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ELECTRONIC COIN TOTALIZER

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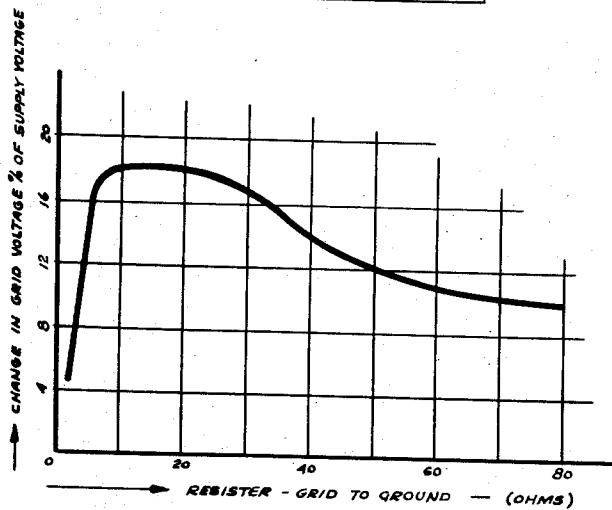
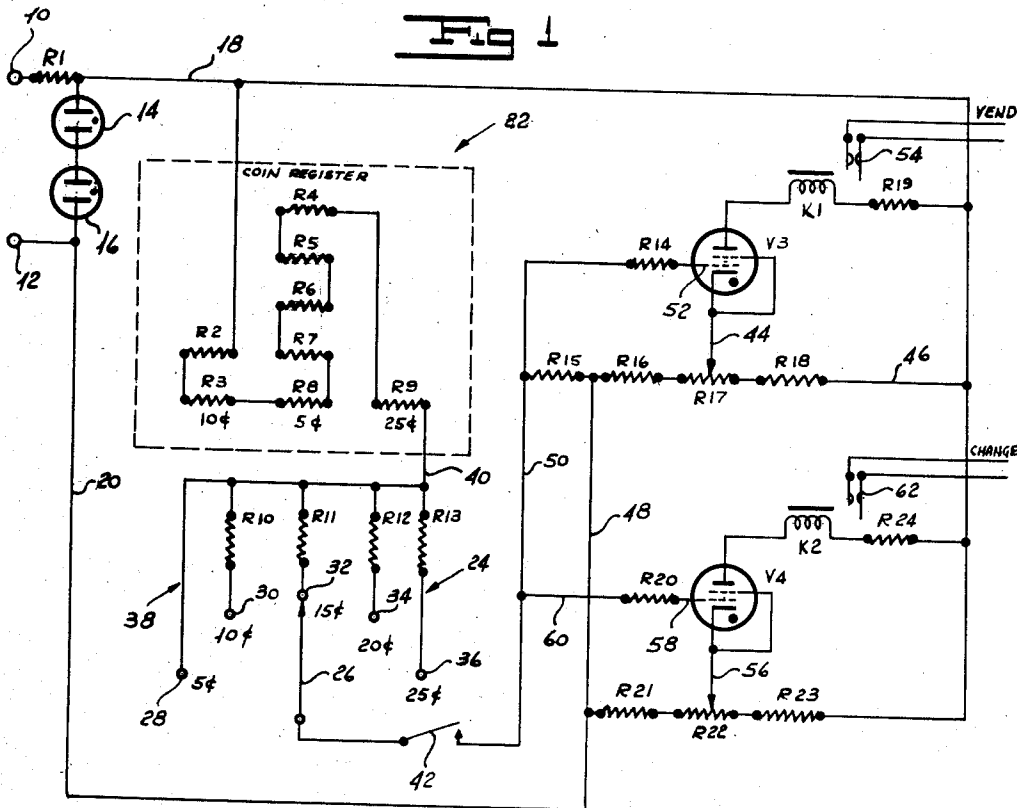


Fig 2

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ELECTRONIC COIN TOTALIZER

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7 Claims. (Cl. 194—6)

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My invention relates to an electronic coin totalizer and more particularly to a device for generating a signal upon the deposit of a predetermined number of coins of various denominations.

