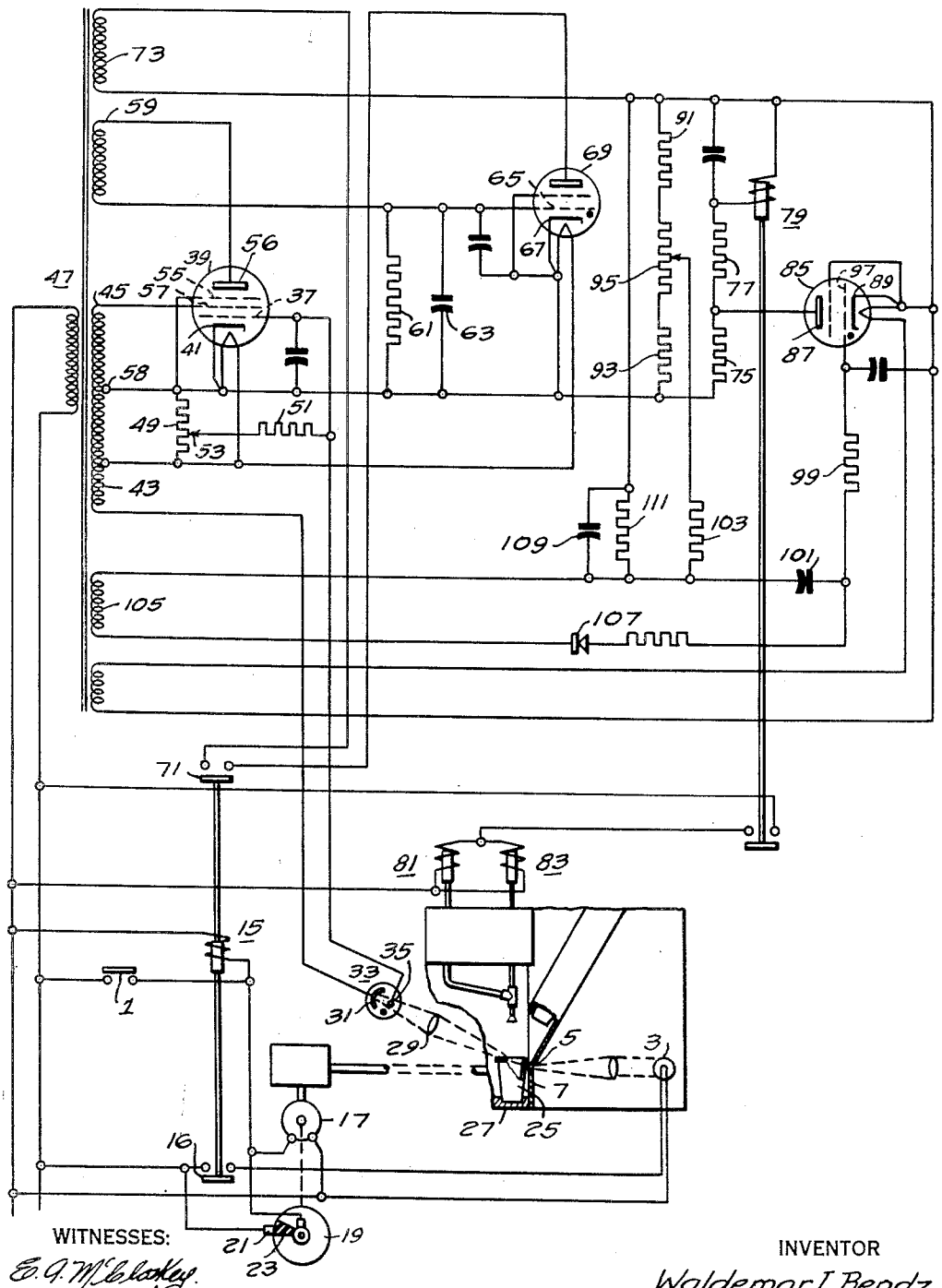
Dec. 22, 1953 W. I. BENDZ 2,663,477

FOOD DISPENSING APPARATUS CONTROL SYSTEM

Filed Dec. 18, 1947



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Patented Dec. 22, 1953

2,663,477

UNITED STATES PATENT OFFICE

2,663,477

FOOD DISPENSING APPARATUS CONTROL SYSTEM

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Application December 18, 1947, Serial No. 792,505

9 Claims. (Cl. 226—46.3)

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My invention relates to photo-sensitive apparatus and has particular relation to food dispensing apparatus.

