

[54] VENDOR CONTROL WITH ESCROW UNTIL AVAILABLE PRODUCT SELECTION

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[51] Int. Cl. G07f 5/24

[58] Field of Search 194/1 N, 10, DIG. 15; 133/2

[56]

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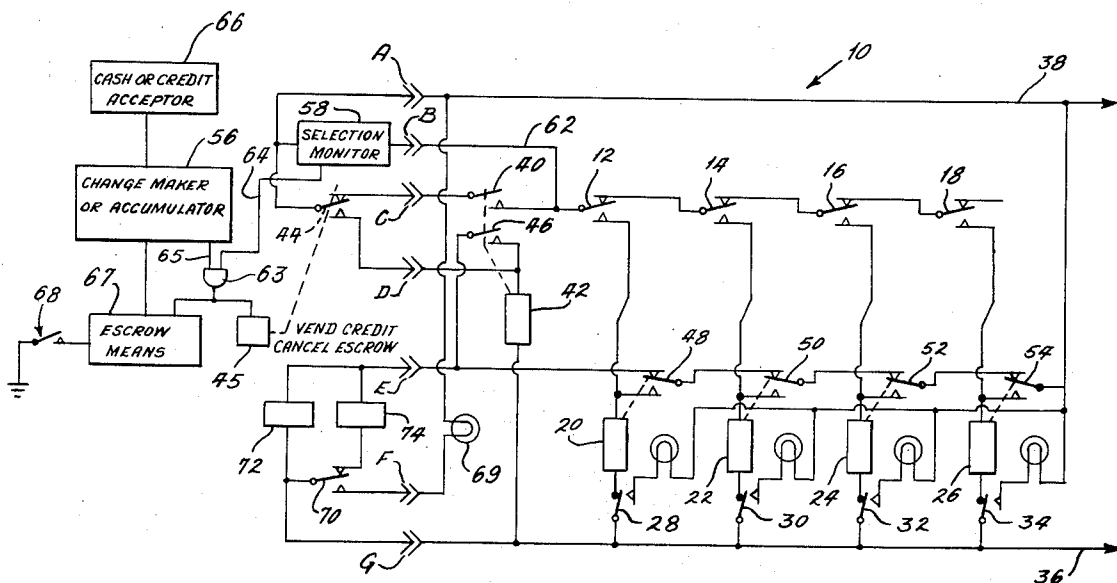
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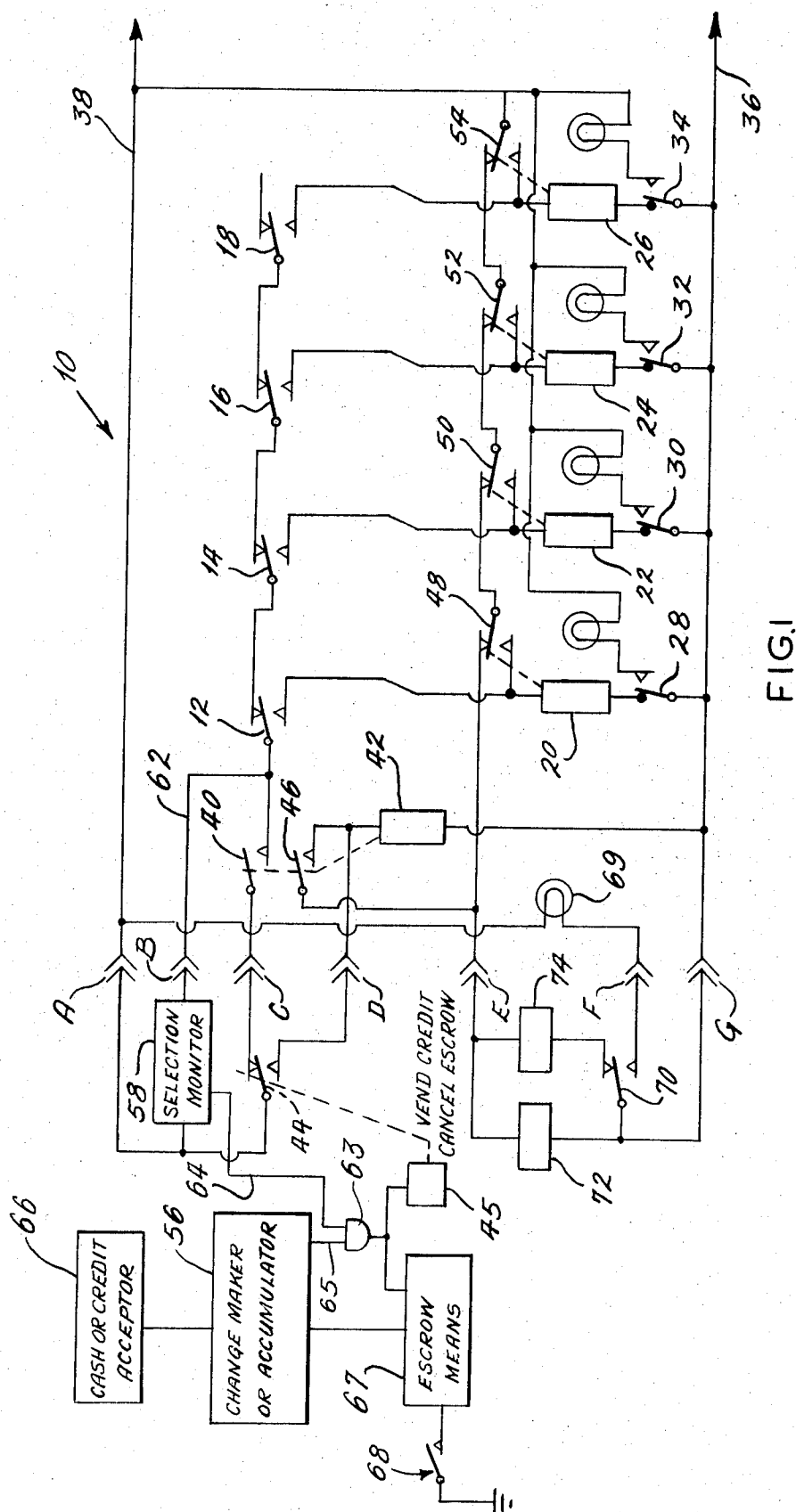
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ABSTRACT

