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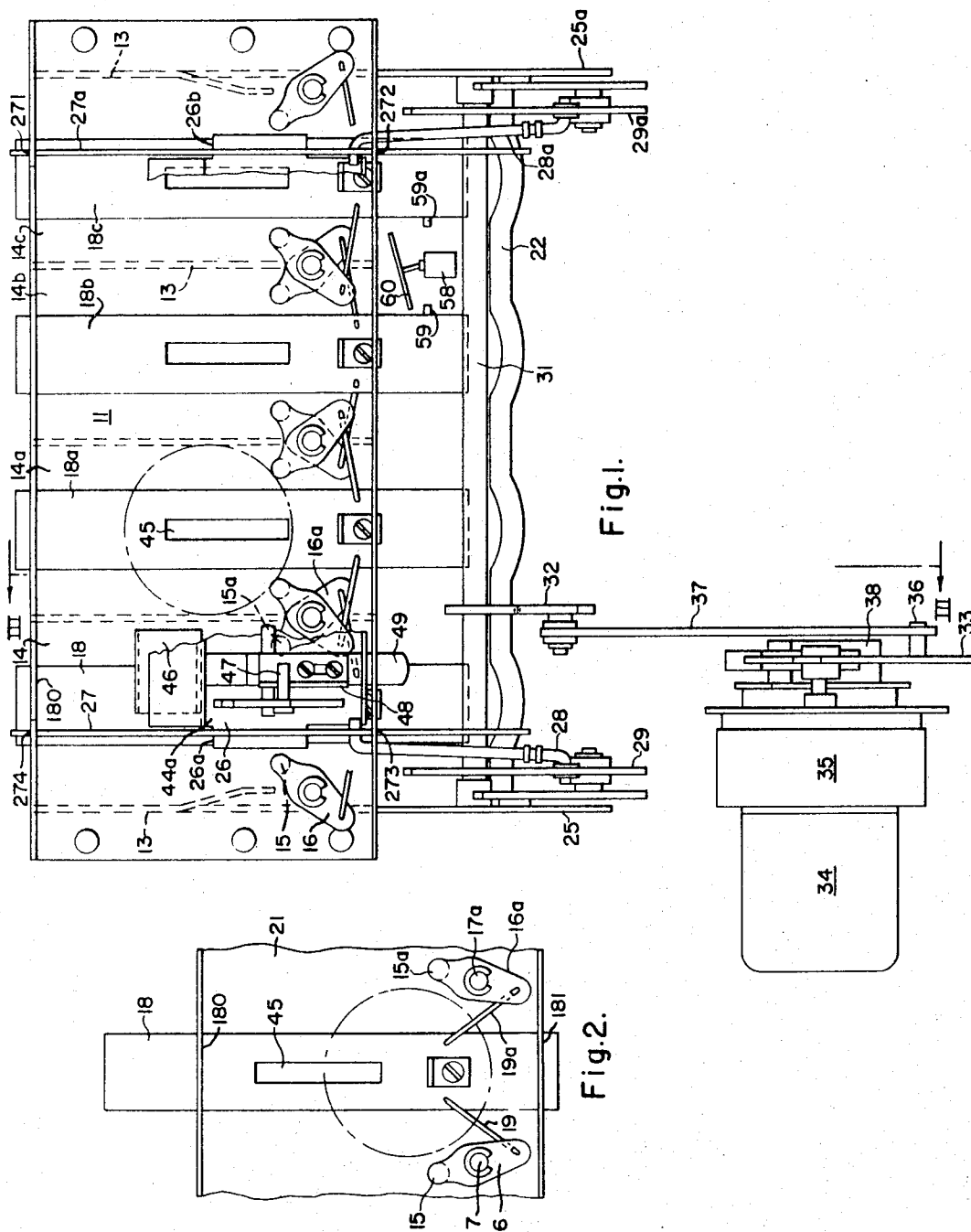
J. E. HOWARD, JR

