March 7, 1967 J. R. SHIRLEY 3,307,671

COIN CONTROLLED MEANS

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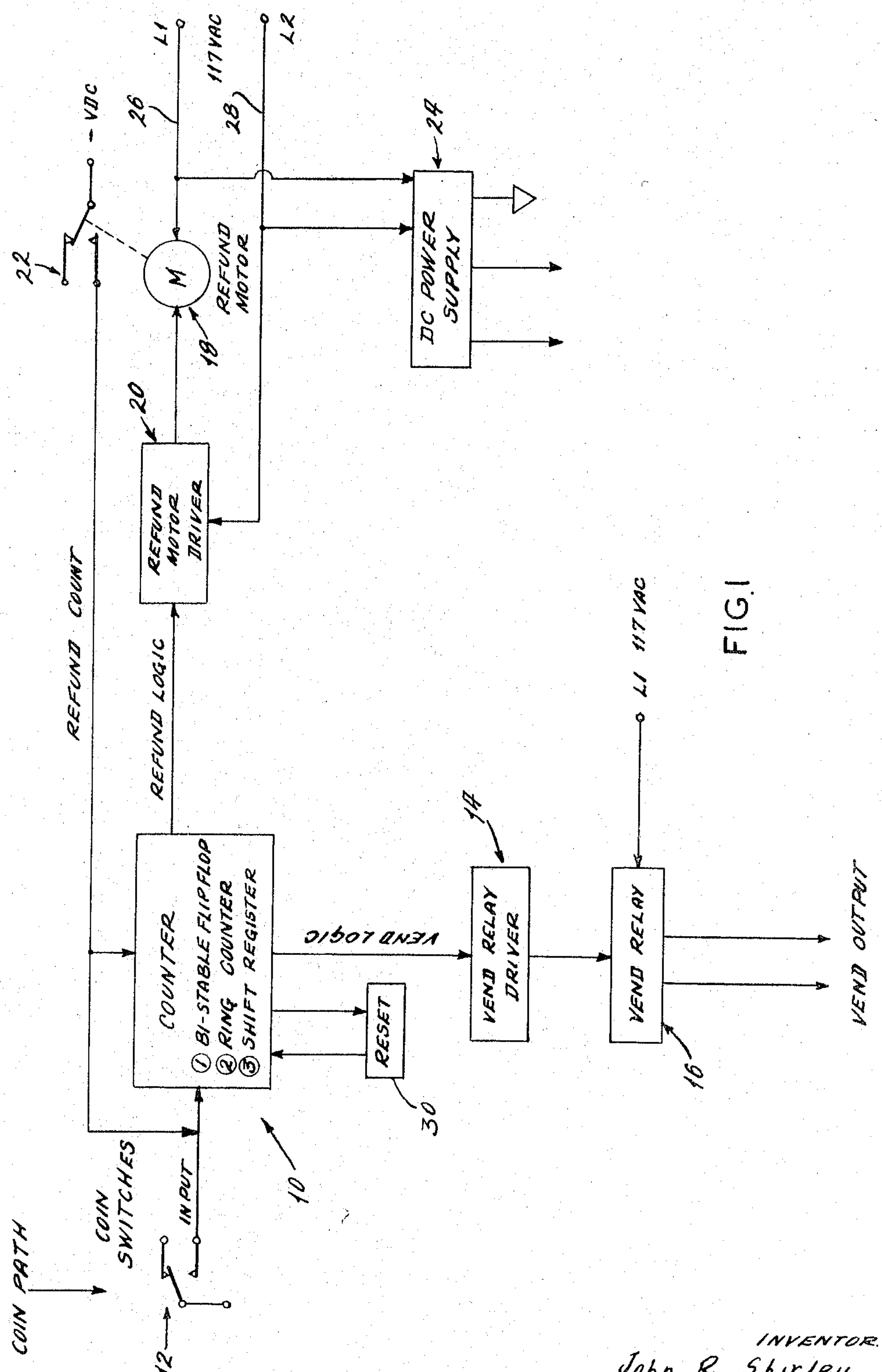

