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[54] **CHECK CONTROLLED VEND RELAY TIMING CIRCUIT**
19 Claims, 1 Drawing Fig.

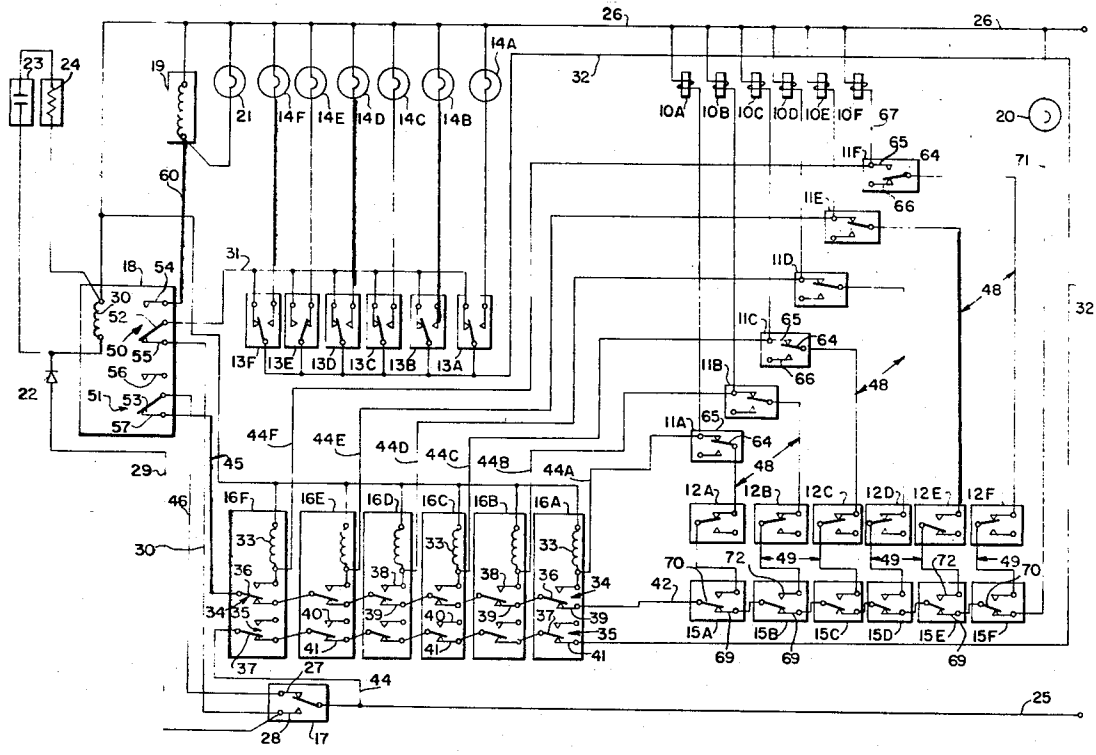
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[50] **Field of Search** 194/2, 10, 9; 317/141

