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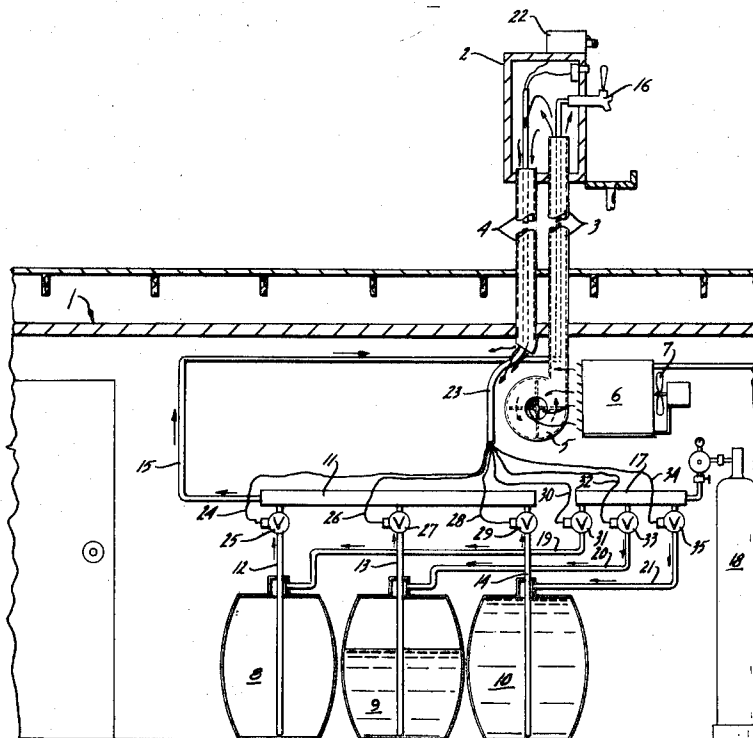
[54] **AUTOMATIC CARBONATED BEVERAGE
 DISPENSING SYSTEM**
 9 Claims, 3 Drawing Figs.

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ABSTRACT: This invention relates to an automatic beer dispensing system wherein an electrical circuit is actuated by a single selector control remote from the barrels containing the beer to simultaneously operate a solenoid valve to open a line from one barrel to a tap and another solenoid valve to open a line from a source of CO₂ gas to the barrel being tapped and to thereafter successively operate corresponding solenoid valves to supply beer from other barrels and CO₂ gas to each respective barrel then supplying the beer.



AUTOMATIC CARBONATED BEVERAGE DISPENSING SYSTEM

SUMMARY OF THE INVENTION

In general, the invention is directed to an electrical release or dispensing system for a plurality of carbonated beverages stored in suitable containers where it is desirable at a remote distance therefrom to initiate the dispensing of the beverages from another and successive container when the container from which the beverage being dispensed is empty. The system provides a header which is connected to the containers to be emptied by separated conduits in which are located solenoid liquid valves. These valves are separately actuated from a selector control unit to open a respective conduit from a container to the header and then to a tap. A second header is connected to a source of CO₂ gas and flow of gas from the header to the containers are through separate conduits to each container. Solenoid fluid valves are located in each gas conduit and are individually actuated to control the flow of gas to the container being tapped. The opening of a respective fluid solenoid valve occurs simultaneously with the opening of a corresponding liquid valve. An important feature of the invention is that the dispensing valves are opened by momentary high surge of current to seize the solenoid armature and are held in the open position by a low holding current. The holding current consumes less power and consequently gives off less heat. In an alternative construction, the liquid dispensing valves may each be dual winding units having an opening winding and a holding winding. The holding winding draws a lesser current and consequently also minimizes generation of heat. Excessive heat is deleterious to the carbonate beverage being dispensed.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1. is a diagrammatic view of the system and apparatus of the invention;

FIG. 2 is a schematic diagram illustrating one embodiment of the electric circuitry of the invention; and

FIG. 3 is a schematic diagram showing a second embodiment of the circuitry of the invention.

Referring to the drawings, there is shown a walk-in cooler 1 which is connected to the tap chest 2 located some distance away by a pair of insulated shafts 3 and 4. Shaft 3 has a blower 5 at the lower end disposed within cooler 1 which blows air from cooler 1 through shaft 3 to tap chest 2. The air returns from the tap chest 2 to cooler 1 through shaft 4. Moisture in the air in the cooler is evaporated by evaporator 6 when it is blown therethrough toward air blower 5 by the fan 7.