FIG. 1

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COIN CONTROLLED MEANS

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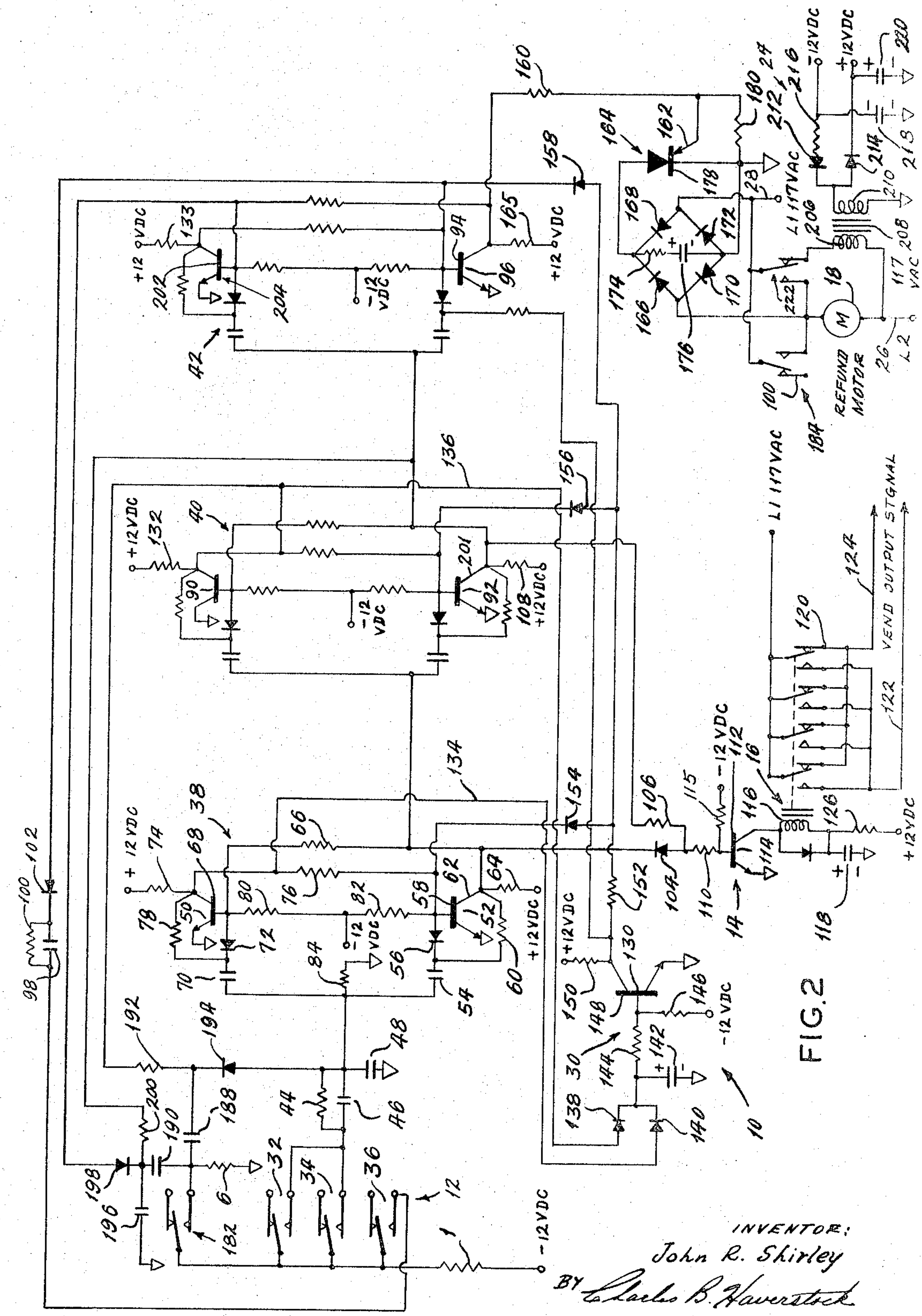

FIG. 2

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COIN CONTROLLED MEANS

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The present invention relates generally to coin controlled devices and the like and more particularly to electronic means for controlling vending, change making and other functions associated therewith.

Many coin operated devices are in existence and some are used for vending, change making and other functions. For the most part, the known devices are limited in their application, are electromechanical in nature, are constructed for specific applications particularly applications which require an exact deposit for each operation and applications where the price of each vend and the amount of each refund is always the same. Mechanical devices are also relatively complicated and require frequent maintenance and repair, and are relatively inflexible. Furthermore, increasing the versatility of mechanical devices disproportionately increases their complexity and cost. Mechanical control devices are also relatively bulky and cumbersome and for this reason are unsuitable for many applications especially applications involving self-contained vending machines where space limitations are critical.

These and other disadvantages and shortcomings of the known vending and coin changing devices are overcome by the present invention which teaches the construction and operation of a novel, versatile and flexible electronic control circuit that is particularly well suited to control vending, coin changing, and other coin operated devices.

The subject circuit is preferably constructed employing solid state components which reduces its size to a minimum and it may include means for accumulating, computing and for other control purposes. The subject control circuit is also relatively inexpensive to construct and install, it can be made relatively small and compact, it is relatively trouble free, and it is extremely versatile so that it can be used for many different applications.

Briefly, the subject device is a control circuit adapted to be used in conjunction with coin controlled equipment such as vending machines and the like and comprises means responsive to the deposit of coins of one or more denominations into a coin unit, means for accumulating the value of the coins deposited, means for controlling a vending or similar operation, and means for refunding the amount deposited in excess of the cost of the vend.

