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Filed July 9, 1956

2 Sheets-Sheet 1

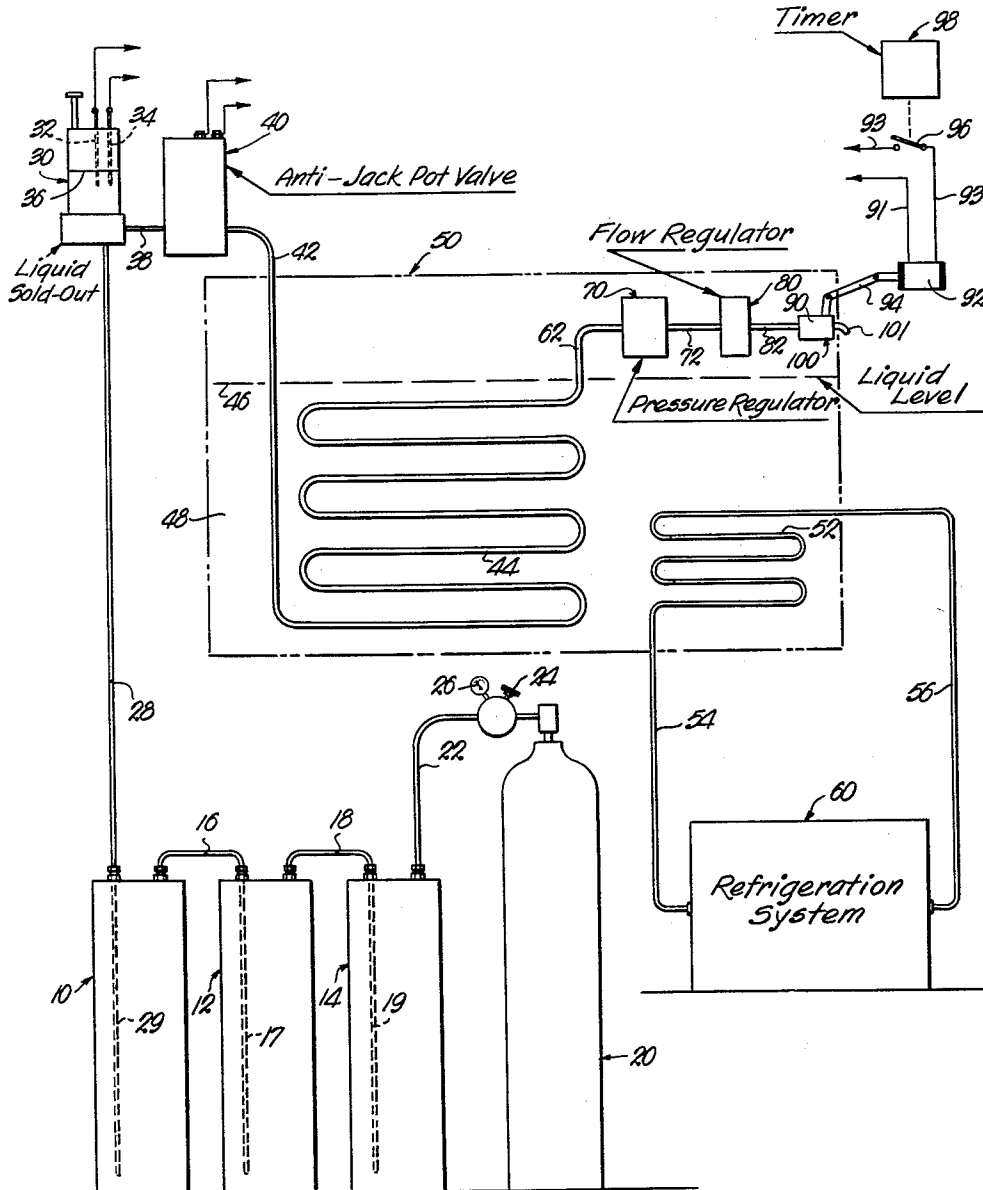


Fig. 1.

