

Hendrickson et al.

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[72] Inventors: **William M. Hendrickson**, St. Louis;
Patrick J. Davis, Florissant, both of
Mo.

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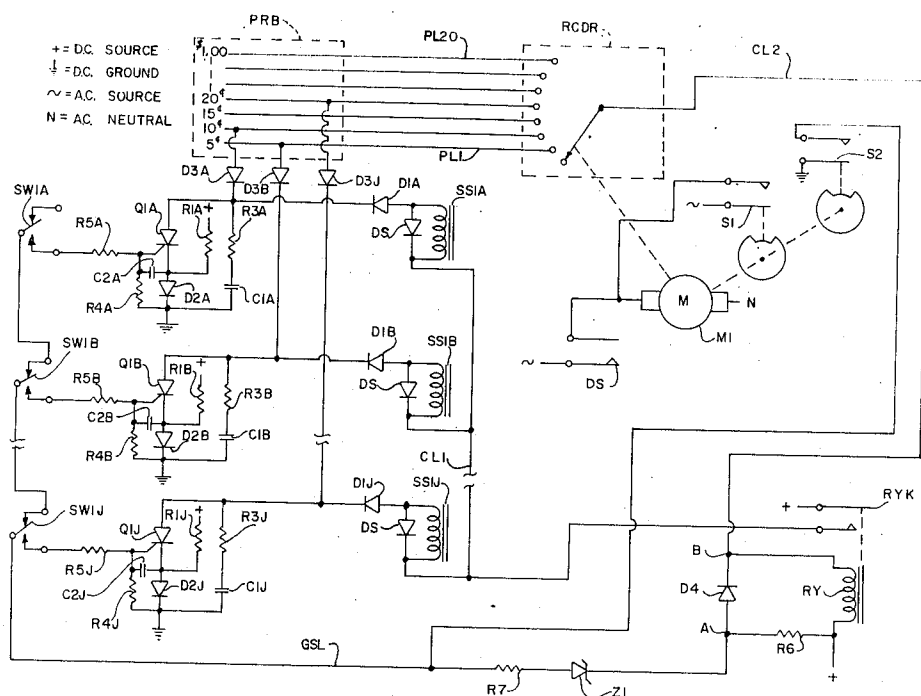
UNITED STATES PATENTS