A principal object of the present invention is to provide improved and more versatile means for controlling vending and like devices.

Another object is to expand the functions performed by vending and like devices.

Another object is to increase the business potential of vending machines and the like.

Another object is to provide means for accumulating the value of coinage deposited in a vending or like device.

Another object is to provide means for refunding amounts deposited in vending machines in excess of the price of the vend.

Another object it to provide relatively inexpensive, compact, and maintenance free means for controlling vending and like devices.

Another object is to provide electronic control means for vending and like devices which can be installed as original equipment or added to existing equipment with minimum modification.

Another object is to provide relatively inexpensive control means for coin operated devices.

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Another object is to provide means for automatically resetting a control circuit after each cycle of operation.

Another object it to simplify the mechanical mechanisms employed in vending and like devices.

Another object is to provide plug-in type control units for vending and like devices.

Another object is to minimize the time required for vending and change refunding operations.

Another object is to minimize maintenance on vending machines and the like.

These and other objects and advantages of the present invention will become apparent after considering the following specification which covers a preferred embodiment of the subject device in conjunction with the accompanying drawings, wherein:

FIG. 1 is a block diagram of a control circuit constructed according to the present invention; and

FIG. 2 is a schematic circuit diagram of the same circuit.

Referring to the drawings more particularly by reference numbers, the number **10** refers to a control circuit for a vending or like machine. The subject circuit **10** is constructed to be used to control the vending operations of the machine and also to accumulate the value of coins deposited in a coin unit in order to refund the amount deposited in excess of the price of the vend. The control circuit **10** includes an accumulating circuit which may be a binary type counter circuit, a flip-flop type counter circuit, a ring counter circuit, a shift register type accumulator, a magnetic core accumulator circuit or device or any other equivalent type counter circuit. The circuit **10** may also include a reset portion which restores it to a preset initial condition after completion of each cycle of operation. In a vending application a cycle of operation may include a vending operation and a refunding operation.

The subject circuit is designed to be used in conjunction with a coin receiving unit that may have provision for receiving one or more different denominations of coins. The coin unit (not shown) has one or more coin operated switches such as switch **12** shown in FIG. 1. The machine also includes a vending relay driver **14** which controls a vend relay **16**, a refund drive motor **18** and a control circuit **20** for the drive motor **18**. The refund drive motor **18** operates other switch means identified generally by **22** which cause control impulses to be fed to certain places in the subject circuit **10** in response to predetermined actuation of the refund motor and the amount of money to be refunded. The subject circuit is provided with power from power supply **24** which includes input leads **26** and **28**, and the circuit as shown in FIG. 1 includes a reset portion identified generally by number **30**.

FIG. 2 is a schematic diagram of a preferred form of the subject control circuit specifically designed for use with a vending device that includes means for making a vend and also for refunding an amount deposited in excess of the cost of the vend. The circuit is shown operated in conjunction with three coin operated switches **32**, **34** and **36** which are positioned in a coin unit and are actuated by predetermined movements of coins therein. The switches **32**, **34** and **36** may be located to respond respectively to actuations by different coin denominations moving in the coin unit and when they are actuated they control operations of the subject circuit including operations of bi-stable accumulator circuits **38**, **40** and **42** or any other type accumulator that happens to be used. The bi-stable circuits function as counter or accumulator means as well as memory means and will be described more in detail hereinafter.

In an actual vending operation the switches **32**, **34** and **36** are located to respond to predetermined movements of nickels, dimes, quarters and the like in respective passages in a coin unit. In the particular embodiment shown, which is for a fifteen cent vend machine, the switch 32 is actuated once by each nickel that is deposited, the switches 32 and 34 are each actuated once by each dime that is deposited, and each of the switches 32, 34 and 36 is actuated once by each quarter deposited. The actuations will cause the respective switches 32, 34 and 36 to momentarily close and will in turn cause negative impulses of current or input signals to be produced which are then used to control various operations of the circuit. Certain of these input signals are fed to an input circuit which includes a resistor 44 and a capacitor 46 in parallel, and a capacitor 48 which has one side grounded as shown. The elements 44 and 46 function as a filter circuit to shape the incoming signals and at other times to discharge the capacitor 48. The capacitor 48 functions as a voltage storage device which is charged by the incoming signals and acts to prevent false inputs which might be caused by a bouncing switch. When an input impulse is stored on the capacitor 48 subsequent impulses such as might be caused by a bouncing switch cannot then also be stored on capacitor 48 because of the existing charge thereon. The capacitor 48 therefore acts as a safety feature to prevent errors that might occur due to faulty switch operations.