A control circuit which provides escrow capability at all times after money is deposited in a vending machine and until selection is made of a product which is available, the control circuit including accumulator means, vend selection means, escrow means, and monitor selector means which respond to operation of the vend selection means under certain conditions to control other operations of the circuit including enabling a vend cycle.

17 Claims, 6 Drawing Figures





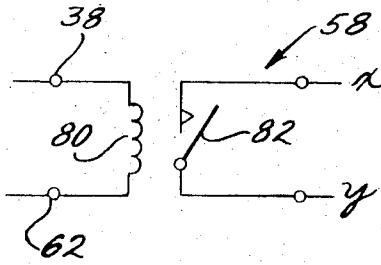


FIG. 2

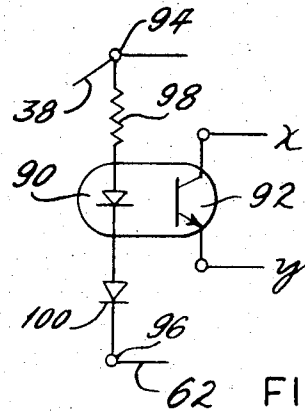


FIG. 3

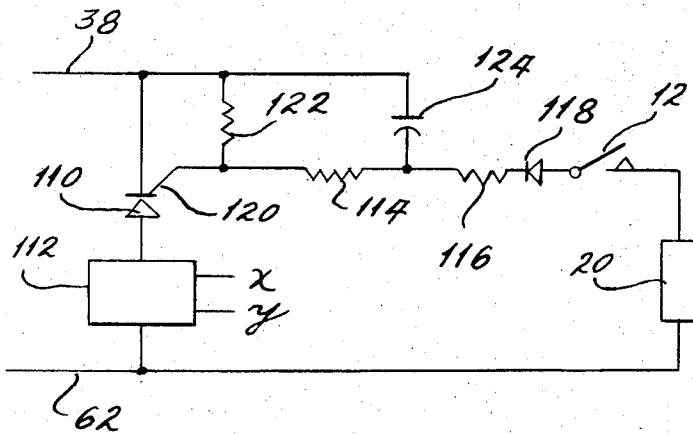


FIG. 4

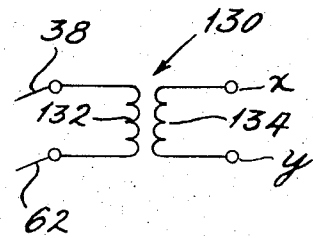


FIG. 5

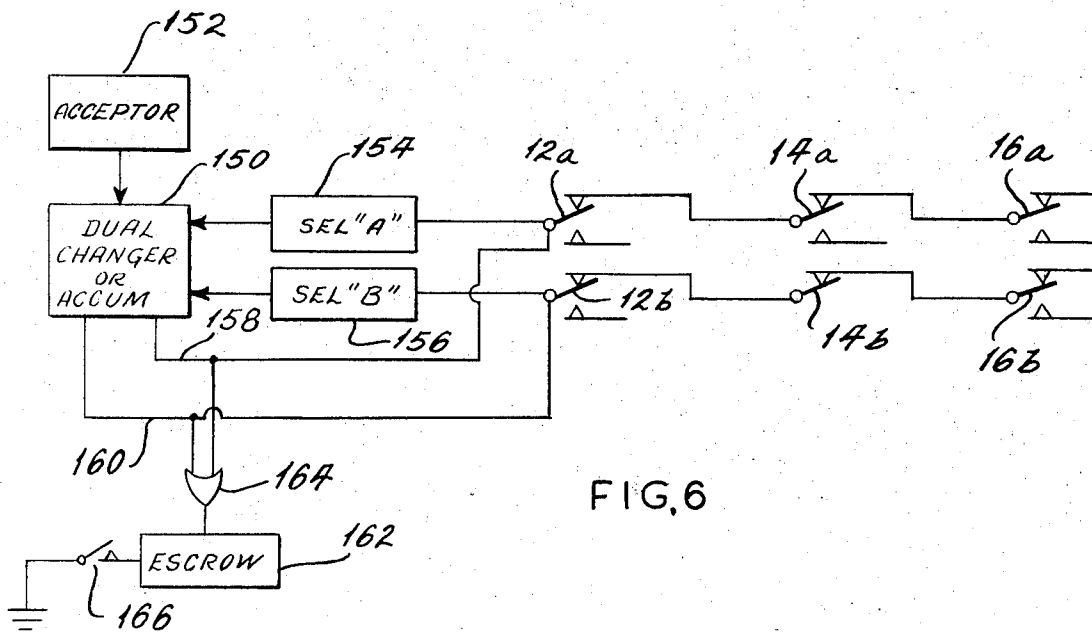


FIG. 6

VEND CONTROL WITH ESCROW UNTIL AVAILABLE PRODUCT SELECTION

Virtually all vending machines including single and multiple product vending machines at one time or another will become empty of one or more of the products it vends. It has been the practice to indicate an empty product condition by some means such as by energizing or deenergizing an incandescent or neon lamp, by providing electro-mechanical indicator means, and by various other such means. A variety of such devices are in use for this purpose. Some vending machines also allow the customer to see into the machine so that he can by visual inspection determine when a product is and when a product is not available. It is also the practice in many vending machines to provide a holding circuit which is energized as soon as the amount of the vend price has been deposited and even before the customer makes his selection. Upon making the selection, the product is then delivered to the customer and the hold circuit is released. For various reasons, many of the known means for indicating the inability of a machine to deliver a particular product and the related means including the hold circuit means have been unsatisfactory. For example, the sold out indicator may become inoperative or unreadable, it may be overlooked by the customer, and it may malfunction or burn out. Such devices also add to the cost and complexity of the machine and increase the machine maintenance. Furthermore, when an empty product condition exists but is not detected for some reason it may force the customer to make another less desirable selection such as a selection of a product or brand or flavor he may not want or lose his money. This often occurs because of the inability of the machine to be able to return the deposit to the customer. Under such circumstances, the customer may become aggravated and abuse the vending machine, and possibly cause irreparable damage. This situation can also occur if the means provided to indicate an empty product condition become inoperative.

