafer switch 256, via its contact 2 to line 310 to the normally closed contacts 4 and 3, in series, of all of the selector switches, thence back via line 312 to contact 6 of the reset relay 226, now closed contact 7 thereof, to line 314, to contact 2 of the stepping switch circuit breaker 316, normally closed on contact 1 thereof. Contact 1 of circuit breaker 316 is connected to line 129 and then via the series resistor 132 to terminal A of the stepping magnet 128 causing the magnet to operate to step the indicator and totalizer stepping switches one step. As the coil is operated, it moves an arm 318 with it which engages circuit breaker 316 in series with the coil to effect disengagement of the contacts whereupon the coil becomes deenergized to allow the contacts of the breaker to again close in order to repeat the stepping operation of the indicator and totalizer switches.

This stepping of the switches continues until the wipers 148B and 152B reach the twenty-seventh position. At this time a cam pin 320 on the shaft of the stepping switches causes an operation of the off-normal switch 306 to cause contacts 1 and 2 to disengage and contacts 2 and 3 to engage. When contacts 1 and 2 of the off-normal switch are broken, the holding circuit to the reset relay is broken, causing release of the relay. D.C.— current will be transferred to wire 322 connected with contact 3 of the off-normal switch and to contact 4 of counting relay 131 which, as has been described, had been deenergized when the reset relay was first energized. From contact 4 of relay 131, D.C.— current flows to contact 3 thereof, a line 324 to line 314, then to the closed contacts of circuit breaker 316 to cause the stepping switch to operate one more step to bring the stepping switches to home or start position illustrated diagrammatically in FIGS. 1A to 1D. The pin 320 then allows contacts 2 and 3 to open, whereby the stepping magnet ceases operation.

Thus far, the operation of the light indicator and the stepping switches have been described with the placing of a D.C.— potential on a line, thus marking the line.

Vending articles

The mechanism for vending a selected article under control of a marked line will now be described.

In the machine selected for the purposes of illustration, there are three racks which may be loaded with goods. For the purposes of illustration, it is assumed that the first rack has a number of pairs of columns with goods of like kind in each pair and additional columns each of which carries goods different from those in other columns, with a single motor for that rack and associated mechanism to remove the goods from any of the columns. The second rack has a number of columns each retaining a different type of goods and which perhaps may require the services of a different type of motor for removal of the goods. The third rack may have a single pair of columns for containing like goods and additional columns each for different types of goods, with a motor like that on the first rack for removal of the goods.

Assuming that an item in rack #1 columns 1 and 2 is priced at 50¢, that 50¢ has been properly received by the machine and that a wire 352, FIG. 1E, leading to selector switch indicated as 354A and B (for the two columns) is plugged into the pricing panel 300, FIG. 1D, in the 50¢ jack, making connection with the 50¢ lead from the totalizer, and that selector switch 354A and B has been oper-

ated, D.C.— potential will be picked up at the jack and travel along wire 352, contacts 1 and 2 of selector switch 354A and B, to contact 2 of an "empty" switch 356B in column 2 to contact 3 thereof (when goods are in column 2), to contact 2 of a like "empty" switch 356A in column 1, thence through its contact 3 (when goods are in column 1) to coil terminal A of a vend relay 360A, the opposite or B terminal of the coil being permanently connected to D.C.+. In the event the first column is empty, the mid-contact of empty switch 356A will be in engagement with contact 1 thereof and the coil of vend relay 360B for the second column will be energized rather than the coil of vend relay 360A for the first column. When bath columns under control of selector switch 354A and B are empty, contact 2 of empty switch 356B will be closed against contact 1 to effect return of the deposited money, as will be explained later. Thus goods are dispensed first from the column under control of vend relay 360A and then under control of vend relay 360B.

On energization of vend relay 360A or 360B, relay self-locking contacts 2 and 3 come into engagement and D.C.— potential to terminal A of the coil of the selected vend relay will be supplied via contact 2 of a limit switch 366A, FIG. 1J, associated with the third rack, through normally closed contact 1 of the switch, thence via a wire 368 to contact 2, see FIG. 1G, of a limit switch 364A associated with the second rack, then through normally closed contact 1 there and wire 370 to contact 2, see FIG. 1E, of a limit switch 362A associated with the first rack, through the normally closed contact 1 thereof and thence via a wire 372 to contact 2 of the energized vend relay 360A. The D.C.— potential will now, via contacts 2 and 3 of the relay and wire 374, be applied to terminal A of the coil of the relay, the relay remaining energized until the circuit is broken through one of the referred to series connected limit switches. Although the first selector switch has been selected for exemplification, the other vend relays for any of the columns on the rack will operate in similar fashion when the associated selector switch is operated. The energization of any vend relay will break the circuit to any subsequent relay, since all of the 1 and 2 contacts of these relays are wired in series, and contact 2 carries the current via contact 1 of a relay to succeeding relays so that only one of them can be locked in.