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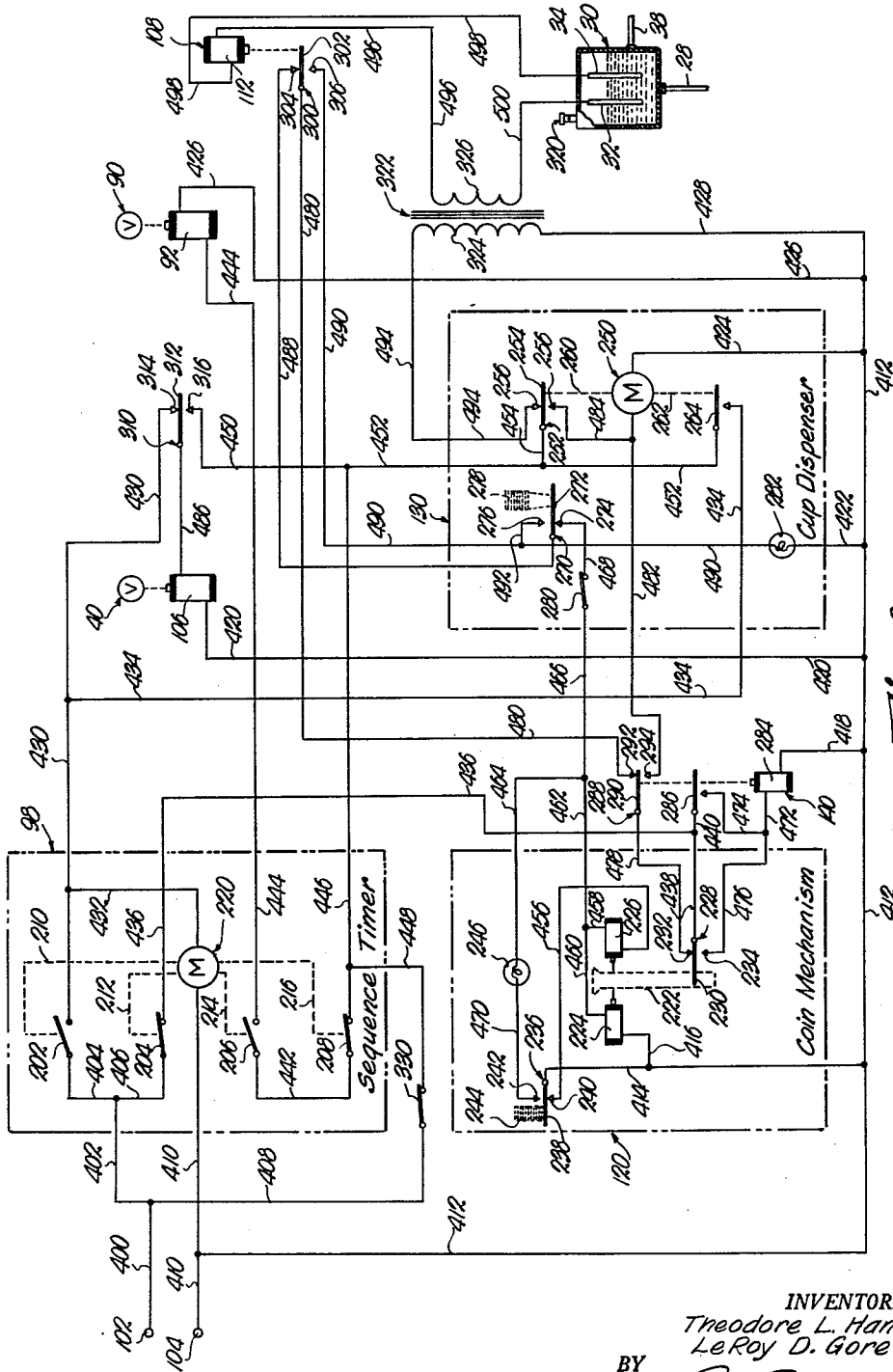


Fig. 2.

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COIN-OPERATED ELECTRICALLY-CONTROLLED CUP DISPENSING MACHINE

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5 Claims. (Cl. 194—13)

This invention relates broadly to the field of machines for vending liquid beverages and, more particularly, to an improved type of bulk beverage vending machine for vending premixed, carbonated beverages.

The primary object of the invention is to provide an improved, overall, integrated liquid handling and electrical control system for vending machines of the premixed type.

It is another important object of the invention to provide improved electrical control circuitry for operating the various mechanisms included in such a machine to accomplish the vending operation in more rapid and reliable manner by the use of control apparatus of optimized simplicity.

Another important object of the invention is to provide such a machine embodying an improved hydraulic system for dispensing carbonated beverages in predetermined bulk quantities and with uniform carbonation and cooling.

Many other important objects of the invention, including improvements in certain sub-combinations and assemblies of the overall machine, will be made clear or become apparent as the following description of the invention proceeds.

In the accompanying drawings:

Fig. 1 is a schematic representation illustrating the hydraulic aspects of a preferred embodiment of the invention; and

Fig. 2 is a schematic diagram illustrating the electrical aspects of such preferred embodiment of the invention.

Referring first to Fig. 1 and giving attention to the hydraulic aspects of the improved vending machine contemplated by the invention, the numerals 10, 12 and 14 generally designate product tanks in which a premixed, carbonated beverage is contained and installed in the machine to serve as a bulk supply of such liquid beverage material. Tanks 10, 12 and 14 will normally be coupled in series by conduit lines 16 and 18 with each of said lines having a pipe respectively designated 17 and 19 extending down into the preceding tanks 12 and 14 respectively.

A supply of carbon dioxide gas under pressure is supplied to the machine within a tank 20, which is coupled with the first product tank 14 through a conduit line 22 having a shutoff valve 24 and pressure measuring gauge 26 interposed therein. A supply line 28 leads from the product tank 10 and includes a portion 29 extending downwardly into the interior of the latter.

It will thus be clear that when the shutoff valve 24 is opened, carbon dioxide gas under pressure will be supplied from the tank 20 into the first product tank 14 to force liquid beverage material from the latter upwardly through the portion 19 of line 18 into the next product tank 12, from which an equal amount of liquid beverage product will be displaced upwardly through the portion 17 of line 16 into the next product tank 10 with an equal amount of liquid beverage being displaced upwardly through portion 29 into the supply line 28 from the

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last product tank 10 of the series (which could comprise either a single product tank 10 or any desired plurality thereof).