Whenever a single nickel is deposited in the coin unit the switch 32 will be actuated to generate a negative impulse for storage on the capacitor 48. This stored impulse will also be fed to the input of the first bi-stable circuit 38 which includes oppositely symmetrically connected transistors 50 and 52. Since the circuit 38 is bi-stable it will always be in one of two conditions in which one of the transistors 50 and 52 is turned on or in conducting condition and the other transistor is turned off or in nonconducting condition. The initial or reset condition of the circuit 38 is arbitrarily determined and is controlled by the reset circuit 30. Hence, if the reset condition of the circuit 38 is such that transistor 52 is turned on and transistor 50 is turned off then the incoming negative impulses will be fed through a capacitor 54 and a diode 56 to the base element 58 of the transistor 52. This will cause the transistor 52 to turn off. At the same time the negative input impulse will be fed through a resistor 60 to the collector element 62 of the transistor 52. Therefore, as soon as the transistor 52 is turned off, its load resistor 64 will pass a positive current impulse through resistor 66 to the base element 68 of the transistor 50. This positive pulse will cause the transistor 50 to turn on thereby completing a reversal of the initial condition of the circuit 38. The circuit 38 in its reversed condition acts as a memory circuit to remember the fact that one nickel has been deposited into the coin unit. This condition will remain until another incoming impulse is received due to the deposit of another coin in the coin unit to cause the circuit 38 to flip back to its previous or reset condition. This can be brought about by the deposit of a second nickel or other coin which produces a second similar negative impulse which is similarly stored on the capacitor 48 and fed as an input signal to the circuit 38.

The second impulse, however, instead of passing through a capacitor 54 will pass through another capacitor 70 and another diode 72 to turn off the transistor 50. When the transistor 50 is turned off a positive pulse will be produced across the load resistor 74 and will be fed through a resistor 76 to the base 58 of the transistor 52. This will cause the transistor 52 to turn on. The circuit 38 has now returned to its original condition representing either no deposit or the deposit of an even number of nickels. The circuit of the transistor 50 is similar to the circuit of the transistor 52 and includes a resistor 78 connected as shown. The emitter elements of both transistors 50 and 52 are shown grounded, and the base elements 58 and 68 of the transistors 52 and 50 are biased to an operating condition by means of a balanced circuit including resistors 80 and 82 respectively. The circuit 38 can also be grounded through a biasing resistor 84 connected between the capacitors 48, 70 and 54 as shown.

At the time the transistor 52 is turned on, the voltage on its collector element 62 will change from a positive value to zero or almost zero voltage. When this occurs a negative going D.C. signal is produced and is fed as an input to the second stage bi-stable circuit 40. The circuit 40 is similar in construction to the circuit 38 and includes two oppositely connected balanced transistors 90 and 92. In its reset condition, the transistor 90 is turned off and the transistor 92 is turned on. The circuit 40 is the dime reading circuit in the subject embodiment. When the second nickel is deposited and causes the circuit 38 to return to its original reset state, a carry impulse will be produced and fed to the input of the second stage circuit 40 to be applied to the base of the transistor 92 in a manner similar to the first impulse applied to the base of the transistor 52. This will cause the transistor 92 to turn off and at the same time will produce a positive impulse which will then be applied to the base of the transistor 90 to turn it on. Hence, after the two nickels are deposited, the circuit 38 will have returned to its original reset state and the circuit 40 will be in a transferred state indicating the deposit of two nickels.

If a third nickel is now deposited into the coin unit, the first stage circuit 38 will again be changed to its transferred state but no signal will be fed to change circuit 40. Therefore, circuits 38 and 40 will both be in their transferred states indicating a total deposit of fifteen cents. For a fifteen cent vend machine this condition would be sufficient to energize the vend relay as will be shown. If a fourth nickel is deposited into the coin unit before the vend were completed it would normally be refunded directly without registering in the accumulating circuits. However, if two dimes are deposited or if a fourth nickel is deposited in a twenty or twenty-five cent vend machine the first stage circuit 38 again would be energized by an input impulse and for a second time return to its reset condition. In so doing it would again produce an output impulse which will be fed to the second stage circuit 40. This would cause the circuit 40 to be restored to its initial or reset condition and in so doing would produce an output therefrom which is fed as an input to the third stage circuit 42 in the same manner as already described in connection with circuit 40. The input to the circuit 42 causes circuit 42 to be changed to its transferred state in a manner similar to that described for circuits 38 and 40. When the circuit 42 is in its transferred state and the circuits 38 and 40 are in their reset states this indicates that at least twenty cents has been deposited. Thereafter, additional nickels and dimes can be deposited depending on the price of the vend and until the vend circuits are energized. It will be apparent that more or less circuit stages similar to the circuits 38, 40 and 42 can be used depending on the capacity desired, the cost of the vend, and the coin denominations that are acceptable. For example, a penny circuit, a fifty cent circuit, a silver dollar circuit, or any other number of circuits including duplications of the circuits already mentioned can be added. The circuit 42 can also be connected to another similar circuit which will then record a total deposit of forty cents, thereby enabling the circuit to be used to a total deposit value of seventy-five cents.

