

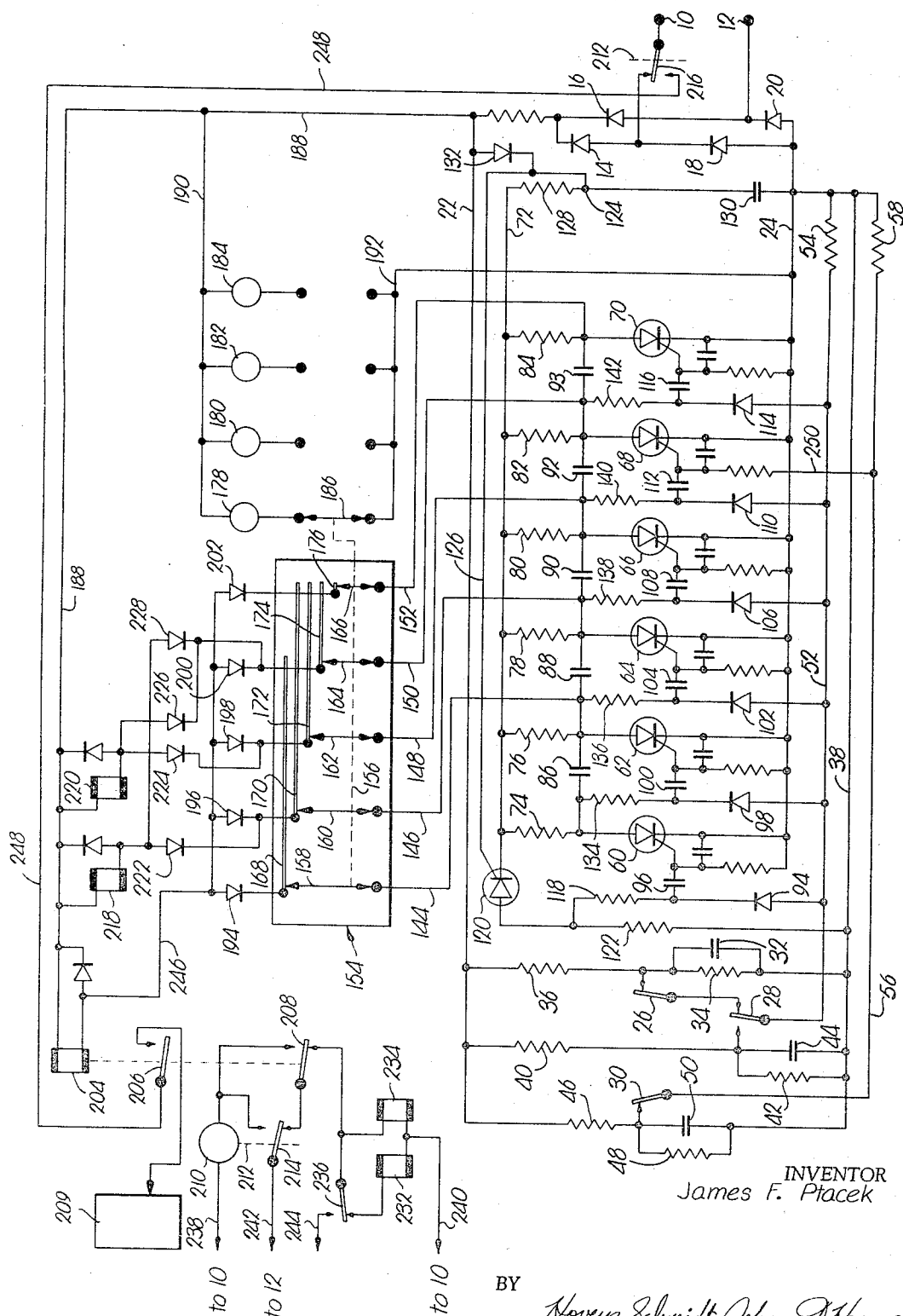
Jan. 23, 1968

J. F. PTACEK

3,365,044

SOLID STATE VENDING MACHINE CONTROL APPARATUS

Filed July 5, 1966



1

3,365,044

SOLID STATE VENDING MACHINE CONTROL APPARATUS

James F. Ptacek, Independence, Mo., assignor to The Vendo Company, Kansas City, Mo., a corporation of Missouri

Filed July 5, 1966, Ser. No. 562,616
19 Claims. (Cl. 194—10)