It is not until a selector switch which has been operated is released and all of the other selector switches are in normal position that A.C. power can be furnished to a delivery motor to dispense the selected article from its column. The A.C. power comes from A.C. line L_1 to contact 7 of the first selector switch 354A and B, thence to normally closed contact 6 of the switch to contacts 7 and 6 of selector switch 354C and D, controlling the dispensing of an article from its two columns, thence to contact 7 of selector switch 354E, FIG. 1F, controlling its single column, to contact 6 thereof and so on through the whole series of selector switches on all of the racks, so that holding any selector switch operated will disable A.C. current flow to the article removing mechanism and prevent removal of an article from any column. The last selector switch 354T and U, FIG. 1J, on rack 3, it will be noted, controls the dispensing of an article from either one of a pair of columns, just as does selector switch 354A and B and selector switch 354C and D associated with the first rack. From contact 6 of this last selector switch, A.C. line L_1 potential will flow along a line 376, to line 378, FIGS. 1E and 1F, thence to a contact 6 of the selected vend relay, as vend relay 360A, thence via its contact 7, lines 380 and 382 to the A terminal of the armature and normal field winding of vend motor 384, the B terminal of the armature and field winding being permanenently connected with A.C. line L_2. The motor may be of the double shaded pole reversible type illustrated, for example, in the patent to Cummings 1,895,880. The terminals C, CW, and CCW on the motor indicate the connections of the shading coils to the terminals, C indicating common, CW indicating clockwise rotation of the motor, and CCW indicating counterclockwise rotation of the motor. One of the sets of shading coils is connected to contacts 4 and 5 of relay 360A which when energized causes the motor to rotate in the direction of the shorted coils.

Thus, with money deposited in the machine, depressing a selector switch and releasing it will set the vend motor into rotation, which rotation continues until a part movable by the rotation of the motor will open limit switch 362A, contacts 1 and 2. Thereupon the vend relay coil will be deenergized, since the line 372 feeding holding contact 2 of the coil is opened at the limit switch, the relay contacts will be restored to the normal position illustrated and the A.C. supply to the motor will be interrupted.

Simultaneously with the energization of the motor, a solenoid, as 386A, is energized, one pole of this solenoid receiving power directly from A.C. line L_2 while the other pole is connected via line 388, contacts 8 and 9 of the energized vend relay 360A, lines 378 and 376, the selector switches 354, contacts 6 and 7, to A.C. line L_1.

This solenoid, see FIG. 3, operates to bring pairs of arms 450 pivotally mounted on the lower ends of brackets depending from a pusher 452 to an operative position wherein actuating arms 454 on a shaft driven by the vend motor may engage the arms to thrust the pusher against a lowermost article stacked in a column, and eject it onto a conveyor belt (not shown). Also, on reversal of the vend motor, a return arm 456 on the shaft engages a projection 458 extending downwardly from the pusher to return the pusher to a position ready to dispense another article. The solenoid is deenergizaed to allow return of the arms controlled thereby when the vend relay coil is deenergized. The particular form of mechanical devices for driving the pusher is not claimed herein and, therefore, no further description thereof is given.

When the vend motor operates the pusher to remove an article from a column, an arm 460 driven by the motor comes into contact with the limit switch 362A opening its contacts 2 and 1 and closing contacts 2 and 3. Thereupon D.C.— power is fed via the D.C.— line, contacts 2 and 1 of limit switch 366A, FIG. 1J, line 368, contacts 2 and 1 of limit switch 364A, FIG. 1G, lines 370 and 371 to contacts 2 and 3 of limit switch 362A and then via line 373 to the A coil terminal of a vend motor return relay 388A. Since the terminal B of this coil is always connected to D.C.+, the coil is now energized. A circuit is established for the relay 388A via line 370, contact 2 of limit switch 362A, contact 3 of the switch, line 373 and terminal A of the coil of relay 388A. When the relay is energized contacts 1 and 2 close, establishing a holding circuit from line 370, contacts 2 and 1 of limit switch 362B, line 389, contact 1 of relay 388A to contact 2 thereof and terminal A of the relay coil. Closure of contacts 3 and 4 of the relay connects the shading coil winding of motor 384 to cause it to reverse its direction of rotation.