When a dime is inserted in the coin unit it will alternately close switches 32 and 34 during movement through the coin unit. In so doing it will generate two distinct negative impulses which will be fed individually to the circuit 38. These impulses will produce succeeding changes in the state of the circuit 38 and will produce one change in the state of the circuit 40 as aforesaid. The operations will be the same as described above for the deposit of two succeeding nickels. In like manner, when two dimes are deposited four distinct negative input impulses (two by each dime) will be generated thereby producing sufficient input impulses to produce two reversals in the state of the circuit 40 and one change in the state of circuit 42 as aforesaid.

When a quarter is deposited in the coin unit it will first actuate the switch 32, then it will actuate switch 36, and finally it will actuate the switch 34. The impulses produced by the actuations of the switches 32 and 34 will operate the bi-stable circuits 38 and 40, in the manner already described, and the impulse produced by actuation of the switch 36 will produce another output which will be fed to the base element 94 of the transistor 96 in the third stage circuit 42. The path for this impulse is through a filter circuit including parallel connected capacitor 98 and resistor 100 in series with diode 102. Therefore the first two impulses generated by the deposit of a quarter will cause the first stage bi-stable circuit 38 to be actuated twice and to finally be in its turned off state which in turn will cause the second stage circuit 40 to be turned on. A quarter deposit will therefore reverse the states of the stages 40 and 42 in the particular fifteen cent circuit disclosed. Many other combinations are also possible using the same or similar counter circuits in varying numbers.

A gate circuit formed by a diode 104 and a resistor 106 is included in the subject circuit 10 and is used in the subject fifteen cent vend circuit to sense when both of the bi-stable circuits 38 and 40 are turned on indicating that the cost of the vend has been deposited. When this occurs positive pulses will pass through the respective load resistors 64 and 108 of the circuits 38 and 40 and will be fed through the gate circuit elements 104 and 106 and through another resistor 110 to the base element 112 of a vend control transistor 114 which is biased into operating condition through resistor 115. This causes the vend transistor 114 to turn on and also causes a positive current impulse to flow through vend relay coil 116 of the vend relay 16. The current flow through the vend relay coil 116 is produced by the discharge of a grounded capacitor 118 which has one side connected to the relay coil 116. The current is enabled by the turning on of the transistor 114 which provides a discharge path to ground. The relay current continues to flow until the condenser 118 is discharged and during this time the relay coil 116 holds its movable contacts 120 in the transferred condition. The transferring of the relay contacts 120 produces an output vend signal on lead 122. Thereafter, when the relay coil 116 is deenergized, the relay contacts 120 will restore to their original condition and in so doing will produce a second vend output signal on lead 124. The combination of two separate output vend signals is necessary to operate the vending apparatus and serves as a safety feature to prevent false vends. The vending apparatus itself is not a part of the present invention. After the vend relay coil 116 is deenergized the capacitor 118 will recharge through a circuit which includes resistor 126 and a positive voltage source. A vend operation will also occur whenever the deposit exceeds the cost of the vend. However, when this occurs refund cycles take place which effect the state of the accumulator circuits and eventually bring them down to the condition described wherein circuits 38 and 40 are both in their transferred states indicating a fifteen cent deposit or the cost of the vend. At this time a vend operation will take place.

The reset means 30 which are included in the subject circuit, include a reset transistor 130 which is provided to reset the bi-stable circuits 38, 40 and 42 to an initial condition after the completion of a vend and change refund operation. The bi-stable circuits 38, 40 and 42 include resistors 74, 132 and 133 respectively for use in their reset operations. When the circuits 38 and 40 are in their reset or off states, positive currents will flow through the resistors 74 and 132. These currents will also flow respectively through leads 134 and 136 and through diodes 138 and 140 to charge a capacitor 142 connected in a circuit with other resistors 144 and 146. This charge is applied to the base element 148 of the reset transistor 130 and causes the transistor to turn on. When this happens current from a positive voltage source will flow through resistor 150 and through the transistor 130 to ground.