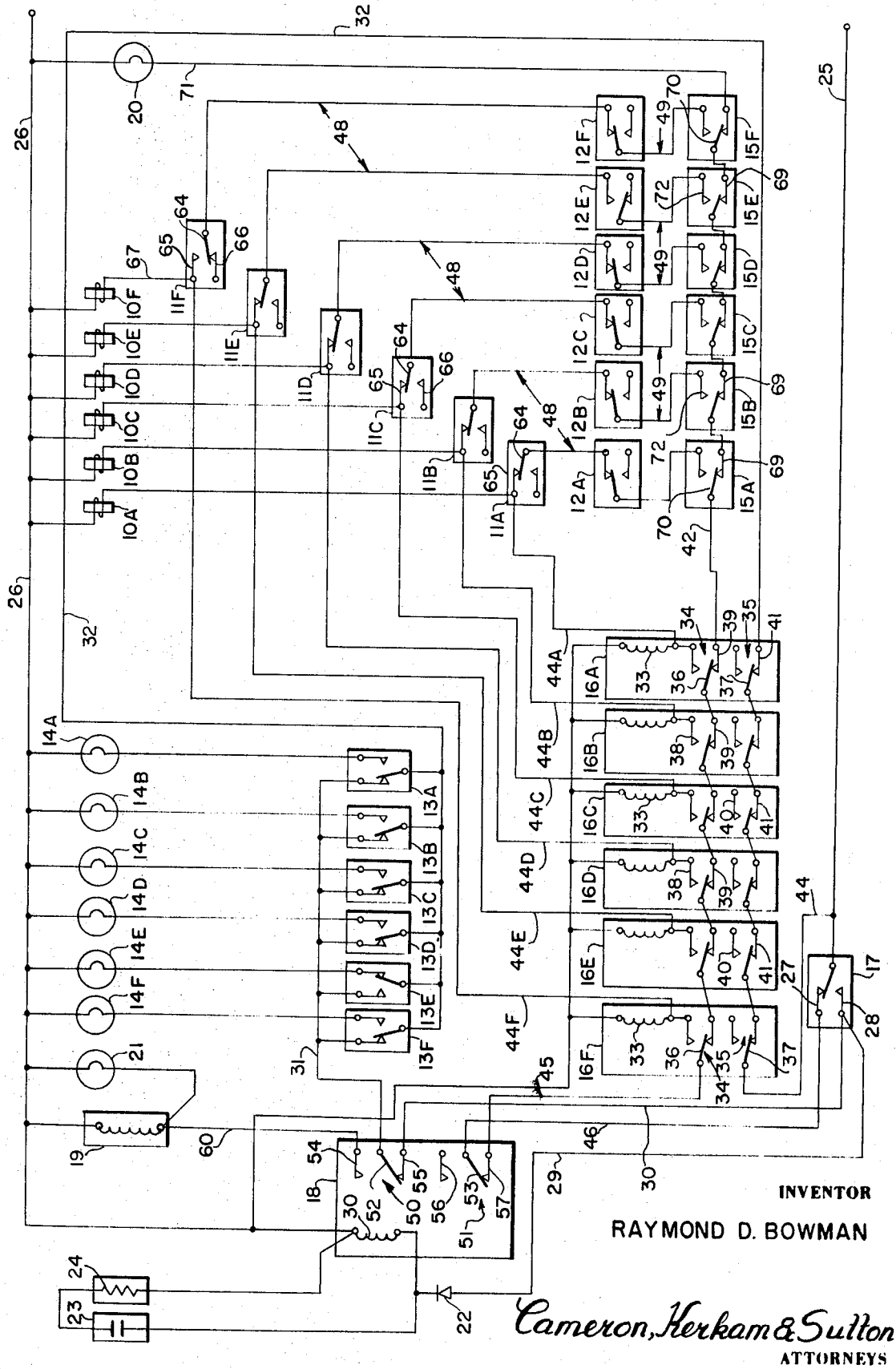
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ABSTRACT: A timing circuit provides an auxiliary source of energization for a vend relay of a multiselection coin operated vending machine wherein dispensing from one of a plurality of columns is controlled by selective energization of a dispensing solenoid. The operating coil of a selected dispensing solenoid is energized upon actuation of a selection switch adapted to be connected in circuit with a pair of normally open contacts of the vend relay which contacts are closed upon energization thereof. A timing capacitor is connected in parallel with the operating coil of the vend relay. The charging circuit of the capacitor is through the hold circuit for the vend relay. The capacitor, upon operation of a vend select switch, which causes energization of a corresponding vend solenoid and deenergization of the vend relay hold circuit, discharges through the operating coil of the vend relay to thereby cause the vend relay to remain energized for a fixed period after the select switch has been actuated.