In its specific aspects my invention applies to coin operable machines for dispensing liquids such as beverages. The operation of such a machine is initiated by the insertion of a coin. Following this event, a cup is deposited on a platform and thereafter a valve is opened and liquid flows into the cup. After the valve has been opened for a predetermined time interval, the valve is closed.

In machines constructed in accordance with the teachings of the prior art, the operations following the insertion of the coin occur in sequence at independently determined time intervals. The insertion of the coin initiates the operation of a series of timing relays. One of these releases the cup; another one operates a predetermined time interval later to open the liquid valve; the third operates a predetermined time interval after the opening of the valve to close it.

In spite of the fact that such relays are ordinarily interlocked, difficulties arise in the operation of prior art machines. The liquid valve may be opened before the cup is in place. Under such circumstances, the liquid falls on the platform. Eventually the receptacle for the cup overflows and the floor under the machine becomes wet. The relay for closing the valve after it is open may operate too early or too late. In the former eventuality, a customer is dissatisfied; in the latter the liquid is wasted and the overflow wets the floor in the region of the machine.

It is accordingly a specific object of my invention to provide a liquid dispensing machine in which the operations following the insertion of the coin shall be dependent each on the actual completion of the preceding operation.

Another specific object of my invention is to provide a liquid dispensing system in which improper flow of the liquid shall be minimized.

A further specific object of my invention is to provide a liquid dispensing system in which each step in the sequence of operations following the insertion of the coin shall be dependent on the completion of a prior step but the flow of the liquid shall be interrupted after a predetermined time interval if it is not interrupted by the completion of the cup filling operation.

Still another specific object of my invention is to provide a liquid dispensing system in which the flow of liquid shall be restrained until released by the proper seating of the cup in the cup receptacle.

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Still another specific object of my invention is to provide a liquid dispensing system in which the flow of liquid shall be stopped either when the liquid reaches a predetermined level in the cup, or in any event, after a predetermined time interval.

A general object of my invention is to provide a food dispensing system which shall operate to satisfy each customer that he has received his money's worth in food while at the same time avoiding any waste of the food.

An ancillary object of my invention is to provide a novel electronic timing system.

More specifically stated, it is an object of my invention to provide a food dispensing system in which each operation of the sequence following the deposit of the coin, with the exception of the operation stopping the flow of food, shall be directly dependent on the completion of the preceding operation, and the operation stopping the flow of food shall be dependent on the completion of the preceding operation but, in any event, shall be stopped a predetermined time interval after it is started.

In accordance with my invention, I provide a radiation-responsive mechanism for controlling the operation of the food dispensing machine. In the practice of the specific aspects of my invention, the deposit of the food container in its receptacle following the deposit of the coin causes a beam of radiated energy to be projected on a radiation-responsive device. The radiation-responsive mechanism causes the food valve to open. When the food in the container has reached a predetermined level the radiation impinging on the radiation-responsive device is interrupted and the valve is closed. If the radiation impinging on the device should not, for any reason, be interrupted a predetermined time interval after the flow of food has been initiated, the food valve is in any event closed.

The novel features that I consider characteristic of my invention are set forth with particularity in the appended claims. The invention itself, however, both as to its organization and its method of operation, together with additional objects and advantages thereof, will best be understood from the following description of a specific embodiment when read in connection with the accompanying drawing in which the single figure is a diagrammatic view showing an embodiment of my invention.

In the drawing, only those features of a liquid dispensing machine concerned with my invention are shown. Such a machine includes switches (not shown) which are closed only if

sufficient quantities of the liquids to be dispensed are available. Such switches when closed, open the coin slot and render the machine capable of accepting a coin. The machine may be provided with several slots (not shown) for accepting different coins such as nickels, dimes, and quarters. The machine also includes a switch which is momentarily closed by the coin as it moves through the coin slot. The mechanical relationship between the coin switch and the slot is well known in the art, and is not shown in detail. Once a coin is deposited relays (not shown) are energized to prevent deposit of another coin until the operation following the first deposit is completed. The machine also includes pilot lights, and switches for such lights (both not shown), for indicating when it is in proper condition for operation and when it is in operation.

The machine in accordance with my invention includes a light source 3 such as an incandescent lamp from which a light beam is projected through an opening 5 in the cup slot 7 to the region beam of the cup. When the machine is not operating, the lamp circuit is open. When the coin switch 1 is momentarily closed, the exciting coil of a relay 15 is energized to close the lamp circuit at its lower contact 16. Current is also momentarily supplied through the coin switch to a cup-drop motor 17. The initial rotation of the motor 17 causes a segmented contact disc 19 to move relative to a brush 21.