The present control circuit is designed to overcome these and other disadvantages and shortcomings of the prior constructions and to provide means whereby a customer can get a full refund of a deposit under circumstances where he has made a partial or full deposit and for some reason is unable to complete the deposit, obtain the desired product, or discovers too late that the product he desires is unavailable. The present means therefore provide full escrow capability until an available product selection has been made. The present means can be used on many types of vending machines including vending machines that accept coins, tokens, credit cards and the like, and they may include means which determine whether the form of a deposit such as use of a credit card are acceptable and/or valid before entering the amount in the change maker and/or accumulator means.

It is therefore a principle object of the present invention to provide means for use on vending machines which will allow a customer who has made a deposit or entry to escrow the amount of the deposit or entry at any point up to the time that a selection is made of a product that is available.

Another object is to eliminate the need on vending machines of means to indicate when a particular product is unavailable.

Another object is to reduce the number of service calls and record keeping required at vending centers due to failure of a machine to indicate a sold out condition.

Another object is to minimize the possibility of a vending machine cheating or disappointing a customer.

Another object is to minimize the number of dissatisfied customers who buy from vending machines.

Another object is to make vending machines more versatile.

Another object is to minimize customer inflicted damage to vending machines.

Another object is to provide a relatively simple, highly flexible and relatively trouble free vending control circuit.

These and other objects and advantages of the present invention will become apparent after considering the following detailed specification which covers preferred embodiments thereof in conjunction with the accompanying drawings, wherein:

FIG. 1 is a schematic diagram showing a vending control circuit constructed according to the present invention;

FIG. 2 is a schematic diagram showing a preferred form of selection monitor means for use in the circuit of FIG. 1;

FIG. 3 shows another embodiment of selection monitor means for use in the circuit of FIG. 1;

FIG. 4 shows another embodiment of selection monitor means which employ a silicon controlled rectifier;

FIG. 5 shows the selection monitor means employing a pulse transformer; and,

FIG. 6 is a schematic block diagram of a vend control circuit for use on a dual price vending machine.