ABSTRACT OF THE DISCLOSURE

A solid state totalizer for a vending machine utilizes silicon controlled rectifiers to count the deposited coinage and register the accumulated credit. Each SCR represents a different integer multiple of the lowest coin denomination (five cents) from one through the maximum credit capacity of the apparatus. A deposit causes the SCR's to be fired in succession in the order of the integer multiples they represent, only one SCR being permitted to remain in a conductive, credit-representing state at a given time. A vend relay and nickel and dime change payout solenoids are selectively connected to the SCR's by a price-setting switch through which energizing circuits for the vend relay and payout solenoids extend. A particular circuit is closed by the firing of a corresponding SCR to, in turn, effect the energization of the vend relay only if the credit equals the exact price of the article, or the energization of the relay and one or both of the solenoids if the credit exceeds the price.

This invention relates to control apparatus for vending machines and, more specifically, to coin-controlled circuitry utilizing solid state components to totalize deposited coins and initiate appropriate vend and coin payout functions.

For a number of years electromechanical totalizers have been employed in vending machine control circuitry as a counting element to register successive coin deposits and establish credit dependent upon the total deposit made by a customer. Although such totalizers have proven to be satisfactory in most respects, problems of size and reliability inherently arise in systems employing mechanical components. Particularly in the vending machine art, reliability is an important factor to a successful commercial operation.

It is, therefore, the primary object of this invention to provide vending machine control apparatus capable of totalizing deposited coins without the use of electromechanical devices such as stepper relays, so that the size and cost of the apparatus may be reduced and reliability increased.

It is another important object of the instant invention to provide vending machine control apparatus having solid state components which count command signals produced in response to the deposit of coinage, wherein the number of signals produced is related both to the number of coins deposited and the denominations of the deposited coins, the components thus serving as an electronic coin deposit totalizer.

Still another important object is to provide apparatus as aforesaid which is operably coupled with means for initiating a vend operation and change payout means in a manner to effect commencement of the vend cycle if proper credit is established and pay out change if the total credit is greater than the price of the article to be vended.

Yet another important aim is to provide a price setting switch utilized in conjunction with the solid state totalizer which automatically sets up proper change pay-back at each price setting thereof.

2

The single figure is an electrical schematic diagram of the control apparatus.

Line current such as 110 volts AC is applied at power terminals 10 and 12 and is full-wave rectified by a bridge rectifier network comprising diodes 14, 16, 18 and 20. The output from the bridge network appears across lines 22 and 24, the latter forming a common connection for the various components of the system.

A normally closed nickel coin switch 26, a single-pole, double throw dime coin switch 28, and a normally closed quarter coin switch 30 comprise coin-operated switches associated with coin tracks of a coin changer and acceptor (not shown) in a conventional manner such that each is operated by the weight of a gravitating coin of appropriate denomination when such coin is deposited in the changer mechanism. Switch 26 controls the discharge of a capacitor 32 connected in parallel with a resistor 34 which, in cooperation with a series connected resistor 36, provides a voltage divider connected between line 22 and a lead 38 which joins with line 24 at the lower right-hand portion of the figure. Resistor 36 is preferably several times greater in ohmic value than resistor 34 so that the total voltage presented to capacitor 32 is substantially less than the voltage existing across lines 22 and 24. Similarly, series connected resistors 40 and 42 are connected between line 22 and lead 38, a capacitor 44 being connected in parallel with resistor 42. A third voltage divider comprises series connected resistors 46 and 48 connected between line 22 and lead 38, a capacitor 50 being connected in parallel with resistor 48.

Lead 52 connects the movable pole of switch 28 to a resistor 54 which, in turn, is connected to line 24. The normally closed contact of switch 28 is connected to the movable pole of switch 26, the contact thereof being connected to the upper plate of capacitor 32. Thus, normally a current path exists from line 22 through resistor 36, switch 26, switch 28, lead 52, and resistor 54 to line 24. Capacitor 32 is normally maintained in a substantially uncharged condition since resistor 54 is very small in value compared to resistor 34.

The normally open contact of switch 28 is connected to the upper plate of capacitor 44; thus, this capacitor is normally charged by the voltage appearing across resistor 42 of the voltage divider 40, 42. The contact of switch 30 is connected to the upper plate of capacitor 50, the movable pole of switch 30 being connected by a lead 56 to a resistor 58 which, in turn, is connected to line 24. Resistor 58 may be of the same value as resistor 54 but, in any event, is very small as compared to resistor 48. Thus, capacitor 50 is normally maintained in a substantially uncharged condition.