Thus the motor will reverse allowing contacts 1 and 2 of switch 362A to again close, the motor continuing to run until limit switch 362B is opened. Thereupon the flow of current to holding contact 1 of the vend motor return relay is interrupted thus breaking the holding circuit for this relay and deenergizing the same. Thereby current to the armature of motor 384, via contacts 5 and 6 of the relay, and to the clockwise producing winding on the motor, via contacts 3 and 4 of this relay, is interrupted. The motor stops with limit switch 362B opened. Recapitulating, when the motor restarts by energization of vend relay 360A, and the closing of the motor circuit via the pole shading field winding contacts 4 and 5 and the armature circuit contacts 6 and 7 of relay 360A, the contacts 1 and 2 of limit switch 362B

close, but since vend motor return relay 338A is not energized, its holding contacts are open. When the motor opens limit switch contacts 1 and 2 of switch 362A, the holding circuit of the vend relay opens, opening the counterclockwise pole shading field winding of the motor 384 and the armature circuit. However, when limit switch contacts 1 and 2 of limit switch 362A are opened, contacts 2 and 3 thereof are closed, energizing the vend motor return relay 388A and closing its holding contacts, the armature circuit for the motor and the reverse CW pole shading field winding of the motor. Therefore the motor will reverse and continue to operate until contacts 1 and 2 of limit switch 362B open, thereby deenergizing relay 388A and stopping the motor.

When the pusher operated, it had engaged the bottommost article of a stack of articles and deposited the same onto a conveyor. The conveyor is provided with a delivery motor 402, FIG. 1E, to drive the conveyor for a short period of time in order to deliver the selected ware to the purchaser. This delivery motor is energized in the following manner: When the coil of vend motor return relay 388A is energized, its contact 7, permanently connected to D.C.—, comes into engagement with contact 8 of the relay. Current then flows from contact 7, through contact 8 and via line 390 to a line 392 (connected with the like contact on the like relay 388C, FIG. 1J, on the third rack and to a contact 6 of vend motor return relay 388B, FIG. 1G, on the second rack); also D.C.— flows to coil terminal A of delivery relay 394, through the coil to terminal B, terminal B being permanently connected to the D.C.+ line. Contact 6 of relay 388B on the second rack is, when that relay is energized, in contact with contact 5, connected to D.C.—. When the delivery relay coil is energized, it becomes self locking by reason of closure of its contacts 3 and 4, current then flowing from the D.C.— line to contact 3 and contact 4, thence to contacts 1 and 2 of an adjustable thermostatic switch 398 to terminal A of the delivery relay coil, through the coil to terminal B and the D.C.+ line. The heater 400 of the thermostatic switch bridges contact 4 and the D.C.+ line thus becoming heated and effecting an opening of the contacts of the thermostatic switch after a predetermined time, in accordance with the adjustment of the thermostatic switch. So long as the thermostatic switch is closed a conveyor drive or delivery motor 402, connected to drive the conveyor on which the dispensed articles are deposited by action of the pusher, is energized via A.C. line L_1, contacts 1 and 2 of the relay, the motor 402, and a connection 403 to the A.C. line L_2. Once the delivery relay is energized, the motor 402 will run under control of the thermostatic switch until after the article is delivered to a receiving bin in the dispensing machine accessible to the purchaser. Subsequently, the normally closed thermostatic switch will open to deenergize relay 394, opening its self holding contacts and opening the relay contacts to the motor. Since the vend motor return relay, before opening of the thermostatic contacts, had been deenergized by reason of opening of limit switch 362B, the coil of relay 394 remains deenergized until a subsequent dispensing of goods from a column takes place. The control for the delivery motor 405 for the third rack is the same as for the first rack.

The second rack has the tandem delivery motors 404, FIG. 1G; the vend relay and vend motor return relay have different arrangements of contacts, these differing in that no field winding controls are necessary and contacts for the field windings have therefore been eliminated; otherwise the control is the same.

An escrow motor 420, FIG. 1B, is employed to operate mechanism to either accept or refund money to the purchaser. The refund may be automatically effected in the event the column or columns of selected merchandise is empty. Or the refund may be initiated by the purchaser.