Vending machines comprise apparatus adapted to deliver merchandise of various types, such as cigarettes, candy, or the like upon the operation of a push button, pull member or lever. Sometimes vending machines operate automatically upon the deposit of a coin or plurality of coins aggregating the value of the merchandise being sold. In some cases change is given. Upon deposit of the correct amount the vending machine is either set into operation or freed for operation.

If merchandise is to be sold for twenty-five cents, for example, it is desirable that a vending machine be permitted to operate on the deposit of a twenty-five cent piece, five nickels, two dimes and one nickel, or by three nickels and one dime. Various devices are known to the art permitting a vending machine to be operated on combinations of coins. One system of the prior art employs a plurality of stepping relays adapted to mechanically step the starting switch to the starting position upon the successive deposit of coins. Another system is shown in the copending application of Christian Gabrielsen and John F. Morrison, Serial No. 166,045, filed June 3, 1950, which employs an electric coin register in which a circuit is adapted to be completed by the deposit of various coins of different denominations aggregating the correct amount for the purchase, which circuit operates a relay to initiate the vending and change-making cycles.

The use of relays is satisfactory. Relays, however, have moving contacts which due to arcing sometimes fail to complete the vending or change-making operation. Then too, relays are costly and must be replaced due to the wearing out of moving parts.

One object of my invention is to provide an electronic coin totalizer in which no moving parts or relays are employed except a single, sturdy relay finally to energize the vending cycle and a single, sturdy relay to energize the change-making cycle. Each of these relays will have but a single contact.

Another object of my invention is to provide an electronic coin totalizer in which a multiplicity of relays are avoided.

A further object of my invention is to provide an electronic coin totalizer in which the aggregate amount of the coins deposited for ini-

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tiating the vending cycle can be varied simply, readily and expeditiously.

Another object of my invention is to provide an electronic coin totalizer which is safe in that the vending cycle will not be initiated until coins of the requisite amount are deposited.

Other and further objects of my invention will appear from the following description.

In the accompanying drawings, which form part of the instant specification, and which are to be read in conjunction therewith:

Fig. 1 is a diagrammatic view of an electronic coin totalizer showing one embodiment of my invention.

Fig. 2 is a curve showing the effect of a change in value of the grid resistance upon the grid voltage.

In general, my invention contemplates a series circuit consisting of a plurality of coin-register resistors and fixed resistors governing price, and a thyatron in series across a constant voltage source. The coin-register resistors are adapted to be shortcircuited by the deposit of coins of predetermined denominations. When the correct value of coins has been deposited in the coin register, the thyatron is adapted to fire to operate a vending relay. A second thyatron may be placed parallel with the first thyatron and set to operate at a higher voltage so that if a coin of larger denomination is deposited in the coin register, not only the first but also the second thyatron will fire. The firing of the second thyatron will operate a change-making relay.

More particularly, referring now to the drawings, a voltage from any desired source is impressed across terminals 10 and 12. A pair of space discharge tubes 14 and 16 are provided. By way of illustration, and not by way of limitation, I employ a voltage of 300 volts. The higher voltage gives an ample voltage change on the thyatron grid for a five-cent credit in the register. Each of these space discharge tubes 14 and 16 may therefore be an 150-volt regulator tube connected in series maintaining a voltage of 300 volts across conductors 18 and 20. The resistor R1 is a 3,000-ohm, 5-watt resistor and is adapted to limit the current flowing across the regulator tubes 14 and 16 when they are conducting in their function of regulating the voltage across lines 18 and 20. The coin register indicated generally by the reference numeral 22 is of the type shown in copending application Serial No. 166,045 in which the contact points are bridged by resistors. The resistors R2 and R3 are adapted to be short-circuited by dimes and each has a value