When the motor 17 is at rest the brush 21 engages an insulating segment 23 of the disc 19. The initial movement of the motor 17 however advances the disc 19 so that the brush 21 engages a conducting portion thereof closing a circuit, independent of the coin switch 1, through the motor 17 and through the exciting coil of the initiating relay 15 independently of the momentary coin contact 1. The motor continues to rotate and a cup 25 is eventually dropped into the cup receptacle 27.

When the lamp 3 is energized by actuation of starting relay 15, it projects a light beam into the cup slot 7. When a cup is not present in the cup receptacle, the beam is projected to the opposite wall of the slot 7 and produces no effect on the liquid supply mechanism.

The cups 25 in use in liquid dispensing machines are ordinarily composed of waxed paper. Such material is translucent. When a cup 25 is deposited in the cup receptacle 27 of the machine, the light beam impinges on its surface producing a light spot which functions as a secondary light source. The radiation from this source is converged by a suitable lens system 29 on the cathode 31 of a photo-electric cell 33.

The anode 35 of the cell 33 is connected directly to a control grid 37 of a pentode 39 and the cathode 31 of the cell is connected to the cathode 41 of the pentode through a portion of the winding 43 of the secondary 45 of a supply transformer 47 and thru a voltage divider 49. The control grid 37 is also connected through a resistor 51 to the movable tap 53 of the voltage divider 49.

When light does not impinge on the photo-electric cell 33, the cell impedance is high, ordinarily of the order of one hundred megohms. Under such circumstances the grid-to-cathode potential of the pentode 39 is determined by the setting of the voltage divider 49. The latter is so set that the control grid 37 is at a sufficiently negative potential relative to the cathode 41 just to prevent the flow of appreciable grid current and limit the maximum anode current within the specifications of the tube rating. The other grid electrodes 55 and 57 of the pentode 39 are so connected that under such circumstances the pentode conducts maximum current.

When light emitted from the cup 25 impinges on the cell 33, the latter becomes more conducting. Current flows through the circuit composed of divider 49 from slider 53, the winding 43 of transformer 47, cell 33 and resistor 51. With the transformer polarities as specified, this occurs when the anode 56 is positive. Current flowing through resistor 51 produces a voltage drop across it, with negative polarity at the right, adjacent to grid 37. This potential across resistor 51 adds the negative grid bias to render the potential of grid 37 more negative than when the cell is not energized. The pentode 39 becomes non-conducting; that is, the current through anode 56 is decreased to a negligible value.

The anode 56 and cathode 41 of the pentode 39 are connected in a circuit extending from the upper terminal of a secondary section 59 of the transformer 47 through the anode-cathode path of the pentode, a network consisting of a resistor 61 and a capacitor 63 connected in parallel, to the lower terminal of the secondary section 59. When a cup 25 is not present in the receptacle 27 and the pentode 39 is conductive, the capacitor 63 is charged with its upper plate negative and its lower plate positive. When the cup is deposited in the receptacle and the pentode becomes non-conductive, the capacitor 63 is discharged through the resistor 61.

The network 61—63 is connected between the control grid 65 and the cathode 67 of a thyratron 69. When the machine is not in operation, the anode circuit of the thyratron 69 is maintained open at an upper contact 71 of the initiating relay 15. When the initiating relay is energized on the deposit of a coin in the coin slot, this contact is closed and the anode circuit through the thyratron 69 is closed. The thyratron, however, remains non-conductive so long as there is no cup in the cup receptacle 27, because a negative potential is impressed by the capacitor 63 connected between its control grid 65 and its cathode 67.

When the capacitor 63 is discharged on the deposit of a cup 25 in the receptacle, potential of grid 65 is reduced to zero and the thyratron 69 becomes conductive. Current then flows in a circuit extending from the upper terminal of a secondary section 73 through the contact 71 of the initiating relay, the anode-cathode path of the thyratron 69, a pair of resistors 75 and 77, the exciting coil of the liquid valve relay 79, to the lower terminal of the secondary section 73. The liquid valve relay 79 is now actuated energizing the valve circuit and causing the valves 81 and 83 which control the flow of carbonated water and syrup respectively to the cup 25 to open. The liquid valves are of any type known in the dispensing art; their specific structure does not concern the present invention.

The liquid continues to flow into the cup 25 until it reaches the desired level. At this point, it deflects or blocks the light beam depending on its optical properties. The photo-electric cell 33 now again becomes highly resistant; the pentode 39 again becomes conductive; the thyratron 69 becomes non-conductive, and the valve relay 79 is deenergized causing the valves 81 and 83 to close.