Six silicon controlled rectifiers 60, 62, 64, 66, 68 and 70 have their cathodes connected to line 24 and their anodes connected to a lead 72 by load resistors 74, 76, 78, 80, 82 and 84, respectively. The anodes of rectifiers 60 and 62 are interconnected by a coupling capacitor 86. Similarly, the anodes of rectifiers 62 and 64 are interconnected by a capacitor 88, and capacitors 90, 92 and 93 interconnect the anodes of subsequent rectifier pairs as illustrated.

A diode 94 has its anode connected to lead 52 and its cathode connected to a DC blocking capacitor 96 which is interposed between the diode and the gate or control element of rectifier 60. Similarly, a diode 98 and a capacitor 100 are connected in series between lead 52 and the gate or control element of rectifier 62. In like fashion, a diode 102 and a capacitor 104, a diode 106 and a capacitor 108, a diode 110 and a capacitor 112, and a diode 114 and a capacitor 116 are connected between lead 52 and the gates of rectifiers 64, 66, 68 and 70, respectively.

Diode 94 forms a diode gate that is controlled by a resistor 118 which connects the cathode of diode 94 to the anode of a silicon controlled rectifier 120. The anode of rectifier 120 is also connected to lead 38 by a resistor 122. Rectifier 120 serves as a starting component for the totalizer formed by rectifiers 60-70 as will become clear hereinafter. Lead 72 connects with the cathode of rectifier 120, and the gate thereof is connected to a function point 124 by a lead 126. Lead 72 is connected to junction point 124 by a resistor 128, a filter condenser 130 being connected between point 124 and line 24. Line 22 from the output of bridge rectifier 14-20 is coupled with junction point 124 through an isolation diode 132; hence, leads 72 and 126 carry a filtered direct current by virtue of the action of condenser 130.

Diodes 98, 102, 106, 110 and 114 are also utilized as control gates, the cathodes thereof being connected to the anodes of rectifiers 60, 62, 64, 66 and 68, respectively, by associated resistors 134, 136, 138, 140 and 142. Additional elements of the totalizer circuit include a resistor and a capacitor shown connected to line 24 and the gate and cathode of each totalizer rectifier 60-70, respectively, which are utilized as conventional noise filters.

Five price leads 144, 146, 148, 150 and 152 are connected to respective anodes of rectifiers 62, 64, 66, 68 and 70 and extend to a price setting switch 154 which is illustrated diagrammatically. A movable switch element 156 has five poles 158, 160, 162, 164 and 166 shown in contact with five terminals within switch 154 connected to leads 144-152, respectively. The poles, in the position of element 156 shown, electrically bridge the associated price leads and respective switching terminals 168, 170, 172, 174 and 176. The switching terminals are illustrated in the form of contact strips which are engaged by corresponding poles or wipers of element 156 as the latter is shifted rightwardly to a selected position thereof. In this regard, it should be understood that element 156 has four possible price positions and, at each position thereof, causes an indicator light 178, 180, 182 or 184 to be energized by a circuit through an additional pole 186 ganged to the other poles 158-166. The circuit through the indicator representing the selected price setting is established via a lead 188 connected to line 22, a lead 190 connecting lead 188 to one side of indicators 178-184, pole 186, and thence along a lead 192 to line 24.

Five diodes 194, 196, 198, 200 and 202 are connected to switching terminals 168-176, respectively, and comprise an OR gate which controls the energization of the coil 204 of a vend relay. Coil 204 has its armature operably coupled to a pair of relay switches 206 and 208. Closure of switch 206 initiates a vend cycle by rendering an article dispensing mechanism 209 operative. Mechanism 209 may, for example, comprise any of a number of conventional article dispensers which are motor-operated; thus, closure of switch 206 would commonly cause the energization of a motor relay and operation of the dispensing mechanism would continue until a carry-over switch controlled by the vend motor returned the mechanism to standby at the close of the vend cycle.

A change payout motor 210 forms a part of a conventional change payout mechanism not illustrated in detail, and has an output shaft 212 which operates a pair of cam switches 214 and 216. A nickel payout solenoid 218 and a dime payout solenoid 220 also form a part of the change payout mechanism and, together with relay coil 204, have one electrical side thereof connected to power lead 188. The other side of solenoid 218 is connected to switching terminal 170 by a diode 222, solenoid 220 being similarly connected to terminal 172 by a diode 224. Two additional diodes 226 and 228 are connected between solenoids 220 and 218, respectively, and switching terminal 174 to perform a logic function to be discussed more fully hereinafter.