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CHECK CONTROLLED VEND RELAY TIMING CIRCUIT

BACKGROUND OF THE INVENTION

The present invention relates to check controlled dispensing apparatus in that the energization of a dispensing solenoid is controlled by the deposit of a coin, but, more specifically, the invention relates to a vend relay timing circuit with a lockout feature for a coin operated vending machine adapted to be operated to selectively dispense articles, one at a time, from a plurality of stacks or columns, each of which receives and stores a plurality of articles. The articles are preferably vertically stacked on a serpentine shelf and on straight run upper shelves for dispensing one at a time by a solenoid actuated release and retaining mechanism in the manner described, for example, in copending application of James C. Lindsey et al. Ser. No. 767,255 filed Oct. 14, 1968 and issued on Apr. 21, 1970 as U.S. Pat. No. 3,507,419, and assigned to the assignee of the present invention. However, other forms of stacking arrangements may be utilized with equal efficiency and the circuit embodying the invention may readily be incorporated into various forms of vending machines adapted to dispense articles one at a time.

Coin-operated vending machines for selectively dispensing articles, one at a time, from a plurality of stacks or columns are well known. Typical arrangements are exemplified by U.S. Pat. Nos. 2,280,323; 2,549,081; 2,686,583; 2,956,660; 3,348,733 and the aforementioned copending application of Lindsey et al. Ser. No. 767,255. Generally, with such arrangements, either a mechanical or an electrical system is provided to prevent delivery of more than one article at a time from a column or stack and prevent "jack-potting" of the machine. The development of an economical system which solves the problem of removing established credit at the proper time and insures delivery of only one article per established credit and which is characterized by minimum requirements of power of operation and minimum interference of elements, thereby allowing a flexibility in construction and operation which reduces cost of operations and maintenance has been a constant challenge to the vending industry.

Electrical vend circuits with lockout features have been found to be more desirable, than mechanical systems. A typical electrical circuit arrangement is disclosed in the U.S. Pat. No. 3,349,881, granted to Vernon D. Camp, on Oct. 31, 1967, and assigned to the Seeburg Corporation, the assignee herein. In the Camp circuit arrangement, dispensing from each column is controlled by a vend motor for each column. Each vend motor is arranged to be energized during a latter portion of its vend cycle through a timer switch that is operably connected to prevent energization of a corresponding relay if the timer switch is not in the normal position upon establishment of credit. A cam actuated lockout switch is electrically connected in circuit and adapted to be displaced upon energization of a lockout motor to remove established credit at the proper time.

The latter described circuit has proved to be very effective, but suffers from the disadvantage that after relatively long periods of continued use, the motors are subject to frequent sticking and require replacement. This disadvantage may be avoided by replacement of the vend motors in the circuit with corresponding vend solenoids as suggested in the aforementioned copending application of Lindsey et al., Ser. No. 767,255. However, this does not avoid difficulties which occur when the lockout motor sticks. Upon sticking or malfunction of the lockout motor, established credit is not removed at the proper time and the solenoids which are energized for an excessive period may be damaged or may burn out. Another disadvantage of the lockout motor-type circuits is that the vend cycle is subject to erratic behavior in the event of large voltage fluctuations of the input supply.

SUMMARY OF THE INVENTION

These and other disadvantages of known prior art arrangements are overcome by the present invention which provides a

novel vend relay timing circuit which removes established credit from a vending machine at the proper time and insures delivery of only one article per established credit and which, in the event of a jamup in one stack or column, allows operation of the remaining selections. To this end, a vend relay is energized through a timing circuit which provides a positive count down for a lockout system. More specifically, a capacitor is connected across the operating coil of the vend relay and upon the energization of the vend relay the capacitor is charged through a pair of contacts of the vend relay. The contacts are serially connected in the selection circuit. A hold circuit for the vend relay is also established through the same contacts. Thus, upon making a selection, both the hold circuit and the charging circuit for the vend relay are disconnected from the power source simultaneously, but the vend relay remains energized for a fixed period due to the discharge of the capacitor through the operating coil of the vend relay. The timing period is set by selection of the resistance and capacitance values of the timing circuit.

Other objects and the attendant advantages of the present invention will be apparent from the following description taken in connection with accompanying drawing. Although one specific form of the invention is illustrated, it is to be expressly understood that this drawing is for the purpose of illustration only and is not intended to represent the full scope of the invention defined by the apended claims which particularly point out and distinctly claim the subject matter of the invention.