Money accept

After a deposit of a proper amount of money has been made in the machine, resulting in marking a line with D.C.— potential, and a selector switch has been depressed, as switch 354A and B. D.C.— potential will flow via the marked line, contacts 1 and 2 of the selector switch, empty switch contacts 2 and 3 (it being assumed that there are goods in at least one of columns 1 and 2 of the machine), line 410, thence to contact 8 and now closed contact 9 of the selector switch, and line 412, and then to line 414 connected with the A coil terminal of an accepted relay 415, the B terminal of the coil being connected permanently to D.C.+. When this coil is energized contacts 3 and 4 thereof are closed. This relay will be energized only as long as a selector switch is held depressed. The closure of contacts 3 and 4 of relay 415 brings A.C. line L_1, to which contact 3 is always connected, to contact 4 and thence via line 416 to the A coil terminal of acceptance relay 418, thence to the B terminal of the coil and A.C. line L_2 to which the B terminal of the coil is always connected. This energizes the coil of the acceptance relay 418; contact 6 of relay 418, always connected to A.C. line L_1, and contact 7 then brings A.C. line L_1 current to the A armature pole of escrow motor 420, the B pole of which is permanently connected to A.C. line L_2. At the same time contacts 8 and 9 are closed completing the field winding circuit to the motor to cause it to rotate in the clockwise direction. The coil of acceptance relay 418 will be held energized until the escrow motor is driven to its limit of rotation in accepting money, by reason of a shunt circuit established to its coil terminal A, this circuit being from A.C. line L_1, contact 2 of an accept limit switch 422, normally closed contact 1 of that switch, line 424 to contact 3 of acceptance relay 418, now closed contact 4 of the relay to terminal A of its coil. When the accept limit switch is actuated by reason of a part driven by the escrow motor shaft moving the switch, the contacts 1 and 2 of the limit switch are broken and the relay 418 becomes deenergized. Current to the motor armature however is maintained by contact 2 of the accept limit switch engaging contact 3 which is connected to the motor armature, and current is maintained to the same field winding by current passing from the common contact of the field winding to contact 4 of accept limit switch 422, now closed contact 5 thereof, line 426, to contact 8 of a returning relay 428, a normally closed contact 7 thereof and the CW terminal of the field winding. Thus the motor will continue to rotate in the same direction until the accept limit switch has been released completely. This arrangement is provided so that the accept limit switch does not try to control the direction of the motor when it is actuated during a money return cycle.

Money refund due to empty column

Should a column be empty, and the selector switch for that column be depressed, D.C.— potential from a marked line at the pricing panel will be transmitted via contacts 1 and 2 of the associated selector switch, to contact 2 of the associated empty switch 356, thence via its now closed contact 1 (the column being assumed to be empty), to a line 434, then to a line 436 common to the lines 434 on each rack and a branch line 438 to the A coil terminal of a temporarily energizable return relay 440, FIG. 1B (deenergized as soon as the selector switch is released), whose B terminal is permanently connected to D.C.+. The temporary energization of relay 440 will close its contacts, whereby A.C. line L_1 power will flow through contact 3 of return relay 440, now closed contact 4 to line 442, thence to terminal A of returning relay 428 through its coil to terminal B and

A.C. line L_2, terminal B always being connected to A.C. line L_2. When the returning relay coil is energized, relay 428 will be locked up by reason of current flow from A.C. line L_1 to contact 6 of now deenergized acceptance relay 418, normally closed contact 5 thereof, line 444, contact 4 of a return limit switch 446, normally closed contact 3 thereof, line 448, to holding contact 3 of returning relay 428, now closed holding contact 4 thereof and to terminal A of the relay coil.

By reason of the control of the circuit for the reversal of the motor passing through contacts 5 and 6 of the acceptance relay 418, the motor cannot be reversed until after the acceptance relay has been restored to normal condition. This eliminates the possibility of energizing the return relay after a vend cycle has started.

When returning relay 428 is energized, the escrow motor armature circuit is completed via a connection between contact 3 of the relay, contact 5 thereof, now closed contact 6 thereof, and pole A of the armature. The field winding to reverse the motor or rotate it counterclockwise, is completed via contacts 1 and 2 of returning relay 428. The escrow motor will then rotate in a direction to effect return of the money and operate until the return limit switch is engaged by a part movable with the shaft of the escrow motor to shift the contacts of the return limit switch to break the hold circuit to returning relay 428.