Other components of the system include a pair of coin-

return electromagnets 232 and 234 which are associated with the changer coin tracks for the purpose of returning coins to the customer when de-energized. Electromagnet 232 controls return of quarters, while electromagnet 234 controls the return of dimes and nickels. A coin tube switch 236 is illustrated for disabling electromagnet 232 when a supply of dimes and nickels are no longer available to make change. Lead 238 extending from change payout motor 210, and lead 240 extending from electromagnets 232 and 234 are connected to supply terminal 10 as indicated; lead 242 extending from switch 214 is connected to supply terminal 12 as indicated; and lead 244 connected to switch 236 may be utilized to energize a "Correct Change Only" light on the cabinet of the vending machine. The three diodes connected in parallel with relay coil 204 and solenoids 218 and 220 serve as reverse transient suppressors.

Operation

The various switching components are shown in the figure in switching positions corresponding to the standby condition of the apparatus. Vend relay coil 204 is normally deenergized and change payout motor 210 is normally inoperative. Switching element 156 of price setting switch 154 is illustrated in its lowest price position with indicator 178 energized. The only other components which are energized when the apparatus is in standby are the coin return electromagnets 232 and 234. Thus, as illustrated, the apparatus is in condition to receive coinage from a customer, totalize the deposit and establish a credit, and effect operation of mechanism 209 if the credit is at least equal to the price of the article to be vended, as established by price setting switch 154. Additionally, change will be paid out if the total credit is greater than the price of the article. Detailed examples of the operation follow.

It should be understood at the outset that totalization of the deposit is effected by a change-of-state of the six rectifiers 60-70. These six rectifiers serve as a counter, firing of rectifier 60 representing a deposit of 5¢, firing of rectifier 62 representing a deposit of 10¢, firing of rectifier 64 representing a deposit of 15¢, and so on for the remainder of the rectifiers with SCR 70 representing a deposit of 30¢ when a change-of-state thereof occurs.

In the first example, it will be assumed that switch element 156 of price setting switch 154 is in the position illustrated, such position corresponding to a price setting of 10¢ since price lead 144 is connected to switching terminal 168 by pole or wiper 158. The various indicators 178-184 are utilized to inform the customer of the price at which the machine is set to vend; manifestly, this represents but one possible approach to price indication and is shown for purposes of illustration only.

If the customer has two nickels to deposit, each deposit will cause nickel coin switch 26 to momentarily open and then reclose, causing capacitor 32 to charge while switch 26 is open and then discharge along the following path when the switch recloses: From capacitor 32 to switches 26 and 28, along lead 52 to resistor 54, and thence to the common line 24. The pulse produced by the voltage drop across resistor 54 is conducted by diode control gate 94 through capacitor 96 to the gate of SCR 60, the cathode thereof being directly connected to common line 24. The voltage across lead 72 and line 24 is selected to establish a potential difference which will cause SCR 60 to fire when the pulse is applied to its gate element. Once firing is effected, SCR 60 remains in conduction until the second nickel actuates switch 26, whereupon a second pulse is delivered by capacitor 32 that is directed to the gate element of SCR 62.

As previously stated, all of the SCR's 60-70 are non-conductive when the apparatus is in its standby condition. Rectifier 120 serves as a starting component to control the initiation of the counting SCR's and, specifically, to condition the circuitry such that the first pulse produced

by capacitor 32 is conducted to the gate element of SCR 60 only.

Rectifier 120 is electrically equivalent to a PNP transistor oriented with its emitter connected to lead 126, the base connected to lead 72, and its collector connected to the junction of resistors 118 and 122. Rectifier 120 is non-conductive when the apparatus is in standby; therefore, the junction of resistor 118, capacitor 96 and the cathode of diode gate 94 is held substantially at the potential of line 24 during standby. Conversely, the cathodes of diode gates 98, 102, 106, 110 and 114 are maintained substantially at the potential of lead 72 during standby since the counting rectifiers 60-70 are not conductive and hence present an open circuit between load resistors 74-84 and common line 24.

The action of voltage divider 34, 36 may now be appreciated in that the pulse produced by the discharge of capacitor 32 will be of lesser potential than the cathodes of the various diode gates except for the cathode of gate 94. Thus, SCR 60 must fire first, whereupon its anode is then reduced to the potential of line 24 except for the internal voltage drop of the cathode-anode circuit of SCR 60. Since the cathode of diode gate 98 is connected to anode of SCR 60 through resistor 134, conduction of SCR 60 now reduces the potential on the cathode of gate 98 so that the next pulse produced by the deposit of the second nickel is gated to SCR 62. Gate 94 is now blocked since firing of SCR 60 places rectifier 120 in conduction, thereby raising the potential of the cathode of gate 94 to a higher level than the potential of the pulse from the discharging capacitor 32.