The eventuality may occur that a dishonest

person may endeavor to maintain the flow of liquid into the cup 25 or a receptacle of his own by projecting light from a match or a flashlight into the cell 33. I provide a timing system to guard against such eventuality. This system includes a second thyratron 85. The anode 87 of this thyratron 85 is connected to the junction of the resistors 75 and 77; the cathode 89, to the lower terminal of the secondary section 73 which supplies anode potential to the first thyratron 69. A pair of resistors 91 and 93 and a voltage divider 95 are connected in parallel with the resistors 75 and 77 and the exciting coil of the valve relay 79.

The control grid circuit of timing thyratron 85 extends from its cathode 89 upward, thence down to the parallel circuit of resistor 111 and capacitor 109, through capacitor 101, grid resistor 99 and to the grid 97. Capacitor 101 is charged by energy from secondary winding 105 of transformer 47 together with rectifier 107, to a polarity such that its left-hand plate is positive and its right-hand plate negative. The potential across capacitor 101 renders the potential of grid 97 negative relative to its cathode and prevents conduction of the timing thyratron 85.

When the first thyratron 69 is conductive, current flows through the resistors 75 and 77 and the exciting coil of the relay 79. The potential drop across the resistor 77 and exciting coil is impressed as an anode-cathode potential across the second thyratron 85. However, this thyratron 85 is maintained non-conductive because its control electrode 97 is biased negative relative to its cathode 89 by the above-mentioned bias-voltage across capacitor 101.

The positive plate of the biasing capacitor 101 is connected to the lower terminal of the secondary section 73 through a capacitor 103 shunted by a resistor 111.

The parallel network, capacitor 109 and resistor 111, are connected in series with resistor 103 between the slider of dividing resistor 95 and the junction to the lower end of winding 73. Prior to starting of the operating cycle by depositing a coin in the machine, the potential across resistors 91, 95 and 93 is zero and capacitor 109 is fully discharged through resistor 111. As soon as cup 25 is properly seated, a voltage appears across resistors 91, 95 and 93, equal to the voltage across the exciting coil and resistors 75 and 77. A portion of this voltage, between the slider of dividing resistor 95 and the top of resistor 91, is impressed across the network composed of capacitor 109 and resistor 103. Positive polarity appears at the slider of resistor 95.

Capacitor 109 is now charged with positive polarity at its lower plate in this network. Hence, the potential across capacitor 109, initially zero, begins to rise at the instant thyratron 69 becomes conducting. The rate at which this potential increases depends upon the value of capacitance 109, resistance 103 and the voltage between the slider of resistor 95 and the top of resistor 91. The latter component is adjustable and controls the rate of increase of the voltage across capacitor 109.

The grid circuit of thyratron 85 includes the shunt network 109—111, the bias voltage across capacitor 101 and grid resistor 99. The polarity of the rising potential across capacitor 109, positive at its lower terminal, opposes that of the steady bias voltage. Thus, the potential of grid 97 becomes less negative as capacitor 109 charges. After the expiration of a predetermined time interval, adjusted by the slider of resistor 95, timing thyratron 85 is caused to conduct. This time interval begins the instant valve relay 79 becomes energized and ends when thyratron 85 becomes conducting.

The anode-cathode elements of thyratron 85 are connected across the series network consisting of the exciting coil of valve relay 79 and resistor 77. The voltage drop across these elements of the thyratron 85 during its conduction is relatively low, so that the potential across the exciting coil in particular drops appreciably when thyratron 85 conducts. This low potential is insufficient to hold the contacts of valve relay 79 closed. That is, valve relay 79 is effectively deenergized when thyratron 85 conducts.

By the timing sequence thus described the valve relay 79 is deenergized and flow of liquid is interrupted a predetermined time interval following its initial opening. Accordingly, if the operation of the system becomes defective or a dishonest person attempts to maintain the flow of liquid by projecting light from a match or flashlight onto the cell 33, the valve relay 79 will open after a predetermined time and interrupt the flow of liquid.

Under normal circumstances, the liquid continues to flow until the light beam is interrupted or deflected and thereafter stops. The motor 17 continues to rotate until the brush 21 engages the insulating segment 23. At this point, the circuits through the motor 17 and the exciting coil of the initiating relay 15 are broken and the latter are deenergized. The lamp 9 is deenergized and the supply of anode potential to the first thyratron 69 and therefore to the second thyratron 85 is interrupted. The operation of a system may now be initiated by the insertion of another coin.