After the contacts have been shifted on the return limit switch, the motor will still continue to run in the counterclockwise direction, notwithstanding the deenergization of relay 428, because of the following connections: The motor armature current will flow from A.C. line L_2 at armature pole B, through the armature to pole A thence to contact 5 of return limit switch 446, now closed contact 4 thereof, to contact 5 of acceptance relay 418 and normally closed contact 6 thereof to A.C. line L_1. The counterclockwise field winding current of the motor will flow from terminal CCW of the field winding to contact 1 of acceptance relay 418, normally closed contact 2 thereof, to contact 2 of return limit switch 446, now closed contact 1 thereof, and line 448 to terminal C of the field winding. Thus the connections are such that the return limit switch does not try to control the direction of the motor when it is actuated during a money accept cycle. The return limit switch is released to the normal position shown after full travel of the motor in the counterclockwise direction, thus stopping the motor.

Empty light

When a column is empty and a selector switch 354 is depressed, D.C.— current will flow from contact 1 of the empty switch 356 to lines 434 and 436 to contact 6 of an empty relay 450, FIG. 1C, thence to normally closed contact 5 thereof to terminal A of the coil of the relay, the opposite or B terminal of which is permanently connected to D.C.+. When the empty relay is energized, lighting current for an empty indicating light 452 flows from A.C. line L_1 to contact 3 of empty relay 450 to contact 4 to terminal A of the light 452 to terminal B thereof and to A.C. line L_2. A holding circuit for the relay 450 is established as follows: from D.C.— to contact 1 of the relay, now closed contact 2 thereof, contact 1 of a thermostatic switch 454, normally closed contact 2 of the switch, to terminal A of the empty relay, the opposite terminal B of the relay, as stated before, being permanently connected to D.C.+. Also a shunt circuit for the heater 456 will be established between contact 2 of switch 454 and D.C.+. After a time delay determined by the setting of the thermostatic switch, the heater will force the contacts open, deenergizing the coil of the relay and the lamp will become extinguished. Thus the lamp will burn for a predetermined time after a selector switch for an empty column has been operated.

Operator operated refund

An escrow switch 460, FIG. 1B, is provided which upon energization by a prospective purchaser effects return of the deposited money. On manual closure of this switch, contacts 1 and 2 thereof are closed. This applies D.C.— potential to the A terminal of return relay 440, the D.C.— potential being derived from contact 2 on wafer 256, see FIG. 1A, line 310 and contacts 4 and 3 of all the series connected selector switches 354 when they are unoperated, the circuit then being established via line 312 and branch line 313 to contact 3 of switch 460, thence through now closed contact 4 thereof, and line 461 to contact 5 on the energized counting relay 131, thence through now closed contact 6 of the counting relay and line 464 to the A terminal of the reset relay 226 of which the B terminal is permanently connected to D.C.+. Operation of the reset relay deenergizes the holding circuit for the counting relay through reset relay contacts 3 and 4. The reset relay, it will be remembered, is operative to restore the stepping switches and switching relay to normal position.

The reset relay is also energized initially by depression of a selector switch, after the wafer switches reach home position. When a selector switch is depressed, the D.C.— power from wafer 256, contact 2, flows to the common contact 4 of a selector switch 354, through the normally open contact 5 thereof and via line 413 to the common contacts 1 on the accept relay 415 and on the return relay 440. The contacts 5 of all of the selector switches 354 are connected to the line 413.

If either the accept relay 415 or the return relay 440 had been energized at the time the selector switch is actuated, the D.C.— power from the common contact 1 of these relays flows through the normally open contact 2 of the relay that is energized then via lines 462 and 461, to the contact 5 of the counting relay 131. If the counting relay be energized, this D.C.— current flows through normally open contact 6 thereof via line 464 to the A terminal of the reset relay coil 226.

When the coil of the reset relay 226 is energized, D.C.— power flows through common contact 4 thereof, through now closed contact 5, to contact 1 of the escrow switch 460, thence through the now operator closed contact 2 of the switch and via line 466 to the A terminal of the return relay 440 whose B terminal is permanently connected to D.C.+. The escrow motor 420 will now operate, as before, to refund the money to the would-be purchaser. The reset relay, of course, also restores the stepping magnet and switching relay to home positions, as before. Obviously, if the counting relay had not been energized, neither the reset relay nor the return relay could have been energized. This discourages unwarranted tampering with the machine controls.