Whenever both of the bi-stable circuits 38 and 40 are in their changed or transferred states, no currents will be able to flow through their respective resistors 74 and 132, and under these circumstances the positive charge on the capacitor 142 will be unable to leak back through the diodes 138 and 140. Instead, the positive charge continues to be applied to the base 148 of the transistor 130 maintaining it in a turned on state. At this time, the capacitor 142 will discharge in a predetermined time interval depending upon the time constant of the circuit, and in so doing will cause a negative bias to be applied to the base element 148 turning the transistor 130 off. When this happens the positive current flowing through the resistor 150 will flow instead through another resistor 152 and then through diodes 154, 156 and 158 to be applied to the base elements of the transistors 52, 92 and 96 respectively. This will cause the transistors 52, 92 and 96 in the respective circuits 38, 40 and 42 to turn on and will restore the circuits to their reset conditions. Thereafter, the reset transistor 130 will also be restored to its initial or reset condition.

When the third stage bi-stable circuit 42 changes from its reset state to its transferred state it produces an output impulse which controls a refund circuit. This will take place in a fifteen cent vend operation whenever two dimes or a quarter are deposited. In the case of a two dime deposit, one nickel refund cycle will take place and in the case of a quarter deposit two nickel refund cycles will take place. The output impulses from the circuit 42 passes through a resistor 160 and is applied to the control element 162 of a silicon controlled rectifier (SCR) 164 to cause the SCR to turn on. The impulse that turns on the SCR 164 is produced by a voltage which is connected to the control element 162 through a resistor 165.

The SCR 164 is connected across a bridge circuit which includes bridge elements 166, 168, 170, 172, 174 and 176 as shown. The SCR 164 is connected across the input terminals of the bridge circuit, and the base element 178 of the SCR is grounded. A resistor 180 is also connected between the control element 162 and ground.

The refund motor 18 is connected in series with an alternating current source across the output terminals of the bridge circuit and is energized to produce a refund cycle whenever an impulse is fed to the SCR 164. When the refund motor 18 is energized it operates two cam control switches 182 and 184 which in turn control functions performed during the refund operation. The switch 184 is in a hold circuit for the refund motor 18 and enables the motor to complete an operating cycle and stop at a predetermined position.

The other cam operated switch 182 is in the input circuit to the first stage bi-stable circuit 38 and enables a negative pulse to be fed to the circuit 38 each time a nickel (or other predetermined coin) is refunded. After a nickel is refunded in a case where two dimes are deposited, the switch 182 closes momentarily thereby allowing a negative pulse to be fed to capacitors 188 and 190. This impulse is fed through the capacitor 188 to a circuit which includes a resistor 192 and a diode 194. The same impulse also goes through the capacitor 190 to three other circuits including a grounded capacitor 196, a diode 198, and a resistor 200. If the second stage bi-stable circuit 40 is sitting in its transferred state, the negative impulse that is present between the resistor 192 and the diode 194 is prevented from having any effect due to the reverse biasing of the transistor 90 produced by the resistor 132 and its associated positive voltage source. The negative impulse between the capacitor 190 and the diode 198 under the same circumstances is not so blocked, however, and is applied to the element 201 of the transistor 92. This is so because of the state of circuit 40 which at this time does not have a similar positive bias across the resistor 108. Therefore, the negative impulse generated after one nickel is refunded passes through the network including elements 190 and 200 and is applied to the base 202 of transistor 204 in the third stage circuit 42. This causes the circuit 42 to change to its off state. Since all three circuits 38, 40 and 42 are now off or in reset condition the reset operation is complete.

If a quarter is deposited in the coin unit for a fifteen cent vend operation, two of the input impulses will be used to turn on circuit 40, one input will be used to turn on circuit 42, and circuit 38 will end up turned off. Under these circumstances, it will be necessary for the refund motor 18 to be energized a second time after the first nickel is refunded. This is accomplished by the switch 182 which will close to allow a negative impulse to be fed through the network consisting of the elements 188, 192 and 194 and be applied to the input of the first stage bi-stable circuit 38. When this occurs, all three circuit stages 38, 40 and 42 are on the same as for a two dime deposit and a second refund cycle and a vend cycle takes place. As the second nickel is refunded the switch 182 will close again permitting a second negative impulse to pass to the input of the first stage circuit 38 to turn it off or reset it and in so doing produces an output impulse to turn off the second stage circuit 40. When circuit 40 is turned off it also produces an output which is used to turn off the third stage circuit 42 to complete the reset operation.

A primary winding 206 of a transformer 208 is connected in parallel with the refund motor 18 across its A.C. source. The transformer also has a secondary 210 which supplies energy to a D.C. circuit which is used to provide the positive and negative voltages necessary to operate the circuit 10. The D.C. circuit includes a pair of oppositely polarized diodes or rectifiers 212 and 214, a resistor 216, and two grounded capacitors 218 and 220. The D.C. outputs are labeled +12 and −12 volts and are connected to correspondingly labeled leads located about the circuit. A manual switch 222 is also connected in the circuit of the primary transformer winding 206 and may be opened to deenergize the circuit. The switch 222 is used by repair and maintenance personnel and can also be used to empty the coins out of the coin refund tube.