BRIEF DESCRIPTION OF THE DRAWING

The accompanying drawing is a schematic diagram of the novel relay timing circuit of the present invention as incorporated in the operating control circuit for a coin-operating vending machine. Since the inventive concept of the invention resides in the new improved circuit that is independent of the cabinet in which it is located or the means for delivery of the article that is dispensed, the invention will be hereinafter described with reference only to the schematic of the control circuit its method of operation and control. For convenience, the circuit is shown for the situation where the F stack is jammed, the E stack is empty or sold out and the coin switch has been actuated upon the deposit of the proper amount of coins, i.e., credit has been established, the vend relay has been energized and the circuit is ready for a selection to be made.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawing, there is illustrated schematically the novel vending cycle control circuit of the present invention for a coin-operated vending machine which includes a plurality of stacks or columns of articles arranged to be selectively dispensed one at a time according to the choice of a customer. For convenience the circuit is illustrated in connection with a coin operated vending machine having 6 stacks of articles; however, it will be apparent that more or less than 6 stacks may be utilized and the operating sequence for dispensing an article from each stack is the same. Accordingly, the operating sequence of only one stack will be described.

The stacks are designated A–F and each component in the operating circuit of one stack that corresponds to a like component in another stack is designated with a like numerical reference character which is followed by an alphabetical character corresponding to the particular stack with which the component is associated. For example, **10A** refers to the vend solenoid for stack A, while **10F** refers to the vend solenoid for stack F.

Each stack has associated therewith a vend solenoid **10**, a solenoid switch **11**, a pair of sold out switches **12** and **13**, a sold out indicator light **14**, a selector switch **15** and a selector relay **16**. In addition to the components associated with a particular stack, a number of common control components are provided including a coin-operated vend switch **17**, a vend

relay 18, a coin reject electromagnet 19, a select indicator light 20, a correct change indicator light 21 and a timing circuit comprising diode 22, capacitor 23 and resistor 24.

Capacitor 23 and resistor 24 are connected in series, the series combination being connected in parallel with the coil 30 of the vend relay. Diode 22 serves to rectify the 115 volt, 60 Hertz input voltage applied through the input power conductors, which may be connected to a conventional alternating current supply source, to provide a pulsating DC. The pulsating DC is used to charge the capacitor and maintain the vend relay operating coil 30 energized for a fixed period after primary power is removed therefrom. Diode 22 also prevents capacitor 23 from becoming damaged from alternating current.

Capacitor 23 is charged upon the establishment of the energizing voltage across the operating coil 30 of the vend relay and discharges through the vend relay operating coil. The vend relay thus remains energized for a fixed time period after the original source of energization to operating coil 30 is removed. In this manner, capacitor 23 provides an auxiliary energizing source that supplements the primary source of energization. The time period is selectively controlled by preselecting the values of resistor 24 and capacitor 23 to provide an optimum timing cycle. However, since there is some inherent resistance in the circuit due to the ohmic resistance of the operating coil and line conductors, the resistor 24, in some applications, may be dispensed with.

Power to the control circuit is applied across a pair of supply conductors 25 and 26 connected to a conventional alternating current supply source. When the vend machine is in normal working order, credit is established upon energization of vend relay 18 which occurs upon insertion of a proper coin or coins into a conventional coin box (not shown) that provides means for actuation of the coin operated vend switch 17.

Vend switch 17 may be a conventional microswitch having a pair of fixed contacts 27 and 28 and a movable contact arm adapted to be momentarily displaced from a first position to a second position and returned to its first position upon insertion of the proper amount of coins into the vend machine coin box. The movable contact arm is connected to supply conductor 25 and upon displacement of the arm to its second position completes the energizing circuit to vend relay 18 through contact 28 and conductor 29 connected to one end of energizing coil 30 of vend relay 18 through diode 22. The other end of the energizing coil 30 is connected to supply conductor 25. Conductor 25 also forms a common power feed line for each of the vend solenoids 10A–10F, sold out indicator lights 14A–14F, selector relays 16A–16F, reject electromagnet 19, select indicator light 20 and correct change indicator 21.

