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H. A. LEDINGHAM
BEVERAGE DISPENSERS

2,860,819

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2 Sheets-Sheet 1

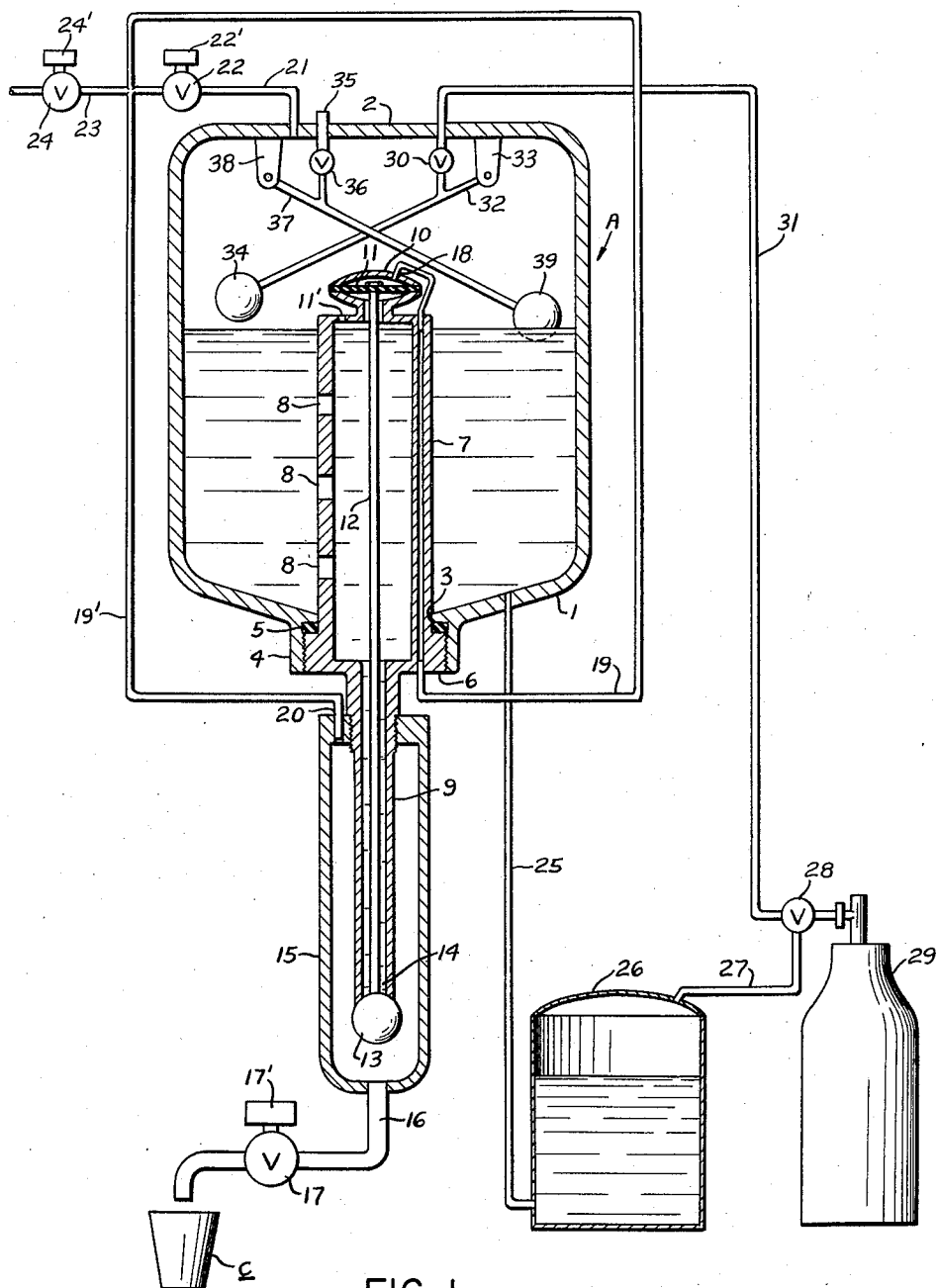


FIG-1

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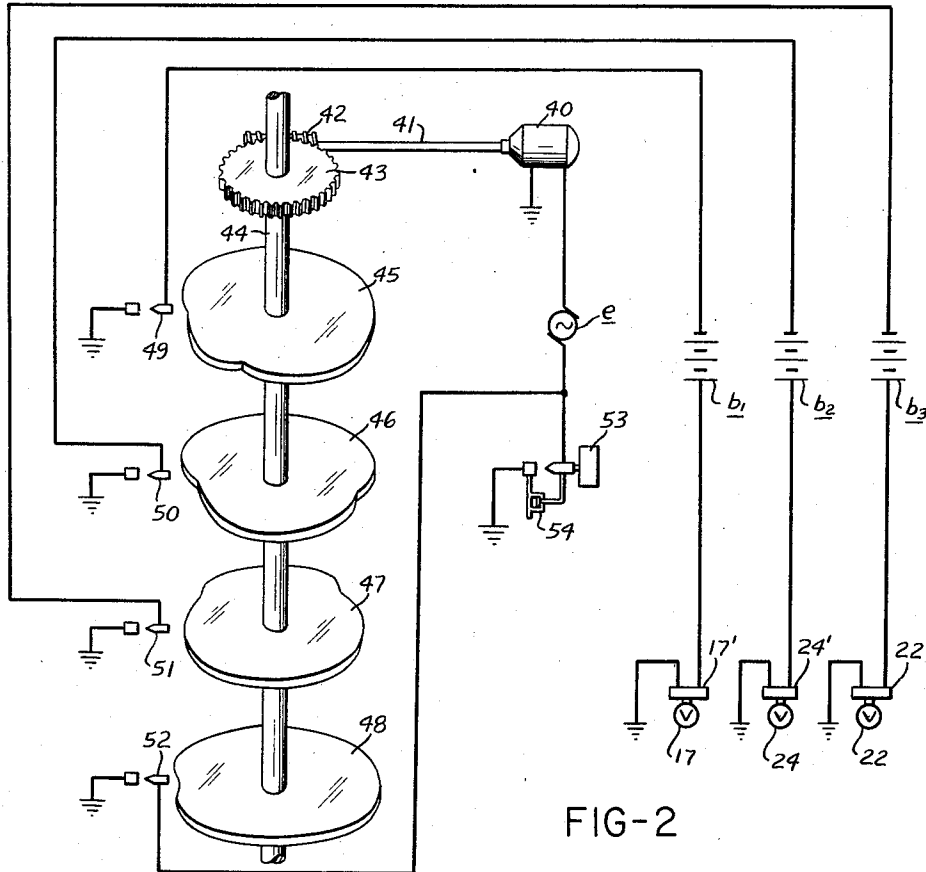


FIG-2

PORTION OF
CYCLE

VALVE AND SOLENOID POSITION

NON OPERATING	SWITCH 52	MOTOR 40	SOLENOID 22'	VALVE 22	SOLENOID 24'	VALVE 24	SOLENOID 17'	VALVE 17
FIRST PORTION	OPEN	OFF	OFF	CLOSED	OFF	OPEN	OFF	OPEN
SECOND PORTION	CLOSED	ON	OFF	CLOSED	ON	CLOSED	ON	CLOSED
THIRD PORTION	CLOSED	ON	ON	OPEN	ON	CLOSED	ON	CLOSED
FOURTH PORTION	CLOSED	ON	OFF	CLOSED	OFF	OPEN	ON	CLOSED
FIFTH PORTION	CLOSED	ON	OFF	CLOSED	OFF	OPEN	OFF	OPEN
RETURN TO NON OPERATING	OPEN	OFF	OFF	CLOSED	OFF	OPEN	OFF	OPEN

FIG-3

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BEVERAGE DISPENSERS

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11 Claims. (Cl. 222—68)

This invention relates in general to dispensing and, more particularly, to a beverage dispenser.

It is a primary object of the present invention to provide a beverage dispenser adapted for dispensing a measured amount of pre-mixed carbonated beverage.

It is a further object of the present invention to provide a beverage dispenser for use in conjunction with vending machines.

It is another object of the present invention to provide a beverage dispenser of the type stated which dispenses pre-mixed carbonated beverage at atmospheric pressure which thereby materially prevents undue loss of carbonation.