3,357,532

ELECTRICAL CONTROL CIRCUIT FOR VENDING MACHINE

Filed Nov. 15, 1966

3 Sheets-Sheet 1



WITNESSES

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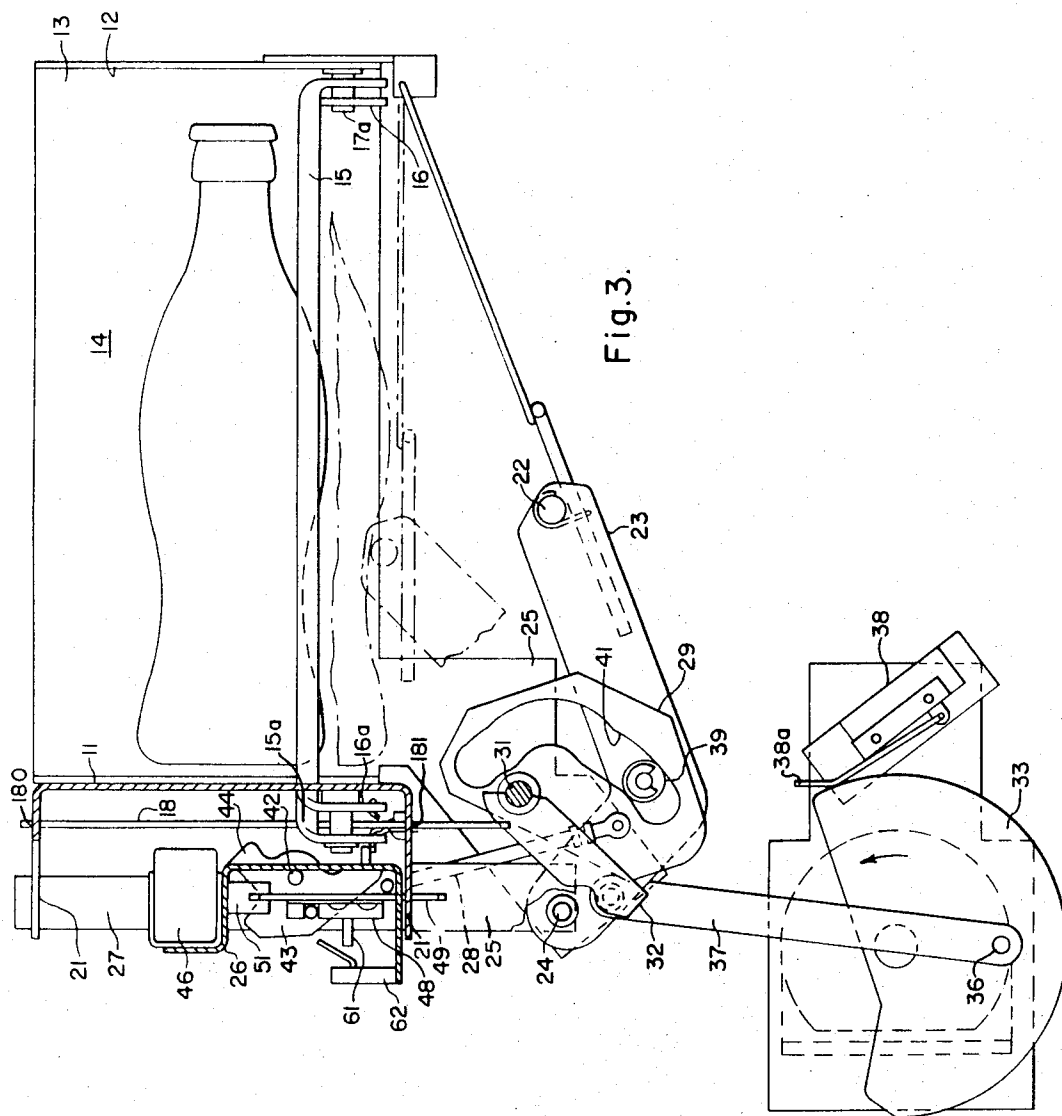
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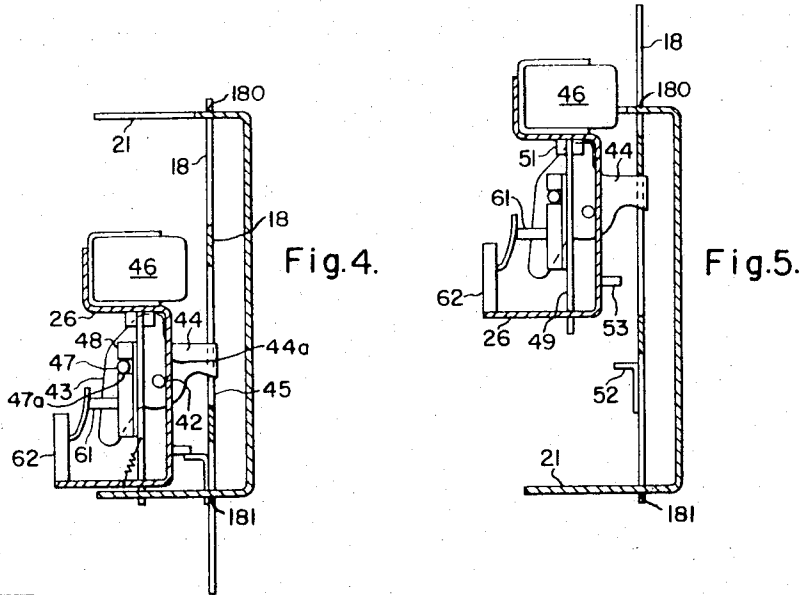
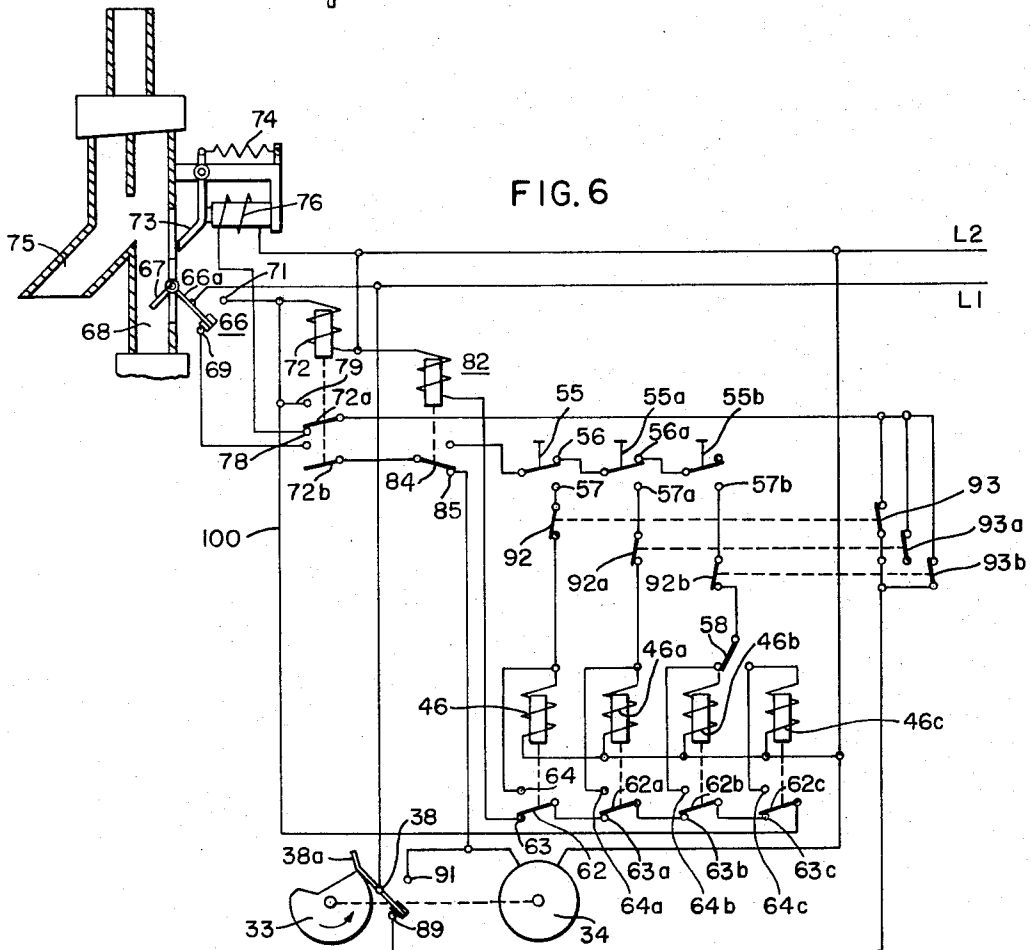
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ELECTRICAL CONTROL CIRCUIT FOR VENDING MACHINE

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5 Claims. (Cl. 194—10)

The present invention relates to vending machines and control circuits therefor and is an improvement for the invention shown by U.S. Patent 3,209,946, issued to John E. Kalista on Oct. 5, 1965, and assigned to the same assignee as the subject invention.