By virtue of the pressure thereon the liquid product proceeds upwardly through supply line 28 to an empty indicating device generally designated 30 adapted for detecting the exhaustion of the liquid beverage product from the series of product tanks 10 et seq. and providing upon detection of such a condition a change of electrical parameter (the opening of a switch in the particular device 30 illustrated) for controlling a "sold out" indicating sign or the like, as will hereinafter be made more clear or will be apparent from our co-pending application Serial No. 596,607, now U.S. Patent No. 2,880,910 entitled "Empty Indicating Device and Gas Purging System for Drink Vending Machines," filed on even date herewith. Since our co-pending application contains a full disclosure of the manner in which a suitable empty indicating device 30 may be constructed, reference is made thereto and such description will not be repeated herein. It will suffice, therefore, to note that the empty indicating device 30 is adapted for electrolytically closing a circuit between a pair of electrodes 32 and 34 within the device 30 whenever the level of liquid beverage (indicated at 36) within device 30 is sufficiently high for such liquid to contact both of electrodes 32 and 34. As will be clear from said co-pending application, such condition obtains when the supply of liquid beverage product from the product tank 10 et seq. is not exhausted and has imposed thereon at least a certain minimum pressure by virtue of the pressure of carbon dioxide gas within tank 20 coupled with the system through the valve 24 and line 22.

The outlet port of device 30 is coupled through a conduit line 38 with an anti-jackpot solenoid valve assembly generally designated 40, the purpose of which is to provide a safeguard against possible theft or undesired delivery of an excessive quantity of beverage due to unauthorized meddling with or faulty operation of the dispensing faucet valve and control mechanism therefor hereinafter to be described.

From the anti-jackpot valve 40 the liquid beverage flows under pressure into a conduit line 42 leading into a cooling coil 44 disposed below the upper level 46 of a quantity of water or other cooling medium 48 within a flash cooler generally designated 50. Also disposed within the liquid cooling medium 48 is a cooling or evaporator coil 52 which is coupled by conduit lines 54 and 56 with any suitable type of refrigeration system generally designated 60. Evaporator coil 52 thus maintains the cooling medium 48 at a desired low temperature for cooling the liquid beverage to a predetermined temperature during its passage from conduit line 42 through cooling coil 48 of flash cooler 50.

The output end of cooling coil 44 is coupled by a conduit line 62 with a pressure regulator generally designated 70 and thence by a conduit line 72 with a flow regulator generally designated 80, and finally, by a conduit line 82 with the dispensing valve portion 90 of a dispensing faucet or spigot generally designated 100 and provided with an outlet 101 externally of cooler 50, the dispensing valve 90 being controlled by an operating solenoid 92 coupled therewith by any suitable mechanical linkage 94. Obviously, the pressure regulator 70, the flow regulator 80, and the dispensing valve 90 are preferably disposed above the level 46 of liquid 48 within the sealed and insulated flash cooler unit 50.

It is significant that the entire path for liquid beverage product between cooling coil 44 and outlet 101, including the faucet 100, lies within the cooler 50. This permits dispensing of carbonated beverage without the excessive foaming that occurs in conventional machines having the dispensing faucet located outside the cooled area,

The operation of the system during dispensing will, with the exception of one important feature to be hereinafter explained, be apparent as involving the release of liquid beverage from the dispensing spigot 100 whenever the dispensing valve 90 is operated by virtue of the pressure under which such liquid beverage is maintained within the system, the beverage material thus displaced from faucet 100 being immediately replaced by a flow throughout the system of further beverage material from the product supply tanks 10 et seq., under the influence of gas pressure from tank 20.

It should now be noted, however, that the pressurized carbon dioxide gas from tank 20, besides serving to provide the propelling pressure for liquid beverage from the supply tanks 10 et seq. also serves the important function of maintaining the liquid beverage in a state of equilibrium with respect to the extent of its carbonation. In order to maintain such carbonation of the beverage at the optimum level throughout the system, and particularly, as it emerges from the cooling coil 44 into the conduit line 62, it is desirable that the carbon dioxide supplied from the tank 20 to the system be maintained at a pressure level substantially above that at which the beverage is preferably dispensed from the spigot 100. In actual installations the system pressure of gas supplied by tank 20 should be at least forty pounds per square inch and may range up to as much as approximately one hundred twenty-five pounds per square inch in elaborate systems having very long cooling coils 44 or the like. By comparison, the preferred delivery pressure of the liquid beverage as it emerges from the spigot 100 will be in the neighborhood of thirty-five pounds per square inch or slightly therebelow. The purpose of the pressure regulator 70 is, therefore, to effect this reduction in pressure between those points of the system identified by the conduit lines 62 and 72. Such pressure regulators are familiar to those skilled in the art and may be obtained on the open market. Although regulator 70 is preferably included in the form of apparatus advocated for optimum operation, as described, it will be clear to those skilled in the art that, if desired, the regulator 70 could be omitted without affecting other facets of the machine's functioning.