Firing of the 10¢ SCR 62 effects the energization of relay coil 204 to initiate the vend cycle, the power circuit to coil 204 being traced by the following path: From bridge rectifier network 14-20 along lead 188 to coil 204, along a lead 246 to diode 194, to switching terminal 168 and pole 158 to lead 144, along lead 144 to the anode of SCR 62, and thence through the cathode-anode circuit of SCR 62 to common line 24.

Energization of relay coil 204 causes relay switches 206 and 208 to engage their upper contacts, switch 208 causing energization of change payout motor 210 by a circuit established by lead 238, switch 208, switch 214, and lead 242. In the instant example neither of the change payout solenoids 218 and 220 will be energized since correct change was deposited; therefore, the operation of motor 210 is significant only for the purpose of operating switch 214 to establish a holding circuit for motor 210, and operating switch 216 (shown in the lower right-hand portion of the figure) to connect power terminal 10 with a lead 243 which extends to relay switch 206.

When the motor-operated switch 216 establishes a circuit through its lower contact, power is delivered along lead 248 to switch 206 to cause a vend pulse to be delivered to mechanism 209 by the now closed relay switch 206. The dispensing mechanism then vends the article and, when the shaft 212 of motor 210 returns to its home position, return of holding switch 214 to the normal position illustrated breaks the power circuit to motor 210. It should be noted that relay coil 204 drops out immediately after the vend pulse is delivered to mechanism 209 since the actuation of switch 216 by motor 210 removes power from the SCR counters. Thus, relay switches 206 and 208 return to the positions illustrated and holding switch 214 ultimately de-energizes motor 210. The vend relay is of the slow-to-release type in order to provide a sufficient time lag between the removal of power from the counters and the return of relay switch 206 to its normal position.

If it is assumed in the foregoing example that the customer deposits a dime for the 10¢ article rather than two nickels, then dime switch 28 is actuated to produce two command pulses in rapid succession. When the movable pole of switch 28 engages its left-hand contact, capacitor 44 discharges through diode gate 94 to fire SCR

60. When switch 28 returns to normal and re-establishes the circuit through its right-hand contact, capacitor 32 discharges and delivers a command pulse in the same manner as described above, since capacitor 32 will now have accumulated a charge due to the momentary disengagement of the movable pole of switch 28 from its right-hand contact. Thus, the 10¢ SCR 62 fires and vending is effected in the same manner as discussed above.

In the first example outlined above the article was vended at a price of 10¢ and no change was required. In the example to follow, it will be assumed that the article is priced at 15¢ and that change is required since the customer possesses either two dimes or one quarter with which to make the purchase.

It should first be noted that the anodes of adjacent pairs of counting SCR's are interconnected by a capacitor; specifically, capacitors 86-93. Thus, for example, when SCR 62 fires, SCR 60 is turned off by the action of a negative transient which is delivered to the anode of SCR 60 by coupling capacitor 86. In this manner, only one of the counting SCR's can be in the conductive state at a given time.

For a 15¢ article price, switch element 156 of price setting switch 154 is shifted one position to the right to connect switching terminal 168 with lead 146 via pole 158. In the 15¢ position, therefore, pole 160 connects switching terminal 170 with lead 148, pole 162 connects switching terminal 172 with lead 150, and pole 164 connects switching terminal 174 with lead 152. Lead 144 is disconnected from the circuit and pole 166 is not used. If 15¢ in correct change is deposited, SCR 64 will be fired since three command pulses will be produced, either by three successive discharges of capacitor 32 if three nickels are deposited, or one discharge of capacitor 44 and two discharges of capacitor 32 if a dime and a nickel are deposited. In either instance, firing of SCR 64 establishes the following power circuit to vend relay coil 204: Along lead 188 to coil 204, along lead 246 to diode 194, through switching terminal 168 and pole 158 to price lead 146, and thence through the cathode-anode circuit of SCR 64 to line 24.

The deposit of two dimes to obtain the 15¢ article causes four command pulses to be produced and, therefore, fires the 20¢ SCR 66. This connects price lead 148 to line 24 and hence, establishes a power circuit to relay coil 204 via lead 246, diode 196, switching terminal 170, and pole 160. Concurrently, however, nickel payout solenoid 218 is energized via lead 188, diode 222, and switching terminal 170. Thus, the article is vended at a price of 15¢ and a nickel is paid back to the customer.