It should now be apparent that by properly arranging the connecting circuits controlled by the cam operated switches, and by properly selecting the circuit connections for the gate circuit which includes the diode 104 and the resistor 106, as well as the other operating components, it is possible to change vend price and also the refund possibilities. It is also possible to change the number of bi-stable circuits to vary the counting or accumulating capacity of the circuit and to enable the circuit to handle an even greater range of vend and refund possibilities. The subject circuit can also be modified for use with a greater variety of coin denominations.

Thus there has been shown and described a novel coin controlled circuit for use with vending and similar devices which fulfils all of the objects and advantages sought therefor. Many changes, modifications, variations, adaptations and other uses and applications of the subject device, however, will become apparent to those skilled in the art after considering this specification which covers a particular preferred embodiment in conjunction with the accompanying drawings. All such changes, modifications, variations, adaptations and other uses and applications of the subject device which do not depart from the spirit and scope of the invention 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 machines and the like comprising counting means including a plurality of serially connected bi-stable counting circuit stages arranged in an order to be energized sequentially in response to the receipt of impulses produced when coins of selected denominations are deposited in the vending machine for accumulating the value of the coinage deposited, each of said circuit stages having two distinct operating states and each of said stages producing an output whenever it is in a selected one of its two operating states, said stages being connected so that the output from one stage produces a change in the state of the next succeeding stage, said counting means including means for producing output impulses whenever the accumulative deposit equals or exceeds a predetermined price of a vend, first means including motor and motor control means under control of said output impulses for controlling refunding of amounts deposited in excess of the vend price, second means under control of the output impulses for producing a vend operation, and means for resetting the counting means to a predetermined condition after each vend operation.

2. The control circuit defined in claim 1 wherein said counting means includes a plurality of bi-stable circuits connected in succeeding stages, each of said circuit stages having an input and an output and each of said circuit stages including means for changing its operating state each time its input receives an impulse.

3. The control circuit defined in claim 2 in which the plurality of bi-stable circuit stages includes a first stage having an input connected to respond to impulses generated in response to the deposit of coins in the vending machine, means in said first stage for generating an output impulse in response to the receipt of every other input impulse thereto, and a second stage having an input connected to respond to the output impulses generated by the first stage.

4. A control means for vending machines and the like which machines include a coin receiving unit capable of receiving coins and producing output impulses corresponding to the value of each coin deposited therein, means for producing a vend operation and means for refunding amounts deposited in excess of the vend price comprising a container including a plug-in receptacle adapted to mate with a receptacle in the vending machine when the container is installed to establish circuit connections therebetween, said container containing a circuit for controlling the operations of the vending machine including at least two bi-stable circuits each of which is capable of being in a first or second operating state, means for changing the state of at least one of said circuits in response to the receipt thereby of each output impulse from the coin receiving unit in the vending machine, said one bi-stable circuit producing an output signal every time it goes from a predetermined one of its operating states to its other state, each output signal from said one circuit producing a change in the state of said other bi-stable circuit, means for producing a control output signal from said bi-stable circuits whenever the said two bi-stable circuits simultaneously have a predetermined arrangement of their operating states, and means connecting said control output signal to the vend producing means and to the refund means on the vending machine to control the operations thereof.

5. The control means defined in claim 4 wherein said means for changing the state of at least one of said bi-stable circuits in response to the deposit of a coin in the coin receiving unit includes means to temporarily store each impulse received from the coin receiving unit, said storage means temporarily preventing other output impulses received from the coin receiving unit from changing the state of said one bi-stable circuit.

6. Means for controlilng the operations of a vending machine and the like which includes vending control

means, a coin receiving unit including means for producing a predetermined number of output impulses for each denomination of coin deposited therein, and means for refunding money deposited in excess of the vend price comprising means for counting the amount of money deposited in a vending machine, said counting means including a counting circuit having a plurality of serially connected counting stages each of which is capable of being in one of two distinct operating states, said counting stages including a first stage having an input which responds to each impulse produced by the coin receiving unit on the vending machine when a coin is deposited therein, said first stage having an output connected to the input of a second counting stage, means for changing the state of the first stage back and forth a predetermined number of times under control of the number of impulses produced by the coin receiving unit in response to the deposits made therein, means in the first stage for producing an output impulse to change the state of the second stage on alternate changes in the state of the first stage, vend control means connected to the output of at least one of said counting stages, said vend control means being actuated by said counting means whenever a predetermined condition of the states of the said counting stages, exists, and means for resetting the states of the counting stages to a predetermined condition after each actuation of the vend control means.

7. The control means for vending machines and like defined in claim 6 wherein the coin refund means on the vending machine are connected to the output of the counting stages, said refund means responding to the occurrence of a predetermined condition of the states of predetermined ones of the counting stages to refund monies deposited in excess of the price of the vend.