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of 2,000 ohms. The resistors R4, R5, R6, R7 and R8 are adapted to be short-circuited by nickels and each of these resistors has a value of 1,000 ohms. The resistor R9 is adapted to be short-circuited by a quarter and has a resistance of 5,000 ohms. A price-adjustment switch assembly indicated generally by the reference numeral 24 comprises a switch arm 26 adapted to be placed selectively in contact with the five-cent price contact terminal 28, the ten-cent price terminal 30, the fifteen-cent price terminal 32, the twenty-cent price terminal 34 or the twenty-five cent price terminal 36. The five-cent price terminal 28 is connected to the terminal conductor 40 of the coin register 22 by a conductor 38 containing negligible resistance. The ten-cent price terminal 30 is connected to the register terminal conductor 40 through a resistor R10 having 1,000-ohms resistance. The fifteen-cent price terminal 32 is connected to the coin register through resistor R11 having a 2,000-ohm resistance. The twenty-cent price terminal 34 is connected with the coin register through resistor R12 having a 3,000-ohm resistance. The twenty-five cent price terminal 36 is connected with the coin register through R13 having a 4,000-ohm resistance. The resistor R15 comprises a 10,000-ohm resistance. The resistor R16 comprises a 12,000-ohm resistance. The potentiometer R17 has a capacity of 10,000 ohms. The resistor R18 has a value of 30,000 ohms. The plate resistor R19 has a value of 3,000 ohms. The switch 42 may be a push button switch to complete the circuit manually if desired. This is used only in multi-column machines where the push button mechanically connects the particular column to the operating bar, as is well known in the art, and is therefore not shown. The thyatron V3 may be any conventional gas tetrode. The relay K1 may be any sensitive D. C. relay having a 2,500-ohm coil.

The thyatron used has a variation in critical voltage of approximately 2 volts. Accordingly, as will be clear to those skilled in the art, a voltage change in the vicinity of five volts will give reliable operation. Tests have shown that variations in the alternating current line voltage as high as plus or minus 20% will not adversely affect the performance of the circuit. Actually, line variations of much less than this are encountered in practice but the added factor of safety is provided to prevent accidental purchase for smaller amounts than required.

The variable arm 44 of the potentiometer R17 adjusts the cathode bias. It will be observed that in the circuit shown current flows around the loop comprising conductor 18, conductor 46, resistor R18, resistor R17, resistor R16, conductor 48 to conductor 20 which is the other side of the line. The voltage drop through part of the resistance of resistor R17 plus the voltage drop across resistor R18 is balanced against the voltage drop across the rest of resistor R17 plus the voltage drop across resistor R16 to determine the cathode bias. Let us consider that switch 42 is closed, and there are no coins in the register. This would occur if someone attempted to operate the machine by merely pressing the push button without depositing any coins. The voltage drop across the resistors R2, R3, R4, R5, R6, R7, R8, R9 and one of resistors R10, R11, R12 or R13, depending upon the position of the switch arm 26, as well as resistor R15 in series determine the grid potential. It will be observed that the series of resistors of the coin register and the

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price-adjustment resistor form, in effect, one arm of a potentiometer of which the other arm comprises resistor R15. A reduction in the value of any of the resistors R2, R3, R4, R5, R6, R7, R8 or R9 or in the value of the price-adjustment resistor increases the voltage drop across resistor R15 and hence raises the potential applied to the grid 52 of thyatron V3. When a coin is deposited in the coin register it is arranged to short-circuit resistor corresponding to the value of the coin. For example, the first nickel deposited will short-circuit resistor R8, the second nickel will short-circuit resistor R7, the third nickel will short-circuit resistor R6, the fourth nickel will short-circuit resistor R5 while the fifth nickel will short-circuit resistor R4. Similarly the first dime will short-circuit resistor R3 and the second dime will short-circuit resistor R2, a quarter will short-circuit resistor R9. It will be clear to those skilled in the art that for the resistor values given and with a voltage of 300 volts, the short-circuiting of 1,000 ohms will produce a voltage change of approximately four volts across resistor R15 which determines the grid potential. The moving of the switch arm from the twenty-five cent contact 36 to the twenty-cent contact 34 will reduce the resistance in series with the coin register resistor from 4,000 ohms to 3,000 ohms, namely 1,000 ohms. This enables a sufficient voltage to be applied to the grid 52 when an additional 4,000 ohms is removed from the series circuit in the coin register. This can be done by short-circuiting four 1,000-ohm resistors by the deposit of four nickels. It may be done by the short-circuiting of two 2,000-ohm resistors by the deposit of two dimes. It may be done further by the short-circuiting of 2,000 ohms by the deposit of one dime and the additional 2,000 ohms by the deposit of two nickels. If a quarter is deposited it will short-circuit 5,000 ohms which is over 4,000 and obviously raise the grid potential to above the firing point. When the grid potential is raised the thyatron will fire and current will flow from conductor 18 through the relay winding K1 from the plate to the cathode of the thyatron thence through a portion of the resistance of resistor R17, the resistor R16, conductor 48 to the other side of the line 20. The energization of the winding K1 will operate relay switch 54 to complete the circuit which energizes the vending cycle.