The drawings illustrate three barrels of beer 8, 9 and 10 which have been located in cooler 1 and which store the beer to be tapped. Barrel 8 is shown as empty, barrel 9 as partially empty and barrel 10 as full.

All the barrels are connected to a common header or manifold 11. Thus, conduit 12 extends from the bottom of barrel 8 and to header 11. Similarly, conduit 13 extends from the bottom of barrel 9 to header 11 and conduit 14 extends from the bottom of barrel 10 to header 11. The header 11 in turn is connected by a single conduit 15 to the tap 16 secured to the front of tap chest 2, the conduit 15 extending through air-cooled shaft 3 and through chest 2.

A second header 17 is secured within cooler 1 to provide a single connection to a source of CO₂ gas or air 18. The gas is dispensed through header 17 from gas source 18 to the upper end of barrel 8 by means of conduit 19 which connects header 17 to barrel 8. Similarly, conduit 20 connects header 17 to barrel 9 and conduit 21 connects header 17 to barrel 10.

The invention is primarily concerned with the dispensing of beer from one of the barrels and simultaneously supplying gas thereto and then remotely switching to another barrel when the first barrel is empty and then to a third barrel and to as many barrels as might be practical to place in the cooler or include in the system. In the illustration in the drawings as previously described, barrel 8 has been emptied, barrel 9 is on tap and barrel 10 has yet to be tapped.

The switching operation is accomplished electrically by a selector control unit 22 located on or adjacent to the tap chest 2. As shown in FIG. 1, a control cable 23 having a plurality of wires or lines therein is connected to selector control unit 22 and extends to the air cooler 1 through air shaft 4. One of the lines 24 of the cable 23 is connected to solenoid actuated liquid valve 25 which is located in conduit 12 which connects barrel 8 with header 11. A second line 26 of cable 23 is connected to solenoid actuated liquid valve 27 which is located in conduit 13 connecting barrel 9 to header 11. A third line 28 of cable 23 is connected to solenoid actuated liquid valve 29 which is located in the conduit 14 connecting barrel 10 to header 11.

In addition to liquid solenoid valves 25, 27 and 29, to open the conduits to the barrels of stored beer, it is necessary to actuate solenoid gas valves to regulate flow of gas from gas source 18 and header 17 to the respective barrel from which beer is being tapped. Thus, a line 30 of cable 23 is connected to the solenoid actuated gas valve 31 in conduit 19, a line 32 of cable 23 is connected to the solenoid actuated gas valve 33 in conduit 20, and a line 34 of cable 23 is connected to gas valve 35 in conduit 21. The gas valves 31, 33 and 35 are actuated simultaneously with the actuation of each liquid valves 25, 27 and 29 with which the respective gas valves correspond, and the actuation of the respective liquid and gas valves will be more fully described in connection with the circuit diagram in FIG. 2.

The valves 25, 27 and 29 and the related valves 31, 33 and 35 are similarly connected to a suitable power supply. The valve 27 and its related valve 33 with the respective circuit connections will be described in detail since they are connected to barrel 9 being tapped with corresponding elements of the other valves identified by corresponding primed and doubled primed numbers from simplicity and clarity of explanation.

Referring particularly to FIG. 2, the power supply is shown including a stepdown voltage transformer 36 having a primary winding 37 to be connected to the usual 120-volt power supply system. A secondary winding 38 of the transformer 36 is wound as a center tapped winding providing a suitable reduced voltage across the secondary as well as between the center tap 39 and the opposite ends of the secondary. For example, the transformer may advantageously establish a 12-volt secondary output with 12 volts appearing between the center tap 39 and each of the opposite ends of the secondary winding 38.

The solenoid actuated liquid valve 27 may be a single or or dual winding assembly having a relatively high level opening current and a relatively low level holding current. A dual winding liquid valve is shown in FIG. 2 and a preferred single winding liquid valve is shown in FIG. 3.