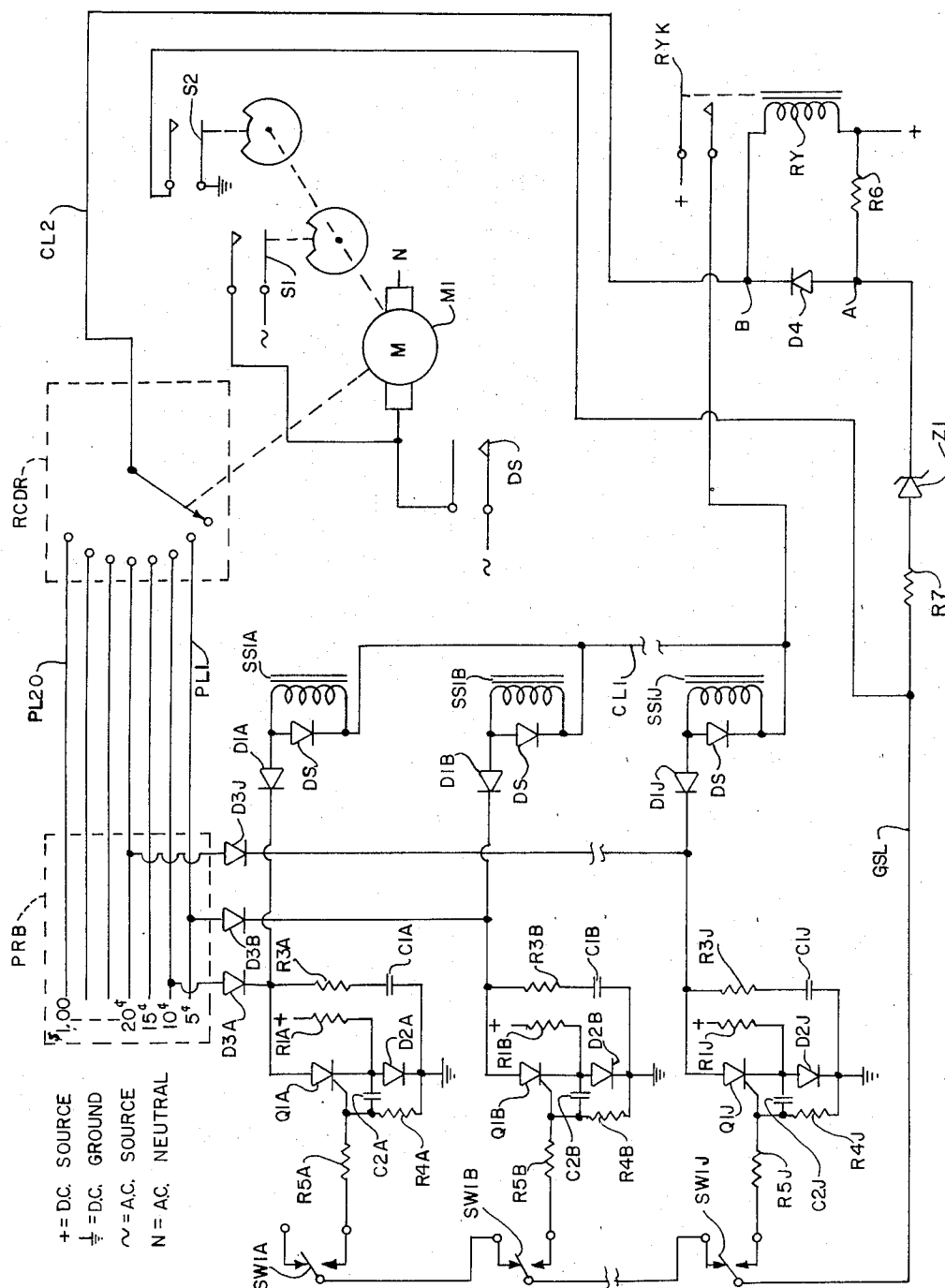
3,596,111 7/1971 Han.....317/137

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Apparatus especially useful for vending selection control. A plurality of triggerable semi-conductor current switching devices are provided for selectively energizing a plurality of vend control means each causing the dispensing of a respective article. The switching devices are triggered by respective ones of selector switches which draw current through a source having a predetermined source impedance. A respective diode connects each of the switching devices to the source so that conduction through any one of the devices immediately shunts the source thereby preventing triggering of any of the other devices, preventing selection of more than one article for each vend operation.

8 Claims, 1 Drawing Figure





William H. Hendrickson,
Patrick J. Davis,
Inventors.
Koenig, Senniger,
Powers and Beavitt,
Attorneys.

INTERLOCKED SELECTION CONTROL APPARATUS

BACKGROUND OF THE INVENTION

This invention relates to selection control apparatus for selecting only one of a variety of control responses, i.e., interlocked selection control, and more particularly to vending selection control apparatus for causing dispensing of only one selected article from a variety of articles.

In vending machine operation, it is important to provide protection against a purchaser obtaining more than one article during a vend operation. In addition, it may be necessary to permit selection of articles at different prices, it being important that an article not be dispensed unless there has been insertion of a sufficient amount of coin. In such machines, however, it may be desired to permit changing of the price associated with a selector or to permit changing of the total number of possible selections.

SUMMARY OF THE INVENTION

Among the several objects of the invention may be noted the provision of selection control apparatus; the provision of such control apparatus for causing only one selected control response from a variety of available control responses; the provision of such control apparatus especially adapted for vending control; the provision of such vending control apparatus providing positive protection against obtaining more than one article during a vend operation; the provision of such vending control apparatus permitting selection of articles at different prices and permitting vending of an article only after insertion of a sufficient amount of coin; the provision of such vending control apparatus readily permitting changing of the price associated with a selector; the provision of such vending control apparatus facilitating changing of the total number of possible selections; and the provision of such vending control apparatus which is primarily electronic in character, and which is reliable and long-lasting in operation. Other objects and features will be in part apparent and in part pointed out hereinafter.