It is still another object of the present invention to provide a beverage dispenser having a reservoir wherein the level of pre-mixed carbonated beverage in the reservoir is maintained between maximum and minimum limits.

It is still a further object of the present invention to provide a beverage dispenser of the type stated which is operated by a system of sequentially operated valves.

With the above and other objects in view, my invention resides in the novel features of form, construction, arrangement, and combination of parts presently described and pointed out in the claims.

In the accompanying drawings (two sheets)—

Fig. 1 is a diagrammatic view of a beverage dispenser constructed in accordance with and embodying the present invention;

Fig. 2 is diagrammatic view of the cyclic switching control system forming a part of the beverage dispenser; and

Fig. 3 is a table showing the operation of the control system during the various stages of the operating cycle.

Referring now in more detail and by reference characters to the drawings, which illustrate a preferred embodiment of the present invention, A designates a beverage dispenser having a reservoir 1 including a top wall 2 and provided at its lower end with an opening 3, and an annular, downwardly projecting flange 4. Threaded into the flange 4 and maintained in fluid tight contact with the reservoir 1 by means of a gasket 5 is an elongated hollow tubular supporting member 6 having an upper portion 7 provided with a plurality of apertures 8 connecting the inside of the tubular element with the reservoir 1, and a downwardly projecting beverage conduit 9. Integrally formed on, and supported by, the upper end of the upper portion 7 of the hollow tubular supporting member 6 is a diaphragm housing 10 provided therein with a pressure-sensitive diaphragm 11, the lower side of which is exposed to the reservoir through an aperture 11'. Rigidly secured to the diaphragm 11 and extending downwardly therefrom is an actuating rod 12 provided on its lower end with a spherical plug valve 13, the latter being adapted to seal off the outlet 14 at the lower end of the beverage conduit 9. Threaded onto the beverage conduit 9 in fluid tight

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relationship therewith and depending therefrom is a vessel 15 which serves as a measuring container. The lower end of the vessel 15 is connected to a discharge line 16 provided with a valve 17 controlled by a solenoid 17'.

Connected to one end 18 to the diaphragm housing 10 and exposed to the upper side of the diaphragm 11 is a line 19 which extends downwardly through the wall of the tubular supporting member 6 and is joined at its other end to a line 19', connected at 20 to the vessel 15, whereby the pressure on the upper side of the diaphragm 11 and the pressure in the vessel 15 will normally remain equal. Connecting the lines 19, 19' to the interior of the reservoir 1 through the top wall 2 is a branch line 21 having a valve 22 controlled by a solenoid 22', and connecting the lines 19, 19' to atmosphere is an exhaust line 23 having a valve 24 controlled by a solenoid 24'.

Connected by a supply line 25 to the reservoir 1 is a supply tank 26 adapted to store pre-mixed carbonated beverage. The supply tank 26 is connected through a line 27 and valve 28 to a carbon dioxide tank 29, whereby the carbon dioxide pressure in the supply tank 26 will force the liquid into the reservoir 1. Connecting the carbon dioxide tank 29 to the reservoir 1 through a float valve 30 in the reservoir 1 is a carbon dioxide supply line 31. The float valve 30 is of conventional construction and includes an operating rod 32 pivotally secured at one end to an ear 33 which projects downwardly from the top wall 2, and on its other end the operating rod 32 is provided with a float 34. Also within the reservoir 1 and located in a vent line 35 is another float valve 36, similar in construction to the float valve 30; and provided with an operating rod 37 pivotally secured at one end to an ear 38 projecting downwardly from the top wall 2, and provided on its outer end with a float 39. The two float valves 30, 36, operate to maintain the level of the liquid within predetermined limits. Thus, when the liquid level reaches the maximum, the float valve 30 will open causing carbon dioxide to enter the reservoir 1 and increase the pressure on the liquid causing the level to fall. On the other hand, if the liquid level falls below the minimum, float valve 36 will open and vent the carbon dioxide through line 35 to atmosphere reducing the pressure in the reservoir 1 on the liquid thereby causing the level to rise.