Attention may now be drawn to the fact that the control solenoid 92 for dispensing valve 90 is energized through a circuit including conductors 91 and 93, the latter having interposed therein a normally open switch 96 whose act and period of closing is controlled by a timer unit generally designated 98. The dispensing valve 90 is, therefore, essentially operated on a time basis, that is, it is opened for a predetermined period of time during each vending operation and then immediately closed. It is, of course, necessary that a uniform quantity of liquid beverage be vended from the spigot 100 during each vending operation. For this result to be accomplished, it is found that the flow of liquid beverage material must be carefully regulated.

Accordingly, the purpose of the flow regulator 80 is to control the rate of flow of liquid beverage material to the dispensing valve 90 when the latter is opened at a uniform rate such that opening of the valve 90 for a predetermined period of time will dispense precisely a correspondingly predetermined quantity of liquid beverage from the spigot 100. Those skilled in the art will recognize that such flow regulator devices as that at 80 are, like the pressure regulator device 70, conventional per se and available on the open market to any specifications required by the design features of a particular installation.

The dual problem of effecting both a pressure reduction in and a regulation of the rate of flow of carbonated liquid beverage material immediately before it is delivered to a dispensing valve and spigot, in order to maintain optimum control over carbonation and the quantity dispensed, is one that has been approached by those skilled

in this field from a number of different angles, many of which have involved the use of complex and expensive combinations of apparatus. The problem is, of course, rendered more complex than appears on the face of the matter by the fact that the resistance to pressures on the liquid beverage within the system are immediately reduced when the valve 90 is opened and are abruptly increased when the valve 90 is closed, all of which, in practice, has a profound effect upon the degree of carbonation being retained by the beverage remaining within the system in cooled condition awaiting dispensing upon the next vending operation. The combination of a pressure regulator 70 and a flow regulator 80 disposed in series in the product line immediately adjacent the dispensing valve 90 and spigot 100 in the preferred embodiment of the invention, has been found to provide a relatively simple and inexpensive, but thoroughly effective, solution to the problem that, insofar as we are aware has gone without satisfactory solution by much more complicated apparatuses proposed for the purpose.

Referring now to Fig. 2 and the electrical portions of the system therein illustrated, the numerals 102 and 104 represent a supply of alternating current power, such as an ordinary power main. Certain portions of the control circuitry can be roughly grouped for purposes of identification as a sequence timer unit generally designated 98 (also shown in Fig. 1), a coin mechanism unit 120, a cup dispenser unit 130, and a holding relay 140. Also shown are the anti-jackpot valve 40, the dispensing valve 90, the operating solenoid 92 for the latter, and the empty indicating device 30 previously identified. An electrical operating solenoid for the anti-jackpot valve 40 is identified by the numeral 106, while the liquid level relay associated with the empty indicating device 30 is generally designated 108 and includes an operating coil 112.

Referring first to the sequence timer unit 98, such unit includes four single pole, single throw switches 202, 204, 206 and 208 adapted to be individually controlled and operated by cam means or the like represented by the dotted lines respectively designated 210, 212, 214 and 216 associated with an electrical timer motor 220. The sequence of operation of the switches 202, 204, 206 and 208 is as follows: Prior to energization and commencement or rotation of the cams 210, 212, 214 and 216 by motor 220, which may be referred to as the normal condition of said switches, as illustrated, the switch 202 is opened, the switch 204 is closed, the switch 206 is opened and the switch 208 is closed; approximately one-half second after the commencement of operation of the timer motor 220, switch 206 closes, the other switches remaining as before; approximately one-half second later during the operation of motor 220, switch 204 opens, then, approximately one-half second later, switch 202 closes; next, after expiration of the dispensing period, switch 208 opens; then, in sequence, first switch 206 reopens, then switch 208 re-closes then switch 204 re-closes and then switch 202 re-opens returning said switches of the timer unit 98 to their normal condition. The consequences of these various steps in the operation of the timer unit 98 will be later explained.

Referring next to the coin mechanism 120, coin receiving chute means are indicated at 222 and have associated therewith a nickel coin reject solenoid 224 and a dime and quarter reject solenoid 226. Also associated with the coin chute means 222 is a single throw, double throw vend switch 228 having a shiftable pole piece 230 adapted to be momentarily shifted from engagement with a stationary contact 232 into engagement with a stationary contact 234 when a coin is inserted and falls through chute means 222. The coin unit 120 also includes a single pole, double throw return supply switch generally designated 236 having a shiftable pole piece 238 normally in engagement with a stationary contact 240 but adapted for shifting into engagement with a stationary contact 242 whenever

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a supply of coins 244 to be used for returning change is exhausted, it being understood that the representation of the relationship between coins 244 and pole 238 of switch 236 is intended as diagrammatic only. Also included in the unit 102 is a lamp 246 adapted when energized for lighting a "Use Correct Change" sign, it being understood that lamp 246 could comprise any suitable indicating mechanism. Other parts and details which will normally be included in the mechanism 120, but which per se form no part of the instant invention, are well known to those skilled in the art and need not be herein discussed.