Briefly, selection control apparatus of the invention as used for vending control is adapted for causing dispensing of only one selected article from a variety of available articles after the price of said selected article is deposited. The apparatus includes a plurality of electromagnetic vend control means each, when energized, being adapted to cause the dispensing of a respective article. A respective plurality of triggerable semiconductor current switching devices is provided for selectively energizing the vend control means, there being a source means for providing current for triggering the devices and which has a predetermined source impedance. Means is responsive to the deposit of money for connecting this current source to those of a plurality of terminals corresponding to different prices for which the amount of money deposited at least equals the respective price. Diode means connects each of the switching devices to that terminal which corresponds to the price of that respective article. Manually operable selection switch means applies current from the source to a selected one only of the switching devices thereby to trigger this one device into conduction when the one device is connected to a terminal to which current is

provided from the source. Conduction through this device immediately shunts the source through the respective diode means thus preventing triggering of any of the other of said devices. One side of each of the vend control means is connected to a respective one of said devices, while electromagnetic relay means responsive to conduction through any of the devices applies a voltage to the other sides of the vend control means. A vend control means connected to a triggered one of the devices is thereby energized by current conducted through the respective device, causing the respective article to be dispensed. Dispensing of all other articles is prevented by the shunting of the source.

BRIEF DESCRIPTION OF THE DRAWING

The single FIG. is a schematic circuit diagram of selection control apparatus of the invention as utilized for vending control purposes.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawing, a.c. and d.c. source connections and their respective ground or neutral connections for a control of the invention are identified by symbols as shown in the legend accompanying the figure.

A coin handling mechanism is used with the control but forms no part of the present invention. A brief description of certain of its elements and their operation is necessary for an understanding of the overall merchandiser apparatus. Reference may be made to coassigned U.S. Pat. No. 3,335,838 for full details of a coin handling mechanism such as may be used. Briefly, the coin handling mechanism includes a coin handling or reset motor M1 which is operative to reset the coin handling mechanism, e.g., after it has been advanced by the deposit of coins and after a vend cycle has been initiated. Operation of motor M1 is initiated by closure of a delivery switch DS upon the vending of a selected article. This motor controls two cam driven switches S1 and S2 which are closed during the reset cycle. Switch S1 provides a holding circuit for the motor M1 itself and switch S2 is employed in completing a vend cycle as described hereinafter.

The coin handling mechanism also includes a so-called recorder or totalizer mechanism RCDR which, as described in the aforesaid U.S. Pat. No. 3,335,838, comprises a form of stepping switch mechanism for progressively connecting a control lead CL2 to selected ones of a plurality of price lines P1-P20 as money is deposited in the coin handling mechanism. Only six of the price lines are shown to conserve drawing space but typically 20 lines might be employed to permit a range of 20 different prices to be accommodated, e.g., from 5¢ to \$1.00. The recorder RCDR may, if desired, be of the type which connects ones of the price leads with a plurality of change leads controlling change-making apparatus of a known type to cause refunding of change if the amount of coin deposited is greater than the price of a selected article. The recorder RCDR is adapted to be reset through operation of reset motor M1.

Indicated at SS1 (A-J) are a plurality of selection solenoids, only three of which are shown to conserve space in the drawing. The operating windings of these

solenoids are shunted by respective suppression diodes DS for suppressing inductive surges upon deenergization. Energization of one of the selection solenoids SS1 (A-J) is adapted to cause the dispensing of a respective article. In place of these solenoids, other types of control response means (such as motors, etc.) may be used. One side of each of the selection solenoids SS1 is connected to a common control lead CL1. The other end of each solenoid is connected to ground through a respective isolation diode D1 (A-J), a respective SCR Q1 (A-J) and a respective bias diode D2 (A-J). Each bias diode is forward biased by current provided through a respective bias resistor R1 (A-J). The anode of each SCR is shunted by a suppression network comprising a resistor R3 (A-J) and a capacitor C1 (A-J). The gate electrode of each SCR is bypassed to its cathode through a capacitor C2 (A-J) and is biased to ground through a resistor R4 (A-J). Triggering current can be applied to the gate of each SCR through a respective article selection switch SW1 (A-J) and a respective current limiting resistor R5 (A-J). The switches SW1 (A-J) are connected in series to provide exclusive operation.