Referring to FIG. 1 more particularly by reference numbers, number 10 identifies a vending control circuit constructed according to the present invention. The circuit 10 as shown has a four product selection capability under control of selection switches 12, 14, 16 and 18 which are connected in series, and when any one of them is actuated it completes a circuit through an associated vending device 20, 22, 24 and 26. Each of the vending devices 20, 22, 24 and 26 is connected in series with an associated empty control switch 28, 30, 32 and 34, which switches are closed when products are available in the associated product compartment on the vending machine. The product empty control switches 28, 30, 32 and 34 have their output sides connected in common to an output circuit line lead 36 which is connected to one side of a power source. In order to actuate any one of the vend devices 20, 22, 24 and 26, it is necessary to complete a circuit there-through from another input line lead 38. These circuits are established through normally open relay contacts 40 under control of credit relay 42 whenever the credit relay has been energized by operation of other switch contacts 44 sometimes referred to as the credit switch contacts. The switch contacts 44 momentarily transfer under control of a vend credit relay 45 which in turn is controlled by an amount having been deposited that is at least equal to the vend price.

When the movable contact of the credit switch 44 transfers from its normally closed to its open position, it establishes a circuit from the line lead 38 to and through the coil of the credit relay 42 to energize the

relay 42 and close its contacts 40 and 46. As soon as the credit relay 42 is energized, its now closed contacts establish a holding circuit to maintain the energized condition of the credit relay 42. This holding circuit is through the contacts 46 and through the normally closed sides of other contacts 48, 50, 52 and 54 to the line lead 38. The contacts 48, 50, 52 and 54 remain in the condition as shown until any one of the vending control devices 20, 22, 24 or 26 is energized and transfers the associated contacts. The vending devices 20, 22, 24 and 26 are usually solenoids or relay devices of some kind. The credit relay 45 is energized and the associated contacts 44 transfer from the normally closed to the open position as aforesaid whenever a change maker or accumulator means 56 has accumulated therein an amount at least equal to the selected vend price. The accumulator 56 can have many different forms including any of those forms shown in Shirley U.S. Pat. Nos. 3,307,671, 3,521,733, 3,508,636, 3,589,492, Johnson U.S. Pat. No. 3,687,255, Levasseur U.S. patent application Ser. No. 267,558, filed June 29, 1972 and Douglass U.S. patent application Ser. No. 204,988, filed Dec. 6, 1971, all of said cases being assigned to Applicant's assignee.

The subject circuit also includes a selection monitor circuit 58 which operates to prevent or inhibit the change maker or accumulator 56 from energizing the relay 45 and the contacts 44 from transferring and energizing the credit relay 42 until a monitoring line shown as line 62 determines that one of the vend selection switches 12, 14, 16 or 18 has been actuated by the customer at a time when there is sufficient accumulation to at least equal the price of the selected product. This occurs when a circuit has been completed through an associated one of the vend control devices 20, 22, 24 or 26 and through the associated empty product switch 28, 30, 32 or 34. The empty product switches have one side of each connected to the line lead 36 as aforesaid.

The selection monitor circuit 58 is particularly important to the present invention for reasons which will be explained, and is constructed to allow only a small amount of current flow through the sensing lead 62 when one of the product switches 12, 14, 16 or 18 establishes continuity through its associated vend control devices 20-26. The current flow thus established, however, should not be sufficient to energize the associated vend control devices. If any one of the product selection switches 12-18, the empty control switches 28-34, the vend control devices 20-26, or the wiring associated with any of these elements should be open or defective for any reason, this would prevent the monitor 58 from directing a control signal on the line 64 to the input of AND gate 63, energizing the credit relay 42. The circuit to accomplish this is by way of AND gate 63 which has inputs from the accumulator 56 and from the monitor 58. The gate 63 also has an output which is connected to the relay 45. If the relay 45 is not energized for any reason it would prevent a vend from occurring. This is because the output of the monitor 58 on lead 64 plus the output of the accumulator 56 on lead 65 are both required to produce the AND condition necessary to energize the relay 45. The operation of the monitor 58 will be explained more in detail in connection with FIGS. 2-6 which show various embodiments of the circuit 58. The number of price selection switches, empty control switches, and associated

vend control means can be increased or decreased depending upon the requirements of a particular vending machine including the number of products to be vended therefrom.

Cash or credit acceptor means 66 are included in conjunction with the circuit 56 to provide usual inputs thereto. The means 66 may include a coin unit (not shown) where coins are deposited, or it may include an input device where a credit card or like device can be inserted, and it may include an interface between such a unit and the change maker or accumulator means 56. Such means are disclosed in the above mentioned patents and applications. The accumulator means 56 also have an output that is connected to escrow means 67 which return the full amount of a deposit to a customer under circumstances where a vend credit condition has not been established. The escrow means 67 are under control of an operator actuable escrow switch 68 and are also under control of the accumulator and also the AND gate 63 which automatically cancels any escrow possibility whenever a vend credit condition is established. The accumulator-change maker circuit 56 can have many different forms as stated and should be able to accumulate amounts deposited or otherwise entered and should be able to make change for deposits in excess of a selected vend price. The form of circuit selected for the circuit 56 is not part of this invention.