It is a principal object of the present invention to provide an improved control circuit for an electrically operated vending machine of the so-called post-select type that will reliably assure that a vending operation may be obtained each time that coin is collected and articles are available to be vended.

A further object of the invention is to provide an electrical control circuit for post-select types of electrically operated vending machines and having holding circuits arranged to be prepared immediately upon collection of coin so that subsequent operation of the various circuit components upon post-selection of a desired article to be vended will be properly maintained during the vend cycle.

While the previously disclosed control circuit of the aforementioned U.S. Patent 3,209,946 is generally effective it has been found that there is a possibility of a failure to vend if the selection solenoid holding circuit is not immediately established through the simultaneous energization of both a vend relay and a selection solenoid upon customer actuation of the desired selection switch. In accordance with the present invention, both the credit relay and the vend relay are energized immediately upon deposit of coin and such energization of the credit relay immediately prepares a holding circuit for the selection solenoids in advance of the post-selection by the customer while the energization of the vend relay prepares an operating circuit for the selection switches. The subsequent post-selection operation of a desired selection switch energizes a particular selection solenoid which is immediately held energized by the previously prepared holding circuit through contacts of the credit relay that was previously energized prior to the post-selection operation. Upon such energization of a selection solenoid, the vend relay is deenergized while the credit relay remains energized and the electric motor is thereby energized for a vend cycle. During the vend cycle, towards the end of a vending operation, a cycle switch as is customary in the art, deenergizes the credit relay and the selection solenoid and at the end of the cycle the cycle switch deenergizes the motor to complete a vend.

Further objects, features and the attendant advantages of the invention will be apparent with reference to the following specification and drawings in which:

FIGURE 1 is a front elevational view of a bottle vending machine embodying the invention, in the rest or non-dispensing position;

FIG. 2 is a front elevational view illustrating, diagrammatically, one bottle releasing mechanism in the releasing or dispensing position;

FIG. 3 is a vertical sectional view taken on the line III—III of FIG. 1, showing the apparatus in the rest or non-dispensing position;

FIG. 4 is a vertical sectional view showing a portion of the apparatus shown in FIG. 3, but showing one lifter or coupling member in position to engage its associated releasing mechanism for actuation by the common operating mechanism;

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FIG. 5 is a similar view to FIG. 4, but showing the apparatus in the dispensing position; and

FIG. 6 is a wiring diagram of the control circuit of the invention, showing the parts in the normal or non-dispensing position.

Referring to the drawings in detail, the present invention is shown embodied in a bottle vending machine having a magazine structure comprising a front wall 11, a rear wall 12, and a plurality of spaced apart parallel walls such as the wall 13 extending between the front and rear walls to provide a plurality of magazines or compartments 14, 14a, 14b, 14c, there being four such compartments in the illustrated embodiment, each adapted to hold a vertical column of bottles of one bottle width. At the lower end of each compartment 14, 14a, 14b or 14c there is a bottle releasing or dispensing mechanism of any suitable type. The illustrated embodiment incorporates the one disclosed and claimed in United States Patent No. 3,118,567, granted Jan. 21, 1964, to Meigs W. Newberry, and assigned to the assignee of the present application.

Each releasing mechanism comprises two bottle supporting and releasing rods such as the rods 15 and 15a extending from front to rear and carried at the upper ends of levers such as the levers 16 and 16a, pivoted about pivot pins such as the pins 17, 17a. The releasing mechanism further comprises vertically movable rod operating plates such as the plates 18, 18a, 18b and 18c, each connected by respective links such as the pair of links 19, 19a to the lower ends of the levers 16, 16a, respectively, below the pivots 17, 17a. Each of the rod operating plates 18, 18a, 18b and 18c are vertically slidable through openings such as the openings formed at 180 and 181, but not shown in detail in the upper and lower flanges of a channel member 21 whose vertical wall forms the lower portion of the front wall 11.