8. A control means for vending machines and the like which machines have coin receiving units including means for generating a predetermined number of impulses to represent the money value of each coin deposited therein, vending control means and means for refunding sums deposited in excess of the vend price, said control means including counting circuit means responsive to the impulses generated by the coin receiving unit when coins are deposited therein and capable of accumulating the value amount of the coins so deposited during each vend operation, said counting circuit means including first and second bi-stable serially connected stages each including at least one solid state element, each of said stages being capable of being in one of two distinct operating states, means connecting the first stage to respond to the impulses generated by the coin receiving unit, each impulse from said unit producing a change in the state of said first stage, said first stage including means for producing an output signal to change the state of the second stage on alternate changes in the state of said first stage, output means associated with said counting circuit for energizing the refund means whenever the amount deposited exceeds the price of the vend, and other means under control of the counting circuit means for energizing the vend control means whenever the counting circuit means has an accumulated amount therein equal to the vend price.

9. The control means defined in claim 8 including means for resetting the counter circuit means to a predetermined condition at the conclusion of each vending operation.

10. The control means defined in claim 8 wherein the refund means includes means for producing an impulse whenever a refund operation takes place, means connecting said refund means to the counter circuit means to energize said counter circuit means in an additive manner to cause the counter circuit means to change its states to represent a new money amount that has been reduced by the amount of each refund.

11. Control means for vending machines having coin receiving units including switch means actuated by predetermined movements of coins therein to produce output signals to represent the amount of each deposit, vending control means, and means for refunding money, comprising counting circuit means responsive to predetermined actuations of the switch means in the coin receiving unit said counting circuit means including first, second and third serially connected bi-stable circuit stages each including at least one solid state element, each of said circuit stages being capable of being in one of two different operating states, said first circuit stage being energized by the output signals from the coin receiving unit, said first stage producing outputs on alternate changes in its state ond stage on alternate changes in its state and said second stage producing outputs on atlernates changes in its state to produce outputs to change the state of the third stage, the state of all of the stages representing the value of coins deposited during each vend operation, said counting circuit means including an output circuit for energizing the refund means on the vending machine whenever the amount of a deposit exceeds the price of the vend, means for reducing the equivalent money value accumulated in the counting circuit means by the amount of each refund, said last named means including means for changing the state of the counting circuit stages by the amount of each refund, and other output means under control of the counting circuit means for energizing the vend control means whenever the counting circuit means has an accumulated amount therein equal to the vend price.

12. The control means defined in claim 11 wherein said counting circuit means includes a ring counter circuit having a plurality of succeeding stages connected in tandem, the first of which is actuated once by each output signal of the coin receiving units, and each succeeding stage in order being actuated upon receipt of a signal from the preceding stage whenever the preceding stage is transferred to its actuated condition.

13. A control circuit for vending machines and the like which have coin receiving means, vending control means and means for refunding coins, said control circuit including counting circuit means having input means responsive to signals generated by the deposit of coins in the coin unit, said counting circuit responding to said input signals to accumulate the value of coins deposited during each vending operation, said input means including charge storage means capable of temporarily storing each input signal for a long enough time to prevent false input signals from producing erroneous input signals to the counting circuit means, said counting circuit means including means for energizing the refund means on the vending machine whenever an amount deposited exceeds the price of the vend, and other means under control of the counting circuit means for energizing the vend control means whenever the counting circuit means has accumulated an amount therein that at least equals the vend price.

14. The control circuit defined in claim 13 wherein the counting circuit means includes a plurality of bi-stable circuit stages each of which includes at least one solid state element.

15. In a vending machine including a coin receiving unit including means for generating an impulse for each unit amounts of money deposited, control means in the vending machine for refunding money amounts deposited in excess of the vend price, and other control means for producing a vend operation, the improvement comprising a packaged control circuit including a container having a circuit therein, said circuit including a counting circuit having a plurality of serially connected circuit stages, each stage having an input, an output and being capable of being in one of two distinct operating states, each of said circuit stages transferring from one of it is operating states to its other operating state every time a pulse is fed to its input, means connecting the input of one of said stages to respond to the impulses generated by the coin receiving unit, said one stage producing an output impulse on alternate changes in its state, the output of said one

stage being connected to the input of a second stage to change in the state of said second stage each time said one stage produces an output impulse, and so on for all of the circuit stages, output connection means for said counting circuit including means for producing an output control impulse whenever the state of said plurality of serially connected circuit stages represent a cumulative coin deposit at least equal to a predetermined vend price, and means connecting said output control impulse to the vending and refunding controls in the vending machine.

16. In the vending machine defined in claim 15 said packaged control circuit includes means for resetting the

serially connected circuit stages to a predetermined condition of their stages each time a vend operation takes place.

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