The specific mechanical structure of the coin payout mechanism is not shown since coin payout devices of various types are well known in the art and widely utilized. One arrangement frequently employed utilizes a pair of coin discharge slides associated with the nickel and dime supply tubes of the changer. The slides are biased toward a coin discharging position but are normally held by respective solenoid-operated latches. Upon release of a slide to discharge a coin, cam-operated mechanism driven by payout motor shaft 212 effects return of the operated slide to the normal, latched position. Thus, in the instant example, it will be assumed that solenoid 218, upon energization thereof, effects release of a nickel payout slide which is subsequently returned to its normal position by payout motor 210.

In the event that a quarter is deposited to obtain the 15¢ article, quarter coin switch 30 is momentarily opened to cause the capacitor 50 to charge and then discharge along lead 56 through resistor 58 to line 24. This delivers a pulse to a lead 250 which is coupled with the gate element of 25¢ SCR 68. The 25¢ SCR is thus directly fired without operation of the lower order SCR's and establishes a power circuit to relay coil 204 via lead 246, diode 198, switching terminal 172, pole 162, and price

lead 150. Simultaneously, a power circuit to dime payout solenoid 220 is established via lead 188, diode 224, switching terminal 172, pole 162, and price lead 150. In all modes of operation, rectifiers 60-70 return to the nonconductive state as the vend cycle is initiated since motor switch 216 is operated to remove the power supplied to the input of the bridge rectifier network 14-20.

Price settings of 20¢ and 25¢ are also possible with the apparatus illustrated, the 20¢ setting being established by positioning switch element 156 such that pole 158 bridges switching terminal 168 and price lead 148. In the 25¢ setting, pole 158 bridges switching terminal 168 and price lead 150. If the price is set at 20¢, a nickel will be paid back if a quarter is deposited; similarly, if the price is set at 25¢, a nickel will be paid back if 30¢ is deposited. It is also apparent from the logic that, if the price is set at 10¢, 15¢ will be returned to the customer if a quarter is deposited due to the action of diodes 226 and 228 which cause both of the solenoids 218 and 220 to be energized when the 25¢ SCR 68 is placed in conduction with switch element 156 in the 10¢ price position illustrated.

Having this described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. In a vending machine:

coin-actuated means for sensing the deposit of coins of a predetermined denomination and for delivering a command signal in response to each deposit;

means for dispensing an article when coins at least equal in value to a predetermined integer multiple of said denomination are deposited;

a plurality of bistate devices each representing a different integer multiple of said denomination from one through at least said predetermined multiple,

each device having a first, standby state and a second, operative state, and being provided with an electrically responsive control element for changing the state thereof from said first to said second state;

circuitry intercoupling said devices and said coin-actuated means for directing successive command signals to the control element of different devices in a predetermined sequence, whereby the devices associated with the command signal excited elements sequentially change from the first to the second states thereof; and

electrically responsive operating means coupling said device representing said predetermined multiple with said dispensing means for actuating the latter in response to a change from the first to the second state of the last-mentioned device, whereby to effect vending of the article.

2. The invention of claim 1,

said circuitry directing said successive command signals to the control elements of the devices in the order of the integer multiples represented by said devices.

3. The invention of claim 1,

said circuitry normally maintaining each of said devices in the first state thereof, and cooperating with said devices during deposit of said coins to direct said successive command signals to devices representing progressively higher integer multiples of said denomination, and to return each operated device to its first state when another device subsequently changes from the first to the second state thereof, whereby only one of said devices is in its second state at a given time.

4. The invention of claim 3,

said circuitry including an electrically responsive control gate operably coupled with the control element of each of said devices respectively, and a starting component normally maintaining the gate associated with the device representing said denomination multiplied by one exclusively in a condition to conduct the command signal produced by the first coin to be deposited, whereby said denomination-representing

device is the first to be placed in its second state by the deposit of coins.

5. The invention of claim 4,

said component having a first state maintaining said control gate associated with the denomination-representing device in said condition, and a second state preventing conduction of command signals by the last-mentioned gate,

said circuitry further including means coupling the denomination-representing device with said component for changing the state of the latter from said first to said second state thereof in response to a change-of-state of said denomination-representing device effected by the first-produced command signal; and

means coupled with said operating means, said devices, and said component for returning the latter and the deposit operated device to their respective first states in response to the initiation of a vend cycle, whereby the apparatus is returned to standby in preparation for a subsequent vending operation.