The anode of each SCR Q1 (A-J) is connected, through a respective diode D3 (A-J), to a price board PRB. The price board PRB is a matrix switch which allows any one of the SCR anode leads to be connected to any one of the price leads (PL1-PL20) and which permits more than one SCR anode lead to be connected to any one of the price leads. Thus each SCR anode lead can be connected to that price lead which corresponds to the price of the item to be vended.

A relay RY is provided whose operation is generally to control the energization of the selection solenoids and, when energized, closes a set of contacts RYK to supply the d.c. source voltage to control lead CL1. One side of relay RY is connected to control lead CL2 and the other side is supplied with the d.c. source potential.

As is described in greater detail hereinafter, current drawn through resistor R6 is provided to the select switches SW1 (A-J) through a circuit which includes a Zener diode Z1, a further resistor R7, and a gate supply lead designated GSL. Lead GSL is interconnected with cam-operated switch S2, the latter being connected, when closed, for grounding lead GSL.

The junction between resistor R6 and Zener diode Z1 is designated junction A in FIG. 1 and is connected through an isolating diode D4 to a point in the circuit or junction designated B. Junction B is connected by control lead CL2 to that one of price leads P1-P20 which corresponds to an exact match between the amount deposited and the price of an item being purchased.

Considering now its operation, the control circuit is illustrated in its normal or ready operating condition, that is, energized but prior to the deposit of any money. The normal operation of the merchandiser from this condition is then substantially as follows: The deposit of money in the coin handling mechanism causes the recorder RCDR to progressively shift control lead CL2 to the price lead PL1-PL20 in conventional manner so that, at each step, a price lead is connected corresponding to the total amount of coin deposited. Prior to the making of a selection, the potential at the points A and B is substantially above ground potential and current is

available therefrom. Thus current can be drawn through the gate supply lead GSL from resistor R6. Accordingly, operating any one of the selection switches SW1 (A-J) will cause triggering current to be applied to the gate of the respective SCR Q1 (A-J).

Assuming that the selection is a proper one and that the anode of the triggered SCR is therefore connected through the price board PRB to one of the price leads PL1-PL20, anode current will be available to the triggered SCR through the resistor R6. Thus, the selected SCR will switch into its conducting state in the manner understood by those skilled in the art. As is also understood by those skilled in the art, conduction in this SCR will continue even though the triggering current is withdrawn from the gate of the SCR. The selection SCR is thus in a sense latched into the conducting state.

It should be noted that the existence of a path of conduction through a selection SCR does not immediately energize the respective selection solenoid SS1 (A-J) since the contacts RYK are open and thus no current is available through the control lead CL1. Conduction through the triggered SCR will, however, cause the voltage at the junction B to immediately drop substantially to ground potential since this conduction effectively shunts the source of gate triggering current causing the supply voltage to be dissipated across the resistor R6 which presents a controlled or predetermined source impedance to the gate supply lead GSL. Assuming that a proper selection is made and that junction B is thus pulled substantially to ground potential, current flow through resistor R6 is diverted from the gate supply lead GSL by conduction through diode D4. The Zener diode Z1 offsets any residual voltage at the junction B caused by forward voltage drops the various semi-conductor junctions in the conduction path and thus substantially all voltage is removed from the gate supply lead GSL. With the source of triggering current thus cut off, no other selection can be made. It should be noted that this action occurs as quickly as the selected SCR Q1 (A-J) can turn on, i.e., in the order of a few microseconds, and does not depend upon the relatively slow operation in any electromechanical element. Thus, triggering of an SCR occurs in much less time than is required to transfer the contacts of another of the selector switches SW1 (A-J).

In addition to cutting off the source of current for triggering the selection SCRs, the dropping of junction B substantially to ground potential applies a voltage across the operating winding of relay RY which is thereby energized. The consequent closing of the contacts RYK thereby applies current to the control lead CL1. When current is provided at lead CL1, the selection solenoid SS1 (A-J) corresponding to the triggered selection SCR Q1 (A-J) is energized since the voltage at the anode of that SCR is maintained substantially at ground potential by conduction through the SCR. The diodes D1 (A-J) and D3 (A-J) prevent any interaction between the solenoids. Energization of the respective selection solenoid causes selected articles to be vended or dispensed.