In FIGS. 1 and 3, each plate 18, 18a, 18b and 18c is at the lower end of its travel and the rods such as rods 15, 15a are in their bottle-supporting or non-dispensing position. To release the lowermost bottle from the column, one of the plates 18, 18a, 18b or 18c is raised. During the first short portion of such upward movement, the links move the lower ends of the levers 16, 16a slightly farther apart and the rods 15, 15a move slightly toward each other. However, as the plate 18 moves upwardly beyond the position in which the links 19, 19a are horizontal, the links draw the lower ends of the levers 16, 16a toward each other and the rods 15, 15a away from each other until the rods 15, 15a are spaced sufficiently to permit the lowermost bottle to drop between the rods, as shown in FIG. 2. A lowering rod such as the rod 22, in the meantime, has been moved upwardly into supporting engagement with the lowermost bottle. While the rod 22 then gently lowers the lowermost bottle, the plate 18 is also lowered and moves the rods 15, 15a toward each other to engage and support the bottle above the lowermost bottle and prevent the escape of the entire column of bottles. The plate 18 continues downwardly to its lowermost or rest position, bringing the rods 15, 15a to their normal or bottle-supporting position as shown in FIGS. 1 and 3. The rod 22 is mounted on the free or movable ends of levers 23, such as the lever which is pivoted at 24 to extensions such as the extension 25 on respective ones of the walls 13. The operation of the rod 22 and the respective ones of the levers 23 in proper timed relation to actuation of the rods 15, 15a will be described later.

The vending machine includes an operating mechanism common to the several releasing mechanisms for operating the selected one of them. The mechanism includes a horizontally-extending channel-shaped carriage 26 supported by and fastened at 26a and 26b to two plates 27, 27a which extend and are movable vertically through

other slots formed at 271, 272, 273 and 274, but not shown in detail in the horizontal flanges of the channel member 21. The plates 27, 27a are moved up and down by links 28, 28a the upper ends of which are pivotally connected to the plates 27, 27a respectively and the lower ends of which are pivotally connected to oscillatable cam plates 29, 29a fixed on an oscillatable shaft 31 rotatably mounted on the extensions 25, 25a. The shaft 31 is actuated by means of a lever 32 fixed thereto. A rotatable cam plate 33, driven by a motor 34 through speed reduction gearing 35, carries a crank pin 36, which is connected to the free end of the lever 32 by a connecting rod 37. The crank pin makes one revolution for each dispensing operation, during which the lever 32 is raised and lowered once to oscillate the shaft 31 first in clockwise (FIG. 3) direction and then in counterclockwise direction, and during which the carriage 26 is raised and lowered. The periphery of the cam plate engages the operating finger of a carrier switch 38 to actuate the latter.

The levers such as the lever 23 carrying the rod 22 are actuated by the cam plates 29, 29a being provided with rollers such as the roller 39 engaging in cam slots such as the slot 41 formed in respective ones of the cam plates 29, 29a. The cam slots 41 are of such shape that, when the cam plates 29, 29a are in the rest position shown in FIG. 3, the levers 23 and the rod 22 are in the lowermost position, and as the shaft 31 and the cam plates are rotated clockwise, the levers 23 and the rod 22 are moved upwardly as the carriage 26 is moved upwardly, so that the rod 22 engages the lowermost bottle about the time that it is released by the rods 15, 15a. Upon return movement of the cam plates 29 in counterclockwise direction, the carriage 26 is moved downwardly through the links 28, and the rod 22 and the levers 23 are moved downwardly by the cam slots 41.