An indicator circuit that includes an indicator light 69 is controlled by another switch 70 referred to as the empty tube switch. The indicator circuit is connected between the power leads 36 and 38 and is energized whenever the switch 70 is in its transferred condition indicating an empty coin tube. When energized, the light 69 provides an "exact change" indication that is visible to the customer and which means that the customer should deposit the exact change only since the machine is not able to make refunds of excess deposits.

A pair of coin return electromagnets 72 and 74, sometimes called "CREMS", are connected into the circuit as shown and are provided to prevent the acceptance of cash and/or credit whenever they are deenergized. This can occur due to a power failure, by the transfer of any one of the series connected holding switches 48, 50, 52 and 54, and by the magnet 74 being deenergized by operation of the empty tube switch 70.

When a customer makes a deposit in a vending machine equipped with the subject control circuit by depositing coins or tokens or by inserting a credit card, the cash or credit acceptor circuit 66 determines whether the deposit (or credit card) is acceptable or valid before permitting an amount to be entered into the change maker or accumulator circuit 56. Thereafter, the customer depresses one of the several vend selection switches 12-18 to establish a circuit for energizing the appropriate solenoid or other control device 20-26. The circuit thus established is through the high impedance of the selection monitor circuit 58, which as will be explained, does not at this time permit enough current flow through the selected device 20-26 to energize it. Several different forms of the circuit 58 are shown in FIGS. 2-6 and these will be described later.

The selection monitor circuit 58 is constructed so as to be able to establish a circuit condition which has a control effect on the operation of the relay 45. This

control effect causes the AND gate 63, when the change maker 56 has sufficient accumulation, to be able to energize the vend relay 45 and to thereby transfer its contacts 44. When this happens, line voltage is applied across the credit relay 42 to energize it and to transfer its associated contacts 40 and 46. The closing of the contacts 46 establishes a hold circuit to maintain the relay 42 in an energized condition, and the closing of the contacts 40 establishes another circuit which is through the selected vend solenoids 20-26 and also through the switch contacts 44 after the contacts 44 return to their normally closed condition due to resetting of the accumulator circuit or vend time occurring. The circuit that is established through the selected vend relay or solenoid is the circuit which energizes other means (not shown) in the vending machine itself to cause the desired vend to take place. As soon as the vend operation, and when necessary a refund also is initiated, the vend signal automatically cancels the possibility for producing an escrow operation out of the escrow means 67 thus preventing the simultaneous occurrence of a vend and an escrow. The reasons for this are obvious. However, if for some reason, no vend takes place such as because of an open circuit or a defective component, then the customer still has the possibility of getting his money back by pressing on the escrow switch 68. This can be done by means which control the accumulator 56 in the manner taught by several of the above mentioned patents. It can also be done under control of the CREMS 72 and 74 in some cases if desired. The means for doing so are not part of this invention.

The present invention resides to a large extent in the construction and operation of the selection monitor circuit 58 and in the way it is connected into the circuit. Several different embodiments of the monitor circuit 58 are included.

One form of the selection monitor circuit 58 is shown in FIG. 2 and includes an electromagnetic coil 80 which when energized closes switch contact 82. The contacts 82 are connected in the circuit of FIG. 1 in position to establish continuity between the selection monitor 58 and the relay or solenoid means 45 by way of the lead 64 and the AND gate 63 at a time when the change maker has enough accumulated to at least equal the selected vend price. The circuit points labeled X and Y in FIG. 2 are therefore connected in series between a control signal source and one of the inputs to the gate 63 through the switch 82 and the lead 64. The connections to the opposite ends of the magnet 80 are labeled 38 and 62 and correspond to the same numbered leads as shown in FIG. 1. The coil 80 is constructed to have a relatively high impedance and is energized at a relatively small current level that is substantially below the current level required to energize the vending devices or solenoids 20, 22, 24 and 26. This means that the coil 80 will be able to be energized and to close its contacts 82 even though there is not enough current flow to also simultaneously energize the selected vend relay. It is also contemplated to substitute for the contacts 82 in the device as shown in FIG. 2, some other well known devices such as a Hall Effect device many of which are commercially available.