Upon return of the movable contact arm to its first or original position, power to the operating coil 30 of the vend relay is maintained through a holding circuit. The holding circuit may be traced from the lower end of coil 30, as viewed in the drawing, through diode 22, conductor 29, conductor 30, a set of contacts (52,55) of the energized vend relay 18, conductor 31, one or more of the closed contacts of sold out switches 13A–13F, conductor 32 and the series arranged lower set of contacts (37,41) of selector relays 16A–16F which are in turn connected or returned to the input conductor 25.

Each selector relay 16 includes an energizing coil 33 and upper and lower set of contacts 34 and 35, respectively, as viewed in the drawing. Each set of contacts includes a movable contact arm 36 and 37 forming a common terminal between a pair of corresponding fixed contacts 38, 39 and 40, 41. As hereinbefore noted, the lower sets of contacts 35, when selector relays 16A–16F are deenergized, are in the holding circuit for the vend relay operating coil. If one or more of the selector relays is energized, the holding circuit is opened at one of the contact sets 37, 41. The upper sets of contacts 34 are utilized to establish the power circuit for the vend solenoids 10A–10F. In one position of movable contact arm 36, the power circuit is maintained through the series connected contacts 36, 39 which are in turn connected to the selector switches through conductor 42. In the second position of movable contact arm 36 corresponding to the energization of a selection relay, the corresponding vend solenoid is energized through contacts 36, 38 and the correspondingly enabled conductor 44.

To this end, fixed contact 40 of each selector relay is dead ended or unconnected, while the movable contact 37 is connected in series with the fixed contact 41 of the selector relay corresponding to the next succeeding stack, with the exception of the last stack. Movable contact 37 of the last stack F is connected to input power conductor 25 through conductor 44. Fixed contact 41 of relay 16A is connected to conductor 32 to thereby establish the holding circuit.

Each movable contact arm 36 of the upper set 34 is similarly connected to the fixed contact 39 of the selector relay corresponding to the next succeeding stack, while the movable contact arm 36 of selector relay 16F is connected to supply conductor 25 through conductor 45, the lower set of contacts (53,57), as viewed in the drawing, of vend relay 18 in its energized condition, conductor 46 and the normally closed contacts of coin-operated vend switch 17.

Initial energization of a selector relay is made through the corresponding selector switch 15, sold out switch 12 and solenoid switch 11. The circuit may be traced from coil 33 through the corresponding connecting conductor 44, solenoid switch 11, conductor 48, sold out switch 12, conductor 49, an energized switch 15, conductor 42, the lower set of contacts (36,39) of the selector relays, conductor 45, contacts 53,57 of the energized vend relay 18, conductor 46 and coin switch 17 to supply conductor 25. Energization of a coil 33, causes the corresponding movable contacts 36 and 37 to be displaced from a first position to a second position in contact with fixed contacts 38 and 40, respectively, to establish a holding circuit for the energizing coil. While power to solenoid 10 is removed from the circuit through the selector switch, it is applied through the holding circuit and conductor 44.

Vend relay 18 comprises an energizing coil 30 and two sets of contacts 50 and 51, each having a movable contact arm 51 and 53, respectively, and a pair of corresponding fixed contacts 54, 55 and 56, 57. As hereinbefore noted, coil 30 is energized upon actuation of coin operated vend switch 17, causing movable contacts 52 and 53 to be displaced downwardly, as viewed in the drawing. The normally closed contacts 52, 54 of vend relay 18 permit power to be applied to the coin reject electromagnet 19 when the coil of vend relay 18 is deenergized. The circuit may be traced from the electromagnet 19 through conductor 60, contacts 52, 54, conductor 31, the normally closed contacts of sold out switches 13, conductor 32, the closed contacts of relays 16A–16F and coin switch 17 to supply conductor 25. Energization of vend relay 18 opens the circuit to the coin reject electromagnet 19 through opening of contacts 52, 54.