6. The invention of claim 5,

each of said control gates comprising a diode having a cathode connection and an anode connection,

each of said devices comprising a silicon controlled rectifier having a cathode and an anode in addition to the control element thereof,

said circuitry further including a capacitor intercoupling each pair of anodes, respectively, of rectifiers representing adjacent integer multiples, means coupling one of said connections of each diode to said coin-actuated means, means coupling the other connection of each diode to the control element of a corresponding device, and means coupling the anode of each rectifier representing a lower integer multiple to the other connection of the diode coupled with the control element of the rectifier representing the next higher integer multiple for maintaining each of such other connections at substantially the potential of the rectifier anode coupled thereto,

said component in the first state thereof maintaining the other connection of the diode associated with said denomination-representing device at a potential less than the potential of command signals delivered by said coin-actuated means and, in the second state thereof, raising the potential of the last-mentioned connection to a level greater than said potential of the command signals.

7. The invention of claim 1,

said predetermined multiple of said denomination being greater than the price of said article; and

change payout means coupled with said device representing said predetermined multiple for discharging change in response to a change-of-state of the predetermined multiple representing device from the first to the second state thereof.

8. The invention of claim 1; and

an additional coin-actuated means for sensing the deposit of a coin of another denomination equal to an integer multiple of said predetermined denomination, and for delivering a command signal in response to the deposit of said coin of said other denomination,

there being circuit means coupling said additional coin-actuated means directly to the control element of the device representing the multiple of said predetermined denomination equal in value to said other denomination, whereby to change the state of the other denomination representing device when a coin of said other denomination is deposited without sequentially operating devices representing lower values.

9. The invention of claim 8,

said other denomination being greater in value than

said predetermined multiple of said predetermined denomination,
 said operating means operably coupling said dispensing means with said other denomination representing device; and
 change payout means coupled with said other denomination representing device for discharging change in response to a change-of-state thereof from the first to the second state of the same whereby, when the deposit of a coin of said other denomination causes said other denomination representing device to be rendered operative, change is returned to the customer and the article is vended.

10. In a vending machine:
 first coin-actuated means for sensing the deposit of coins of a first denomination and for delivering a command signal in response to each deposit;
 second coin-actuated means for sensing the deposit of coins of a second denomination equal to an integer multiple of said first denomination, and for delivering a plurality of command signals in succession equal in number to said integer in response to the deposit of each of said coins of said second denomination;
 means for dispensing an article when coins at least equal in value to a predetermined integer multiple of said first denomination are deposited;
 a plurality of bistate devices each representing a different integer multiple of said first denomination from one through at least said predetermined multiple, each device having a first, standby state and a second, operative state, and being provided with an electrically responsive control element for changing the state thereof from said first to said second state;
 circuitry intercoupling said devices and said first and second coin-actuated means for receiving command signals delivered by both of the coin-actuated means, and for directing successively received command signals to the control element of different devices in a predetermined sequence, whereby the devices associated with the command signal excited elements sequentially change from the first to the second states thereof; and
 electrically responsive operating means coupling said device representing said predetermined multiple with said dispensing means for actuating the latter in response to a change from the first to the second state of the last-mentioned device, whereby to effect vending of the article.

11. The invention of claim 10; and
 third coin-actuated means for sensing the deposit of a coin of a third denomination greater than said second denomination and equal to an integer multiple of said first denomination, and for delivering a single command signal in response to the deposit of said coin of said third denomination,
 there being circuit means coupling said third coin-actuated means directly to the control element of the device representing the multiple of said first denomination equal in value to said third denomination, whereby to change the state of the device coupled with the third coin-actuated means when a coin of said third denomination is deposited without sequentially operating devices representing lower values.

12. The invention of claim 10,
 said circuitry directing said successively received command signals to the control elements of the devices in the order of the integer multiples represented by said devices.

13. The invention of claim 12,
 one of said devices representing an integer multiple of said second denomination greater in value than said predetermined multiple of said first denomination,
 said operating means operably coupling said dispensing means with said one device; and

change payout means coupled with said one device for discharging change in response to a change-of-state of said one device from the first to the second state thereof whereby, when the total deposit causes said one device to be rendered operative, change is returned to the customer and the article is vended.

14. The invention of claim 13,
 said second denomination being twice the value of said first denomination,
 said one device representing the next integer multiple of said first denomination following said predetermined multiple,
 said change payout means being operable to discharge a coin of said first denomination in response to said change-of-state of said one device.