FIG. 3 shows another embodiment of the selection monitor circuit 58 constructed using a light emitting diode 90 that will transmit light to a photo-transistor 92

whenever sufficient current passes through the diode 90 between the circuit connections 94 and 96. In this case the connections 94 and 96 are connected respectively to the circuit leads 38 and 62. In this construction a current limiting resistor 98 and another diode 100 are also connected in series with the light emitting diode 90. The photo-transistor 92 has two circuit connections labeled X and Y which are connected in series with the control lead 64 between a signal source such as the lead 38 and the gate 63 as shown in FIG. 1. The light control circuit of FIG. 3 operates in a manner somewhat similar to the circuit of FIG. 2 except that it relies on the generation of light produced by the current flow to complete the control connection to the gate 63 hence to the control means or relay 45 rather than relying on the closing of a switch. It is also contemplated and within the scope of the invention to use other types of light sources for the device 90 including light sources such as an incandescent light source, a neon light source, a fluorescent light source and so forth. Substitutions can also be made for the photo-transistor device 92 including substituting devices such as light sensitive resistors, field effect transistors (FETS), and silicon controlled rectifiers (SCRs).

FIG. 4 shows another embodiment of the selection monitor circuit 58 using SCR 110 which operates by conducting through a load circuit 112 whenever a selection switch such as the selection switch 12 passes current through the associated vend device 20 by way of the circuit shown including by way of limiting resistors 114 and 116 and diodes 118. This circuit, like the circuits of FIGS. 2 and 3, operates to complete the connection between the circuit leads 38 and 62 and in so doing applies a control signal to the control or gate electrode 120 of the SCR 110 to turn the SCR on or make it conduct. Another resistor 122 is also included in the circuit to help control the voltage applied to the input gate 120. The opposite side of the resistor 122 is connected to the lead 38. A capacitor 124 is connected as shown provides another circuit path around the resistor 122 and is included to bypass extraneous noise and transients that may be present on the power lead 38. The load 112 may be of any one of many different possible load circuit constructions including being a circuit or circuit element such as those shown in FIGS. 2 and 3. Load circuits like the circuits described above have their leads labeled X and Y connected in series with the lead 64 of FIG. 1.

Still another form of the selection monitor circuit 58 is shown in FIG. 5 and includes a relatively simple pulse transformer device 130 whose primary winding 132 is connected in the circuit between the circuit leads 38 and 62. The primary winding 132 is constructed to have a relatively high impedance, and secondary winding 134 may have a relatively low impedance. The pulse transformer 130 operates in a manner somewhat similar to the other disclosed embodiments of the circuit 58 as described above.

FIG. 6 shows a dual changer or accumulator circuit 150 which may be similar to that shown in Johnson U.S. Pat. No. 3,687,255 and which has one of its inputs connected to a cash or credit acceptor circuit 152. The circuit also has two similar selection monitor circuits 154 and 156 respectively labeled "SEL A" and "SEL B", and these circuits are connected respectively to sets of series connected ladder selection switches labeled respectively, 12a, 14a and 16a, and 12b, 14b and

16b. Each series connected set of switches of the "a" and "b" sets are connected to associated vend control means for products that have the same price. In other words, all of the "a" switches control product vends of one price and all of the "b" switches control the vending of products at the same or at some different price. Whenever one of the price selection switches is actuated and closed by the customer it signals an appropriate means in the dual price changer circuit 150 by way of the associated selection monitor circuit 154 or 156 and through the actuated switch, and thereafter the circuit operates in the manner substantially similar to that described above. The changer circuit 150 also has output leads 158 and 160 on which output signals are produced to cause a desired vend operation to take place. This can occur only when the amount deposited and accumulated in the circuit 150 is at least sufficient to satisfy the price of a selected vend. In the circuit of FIG. 6, as in the circuit of FIG. 1, the credit switch 44 must not have its contacts transfer under control of the change maker and accumulator circuit 150 alone even when the amount of the vend price has been deposited, until it is enabled by operation of the associated selection monitor circuit 154 or 156. This means that a vend selection switch must also have been actuated by the customer. This is the case regardless of the form selected for the selection monitor circuit. The circuit of FIG. 6 may also be provided with escrow means 162 similar to the escrow means 67 and operated similarly except for the fact that with the dual price selection feature of FIG. 6, an OR gate circuit 164 is also provided and is connected between the separate accumulator output leads 158 and 160 and the escrow circuit 162. This means that the escrow circuit will be operated selectively in so far as the changer circuit 150 is concerned depending upon the price of the article that has been selected by the customer. An operator actuable escrow switch 166 is also provided as in the other cases.

It is important that the credit switch 44 be transferred by the change maker or accumulator circuit 56 (or 150) only after the vend price has been deposited and not until after it is enabled by operation of the selection monitor circuit 58. The construction and operation of the change maker or accumulator circuit 56 can have many different forms including being an electromechanical device or an electronic circuit, and it may include means to refund amounts deposited when required to do so. Patents which show examples of typical change makers and accumulators and their associated controls which can be used in the present circuit include those listed above. Other examples are also known in the art.