The several solenoid-actuated valves 17, 22, 24, are sequentially operated by a cyclic switching system diagrammatically illustrated in Fig. 2, which includes an electric motor 40 powered from a current source *e* and having a shaft 41 provided on one end with a worm 42 for driving a worm wheel 43 and shaft 44. Rigidly secured to the shaft 44 are a plurality of revolving cam wheels 45, 46, 47, 48, which are designed to open and close spring biased switches 49, 50, 51, 52, respectively, in predetermined timed relation. The switches 49, 50, 51, are adapted to close the solenoid circuits so that the solenoids 17', 24', 22', respectively, are energized by batteries *b*¹, *b*², *b*³, or other similar sources of current, and the switch 52 is adapted to close the motor circuit. Also provided for initially starting the motor 40 is a coin-controlled, spring-biased starting switch 53 provided with a dashpot 54 or other suitable time delay mechanism so that the switch 53 may be held closed for a short interval of time and the motor 40 turned over to permit the cam wheel 48 to close the switch 52. It should be understood that the cam wheels 45, 46, 47, 48, are illustrated diagrammatically as they may be of any specific construction so long as they operate the switches 49, 50, 51, 52, in proper timed sequence.

In use, the several solenoid controlled valves 17, 22,

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24, operate in the sequence shown in Fig. 3. Thus, in the initial or non-operating condition, the switch 52 is open and the motor 40 is off. Valves 17 and 24 are open and valve 22 is closed. To operate the device, the switch 53 is depressed whereupon motor 40 and the cam wheels 45, 46, 47, 48, begin to rotate. The cam wheel 48 closes the switch 52 and shortly thereafter the time delay starting switch 53 will be opened. During the first portion of the cycle, switches 49, 50, will close and switch 51 will remain open causing valves 17, 22, 24, to be closed, but as the cam wheels 45, 46, 47, 48, rotate, the second portion of the cycle is reached and switch 51 is closed and valve 22 will be opened. Pressure from the inside of the reservoir will then be established in line 19 and on the upper side of the diaphragm 11, and since the pressure on the upper and lower sides of the diaphragm are equal, the weight of the liquid will cause the plug valve 13 to open permitting fluid to flow from the reservoir 1 through the beverage conduit 9 so as to fill the vessel 15, and rise in line 19' to a level which is equivalent to the level of liquid in the reservoir 1. When the filling is completed, switch 51 is opened closing valve 22 to complete the third portion of the cycle. Then switch 50 is opened whereupon valve 24 is opened and the lines 19, 19', and the upper side of the diaphragm 11 are vented to atmosphere through the vent line 23, seating the plug valve 13 against the outlet 14 of the beverage container 9, thus completing the fourth portion of the cycle. The switch 49 is then opened so that valve 17 is opened and the pre-mixed beverage will flow under gravity from the vessel 15 through line 16 and into the receptacle or cup c, completing the fifth portion of the cycle. Finally, the switch 52 is opened stopping the motor 40 and the device is returned to the non-operating condition.

It should be understood that changes and modifications in the form, construction, arrangement, and combination of the several parts of the beverage dispenser may be made and substituted for those herein shown and described without departing from the nature and principle of my invention.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. A beverage dispensing system comprising a reservoir adapted to hold a substantial quantity of beverage up to a predetermined level, a closed vessel having beverage-dispensing means, a beverage conduit opening at one end to the reservoir below the liquid level thereof and opening at its other end to the vessel, a pressure-responsive diaphragm associated with the conduit and having one side exposed to the pressure within the reservoir, a valve operatively connected to said pressure-responsive diaphragm for controlling the flow of beverage between the reservoir and the vessel, means for communicating the other side of said pressure-responsive diaphragm to the vessel, means for equalizing the pressure on both sides of the pressure-responsive diaphragm to actuate said valve and open the beverage conduit whereby fluid may flow from the reservoir into the vessel, and means for reducing the pressure on said other side of the diaphragm to close said valve and shut off the flow of beverage from the conduit.