What is claimed is:

1. A coin controlled apparatus comprising chutes for receiving coins of different multiple denominations, switches in said chutes, a stepping switch and stepping magnet to operate the stepping switch, a pulsing switch having plural contacts connected to the stepping magnet and an arm to successively close with the contacts, a motor to drive the arm, direct connections between the switch in the chute adapted to receive a coin of the lower denomination and the stepping magnet to momentarily energize the same to move the stepping switch one step, connections between a switch in a chute of higher denomination with the arm of the pulsing switch and with the motor to set the motor into operation to cause the pulsing switch to transmit a number of pulses to the stepping magnet for each rotation of the arm, and connections to the motor to limit the movement of the arm to one cycle for each coin of higher denomination deposited in the machine, the connections to the motor including normally closed contacts on each of the coin operated switches and opened when a coin is engaging the switch, with the said contacts on each coin operated

switch in series with the said contacts on all of the switches and in series with the motor.

2. A check controlled apparatus comprising chutes for receiving checks in the form of coins of different multiple denominations, switches in said chutes, a stepping switch and stepping magnet to operate the stepping switch, a pulsing switch having plural contacts connected to the stepping magnet and an arm to successively close with the contacts, a motor to drive the arm, direct connections between the switch in the chute adapted to receive a coin of the lower denomination and the stepping magnet to momentarily energize the same to move the stepping switch one step, connections between a switch in a chute of higher denomination with the arm of the pulsing switch and with the motor to set the motor into operation to cause the pulsing switch to transmit a number of pulses to the stepping magnet for each rotation of the arm, connections to the motor to limit the movement of the arm to one cycle for each coin of higher denomination deposited in the machine, another switch closed by acceptance of a check other than a coin, a first relay closed on closure of said another switch, contacts closed by said first relay to close a holding circuit for itself, control the energization of a second relay, start the motor and transmit pulses from the multiple contact switch to the stepping magnet, means under control of the arm of the motor for completing the circuit for energizing the second relay upon a completion of a first revolution of the arm, and the contacts of said second relay closing holding contacts for itself, energizing the motor for a second revolution of the arm and transmitting additional pulses to the stepping magnet.

3. In a check controlled vending machine, means for receiving checks, a stepping magnet controlled by the acceptance of said checks, stepping switches, each having contacts connected to output devices and each having a contact sweeping arm operated by said stepping magnet, a switching relay having an energizing coil and contacts to alternately apply potential to said arms and normally applying poteintial to the arm of one of said switches, and means to energize the coil of the switching relay to shift the potential to the other arm, said means including a connection between the last contact on the first stepping switch and the coil of the relay.

4. In a check controlled apparatus, check receiving mechanism, a plug board, a stepping magnet controlled by pulses transmitted from the check receiving mechanism a stepping switch controlled by said stepping magnet, and an indicator having two signals controlled by said stepping switch, said stepping switch comprising a number of units, each comprising a substantially semicircular array of contacts with a contact arm sweeping thereover and with the contact arms of each unit substantially diametrical of one another, means connecting the two arms together to a source of potential, a pair of leads from the stepping switch to the indicator, one lead being connected to alternate contacts on each unit and the other lead being connected to the other contacts, the leads at the indicator being connected respectively to the two individual signals, totalizer stepping switches operated by said stepping magnet, lines connected between the totalizer switches and said plug board, means connected with the plug board to vend an article under control of a said line connected to the board when the line is energized, and means to energize the said line.

5. A check controlled apparatus comprising a switch mechanism energized by the acceptance of a check, a first circuit including a pulsing switch set into operation by the operation of the check operated switch mechanism, a stepping magnet energized by pulses from said pulsing switch, stepping switches advanced by said stepping magnet, a reset relay to control the movement of the stepping switches to a home position, means to initially energize the reset relay, an off-normal switch comprising a single pole, double throw switch, with the common contact of the double throw switch connected to one pole of a source of a potential, a first contact normally closed with the common contact connected with contacts on said reset relay to hold the relay in energized condition, said stepping switches having a common driving shaft, means on the shaft cooperating with the double throw switch to bring the common contact and a second contact of the double throw switch into engagement for one step only of the stepping switches, a circuit breaker in a second circuit, said circuit breaker being in series with said stepping magnet, an arm operated by said stepping magnet to open the circuit breaker when the magnet is energized, a counting relay energized upon operation of the pulsing switch and deenergized upon initial energization of the reset relay, the circuit breaker being in series with normally closed contacts on the counting relay, whereby the stepping magnet advances the stepping switches toward home position and the off-normal switch when the common contact is in contact with the second contact of the double throw switch controls the stepping of the stepping switches one step to home position.