The selection monitor circuit 58 can, if desired, be constructed to be a part of the change maker or accumulator circuit 56, and the same is true of the escrow circuit 67 (and 162) and the relay means 45. Furthermore, the addition of the selection monitor circuit 58 usually only makes it necessary to add one additional lead connection between the vending machine itself and the subject control circuit and this is the lead 62 as shown in FIG. 1. This is a relatively minor machine and circuit change which can easily be made even in the field and does not substantially increase the cost or complexity of the present means or of the vending machine and yet substantially increases the versatility of both. In FIG. 1, the connections between the controls

on the vending machine and the subject control means are identified by the symbols << labeled A, B, C, D, E, F, and G. These connections can easily be included in a relatively simple multi-prong plug thereby making the installation and removal or replacement of the subject control circuit relatively simple.

Thus there has been shown and described a novel and versatile control circuit with provision for escrow until an available product selection has been made, which control circuit fulfills all of the objects and advantages sought therefor. It will be apparent to those skilled in the art however, that many changes, modifications, variations, and other uses and constructions of the subject control means are possible and are contemplated without departing from the intention and scope of the invention, and all such are deemed to be covered by the invention which is limited only by the claims which follow.

What is claimed is:

1. A control circuit for vending or other similar devices which have coin units capable of accepting coins of selected denominations, said coin unit including means for producing output signals corresponding to the value of each coin deposited, accumulator means having an input connected to receive the output signals of the coin unit and including means to accumulate the amount of credit entered in the coin unit during each vending operation, means under control of the accumulator whenever an amount accumulated at least equals the amount of a selected vend price for establishing a condition to enable a vend operation to take place, said last named means including operator actuable vend selection means including switch means and associated vend producing means under control thereof, a vend enabling circuit having a first portion operatively associated with the operator actuable switch means and a second portion under control of the first portion, said first portion being connected in circuit with the vend producing means when the vend switch means are actuated, said second portion and said accumulator each having an output where output signals are produced, means responsive to the simultaneous occurrence of output signals at the outputs of both said second portion and said accumulator to enable a vend operation, actuation of said switch means at a time when the amount accumulated in the accumulator means at least equals the vend price associated therewith energizing the said first portion of the vend enabling circuit to thereby change the condition of and enable the second portion thereof so that said second portion produces an output signal which in association with an output signal from the accumulator means establishes a circuit condition that initiates a vend operation.

2. The control circuit of claim 1 including means to enable full escrow of an amount accumulated in the accumulator means until a vend operation is initiated.

3. The control circuit of claim 1 wherein said first portion of said vend enabling circuit includes relatively high impedance circuit means connected in series with the vend producing means, the impedance of said first portion being selected to be too high to enable sufficient current flow through the associated vend producing means in series therewith for the vend producing means to be able to initiate a vend operation.

4. The control circuit of claim 1 wherein said operator actuable switch means include a plurality of

switches, one of which is associated with each different product to be vended.

5. The control circuit defined in claim 4 wherein said first portion of said vend enabling circuit includes a magnet coil and said second portion includes switch means movable from an open to a closed condition whenever the coil is energized by a customer actuating a selected one of the plurality of switches in the vend selection means at a time when the accumulator has an amount accumulated therein at least equal to the vend price.

6. The control circuit defined in claim 1 wherein said first portion of said vend enabling circuit includes a photo-diode, and said second portion includes means responsive to the light produced when said photo-diode is energized by operation of the switch means in the vend selection means at a time when the accumulator has an amount accumulated therein at least equal to the vend price.

7. The control circuit defined in claim 1 wherein said first and second portions of said vend enabling circuit respectively are electromagnetically coupled coils, one of which has a relatively high impedance as compared to the other.

8. The control circuit defined in claim 1 wherein said first and second portions of said vend enabling circuit respectively include a silicon controlled rectifier circuit including a silicon controlled rectifier having cathode, anode and gate electrodes and circuit means operatively connected to the gate electrode, said second portion includes circuit means connected to the cathode and anode electrodes of the silicon controlled rectifier.

9. The control circuit of claim 8 wherein said second portion includes a relatively high impedance circuit element connected in series with the anode and the cathode electrodes.

10. The control circuit of claim 1 including a price relay having a relay coil operatively connected to the second portion of the vend enabling circuit, said price relay having contacts connected in circuit with the vend producing means to control the operation thereof.

11. Improvements in a vend control circuit for a vending machine having a coin unit for receiving coins of at least one denomination, said vending machine having an accumulator operatively connected to the coin unit and responsive to outputs produced thereby when coins are deposited to accumulate the value thereof, said accumulator including means to control the refunding of amounts deposited in excess of the vend price of a selected product and means for producing an accumulator output signal whenever the amount accumulated therein at least equals the price of a selected vend, means including at least one price selection switch actuatable by a customer to initiate a vend cycle whenever the amount accumulated in the accumulator at least equals the vend price, the improvements comprising means to inhibit the accumulator from initiating a vend or refund operation until after the customer has actuated one of the product selection switches at a time when the amount accumulated in the accumulator at least equals the selected vend price, said accumulator inhibit means including a control monitor circuit having an input control portion connected in circuit with the product selection switch and energized by actuating said product selection switch at

a time when the amount accumulated at least equals the selected vend price, energization of the input control portion of the monitor circuit by itself being insufficient to cause a vend operation to take place, an output portion of said control monitor circuit including means for generating a control output signal whenever the input control portion is energized, and means including a gate circuit and vend control means, said vend control means being energized whenever the gate circuit simultaneously receives input signals from the output of the accumulator and from the output portion of the control monitor, said vend control means including means in circuit with the vend producing means operable to enable vend and refund operations to take place.