Coin reject electromagnet 19 provides a conventional coin blocking function through operation of its armature (not shown). In its normally energized condition, the armature is actuated so as to permit a coin to be inserted for establishing credit; however, once the coin operated vend switch 17 is closed and vend relay 18 is energized, the coin reject electromagnet 19 is deenergized so as to operatively prevent the insertion of another coin. Correct change light 21 is connected across the energizing coil of the coin reject electromagnet 19 to provide a suitable indication, when lit, that the vending machine is ready to receive coins.

The energizing circuit for the coin reject electromagnet is established through parallel connected sold out switches 13. Each sold out switch 13 is disposed at a corresponding stack for monitoring the supply and is actuated in a conventional manner from a first to a second position upon depletion of the supply of articles in that stack. Upon actuation to a second position, a corresponding indicator light 14 is energized to indicate that the stack is empty as shown for example in the circuit for stack E.

A second group of sold out switches 12 are provided in the energizing circuit of the vend solenoids to prevent the energization of a corresponding vend solenoid when the supply of articles in the stack is depleted. Sold out switches 12 may be operated independently of sold out switches 13 or they may be ganged thereto for simultaneous operation. In any event, sold out switches 12 are electrically connected in series with the corresponding selector switches 15.

Each vend solenoid 10 has associated therewith a corresponding solenoid switch 11 comprising a movable contact 64 and a pair of fixed contacts 65 and 66. Each switch 11 is adapted to be actuated between a first position and a second position. In the first position, the corresponding vend solenoid 10 is energized through conductors 67, 48, sold out switch 12, conductor 49 and an actuated selector switch 15. In the second position, the switch is dead ended, but a bypass energizing circuit for the vend solenoid is provided through conductor 44. Each solenoid switch 11 may be preferably a microswitch having its movable contact biased in one position and adapted to be released to its second position by a linkage connected to the solenoid armature. The solenoid switches are operated or actuated when the solenoid for each corresponding selection is energized. Advantageously, the switches are actuated before the solenoid moves far enough to cause the mechanism to vend, thus insuring that the corresponding selector relay 16 for that selection is energized before the vend can be completed. This insures only one vend per established credit.

The solenoid switches also function as part of a lockout system. The most probable position for a mechanical jam to occur is at the solenoid mechanism. Should a solenoid be jammed in the vend position, the corresponding solenoid switch, as shown in stack F for example, prevents that selection from being initiated on subsequent credits and thus prevents a vend cycle being completed without having a product delivered. Advantageously, the jamming of one stack has no effect on remaining selections and the machine will operate normally on the remaining unjammed selections.

Initial energization of a vend solenoid is effected through actuation of the corresponding selector switch 15 which also establishes the energizing circuit for a corresponding selector relay 16 through contacts 64,65. Each selector switch has one fixed contact 69 serially connected to the movable contact 70 of the selector switch in the next succeeding stack. The fixed contact 69 of the last selector switch is connected in series with the select indicator light 20 through conductor 71 to provide a visual indication to the customer that the machine is ready for selection. Movable contact 70 forms a common terminal for both positions of the selector switch and is connected at 70A to conductor 42. The other fixed contact 72 of each selector switch is connected to the movable contact of a corresponding sold out switch 12 through jumper conductors 49.

For convenience, a typical sequence of operation of the vending cycle lockout circuit is set forth as follows:

A coin is inserted in the coin box which actuates the coin operated vend switch 17. Actuation of coin operated vend switch 17 breaks the initial energizing circuit to contact 27 and enables conductor 29 so that operating coil 30 is energized and capacitor 23 is charged. Upon energization of the vend relay 18, the energizing circuit for the coin reject electromagnet 19 is broken, causing it to reject further coins. Simultaneously, a holding circuit is established through contacts 52, 55 to maintain the vend relay coil 30 energized when the vend switch 17 returns to normal. Closure of contacts 53, 57 enables the holding circuit for the selector relays and the energizing circuit of the vend solenoids.