Upon delivery of the selected article, delivery switch DS closes to energize and thus initiate operation of motor M1. Upon rotation of motor M1, switch S1 closes to maintain energization of the motor to ensure that it completes a full cycle. Switch S2 also closes

causing grounding of the gate supply lead GSL thereby to prevent triggering of one of the SCRs Q1 (A-J) during resetting of the recorder or totalizer RCDR. Continued operation of motor M1 resets the recorder thereby opening the circuit between junction B through control lead CL2 to the triggered selection SCR. Junction B then returns to the d.c. supply potential and relay RY is accordingly deenergized, permitting its contacts RYK to open. As a result, the selection solenoid which had been energized is now deenergized. Since no potential is now supplied to any of the SCRs Q1 (A-J), the triggered SCR is thereby commutated and hence becomes once again non-conductive. At the completion of its cycle, motor M1 causes switches S1 and S2 to return to their normally-open conditions and motor M1 thereby stops. The apparatus is then ready for a new vend cycle.

In view of the above, it will be seen that the several objects of the invention are achieved and other advantageous results attained.

As various changes could be made in the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

WHAT IS CLAIMED IS:

1. Selection control apparatus for causing only one selected control response from a variety of available control responses, said apparatus comprising:

a plurality of control response means each of which, when energized, causes a respective control response;

a respective plurality of triggerable semiconductor current switching devices;

source means for providing current for triggering said devices, said source means having a predetermined source impedance;

manually operable selector means for applying current from said source to a selected one only of said devices thereby to trigger said one device into conduction;

a respective diode means connecting each of said switching devices to said source whereby conduction through any one of said devices immediately shunts said source thereby preventing triggering of any of the other of said devices; and

circuit means interconnecting each of said control response means with a respective one of said devices for energization of that control response means by current conducted through the respective device whereby triggering of one of said devices causes a respective control response and prevents any other of the available control responses.

2. Selection control apparatus as set forth in claim 1 wherein each of said control response means comprises a solenoid.

3. Selection control apparatus as set forth in claim 1 wherein said triggerable semi-conductor current switching devices are silicon controlled rectifiers.

4. Selection control apparatus as set forth in claim 1 wherein said source means includes a resistor providing said predetermined source impedance.

5. Selection control apparatus as set forth in claim 1 wherein said selector means comprises a plurality of double-throw switches which are connected in series through one side of each of said switches, the other side of each switch being connected to a respective one of said current switching devices thereby to provide triggering current to said one device exclusively.

6. Vending selection control apparatus for causing dispensing of only one selected article from a variety of available articles after the price of said selected article is deposited, said apparatus comprising:

a plurality of electromagnetic vend control means each of which, when energized, is adapted to cause the dispensing of a respective article;

a respective plurality of triggerable semiconductor current switching devices for selectively energizing said vend control means;

source means for providing current for triggering said devices, said source means having a predetermined source impedance;

a plurality of terminals corresponding to different prices;

means responsive to the deposit of money for connecting said current source to those terminals for which the amount of money deposited at least equals the respective price;

isolation means connecting each of said devices to that terminal which corresponds to the price of that respective article;

manually operable switch means for applying current from said source to a selected one only of said devices thereby to trigger said one device into conduction when said one device is connected to a terminal to which current is provided from said source, conduction through said one device immediately shunting said source through the respective isolation means thereby preventing triggering of any of the other of said devices;

circuit means connecting one side of each of said vend control means to a respective one of said devices; and

means responsive to conduction through any of said devices for applying a voltage to the other sides of said vend control means whereby a vend control means connected to a triggered one of said devices is energized by current conducted through the respective device to cause the respective article to be dispensed and whereby dispensing of all other articles is prevented by the shunting of said source.

7. Vending selection control apparatus as set forth in claim 6 wherein said isolation means comprises a plurality of diodes respectively connected with each of said devices.

8. Vending selection control apparatus as set forth in claim 6 wherein said means responsive to conduction through any of said devices comprises electromagnetic relay means connected in a circuit with said source and said means responsive to the deposit of money.

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