The cup dispenser unit 130 includes a cup dispensing motor 250 having associated therewith a single pole, double throw motor switch 252 provided with a shiftable pole piece 254 normally in engagement with a stationary contact 256 but shiftable by a cam 260 moved by motor 250 onto engagement with a stationary contact 256. Also associated with motor 250 is a second cam 262 for closing a normally open, single pole, single throw timer energizing switch 264. The cup dispenser unit 130 further includes a single pole, double throw cup supply switch 270 having a shiftable pole 272 normally in engagement with a stationary contact 274 but shiftable into engagement with a stationary contact 276 whenever a supply of cups 278 to be dispensed by the unit 130 for receiving liquid beverage material from the spigot 100 is exhausted. Unit 130 is further provided with a normally closed, single pole, single throw cup anti-jackpotting switch 280 and a "Sold Out" indicating lamp or mechanism 282. It will be understood that the relationship between the cups 278 and the pole piece 272 of switch 270 is illustrated schematically. It should also be observed that the unit 130, whose purpose is to deliver a cup 278 to a position for receiving beverage material from outlet 101 of faucet 100 during each operating cycle of the machine, is per se conventional and of a type available on the open market. Accordingly, details of such unit 130 forming no part of the contribution to the art of the present invention are not herein treated or disclosed.

The holding relay includes an operating coil 284, a single pole, single throw normally open switch 286 and a single pole, double throw switch 288 having a pole piece 290 normally in engagement with a stationary contact 292 but shiftable when coil 284 is energized into engagement with a stationary contact 294.

The liquid level relay 108 includes, besides operating coil 112, a single pole, double throw switch 300 having a shiftable pole piece 302 normally in engagement with the stationary contact 304 but shiftable into engagement with a stationary contact 306 when the coil 112 is deenergized, it being understood that the normal condition of relay 108 is one of energization, except when the supply of liquid beverage in the tanks 10, 12 and 14 is exhausted or other conditions rendering the machine inoperative prevail.

A single pole, double throw manually operable switch 310 is provided with a pole piece 312 normally in engagement with a stationary contact 314 but shiftable into engagement with a stationary contact 316 for use in opening the anti-jackpot valve 40 by energization of solenoid 106 for purging the hydraulic system of bubbles of gas which may accumulate as a result of continued operation involving repeated changing of product tanks 10, 12 and 14 and substitution of new tanks therefor. Such purging is particularly necessary in a system where a different type of empty indicating device 30 than the one described as the preferred embodiment in our said co-pending application is used, it being noted that such preferred form of device 30 includes its own provision for the purging or bleeding-off of gas through means of the valve generally indicated in Fig. 2 by the numeral 320.

An isolating or voltage step-down transformer corresponding to the one described in our said co-pending application is shown in Fig. 2 at 322 and includes a primary winding 324 and a secondary winding 326.

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Also shown in Fig. 2 is a normally closed single pole, single throw disposal switch 330 adapted to be opened whenever facilities provided within the machine for collecting overflowed or waste liquid beverage material are filled to capacity, an analogous switch being disclosed in the copending application, Serial No. 578,997 now U.S. Patent No. 2,836,672, of Herman P. Craven, Jr. and Leonard Bieri, Jr., entitled "Safety Device for Waste Tank," filed April 18, 1956 and owned by the same assignee as the subject invention, reference being made to such last-mentioned application for a disclosure of suitable waste tank structure for operating the switch 330.

The construction or electrical connections between the various components mentioned will first be recited, then the operation of the apparatus will be described.

The power terminal 102 is coupled through conductive means 400, 402 and 404 with switch 202 of timer unit 98 and, through conductive means 400, 402 and 406 with switch 204 of timer unit 98. Terminal 102 is also coupled through conductive means 400 and 408 with the disposal switch 430.

The other power terminal 104 is coupled by conductive means 410 with the operating motor 220 of timer unit 98; through conductive means 410, 412 and 414 with the pole piece 338 of coin supply switch 236; through conductive means 410, 412, 414 and 416 with the nickel reject solenoid 224; through conductive means 410, 412 and 418 with the coil 284 of holding relay 140; through conductive means 410, 412 and 420 with the operating solenoid 106 of anti-jackpot valve 40; through conductive means 410, 412 and 422 with the "Sold Out" lamp 282; through conductive means 410, 412 and 424 with the cup dispensing motor 250; through conductive means 410, 412 and 426 with the operating solenoid 92 of dispensing valve 90; and, through conductive means 410, 412 and 428 with one side of the primary winding 324 of transformer 322.

The side of timer switch 202 opposite terminal 102 is coupled through conductive means 430 with the stationary contact 314 of manual switch 310; through conductive means 430 and 432 with the side of timer motor 220 opposite terminal 102; and, through conductive means 430 and 434 with one side of the timer energizing switch 264 in the cup dispenser unit 130.

The side of timer switch 204 opposite terminal 102 is coupled through conductive means 436 and 438 with pole piece 230 of the coin operated vend switch 228 and, through conductive means 436 and 440 with one side of switch 286 of the holding relay 140.

Timer switch 206 has one side thereof coupled with one side of timer switch 208 by conductive means 442. The opposite side of timer switch 208 is coupled through conductive means 444 with the side of operating solenoid 92 for dispensing valve 90 opposite terminal 104.

The side of timer switch 208 opposite from timer switch 206 is coupled through conductive means 446 and 448 with the side of disposal switch 330 opposite terminal 102; through conductive means 446 and 450 with stationary contact 316 of manual switch 310; through conductive means 446 and 452 with the side of timer energizing switch 264 opposite timer switch 202; and, through conductive means 446, 452 and 454 with the shiftable pole piece 254 of motor control switch 252.