The carriage 26 carries a horizontal hinge shaft 42 on which there is pivotally mounted a lifter such as the lifter 43 for each plate 18, 18a and 18b and 18c. The lifter 43 includes a finger 44 extending through a slot formed at 44a in the carriage 26 and movable into a slot 45 in the plate 18 into vertical alignment or registry with the upper edge of the slot 45 so that when the carriage 26 is raised, the finger 44 moves into abutment with the upper edge of the slot 45 and moves the plate 18 upwardly. The lifter 43 is rotated from its rest position in FIG. 3 to its operative position shown in FIG. 4 by energization of a solenoid 46. This is effected by means of a pin 47 carried by the lifter and extending through a recess 47a in an angle piece 48 attached to a vertically extending plate 49 which is attached to and actuated by the armature 51 of the solenoid 46.

To assure downward movement of all the plates 18 upon downward movement of the carriage 26, each plate is provided with an angle piece such as the piece 52 (FIG. 5) having a horizontally extending tab disposed under a tab 53 struck out from the carriage 26 and adapted to be engaged thereby upon downward movement of the carriage 26.

There is shown in FIG. 6, a control incorporating the present invention and adapted for use with a vending machine as shown in FIGS. 1 to 5, having four bottle compartments 14, 14a, 14b and 14c and adapted to contain and vend bottles of three different flavors, the third and fourth compartments 14b and 14c containing bottles of the same flavor. This control comprises three push-button selector switches 55, 55a and 55b, one for each flavor, the first and second selector switches 55 and 55a being associated with the first and second solenoids 46, 46a, respectively, for first and second flavor compartments 14, 14a and the third selector switch 55b being associated with and adapted to control the third and fourth solenoids 46b, 46c for the two third flavor compartments 14b and 14c.

Each selector switch comprises a movable armature which normally engages contacts such as contacts 56

and 56a, respectively, except for the last switch 55b, the contacts 56, 56a of the several switches being connected in series, but which movable armature is adapted, when actuated, to engage normally open sets of contacts such as contacts 57, 57a, 57b, respective ones of which are connected through an associated "empty" switch 92, 92a and 92b to the upper terminal of the associated solenoid 46, 46a, 46b and 46c. Thus, when any one selector switch such as switch 55, 55a, 55b is actuated, it opens the circuit to the selector switches 55, 55a, 55b, later in series, to the right in FIG. 6, and completes the circuit to the associated solenoid 46, 46a, 46b or 46c as the case may be.

The contacts 57b of the third selector switch 55b are connected alternately to the third and fourth solenoids 46b and 46c by means of a transfer switch 58 shown in FIG. 1. When the plate 18b of the third compartment 14b is raised during a dispensing operation, a projection 59 carried thereon engages a lever 60 of the transfer switch 58 to move it clockwise to bring its movable contact into engagement with the contact for the fourth solenoid 46c, so that the next time that the third selector switch 55b is actuated, a bottle will be disposed from the fourth compartment 14c. Upon such dispensing operation, upward movement of the fourth compartment plate 18c causes its projection 59a to rotate the arm 60 counterclockwise and move the transfer switch 58 back to the position shown for subsequent operation of the third solenoid 46b. The transfer switch is the subject of U.S. Patent 3,240,386 of Graham C. McCloy, issued Mar. 15, 1966.

Each solenoid 46, 46a, 46b and 46c is provided with a hold-in switch 62, 62a, 62b and 62c operated thereby in any suitable manner; for example, the angle piece of each solenoid such as the angle piece 48 for solenoid 46 (FIG. 4) may be provided with a projection 61 that engages an operating finger of the switch 62 when the solenoid armature 51 is raised upon energization of the solenoid 46, as shown in FIGS. 4 and 5. Each solenoid holding switch armature 62, 62a, 62b and 62c normally engages respective contacts 63, 63a, 63b and 63c connected in series, but which movable armature is adapted, when the respective solenoid is energized, to engage selected ones of normally open contacts 64, 64a, 64b, 64c, electrically connected to the upper coil terminal of the associated solenoid. Thus, when any solenoid is energized and its respective armature 62, 62a, 62b, 62c is actuated, the respective contacts or hold-in switches 63, 63a, 63b, 63c open the circuit to the hold-in switches later in the series of hold-in switches or to the left in FIG. 6, and complete a holding circuit through the respective contacts 64, 64a, 64b or 64c to the coil of the associated solenoid 46, 46a, 46b or 46c to maintain it energized.