6. In a check operated vending machine having columns of articles to be vended and having means to receive checks and to connect a line with one side of a source of potential in response to the deposit of checks in the machine, a manually operated selector switch for verding an article stored in a selected column, contacts forming part of the selector switch closed when the switch is operated and operative to conduct current therethrough from the line with potential thereon, a vend relay having a coil responsive to an operation of a selector switch in circuit with the output from said selector switch and connected with the opposite side of the source of potential, a relay holding circuit for said vend relay, including contacts operated by said vend relay, a motor operative to vend an article controlled by energization of said vend relay and closure of a pair of contacts thereof, limit switches operated by said motor to limit operation thereof in each of two opposite directions, means under control of one of said limit switches to reverse the motor and means under control of the second limit switch to break the holding circuit of the vend relay to thereby deenergize the relay and stop the motor.

7. The structure defined in claim 6 and including an additional pair of normally closed contacts on the selector switch in series with the pair of contacts of the vend relay.

8. In a check operated vending machine having columns of articles to be vended and having means to receive checks and to connect a line with one side of a source of potential in response to the deposit of checks in the machine, a manually operated selector switch for vending an article stored in a selected column, contacts forming part of the selector switch closed when the switch is operated and operative to conduct current therethrough from the line with potential thereon, an empty switch to sense the presence of articles in a column, said empty switch being in series with said contacts of the selector switch, a vend relay having a coil in series with the empty switch and with the opposite side of the source of potential, said coil being responsive to an operation of the selector switch when the columm is not empty, a relay holding circuit for said vend relay including contacts operated by said vend relay, a motor operative to vend an article controlled by said vend relay, limit switches operated by said motor to limit operation thereof in each of two opposite directions, means under control of one of said limit switches to reverse the motor and means under control of the second limit switch to break the holding circuit of the vend relay, to thereby deenergize the relay and stop the motor.

9. The structure defined in claim 7 and including an additional pair of contacts closed by said vend relay, a solenoid to assist in the vending operation in series with said contacts and in series with one pole of an A.C. line,

the other pole of the A.C. line being connected to one of the additional pair of normally closed contacts of the selector switch, with said additional pair of contacts on the selector switch in series with the additional pair of contacts closed by said vend relay.

10. The structure defined in claim **8** and including an acceptance relay the coil of which is initially energized by reason of potential coming from said line via the selector switch when operated and via the empty switch, and by way of additional normally open contacts on the selector switch, an escrow motor operative to deposit the received check into the machine under control of said acceptance relay, a self-locking circuit for said acceptance relay including holding contacts operated by said relay, and a limit switch in series with said holding contacts to open the contacts upon operation of the motor, deenergize the acceptance relay, and stop the escrow motor.

11. The subject matter of claim **10** in which there is included an accept relay, connected to the other pole of the source of potential, the potential coming from the said line and being applied to the coil of said accept relay to hold it energized so long as the selector switch is operated, and a circuit including contacts operated by said accept relay to energize the coil of the acceptance relay.

12. In a check operated vending machine having columns of articles to be vended and having means to receive checks and to connect a line with one side of a source of potential in response to the deposit of a check in the machine, a manually operated selector switch for vending an article stored in a selected column, contacts forming part of the selector switch closed when the switch is operated and operative to conduct current therethrough from the line with potential thereon, an empty switch to sense the presence of articles in a column, said empty switch being in series with said contacts of the selector switch and having contacts which are closed when the column is empty, a return relay under control of said empty switch and energized when the contacts of the selector switch and empty switch are closed, a returning relay whose energization is effected upon the energization of the return relay, an escrow motor operative to refund checks upon rotation of the motor in one direction and circuits closed by energization of said returning relay for energizing the motor to cause it to run in said direction.

13. The structure of claim **12** wherein the line is connected to the one side of the source of potential via a stepping switch and wherein the stepping switch is advanced from a given position by acceptance of checks, and wherein the returning relay is energized through closure of the return relay, the return relay being in series with the empty switch and the opposite pole of the source of potential, a second circuit closed by said return relay, a reset relay in said second circuit and means controlled by said reset relay to restore the stepping switch to a start position.