15. The invention of claim 12,
 a pair of said devices representing values greater than said predetermined multiple of said first denomination,
 said operating means operably coupling said dispensing means with said pair of devices; and
 change payout means coupled with said pair of devices and including a first change payout structure for discharging change of a first monetary amount in response to a change-of-state of one of said pair of devices from the first to the second state thereof, and a second change payout structure for discharging change of a second, different monetary amount in response to a change-of-state of the other of said pair of devices from the first to the second state thereof whereby, when the total deposit causes either said one or said other device to be rendered operative, change is returned to the customer and the article is vended.

16. The invention of claim 15,
 a third of said devices representing a value equal to said predetermined multiple of said first denomination plus said change of first amount and said change of second amount,
 said operating means operably coupling said dispensing means with said third device,
 said change payout means further including means coupled with said third device for effecting operation of both of said structures in response to a change-of-state of said third device from the first to the second state thereof.

17. In a vending machine:
 first coin-actuated means for sensing the deposit of coins of a first denomination and for delivering a command signal in response to each deposit;
 second coin-actuated means for sensing the deposit of coins of a second, larger denomination equal to an integer multiple of said first denomination, and for delivering a plurality of command signals in succession equal in number to said integer in response to the deposit of each of said coins of said second denomination;
 means for dispensing an article when coins at least equal in value to a selected integer multiple of said first denomination are deposited;
 a plurality of bistate devices representing a series of integer multiples of said first denomination commencing with the integer one,
 each device having a first, standby state and a second, operative state, and being provided with an electrically responsive control element for changing the state thereof from said first to said second state;
 circuitry intercoupling said devices and said first and second coin-actuated means for receiving command signals delivered by both of the coin-actuated means, and for directing successively received command signals to the control element of different devices in the order of the integer multiples represented by said devices, whereby the devices associated with the

command signal excited elements sequentially change from the first to the second states thereof;

a price setting switch including first and second switching terminals, and a shiftable switch element having a first price position coupling said terminals with a first pair of said devices and a second price position coupling said terminals with a second pair of said devices, the lower multiple representing device of each of said pairs corresponding to the selected price of the article, said switch element in each of said positions effecting said coupling between the first terminal and the price representing device of the respective pair, and the second terminal and the higher multiple representing device of the pair;

electrically responsive operating means coupling said first and second terminals with said dispensing means for actuating the latter in response to a change from the first to the second state of either of the devices coupled to said terminals when said switch element is in either of said positions thereof; and

electrically responsive change payout means coupled with said second terminal and operable in response to a change from the first to the second state of the device coupled to said second terminal when said switch element is in either of said positions thereof, whereby change is paid out in either price position if the total deposit causes a change-of-state of the higher multiple device of the respective pair.

18. The invention of claim 17; and

third coin-actuated means for sensing the deposit of a coin of a third denomination greater than said second denomination and equal to an integer multiple of said first denomination,

there being circuit means coupling said third coin-actuated means with the control element of the device representing the multiple of said first denomination equal to said third denomination, and operable to excite the last-mentioned control element in response to said deposit of a coin of said third denomination.

19. The invention of claim 17,

the difference between the values represented by the

devices of each of said pairs being equal to said first denomination,

said price setting switch having a third switching terminal,

said switch element in each of said positions thereof coupling said third terminal with the device representing the next integer multiple following the multiple represented by the higher multiple device of the respective pair whereby, in either of said positions of the switch element, said first and third terminals are coupled with devices representing a difference in value equal to twice said first denomination,

said operating means coupling said third terminal with said dispensing means for actuating the latter in response to a change from the first to the second state of the device coupled to said third terminal when said switch element is in either of said positions thereof,

said change payout means including a first change payout structure coupled with said second terminal for discharging change of a value equal to said first denomination in response to a change from the first to the second state of the device coupled to said second terminal when said switch element is in either of said positions thereof, and a second change payout structure coupled with said third terminal for discharging change of a value equal to twice said first denomination in response to a change from the first to the second state of the device coupled to said third terminal when said switch element is in either of said positions thereof.

References Cited

UNITED STATES PATENTS

3,067,936	12/1962	Kasper et al.	194—9 X
3,140,765	7/1964	Sundblad et al.	133—2 X
3,221,860	12/1965	Klaffky	194—5
3,279,480	10/1966	Jarvis.	
3,308,914	3/1967	Lake	133—2 X

SAMUEL F. COLEMAN, *Primary Examiner.*