The machine is now ready for a particular selection by the customer which is effected through operation of a selector switch. For example, if the selector switch 15A for the first stack is actuated, a circuit is established for energization of vend solenoid 10A and also for energization of selector relay 16A through contacts 64, 65 of solenoid switch 11A. Energization of selector relay 16A opens contacts 36, 39 to prevent double vending. Contacts 37, 41 are also opened to break the holding circuit for the vend relay operating coil 30. At this point, however, the auxiliary power source provided by the timing circuit formed by capacitor 23 and resistor 34 maintains the operating coil 30 energized for a fixed period to enable completion of the selection. Energizing current to the vend solenoid is applied through contacts 36, 38 of selector relay 16A, and contacts 36, 39 of the remaining selector relays 16B–16F and contacts 53, 57 of vend relay 18. Upon discharge of capacitor 23, vend relay 18 is deenergized and contacts 53, 57 open to remove operating power from the vend solenoids and selector relay operating coils. The energizing coil of selector relay 16A and vend solenoid 10A remain energized until the vend relay is deenergized which occurs upon discharge of the capacitor. When vend relay 18 is returned to its normal standby position, the energizing circuit to the holding circuit for the selector relay 16A is broken and the circuit for coin reject electromagnet 19 is energized.

In the event of a stall of vend solenoid 10A, the solenoid switch 11A does not return to the initial standby position; however, the remaining selections are unaffected and will operate properly. The circuit will operate properly with any number of selection stalls, so long as there is at least one selection that is not stalled.

While the vend machine operating circuit of the present invention has been described with reference to a particular embodiment, changes in or modifications to the illustrated embodiment may now be suggested to those skilled in the art without departing from the present inventive concept. Reference therefore should be had to the appended claims to determine the full scope of the invention.

I claim:

1. A relay circuit comprising a relay having an operating coil, means for selectively connecting and disconnecting said coil from a primary energizing source, an auxiliary energizing source and means for connecting said coil to said auxiliary energizing source upon electrical disconnection of the coil from the primary energizing source. Said auxiliary source comprising a reactive element adapted to be connected to the primary energizing source to store energy received from the primary source and discharge said stored energy to said coil for maintaining said coil energized for a finite period upon electrical disconnection of the coil from the primary energizing source and said means for selectively connecting and disconnecting said coil includes a momentary energizing circuit and a holding circuit, said holding circuit including contacts adapted to be displaced between a closed and an open position to effect the connection and disconnection of said coil to and from the primary source.

2. A relay circuit as set forth in claim 1, further including a semiconductive element common to said momentary energizing and said holding circuit.

3. A relay circuit as set forth in claim 2 wherein said semiconductive element is a diode.

4. A relay circuit as set forth in claim 1, further including a resistive element, means for serially connecting said resistive element to said reactive element.

5. A relay circuit as set forth in claim 4 wherein said reactive element is a capacitor, thereby forming a resistive-capacitive timing network for controlling the energization of said coil for a fixed period upon its disconnection from the primary energizing source.

6. A relay circuit as set forth in claim 5 wherein said resistive-capacitive timing network is connected in parallel with said operating coil.

7. A relay circuit comprising a relay having an operating coil and at least a first set of contacts adapted to be actuated upon energization of said coil between a first and a second position, a first and a second source of energization for said operating coil, means for electrically connecting said first source across said coil for a momentary period, a holding circuit for said coil including said first set of contacts in the

second position for maintaining said coil electrically connected across said first source after said momentary period is complete, means in said holding circuit for electrically disconnecting said coil from said first source and means for electrically connecting said second source of energization across said coil, said second source being operative to maintain said coil energized for a fixed period upon electrical disconnection of the coil from the first source after said momentary period is complete.

8. A relay circuit as set forth in claim 7 wherein said second source is a charging circuit having a capacitor connected to be charged from said first source.

9. A relay circuit as set forth in claim 7 wherein said second source comprises a timing circuit including a serially connected resistor and capacitor, said capacitor being connected to be charged from said first source.