14. In a check operated vending machine having columns of articles to be vended and having means to receive checks and to connect a line with one side of a source of potential in response to the deposit of a check in the machine, a manually operated selector switch for vending an article stored in a selected column, contacts forming part of the selector switch closed when the switch is operated and operative to conduct current therethrough from the line with potential thereon, an empty switch to sense the presence of articles in a column, said empty switch being in series with said contacts of the selector switch and having contacts which are closed when the column is empty, an empty relay having a coil in series with the empty switch, with the opposite pole of the source of potential connected thereto and energized upon the line with potential thereon being connected to the selector switch, and the selector switch being depressed and the empty switch closed, an empty light and a circuit therefor including contacts closed by energization of the relay, and a holding circuit for the relay, said holding circuit including a thermostatic switch opened, after an interval, by the heating thereof.

15. In a check controlled vending machine having columns of articles to be vended, and having means to receive checks, means operative on receipt of a check to operate a pulsing switch, a stepping magnet operated by pulses from said pulsing switch, a stepping switch operated by said stepping magnet to connect a line with one side of a source of potential, a plurality of manually operated selector switches, each connected to said line and controlling mechanism for vending an article stored in a column of said machine, additional mechanism under control of said selector switch to accept the check within the machine, and means to refund a deposited check including a contact on said pulsing switch, which, when the pulsing switch is in normal unoperated position, connects potential to normally closed contacts on the selector switches, the normally closed contacts of all of said selector switches being connected in series, an operator-operated escrow switch and a reset relay each having a contact in series with the normally closed contacts of the selector switches, a normally open cooperating contact on the escrow switch, which, when closed on the said contact thereof controls a circuit to effect energization of the coil of the reset relay, an additional pair of normally open contacts on said escrow switch, which, when closed, effects a refund of the deposited check and another contact on the reset relay which when closed upon the series connected contact of the reset relay and upon energization thereof is connected to the stepping magnet to effect energization thereof.

16. The structure defined in claim **15** and wherein there is included a counting relay energized in response to the receipt of a check by said vending machine, said counting relay when energized closing a circuit in series with the coil of the reset relay and in series with the first mentioned pair of contacts on the escrow switch.

17. In a check controlled vending machine, means for effecting the delivery of an article from a column of articles under control of the deposit of a check, said means including a pusher for stripping an article from the column, a motor and connections for causing the motor to operate the pusher, a vend relay energized under control of the check, contacts closed thereby to effect the drive of said motor in one direction, a vend motor return relay, a limit switch having contacts closed because of said drive of the motor, said limit switch having contacts biased to closed position and in series with normally open contacts on said vend motor return relay, a second limit switch operated because of said drive of the motor having normally closed contacts to maintain the vend relay energized and opened upon continued drive of the motor, the deenergization of said relay effecting a momentary stoppage of motor drive, and another contact means on the second limit switch closed when the first pair of contacts on said limit switch is opened to energize the vend motor return relay, the now closed contacts on the first limit switch holding the vend motor return relay energized through its holding contacts, contacts on said vend motor return relay to reverse the motor allowing the normally closed pair of contacts on the second limit switch to close, the motor continuing in its reverse movement until it effects opening of the contacts of the first limit switch, a conveyor for receiving articles as they are removed from a column, a delivery relay and a holding circuit therefor, and additional contacts closed by energization of said vend motor return relay to energize said delivery relay, and a second motor driving the conveyor energized by closing of contacts of the delivery relay.

18. The structure of claim **17** including a thermostatic switch with a normally closed pair of contacts and a heater adjacent to the contacts, the delivery relay having a coil one end of which is directly connected to one pole of a source of potential and the other end of which is connected to a line leading to a normally open contact con-

nected to one of the pair of contacts of the thermostatic switch and to one end of the heater, the other of the pair of contacts of the thermostatic switch being connected to the end of the coil of the delivery relay which is connected to the contact on the vend motor return relay and the opposite end of the heater being directly connected to said one pole of the source of potential.

19. In a check operated vending machine, selector switches for selecting an article to be vended by said machine, check receiving mechanism, a totalizer, a vending motor, means responsive to the receipt of a check by said mechanism to advance the totalizer, output lines from the totalizer, means connecting these output lines to normally open contacts on said selector switches, vending relays controlled by said selector switches and said selector switches transmitting current through said lines to said vending relays via said normally open contacts, contacts on and controlled by the relays effective to close a circuit to said vending motor, said motor circuit also flowing through normally closed series connected contacts on said selector switches, whereby operation of one of said selector switches disables the motor control circuit through others of the selector switches.

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