It will be observed that a second thyatron V4 is connected parallel with the first thyatron V3, in an analogous circuit. The resistor R21 has a value of 12,000 ohms similar to resistor R16. The resistor R23 has a value of 20,000 ohms similar to the value of resistor R18. The resistance of the potentiometer R22 is 10,000 ohms similar to the value of the resistance of potentiometer R17. The variable arm 56 of the potentiometer R22 however, is adjusted to give a cathode bias more positive than the bias placed upon the cathode of thyatron V3. In this manner it will require a greater grid potential placed upon the grid 58 of thyatron V4 to cause this tube to fire. The arrangement is such in the example given that the deposit of two dimes, or other coins totalling exactly twenty cents, only cause thyatron V3 to fire while thyatron V4 will not fire. When twenty-five cents is deposited, however, the increased voltage drop across resistor R15 is communicated through conductor 60 to the grid 58 and will be of sufficient magnitude to cause thyatron V4 to fire in addition to firing thyatron V3, thus energizing relay winding K2 and clos-

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ing switch 62 to energize the change-making cycle as well as operating the vending relay. Any suitable change maker known to the art may be employed to give a nickel in change whenever a quarter is deposited for a twenty-cent purchase. If the variable arm 26 were adjusted to make contact with terminal 30, 3,000 ohms will be removed from the circuit as compared with that present when contact terminal 26 is in contact with the twenty-five cent price-adjustment terminal 30. The thyatron V3 will fire upon the deposit of a dime, upon the deposit of two nickels and will also fire when a twenty-five cent piece is deposited. In this case the change-maker is adjusted to give three nickels in change. In the position shown in the drawing with the arm 26 in contact with the fifteen-cent price-adjustment terminal, the thyatron V3 will fire upon the deposit of three nickels, two dimes, or a dime and one nickel, as well as by a quarter. In the case of two dimes, one nickel change is given. In the case of a quarter two nickels change is given. The change-making structure forms no part of the instant invention and any suitable change maker known to the art may be employed, and accordingly the details of the change maker are not described. If the price-adjustment arm is set on the terminal 28 for a five-cent purchase the thyatron V3 will fire upon the deposit of a nickel or upon deposit of a dime, or upon the deposit of a quarter. In the case of a dime or the quarter, the change-maker will operate and one nickel change is given for a dime and four nickels change is given for a quarter.

My circuit cannot be cheated by pulling out the power cord, letting the tubes cool and then attempting to make a purchase before the tubes are completely warmed up. Under these conditions greater resistances must be short-circuited and it will be necessary, for example, if this is attempted, to put in twenty-five cents to make a twenty-cent purchase.

It will be seen that I have accomplished the objects of my invention. I have provided an electronic coin totalizer for controlling vending machines which is flexible and simple in construction. I have provided an electronic coin totalizer in which a single contact relay is used to complete the vending cycle and a single contact relay is employed to operate the change maker. Both relays are automatically controlled from the same coin register. Changes in prices at which the totalizer will complete the circuit may be rapidly and expeditiously made. My electronic coin totalizer is very flexible, has only two moving parts and cannot be cheated. It is simple and inexpensive to construct and easy to maintain.