10. A relay circuit as set forth in claim 7, wherein said means for electrically connecting said first source across said coil for a momentary period comprises a switch operable between a first and a second position, said switch in the second position being serially connected to said first set of contacts in the second position and means serially connected to said first set of contacts in the first position for preventing operation of said switch while said coil is energized, said last name means comprising an electromagnet.

11. A relay circuit as set forth in claim 7 wherein said relay further includes a second set of contacts operable between a first and a second position upon energization of said coil, a control circuit serially connected to said second set of contacts when in the second position, said control circuit comprising a plurality of switches manually operable between a first and a second position, said manually operable switches being serially connected when in the first position, a plurality of solenoids, each having an operating coil serially connected to one of said manually operable switches and to said first source for energization of a solenoid operating coil when the corresponding switch is actuated to its second position.

12. A control circuit comprising a relay having an operating coil and at least a first and a second set of contacts, each set of contacts including a pair of stationary contacts and a movable intermediate contact adapted to be displaced from a first position in contact with one of said stationary contacts when said coil is deenergized and a second position in contact with the other of said stationary contacts upon energization of said operating coil, means for causing the operating coil to be momentarily energized from a first source of energization, a holding circuit for maintaining said operating coil energized from the first source, said holding circuit including said first set of contacts in the second position, a control circuit for energizing a control device from said first source of energization, said control circuit including said second set of contacts in the second position, means for electrically disconnecting said holding circuit from the first source of energization and a second auxiliary energization source electrically connected to said relay operating coil for maintaining said coil energized for a fixed period after electrical disconnection of the first energization source.

13. A control circuit as set forth in claim 12 wherein said means for causing the relay operating coil to be momentarily energized comprises a coin operated switch and further including electromagnet means having an operating coil serially connected to the first set of contacts in the first position and arranged to prevent normal operation of said coin operated switch while said relay operating coil is energized.

14. A control circuit as set forth in claim 12 wherein said second auxiliary source of energization comprises a charging circuit including at least one reactive element, said charging circuit adapted to be connected to said first source and disconnected therefrom by said means for causing momentary energization of said relay operating coil.

15. A control circuit as set forth in claim 14 wherein said charging circuit is a resistive capacitive timing network connected in parallel with said relay operating coil.

16. A control circuit as set forth in claim 12 wherein said means for causing the relay operating coil to be momentarily energized comprises a coin operated switch being connected to the first source in its first and second position and further including a diode serially connected to said switch in its second position.

17. In a coin-operated vending machine having a plurality of stacks of articles adapted to be selectively dispensed and a plurality of vend solenoids, each of which corresponds to a separate stack and is arranged to be selectively energized from a primary source of energization to dispense articles from the corresponding stack, one at a time, according to the choice of a customer, a vend relay adapted to be momentarily energized from the primary source, a coin operated vend switch electrically connected to said primary source and adapted to be momentarily actuated from a first to a second position upon insertion of a proper amount of coins corresponding to the cost of the selection to be vended for momentary energization of said vend relay the improvement comprising a timing circuit for establishing a secondary source of energization for said vend relay, said timing circuit including a capacitor connected across the operating coil of said vend relay and means connecting said capacitor to said primary source through said coin operated switch in the second position and also establishing a holding circuit for said relay operating coil.

18. A coin-operated vend switch as set forth in claim 17, wherein said timing circuit further includes a resistor in series with said capacitor.

19. A coin-operated vend switch as set forth in claim 17 wherein said means connecting said capacitor to said primary source includes a diode poled to prevent damage to said capacitor from the primary source.

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,613,854 Dated October 19, 1971

Inventor(s) Raymond D. Bowman

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Col. 2, line 4, "jamup" should be --jam-up--; col. 5, line 16, "bypass" should be --by-pass--; col. 8, line 27, 46 and 49, (line 1 of claims 17, 18 and 19) "coin-operated" should not be hyphenated; col. 6, line 40 (line 6 of claim 1) "source. Said" should be --source, said--.

Signed and sealed this 4th day of July 1972.

(SEAL)
Attest:

EDWARD M.FLETCHER, JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents

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