Each of the selector switches 55, 55a, 55b and solenoid armatures 62, 62a, 62b and 62c, may be referred to as a three-way switch, one of each pair of contacts being connected to a common terminal or conductor which, in turn, is connected to the normally closed contact of the switch previous in series or to the conductor through which current is supplied to the switches.

The control includes a coin switch 66 having a movable contact or armature 66a connected to the power supply or line conductor L1 and operated by a pivoted finger 67 that extends into a coin chute 68. The movable contact 66a normally engages a stationary contact 69, but is movable by a coin passing through the coin chute 68 into momentary contact with a stationary contact 71, which is connected to one terminal of the winding of a credit relay 72.

A coin deflecting finger 73 is pivotally mounted and is biased by a spring 74 so as to extend into the coin chute 68 above the finger 67 to deflect a coin into a coin return chute 75. The finger 73 is adapted to be retracted by a solenoid 76 from the coin chute to permit passage of a coin into the coin collect chute 68.

The momentary connection of the coin switch 66 at

contact 71 also provides a momentary energizing circuit for the vend relay 82 through the normally closed holding switch armatures 62, 62a, 62b and 63c of the selection solenoids 46, 46a, 46b and 46c and conductor 100 to coin switch contact 71. The momentary energization of the vend relay 82 is held energized by a holding circuit established through the operated contacts 72a and 79 of the then operated credit relay 72 and the previously described circuit including any one of the empty switches 93, 93a, 93b and the normally closed contacts 89 of the cycle switch 33. Thus both the credit relay 72 and the vend relay 82 are maintained energized after the momentary operation of the coin switch 66.

The operation of the credit relay 72 and the vend relay 82 closes contacts 72b and 84 to prepare an operating circuit for the selector switches 55, 55a and 55b. Also, it will be noted that the previously described holding circuit for the credit relay 72 through its operated contacts 72a is extended through line 100 to immediately prepare a holding circuit through the series connected holding switches 62, 62a, 62b and 62c for the respective selection solenoid 46, 46a, 46b and 46c when such selection solenoid is operated upon the post-selection operation of a particular desired selector switch 55, 55a, 55b.

The operation of the vend relay 82 as previously described at the time of deposit of coinage also opens the normally closed contacts 85 to prevent the operation of the vend motor 34 at that time and until a selection is energized. Thereafter, upon post-select operation by a customer of a desired one of the selector switches 55, 55a or 55b, a desired one of the selection solenoids 46, 46a or 46b and 46c will be energized. Assuming for example that selector switch 55a is operated, selection solenoid 46a will be energized and its holding switch armature 62a will be switched into connection with the stationary contacts 64a to complete the previously prepared holding circuit through normally closed holding switches 62b and 62c and line 100. Thus the energization and the holding of energization circuit for a selected solenoid such as the selection solenoid 46a, will be immediately obtained upon the operation of the particular selector switch such as the selector switch 55a. It will be noted that the operation of a particular selection solenoid 46, 46a, 46b or 46c will interrupt the holding circuit previously extended through line 101 to the vend relay 82 so that the vend relay 82 is thereupon deenergized upon the operation of a particular selection switch such as the selection switch 55a and its associated selection solenoid 46a.

Upon the deenergization of the vend relay 82 normally closed contacts 85 are reconnected to energize the vend motor 34 which thereupon operates to begin the vend cycle and rotate the cycle switch cam 33 in the direction of the arrow. Towards the end of the vend cycle, finger 38a of the cam cycle switch engaging the periphery of the cam 33 will move the cam cycle switch armature 38 from normal contact with stationary contact 89 into engagement with stationary contact 91 to continue the energization of the motor 34 but interrupt the credit relay 72 holding circuit through the empty switches 93, 93a, 93b and operated contacts 72a. Thus, the credit relay 72 is deenergized late in the vend cycle by the cyclical operation of the cycle switch armature 38. At the end of the vend cycle when the cycle switch armature 38 again moves into engagement with the stationary contact 89, the circuit to the vend motor 34 is interrupted since the armature 72b of the credit relay 72 is now in its normally open position.

The remaining operation of the electrical vending machine and control circuit of the invention is the same as that previously described in the specification of U.S. Patent 3,209,946 mentioned above and for purposes of simplifying the description of the present invention additional operational description will not be repeated herein.