The normally closed stationary contact 240 of coin supply switch 236 is coupled through conductive means 456 with one side of the dime and quarter reject solenoid 226, the other side of reject solenoid 226 being coupled through conductive means 458 and 460 with the side of nickel reject solenoid 224 opposite terminal 104. Such last-mentioned side of coin reject solenoid 226 is also coupled through conductive means 458, 462 and 464 with one side of the "Correct Change" lamp 246 and, through conductive means 458, 462 and 466 with the cup anti-jackpotting switch 280. The other side of the cup anti-jackpotting switch 280, is coupled through conductive

means 468 with stationary contact 274 of cup switch 270 and the other side of "Correct Change" lamp 246 is coupled through conductive means 470 with the normally open, stationary contact 242 of the coin supply switch 236.

The side of holding relay coil 284 opposite terminal 104 is coupled through conductive means 472 and 474 with the side of normally open relay switch 286 opposite the timer switch 204 and, through conductive means 472 and 476 with the normally open, stationary contact 234 of coin operated, vend switch 228. The normally closed stationary contact 232 of vend switch 228 is coupled through conductive means 478 with the movable pole piece 290 of holding relay switch 288.

Normally closed stationary contact 292 of relay switch 288 is coupled through conductive means 480 with the movable pole piece 302 of the liquid level relay switch 300. The normally open contact 294 of holding relay switch 288 is coupled through conductive means 482 with the side of cup dispensing motor 250 opposite terminal 104 and, through conductive means 482 and 484, with the normally open stationary contact 256 of motor control switch 252.

The movable pole 312 of manual switch 310 is coupled with the side of anti-jackpot operating solenoid 106 opposite terminal 104 by conductive means 468. The normally closed stationary contact 304 of liquid level relay switch 300 is coupled through conductive means 488 with the movable pole piece 272 of cup supply switch 270. The normally open stationary contact 306 of liquid level switch 300 is coupled through conductive means 490 with the side of "Sold Out" lamp 282 opposite terminal 104 and, through conductive means 490 and 492 with the normally open stationary contact 276 of cup supply switch 270.

The normally closed stationary contact 256 of motor control switch 252 is coupled through conductive means 494 with the side of primary winding 324 of transformer 322 opposite terminal 104. One side of secondary winding 326 of transformer 322 is coupled through conductive means 496 with one side of liquid level relay coil 112 and the opposite side of coil 112 is coupled through conductive means 498 with electrode 34 of device 30. Electrode 32 of device 30 is coupled through conductive means 500 with the other side of secondary winding 326.

It should be observed that the conductors 91 and 93 and the switch 96 shown for purposes of general illustration in Fig. 1, correspond generally to the conductive means 426, the conductive means 444 and the switch 206 of Fig. 2, although the precise connection is, of course, as shown in Fig. 2.

Operation

The normal or stand-by condition of the various components of the control system is shown in Fig. 2 under conditions assuming that power is connected with terminals 102 and 104, there is an adequate supply of liquid beverage material within the product tank 10 under proper pressure of carbon dioxide gas from the tank 20, there is an adequate supply of cups 278 for dispensing and coins 244 for change-making, and the coin operated vend switch 228 has not yet been actuated by a coin deposited in chute means 222. These are the conditions that obviously obtain between vending operations when the machine is in proper working order in all respects.

When the control apparatus is in this normal condition, the timer-motor 220 is de-energized, the coin reject solenoids 224 and 226 are both energized to withdraw portions thereof from the coin chute means 222 permitting the insertion of coins by a potential customer, the relay 140 is de-energized, the cup dispensing motor 250 is de-energized, the liquid level relay 108 is energized by the electrolytic completion of the circuit including electrodes 32 and 34 of device 30, the dispensing solenoid 92 is de-energized leaving dispensing valve 90 in closed condition,

and the anti-jackpot solenoid 106 is de-energized leaving anti-jackpot valve 40 in closed condition.

Next, assume that a customer deposits the proper coin or coins in the coin chute means 222, such coins will in their descent strike and momentarily swing the movable pole piece 230 of the coin operated vend switch 228 into contacting engagement with stationary contact 234. This energizes coil 284 of holding relay 140 through a circuit traceable from terminal 102 through conductive means 400, 402 and 406, closed timer switch 204, conductive means 436 and 438, pole piece 230 and contact 234 of vend switch 228, conductive means 476 and 472, coil 284, and conductive means 412 and 410 back to the opposite terminal 104. Relay 140 is immediately locked in through a holding circuit in parallel by-passing relationship to pole 230 and contact 234 of vend switch 228, which is traceable from coil 284 through conductive means 472 and 474, now closed relay switch 286 and conductive means 440 to conductive means 436 and thence to terminal 102.

After the coins have passed the pole piece 230 within chute 222, pole piece 230 returns to engagement with contact 232 of vend-switch 228 completing an energizing circuit for the cup dispensing motor 250 traceable from terminal 102 through conductors 400, 402 and 406, closed timer switch 204, conductors 436 and 438, pole piece 230 and contact 232 of vend switch 228, conductor 478, pole piece 290 and contact 294 of now operated relay switch 288, conductive means 482, cup motor 250 and conductive means 424, 412 and 410 to terminal 104.