While I have shown and described certain specific embodiments of my invention, other modifications thereof are possible. My invention therefore is not to be limited except in so far as is necessitated by the prior art and the spirit of the appended claims.

I claim as my invention:

1. Apparatus for controlling a food dispensing system including a chamber in which food is disposed, said chamber having a valve therein through which food may pass and a receiver to be positioned to receive the food which passes through said valve; comprising in combination, a relay for controlling the closing and opening of said valve, a radiation actuable system for controlling said relay to open said valve when said container is positioned to receive said food and a control system for causing said relay to close said valve a predetermined time interval after it is opened.

2. Apparatus for controlling a food dispensing system including a chamber in which food is disposed, said chamber having a valve therein through which food may pass and a receiver to be positioned to receive the food which passes through said valve; comprising in combination, a relay for controlling the closing and opening of said valve, a radiation actuable system for controlling said relay to open said valve when said container is positioned to receive said food and to close said valve when a predetermined quantity of food is deposited in said receiver, and a control system for causing said relay to close said valve independently of the quantity of food in said receiver, a predetermined time interval after said valve is opened.

3. Apparatus for controlling a food dispens-

ing system including a container and means for projecting food into said container; comprising in combination, means for projecting a beam of radiant energy on said container, means responsive to the resultant beam of radiant energy emitted by said container when it is in a position to receive said food for turning said projecting means on and responsive to the interruption of said resultant beam when the food in said container is at a predetermined level to turn said projecting means off, and means for turning said projecting means off after a predetermined time interval independently of the quantity of food in said container.

4. In combination a first electric discharge device, a second electric discharge device, said second device having an anode, cathode and control electrode, means for rendering said first discharge device conductive, means, responsive to said first discharge device when it is conductive, for supplying potential between said anode and cathode, and means for supplying a potential between said control electrode and said cathode which varies so that said second device is rendered conductive a predetermined time interval after said first device is rendered conductive.

5. In combination a first electric discharge device, a second electric discharge device, said second discharge device having an anode, cathode and control electrode, means for rendering said first discharge device conductive, means, responsive to said first discharge device when it is conductive, for supplying potential between said anode and cathode, and means, responsive to said first device when it is conductive, for supplying a potential between said control electrode and said cathode which varies so that said second device is rendered conductive a predetermined time interval after said first device is rendered conductive.

6. In combination a first electric discharge device; an impedance in circuit with said first device; so that current flows through said impedance when it flows through said device; a second electric discharge, said second device having a plurality of principal electrodes and a control electrode, said impedance being connecting between said principal electrodes; and a reactive impedance in circuit with said first device so that current flows through said reactive impedance when it flows through said first device, said reactive impedance being connected between said control electrode and one of said principal electrodes.

7. In combination a first electric discharge device; an impedance in circuit with said first device; so that current flows through said impedance when it flows through said device; a second electric discharge, said second device having a plurality of principal electrodes and a control electrode, said impedance being connecting between said principal electrodes; a reactive impedance in circuit with said first device so that

current flows through said reactive impedance when it flows through said first device, said reactive impedance being connected between said control electrode and one of said principal electrodes, and an adjustment for setting the current flow to said reactive impedance to a value such that energy builds up in said reactive impedance at a rate such that said second device is rendered conductive a predetermined time interval after said first device becomes conductive.

8. In combination a first electric discharge device; an impedance in circuit with said first device; so that current flows through said impedance when it flows through said device; a second electric discharge, said second device having a plurality of principal electrodes and a control electrode, said impedance being connecting between said principal electrodes; a reactive impedance in circuit with said first device so that current flows through said reactive impedance when it flows through said first device, said reactive impedance being connected between said control electrode and one of said principal electrodes, and means for rendering said first device conductive, said second device becoming conductive a time interval after said first device becomes conductive which is dependent on the magitude of said reactive impedance.

9. In combination a first electric discharge device; an impedance in circuit with said first device; so that current flows through said impedance when it flows through said device; a second electric discharge, said second device having a plurality of principal electrodes and a control electrode, said impedance being connecting between said principal electrodes; a reactive impedance in circuit with said first device so that current flows through said reactive impedance when it flows through said first device, said reactive impedance being connected between said control electrode and one of said principal electrodes, means for rendering said first device conductive, said second device becoming conductive a time interval after said first device becomes conductive which is dependent on the magnitude of said reactive impedance, and means for discharging the energy in said reactive impedance independently of said second device.

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