12. The improvements in a vend control circuit defined in claim 11 including separate escrow means operatively connected to the accumulator, said escrow means including an escrow switch operable by a customer, and means under control of said escrow switch to cause total refund of an amount deposited up to the capacity of the accumulator, and means to disable the escrow means when said price selection switch is operated at a time when the accumulator has an amount accumulated therein at least equal to the vend price.

13. Improvements in a vend control circuit for a vending machine having a coin unit for receiving coins of at least one denomination, said vending machine having an accumulator operatively connected to the coin unit and responsive to outputs produced thereby when coins are deposited to accumulate the value thereof, said accumulator including means to control the refunding of amounts deposited in excess of the vend price of a selected product and means for producing an accumulator output signal whenever the amount accumulated therein at least equals the price of a selected vend, means including at least one price selection switch actuatable by a customer to initiate a vend cycle whenever the amount accumulated in the accumulator at least equals the vend price, the improvements comprising means to inhibit the accumulator from initiating a vend or refund operation until after the customer has actuated one of the product selection switches at a time when the amount accumulated in the accumulator at least equals the selected vend price, said accumulator inhibit means including a control monitor circuit having an input control portion connected in circuit with the product selection switch and energized by actuating said product selection switch at a time when the amount accumulated at least equals the selected vend price, an output portion of said control monitor circuit including means for generating a control output signal whenever the input control portion is energized, means including a gate circuit and vend control means, said vend control means being energized whenever the gate circuit simultaneously receives input signals from the output of the accumulator and from the output portion of the control monitor, said vend control means including means in circuit with the vend producing means operable to enable vend and refund operations to take place, said vend control means include a vend control relay having a relay contact which goes from a normal to a transferred condition when the relay is energized under control of the gate circuit, a credit relay having a coil connected in circuit with the vend control relay contacts and energized when said contacts are in their transferred condi-

tion, said credit relay including means establishing a hold circuit therefor and other means including contact means connected in circuit with the vend control relay contacts in the normal condition thereof and with the said price selection switch to establish a circuit to cause a vend operation to take place.

14. Means to enable full refund of a deposit in a vending machine until customer selection of an available product after an adequate deposit has been made, the vending machine including operator actuatable vend selection switch means corresponding to each product to be vended, means for entering a credit in the vending machine including accumulator means and means associated therewith for making an entry therein, said accumulator means having first and second outputs, escrow means including a customer actuatable escrow switch operatively connected to the first accumulator output, said escrow switch being actuatable by the customer to obtain a refund of a deposit until product selection is made at a time when the accumulator means have an amount accumulated therein at least equal to the price of the selected vend, means energizable by the escrow switch including refund circuit means operatively connected to the accumulator means to initiate refund of an amount accumulated therein, vend producing means operatively connected to the second accumulator output including means to enable a vend operation to take place whenever the vend selection means are actuated at a time when the accumulator has an amount accumulated therein at least equal to the vend price as determined by operation of the vend selection means, said vend producing means including means to inhibit operation of the escrow means whenever a vend operation is initiated, and a monitor selector circuit having a relatively high impedance input circuit portion and a lower impedance output circuit portion, means connecting said high impedance

input circuit portion in series circuit with the vend selection switch means, said high impedance input circuit portion including means to enable the lower impedance output circuit to initiate a vend operation whenever one of the vend selection switch means are actuated at a time when the accumulator means have an amount accumulated therein at least equal to the price of a selected vend, said last named means including a gate circuit having a first input connected to the second output of the accumulator means, a second input connected to the low impedance output of the monitor selector circuit and an output connected to the vend producing means, a vend operation taking place whenever input signals are present simultaneously on the first and second gate inputs.

15. The means defined in claim 14 wherein the vend producing means include vend relay means having a vend relay coil operatively connected to the output of the gate circuit to be energized by the accumulator means whenever simultaneously enabled by the output circuit portion of the monitor selector, said relay means having relay contacts connected in circuit with the vend selector switch means.

16. The means defined in claim 14 including a tube for storing coins used in refunding and escrowing operations, switch means actuatable when the coin storage tube is empty, and means under control of said empty coin tube switch means to indicate to the customer that future deposits should be made only in the exact change required for the selected vend.

17. The means defined in claim 14 including switch means actuatable when the supply of a product to be vended by the vending machine is exhausted, said empty product switch means when actuated preventing a vend operation from taking place when the customer actuates the associated vend selection means.

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