2. A beverage dispensing system comprising a reservoir adapted to hold a substantial quantity of beverage up to a predetermined level, a closed vessel having beverage-dispensing means, valve-controlled means for subjecting the vessel to atmospheric pressure, a beverage conduit opening at one end to the reservoir below the liquid level thereof and opening at its other end to the vessel, pressure-responsive means associated with the conduit for controlling the flow of beverage between the reservoir and the vessel, means for subjecting one side of said pressure-responsive means to pressure within the reservoir and thereby prevent flow of fluid from the conduit to the vessel, means for equalizing the pressure on both sides of

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the pressure-responsive means to cause fluid to flow from the conduit to the vessel, and means for subjecting the other side of the pressure-responsive means to reduced pressure and thereby shut off the flow of fluid from the conduit to the vessel.

3. A beverage dispenser comprising a reservoir adapted to hold a substantial quantity of beverage up to a predetermined level, a beverage conduit connected to said reservoir in fluid tight relationship therewith, a pressure-responsive diaphragm mounted in said reservoir and having one side exposed to the pressure within said reservoir, a valve operatively connected to and responsive to movement of said pressure-responsive diaphragm, said valve normally closing said beverage conduit, a measuring container communicating with said beverage conduit, means for communicating the other side of the pressure-responsive diaphragm to the measuring container, means for equalizing the pressure on both sides of the pressure-responsive diaphragm to actuate said valve and open the beverage conduit whereby fluid may flow from the reservoir into said container, means for reducing the pressure on said other side of the pressure-responsive means to cause the valve to close said conduit, and means for withdrawing the beverage from said container.

4. A beverage dispenser comprising a reservoir adapted to hold a substantial quantity of beverage up to a predetermined level, a supporting member mounted on and projecting into the reservoir, said supporting member being provided with a beverage conduit, a pressure-responsive diaphragm within said reservoir and mounted on said supporting member, said diaphragm having one side exposed to the pressure within said reservoir, a valve responsive to movement of said pressure-responsive diaphragm and normally closing said beverage conduit, a measuring container communicating with said beverage conduit, means for communicating the other side of the pressure-responsive diaphragm to the measuring container, means for equalizing the pressure on both sides of the pressure-responsive diaphragm to actuate said valve and open the beverage outlet whereby fluid may flow from the reservoir into said container, means for reducing the pressure on said other side of the pressure-responsive diaphragm to cause the valve to close said conduit, and means for withdrawing the beverage from said container.

5. A beverage dispenser comprising a reservoir adapted to hold a substantial quantity of beverage up to a predetermined level, a supporting member mounted on and projecting into said reservoir, said supporting member being provided with a beverage conduit which extends outwardly from said reservoir, a pressure-responsive diaphragm in said reservoir and mounted on said supporting member, said pressure-responsive diaphragm having one side exposed to the pressure within said reservoir, a valve responsive to movement of said pressure-responsive diaphragm and normally closing said beverage conduit, a measuring container communicating with said beverage outlet, means for communicating the other side of the pressure-responsive diaphragm to the measuring container, means for equalizing the pressure on both sides of the pressure-responsive diaphragm to actuate said valve and open the beverage conduit whereby fluid may flow from the reservoir into said container, means for reducing the pressure on said other side of the pressure-responsive diaphragm to cause the valve to close said conduit, and means for withdrawing the beverage from said container.

6. A beverage dispenser comprising a reservoir adapted to hold a substantial quantity of beverage up to a predetermined level, a supporting member mounted on and projecting into said reservoir, said supporting member being provided with a beverage conduit which extends outwardly from said reservoir, a pressure-responsive diaphragm in said reservoir and mounted on said supporting member, said pressure-responsive diaphragm having one side exposed to the pressure within said reservoir, a valve

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responsive to movement of said pressure-responsive diaphragm and normally biased against and closing said beverage conduit, a measuring container mounted on and communicating with said beverage conduit, means for communicating the other side of the pressure-responsive diaphragm to the measuring container, means for equalizing the pressure on both sides of the pressure-responsive diaphragm to actuate said valve and open the beverage conduit whereby fluid may flow from the reservoir into said container, means for reducing the pressure on said other side of the pressure-responsive diaphragm to cause the valve to close said conduit, and means for withdrawing the beverage from said container.