Operation of the cup dispensing motor 250 first actuates the motor control switch 252 to move pole piece 254 into engagement with contact 256 for completing an alternate energizing circuit for the motor 250 traceable from terminal 102 through conductors 400 and 408, normally closed disposal switch 330, conductors 448, 446, 452 and 454, pole piece 254, contact 256 and conductors 484 and 482 to motor 250. It may be noted that de-energization of the transformer 322 by breaking of the contact between pole piece 254 and contact 256 of motor control switch 252 does not result in operation of the "Sold Out" lamp 282, even though relay 108 is temporarily de-energized, by virtue of the fact that the circuit for energizing pole piece 302 of relay switch 300 is broken by the shifting of pole piece 290 of holding relay switch 288 out of engagement with contact 292 thereof.

Approximately a second after the operation of motor control switch 252 by the cup dispenser motor 250, motor 250 also actuates the timer energizing switch 264 to close the same. Closure of switch 264 completes an energizing circuit for the operating motor 220 of timer unit 98 traceable from terminal 102 through conductors 400 and 408, closed disposal switch 330, conductors 448, 446 and 452, closed switch 264, conductors 434, 430 and 432, motor 220, and conductor 410 to terminal 104.

It may be noted that, when liquid level relay 108 was de-energized by the de-energization of transformer 322 responsive to the operation of motor control switch 252, the energizing circuit for coin reject solenoids 224 and 226 was broken at relay switch 300, and such solenoids 224 and 226 operated to preclude insertion of further coins into the chute means 222.

Upon the closing of timer energizing switch 264, the anti-jackpot solenoid 106 is also energized along a circuit identical to that traced for energizing the motor 220 as far as conductor 434, thence through conductor 430, contact 314 and pole 312 of manual switch 310, conductor 464, solenoid 106 and conductors 420, 412 and 410 back to terminal 104. Energization of solenoid 106 opens the anti-jackpot valve 40 to permit flow of liquid beverage from conduit line 38 on into conduit line 42, the cooling coil 44 and, eventually, the spigot 100, when the dispensing valve 90 has been operated.

Next, as above noted, timer switch 206 closes to complete an energizing circuit for the operating solenoid 92

of dispensing valve 90 through a circuit traceable from terminal 102 through conductors 400 and 408, closed disposal switch 330, conductors 448 and 446, closed timer switch 208, conductor 442, now closed timer switch 206, conductor 444, solenoid 92 and conductors 426, 412 and 410 to terminal 104. Energization of dispensing solenoid 92 opens the dispensing valve 90 to permit liquid beverage to flow out the spigot 100 under the force of the mentioned pressure therebehind and at a rate determined by the flow regulator 80.

Next, the timer switch 204 opens, and still later, the timer switch 202 closes, the intervals involved being approximately one-half second in duration. The opening of timer switch 204 breaks the holding circuit above traced for coil 284 of holding relay 140 and the latter becomes de-energized. The closing of timer switch 202 completes an alternate energizing circuit for the timer motor 220 independent of that above traced, such alternate circuit being traceable from terminal 102 through conductors 400, 402 and 404, now closed timer switch 202, conductors 430 and 432, motor 220 and conductor 410 to terminal 104.

At the end of the period selected for operation of the dispensing valve 90, the motor 220 will open the timer switch 208 breaking the above traced energizing circuit for the dispensing solenoid 92 and thereby closing the dispensing valve 90 to cut off the flow of liquid beverage through the spigot 100. Such dispensing time will normally be of the order of about six seconds.

The operating cycle is then completed, except for returning the various portions of the control circuitry to their normal or stand-by condition. This is accomplished by the motor 220 sequentially, first, opening timer switch 206, then closing timer switch 208, then closing timer switch 204, then opening timer switch 202 to de-energize the motor 220 and leave the system in its normal condition. It may be noted that upon completion of its cup dispensing cycle, the cup dispensing motor 250 released the timer energizing switch 264 to break the first traced energizing circuit for timer motor 220; however, since by that time the timer switch 202 had already been closed to complete the alternate energizing path for motor 220, the operation of the latter continued until the timer switch 202 was finally reopened as the last step of returning the apparatus to its normal condition.

If the supply of coins 244 used for change making should be exhausted, the pole 238 of switch 236 swings into engagement with contact 242 of the latter to energize the indicating lamp 246 for warning customers that they must use correct change only in operating the machine. Should the supply of cups 278 which are used for receiving the vended liquid beverage dispensed from spigot 100 be exhausted, the pole piece 272 of switch 270 would swing into engagement with contact 276 of the latter, energizing the "Sold Out" lamp 282 through a circuit traceable from terminal 102 through conductors 400, 402 and 406, timer switch 204, conductors 406 and 438, pole 230 and contact 232 of vend switch 228, conductor 478, pole 290 and contact 292 of hold relay switch 288, conductor 480, pole piece 302 of empty indicating relay switch 300, contact 304 of the latter, conductor 488, pole piece 272 of switch 270, contact 276 of the latter, conductors 492 and 490, lamp 282 and conductors 422, 412 and 410 to terminal 104.