It will be understood that certain features and subcombinations are of utility and may be employed without reference to other features and subcombinations. This is contemplated by and is within the scope of my claims. It is further obvious that various changes may be made in details within the scope of my claims without departing from the spirit of my invention. It is therefore to be understood that my invention is not to be limited to the specific details shown and described.

Having thus described my invention, what I claim is:

1. An electronic coin totalizer including in combination a thyatron having a grid and an anode and a cathode, a voltage source, a circuit including a relay winding for impressing poten-

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tial from the voltage source across the anode and cathode of the thyatron, means for biasing the cathode to a predetermined potential with respect to ground, a potentiometer comprising a pair of fixed resistors, a coin circuit for connecting the potentiometer across the voltage source, a conductor connecting the grid to the potentiometer intermediate the resistors, a coin register adapted to receive coins, one of said potentiometer resistors being positioned in the coin register to be short-circuited by a coin deposited therein, the construction being such that upon the short-circuiting of one of the potentiometer resistors by a coin deposited in the register the potential impressed by the potentiometer upon the grid will be increased to a point to fire the thyatron whereby to energize the relay winding and a contact adapted to be closed by the energization of the relay winding.

2. An electronic coin totalizer including in combination a thyatron having a grid and an anode and a cathode, a voltage source, a circuit including a relay winding for impressing potential from the voltage source across the anode and cathode of the thyatron, means for biasing the cathode to a predetermined potential with respect to ground, a potentiometer comprising a group of a plurality of fixed resistors and a separate fixed resistor, a coin circuit for connecting the potentiometers across the voltage source, a conductor for connecting the grid to the potentiometer intermediate the group of fixed resistors and the separate fixed resistor, a coin register adapted to receive coins, each of the plurality of the group of fixed resistors being positioned to be short-circuited by respective coins in the coin register, the construction being such that the short-circuiting of a predetermined number of resistors will raise the voltage applied to the grid to a point to cause the thyatron to fire whereby to energize said relay winding and a contact adapted to be closed upon the energization of the relay winding.

3. An electronic coin totalizer as in claim 2 including a second thyatron having a grid and an anode and a cathode, a circuit including a second relay winding for impressing potential from the voltage source across the anode and cathode of the second thyatron, means for biasing the second cathode to a predetermined potential with respect to ground above that to which the first cathode is biased, a conductor for connecting the grid of the second thyatron to the potentiometer intermediate the group of fixed resistors and the separate resistor, the construction being such that upon the short-circuiting of a greater number of resistors of the group of fixed resistors than the predetermined number of resistors the second thyatron will fire in addition to the firing of the first thyatron whereby to energize the second relay winding and a second contact adapted to be closed upon the energization of the second relay winding.

4. An electronic coin totalizer as in claim 2 in which some of the group of resistors of the potentiometer positioned in the coin register are adapted to be short-circuited by nickels, some resistors of the group of resistors positioned in the coin register are adapted to be short-circuited by dimes, and one of the resistors of the group of resistors positioned in the coin register is adapted to be short-circuited by a quarter.

5. An electronic coin totalizer as in claim 2 in which said coin circuit includes a variable resistor connected in series whereby to vary the

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number of resistors which must be short-circuited to fire the thyatron thereby providing for price adjustment.

6. An electronic coin totalizer as in claim 2 in which said voltage source comprises the output of a space discharge tube whereby to produce a constant voltage.

7. An electronic coin totalizer as in claim 2 in which said means for biasing the cathode to a predetermined potential includes a second potentiometer connected across the voltage source

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with the intermediate arm of the potentiometer adjustably connected to the cathode.

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References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,980,816	McDill	Nov. 13, 1934
2,462,326	Manoog et al.	Feb. 22, 1949
2,540,063	Victoreen	Jan. 30, 1951
2,589,214	Andrews	Mar. 18, 1952