7. A beverage dispenser comprising a reservoir adapted to hold a substantial quantity of beverage up to a predetermined level, a supporting member mounted on and projecting into said reservoir, said supporting member being provided with a beverage conduit which extends outwardly from said reservoir, pressure-responsive means in said reservoir and mounted on said supporting member, said pressure-responsive means having one side exposed to the pressure within said reservoir, an actuating rod extending through said supporting member and beverage conduit, said actuating rod being connected to said pressure-responsive means, a valve connected to said actuating rod whereby said actuating rod will operate the valve responsive to movement of said pressure-responsive means, said valve normally being biased against and closing said beverage conduit, a measuring container mounted on and communicating with said beverage conduit, means for communicating the other side of the pressure-responsive means to the measuring container, means for equalizing the pressure on both sides of the pressure-responsive means to actuate said valve and open the beverage outlet whereby beverage may flow from the reservoir into said container, means for reducing the pressure on said other side of the pressure-responsive means to cause the valve to close said conduit, and means for withdrawing the beverage from said container.

8. A beverage dispensing system comprising a reservoir adapted to hold a substantial quantity of beverage between maximum and minimum predetermined levels, a beverage supply tank, means for introducing beverage under pressure from the supply tank to the reservoir, a source of gas under pressure, first means responsive to the minimum level for raising the level of the liquid for subjecting the reservoir to reduced pressure and thereby permit beverage to flow from the supply tank to the reservoir, second means responsive to the maximum liquid level for subjecting the reservoir to increased pressure from said source of gas and thereby cause some of said liquid to flow back into the supply tank, and means for withdrawing a predetermined quantity of beverage from said reservoir.

9. A beverage dispensing system comprising a reservoir adapted to hold a substantial quantity of beverage under pressure between maximum and minimum predetermined levels, a beverage supply tank, means for introducing beverage under pressure from the supply tank to the reservoir, a source of gas under pressure, a first float controlled valve within said reservoir responsive to the minimum liquid level for subjecting the reservoir to re-

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duced pressure and thereby permit beverage to flow from the supply tank to the reservoir, a second float controlled valve within said reservoir responsive to maximum liquid level for subjecting the reservoir to increased pressure from said source of gas and thereby cause some of the beverage to flow from the reservoir back into the supply tank, and means for withdrawing a predetermined quantity of beverage from the reservoir.

10. A beverage dispensing system comprising a reservoir adapted to hold a substantial quantity of beverage up to a predetermined level, a closed vessel having a beverage dispensing valve, a beverage conduit open at one end to the reservoir below the liquid level and at its other end to the vessel, pressure-responsive means operatively connected to a first valve for controlling the flow of beverage through the conduit, means including a second valve for subjecting the vessel to atmospheric pressure, means including a third valve for actuating the pressure-responsive means, thereby opening said first valve and allowing beverage to flow from said conduit into said vessel, means including said second valve for subjecting the pressure-responsive means to atmospheric pressure so as to close said first valve and shut off the flow of beverage from the conduit to the vessel, means for closing the third valve when the second valve and beverage dispensing valve are open, means for closing the third valve, second valve and beverage dispensing valve at the same time, means for opening the third valve when the second valve and beverage dispensing valve are closed, and means for opening said second valve when the third valve and beverage dispensing valve are closed.

11. A beverage dispensing system comprising a reservoir adapted to hold a substantial quantity of beverage up to a predetermined level, a closed vessel having a beverage dispensing valve, a beverage conduit open at one end to the reservoir below the liquid level and at its other end to the vessel, pressure-responsive means operatively connected to a first valve for controlling the flow of beverage through the conduit, means including a second valve for subjecting the vessel to atmospheric pressure, means including a third valve for actuating the pressure-responsive means, thereby opening said first valve and allowing beverage to flow from said conduit into said vessel, means including said second valve for subjecting the pressure-responsive means to atmospheric pressure so as to close said first valve and shut off the flow of beverage from the conduit to the vessel, solenoid operated means for closing the third valve when the second valve and beverage dispensing valve are open, solenoid operated means for closing the third valve, second valve and beverage dispensing valve at the same time, solenoid operated means for opening the third valve when the second valve and beverage dispensing valve are closed, and solenoid operated means for opening said second valve when the third valve and beverage dispensing valve are closed.

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