Should the supply of liquid beverage from the tanks 10, 12 and 14 become exhausted or there be insufficient pressure in the system coming from the carbon dioxide tank 20, the electrolytic circuit between electrodes 32 and 34 of device 30 would be broken and the energizing circuit for liquid level relay 108 de-energized. This would result in movement of pole piece 302 into engagement with contact 306 of the relay switch 300 completing an energizing circuit for the "Sold Out" indicator 282 traceable from the pole piece 302 (which is energized as above traced) through relay switch contact 306, conductor 490,

indicator 282 and conductors 422, 412 and 410 to terminal 104.

It will now be apparent that the improved machine contemplated by this invention is ideally adapted for accomplishing all of the objects specifically above mentioned as well as many others resulting in substantial over-all improvement of the apparatus and its operation. It will also be manifest, however, that a number of minor changes or modifications could be made from the precise details of the structure disclosed for purposes of illustration without departing from the true spirit or intention of the invention. Accordingly, it is to be understood that the invention shall be deemed limited only by the fair scope and contemplation of the claims that follow.

Having thus described the invention what is claimed as new and desired to be secured by Letters Patent is:

1. In a machine for vending liquid beverage in bulk, a dispensing spigot; a liquid conduit line adapted for delivering beverage material from a stored supply thereof to the spigot; a dispensing valve interposed in the conduit line; a solenoid operably coupled with the valve for operating the latter; a cup dispensing unit adapted for delivering a cup from a stored supply thereof to a location for receiving beverage material dispensed from the spigot, said unit including an electrical operating motor for powering the unit, and an electrical timer energizing switch operably coupled with the operating motor for actuation of the switch a predetermined time after energization of the operating motor; a coin operated transfer switch having a first contact, a second contact and a movable pole piece normally in engagement with the first contact but shiftable into momentary engagement with the second contact upon deposit of a coin in the machine; a relay having a coil, a first normally open relay switch and a second normally open relay switch; a timer unit having an electrical timer motor and at least one timer switch operably coupled with the timer motor for operation by the latter; a pair of terminals adapted for coupling with a source of electrical power; first circuit means coupling the pole piece with one terminal; second circuit means coupling the second contact with one side of the coil; third circuit means coupling the other side of the coil with the other terminal; fourth circuit means coupling one side of one relay switch with the first circuit means; fifth circuit means coupling the other side of the one relay switch with the second circuit means; sixth circuit means coupling the first contact with one side of the other relay switch; seventh circuit means coupling the other side of said other relay switch with one side of the operating motor; eighth circuit means coupling the other side of the operating motor with the third circuit means; ninth circuit means coupling the timer motor and the timer energizing switch in series between the terminals; and tenth circuit means coupling said one timer switch and the solenoid in series between the terminals.

2. In a machine as set forth in claim 1, wherein is provided a normally open, second timer switch operably coupled with the timer motor for operation by the latter, said timer energizing switch remains actuated by the operating motor only for a predetermined interval of time, said second timer switch is operated by the timer motor during said interval, and there is provided eleventh circuit means coupling said second timer switch in parallel with said timer energizing switch.

3. In a vending machine adapted for operation from a source of electrical power having a pair of terminals, a single, coin operable, single pole, double throw switch having a pair of contacts and a pole piece normally in engagement with one of said contacts but adapted to be momentarily shifted into engagement with the other of said contacts upon deposit of a coin in the machine; a relay having a pair of normally open relay switches and an operating coil for closing said relay switches when the coil is energized; electrically responsive dispensing means

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requiring energization during an interval of time longer than the period of momentary shifting of said coin operable switch under the influence of a deposited coin for vending operation of the machine; first electrically conductive means for coupling one of said terminals with each of one side of said coil and one side of said electrically responsive means; second electrically conductive means for coupling the other of said terminals with each of said pole piece of said coin operable switch and one side of one of said relay switches; third electrically conductive means coupling said one contact of said coin operable switch with one side of the other of said relay switches; fourth electrically conductive means coupling the other side of said coil with each of the other contact of said coin operable switch and the other side of said one relay switch; and fifth electrically conductive means coupling the other side of said other relay switch with the other side of said electrically responsive means.

4. In a machine as set forth in claim 3, wherein said electrically responsive means includes a receptacle dispenser motor having a normally open, motor controlled switch operably coupled therewith for closure during receptacle dispensing operation of said receptacle dispenser motor and a predetermined interval after commencement of said receptacle dispensing operation; there is provided electrically operable, product dispensing control means for controlling the dispensing of a quantity of product into a previously dispensed receptacle; and there are further provided sixth electrically conductive means for coupling said one terminal with one side of said control

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means, seventh electrically conductive means for coupling said other terminal with one side of said motor controlled switch, and eighth electrically conductive means coupling the other side of said motor controlled switch with the other side of said control means.

5. In a machine as set forth in claim 4, wherein said control means includes a timer motor having a normally open, timer switch operably coupled therewith for closure during operation of said timer motor and a predetermined interval after commencement of said operation of said timer motor; there is provided an electrically actuatable product dispensing valve having an operating solenoid therefor; and there are further provided ninth electrically conductive means for coupling said one terminal with one side of said solenoid, tenth electrically conductive means for coupling said other terminal with one side of said timer switch, and eleventh electrically conductive means coupling the other side of said timer switch with the other side of said solenoid.

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