There has now been described a control circuit for an

automatic electrically operated vending machine which enables the post-selection operation of a desired vending release mechanism to be operated by a common operating mechanism during a vend cycle. The arrangement of the invention as described provides that both a credit relay 72 and a vend relay 82 are energized and maintained energized by suitable holding circuits upon deposit of the required coinage. The operation of the credit relay 72 immediately prepares a holding circuit through line 100 for any one of the selection solenoids 46, 46a, 46b, and 46c. The simultaneous operation of both the credit relays 72 and the vend relay 82 prepares an operating circuit for the individual selector switches 55, 55a and 55b through operated contacts 72b of the credit relay 72 and operated contacts 84 of the vend relay 82. The operating circuits for each of the selection solenoids 46, 46a, 46b and 46c extend from the respective selector switches such as selector switches 55, 55a and 55b through the normally closed empty switch contacts 92, 92a and 92b such that if any of the empty switches are operated due to an absence of articles to be vended, the desired associated selection solenoid 46, 46a, 46b or 46c cannot be energized. Similarly, the holding circuit for the credit relay 72 extends through empty switches 93, 93a and 93c in parallel such that should all of the columns of the vending machine be empty so that all of the empty switches 93, 93a and 93b are open, it will not be possible to provide a holding circuit for the credit relay 72 or the vend relay 82. Similarly the coin reject solenoid 76 will be deenergized to reject coins since its energizing circuit through the normal contacts 78 of the credit relay 72 and any one of the empty switches 93, 93a and 93b in parallel will be open.

Various modifications will occur to those skilled in the art.

I claim as my invention:

1. A vending machine comprising a plurality of article dispensing mechanisms, a common operating mechanism for releasing said dispensing mechanisms, electric motor means adapted to be energized to be operated for operating said common operating mechanism during each vend cycle, a credit relay, a vend relay, a respective connecting solenoid for each dispensing mechanism adapted to be energized to connect a respective dispensing mechanism to said common operating mechanism during a particular vend cycle to thereby selectively dispense an article, a respective selection switch for each of said solenoids, means responsive to the deposit of requisite coinage to energize both said credit and vend relays, a holding circuit for said vend relay, means responsive to the energization of said credit relay to prepare a holding circuit for said solenoids, means responsive to the energization of said vend relay to prepare an operating circuit for said selection switches, means responsive to the operation of a selected one of said selection switches to extend the previously prepared operating circuit to energize a selected one of said solenoids, means responsive to the energization of a selected one of said solenoids to maintain said solenoid energized through the previously prepared holding circuit and to interrupt the holding circuit for said vend relay and deenergize said vend relay, means responsive to the deenergization of said vend relay while said credit relay is still energized to energize said electric motor means, cycle switch means adapted to be operated in response to the operation of said motor means to maintain the energization of said motor means for the duration of a vend cycle, and means responsive to the operation of said cycle switch during a vend cycle to interrupt the holding circuit for said credit relay and deenergize said credit relay and thereby interrupt the respective holding circuit to deenergize the respective selection solenoid.

2. The invention of claim 1 in which a first group of respective normally closed empty switches is provided for each respective dispensing mechanism, and means

connecting each empty switch of the first group of empty switches in parallel with each other and in series with the holding circuit for said credit relay.

3. The invention of claim 2 in which a second group of respective normally closed empty switches is provided for each respective dispensing mechanism, and means connecting a respective one of each empty switch of the second group of empty switches in series with the means to energize a respective one of said solenoids by the operation of a selected one of said selection switches.

4. The invention of claim 1 in which a group of respective normally closed empty switches is provided for each respective dispensing mechanism, and means connecting a respective one of each empty switch in series with the means to energize a respective one of said solenoids by the operation of a selected one of said selection switches.

5. The invention of claim 1 in which each selection

solenoid includes holding switch contacts having normal positions connected in series with each other to be included in the energizing and holding circuits for said vend relay whereby the energization of any one of said selection solenoids interrupts the holding circuit of the vend relay to deenergize the vend relay at the same time the previously prepared holding circuit for a respective selection solenoid is completed during the continued energization of the credit relay.

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