Referring particularly to FIG. 2, a dual winding valve 27 having a high current actuating an opening winding 40 and a low current holding winding 41 is shown. The related gas valve 33 includes a single high current actuating and holding winding 42. The liquid valves are preferably constructed to provide a fluidtight seal and thereby positively prevent leakage of air into the barrel 9 or loss of CO₂ gases from the beer with a consequent loss of the carbonation of the beer. However, in order to open, the liquid valves, such as valve 27, require a very substantial opening force. Although satisfactory high-powered valves are available, they would also provide a certain amount of heating of the associated mechanism which in turn would tend to adversely affect the taste and character of the beer as it is dispensed. Therefore, in accordance with the one embodiment illustrating a particularly novel aspect of the present invention, the dual winding solenoid is provided for actuating of the liquid valve 27. The several windings 40, 41 and 42 are selectively interconnected to the secondary winding 38 through a selector switch 43 and a final pushbutton release switch 44 to permit selective actuation of the several paired valves which are connected respectively to the barrels 8, 9 and 10. Both switches 43 and 44 are mounted on control unit 22 for remote control of the valves.

The selector switch 43 includes a common contact arm 45 connected to the secondary center tap 39. The arm 45 is rotatable to selectively engage any one of a plurality of six contacts 46-51, inclusive, which in turn are connected to or adapted to be connected to windings of the several liquid and gas valves. In the illustrated embodiments of the invention, only three of the contacts, namely, contacts 46, 47 and 48 are employed. The other contacts 49, 50 and 51 can be provided in the event additional controls are desired for additional barrels. In many storage systems, 6 or ore kegs of beer may well be provided in a single storage area and selectively interconnected to the common manifold or header 11 through the proper operation of the selector switch 43 and the pushbutton switch 44.

The first contact 46 is connected to control the solenoid valves 25 and 31 of barrel 8. Contact 47 is similarly connected to control valves 27 and 33 for barrel 9 and contact 48 is similarly connected to control valves 29 and 35 of barrel 10.

As previously noted, the structure or system is shown for dispensing beer from barrel 9 and consequently, the circuit is described with the selector switch 43 positioned with contact arm 45 engaging contact 47 for energizing the valves 27 and 33 and permitting withdrawal of beer from barrel 9.

Contact 47 which is connected to the center tap 39 through the contact arm 45 is connected to the one side of the low current holding coil winding 41 via a lead 52. The opposite side of winding 41 is connected directly to the one end of the secondary winding 38, shown as the right side of such winding in FIG. 2, via a lead 53. When the selector switch 43 is moved to the second position or contact 47, the 12 volts appearing between the center tap 39 and the right end of the secondary winding 38 is supplied directly to the holding winding 41. This is insufficient however, to open the liquid valve 27.

The high current actuating winding 40 of the solenoid valve 27 also has its one side connected to the right side of the transformer secondary 38 via the lead 53. The opposite end of the winding 40 is connected directly to the opposite end of the transformer secondary 38 through a lead 54 and the pushbutton release switch 44. Thus, when contact arm 45 is first turned to the contact 47 or the number two position, power is supplied only to the low current holding winding 41. This is insufficient, however, to cause any change in the position of armature 55 of valve 27 and the valve remains closed. When the pushbutton release 44 switch, however, is closed, the right side of the winding 40 is connected to the left side of the secondary winding 38 and 24 volts is applied directly across the high current coil winding 41. In the illustrated embodiment of the invention, the current is shown flowing through the two coils or windings 40 and 41 in the opposite direction. The windings 40 are preferably wound such that they create additive magnetic fields which are sufficient to move the associated armature 55 to open the valve 27. When the pushbutton release switch 44 is released, the switch 44 opens and breaks the circuit to the high current opening winding 40. However, once the valve has been opened, the magnetic force required to hold the armature 55 in the actuated position is much less than the required to move it from the nonactuated to the actuated position. Consequently, the field established by the holding winding 41 is sufficient to hold the valve 27 open.

It should be noted that although power is simultaneously applied to all of the opening windings 40, 40' and 40'', only the valve 27 has both the holding winding 41 and the opening winding 40 energized and consequently, only valve 27 will open. Valve 25 which was previously open may be held open if the pushbutton switch 44 has been held down during the movement of the selector switch 43 and if the selector switch 43 is rapidly moved from contact 45 to contact 47 due to the time delay or lag in the closing of the valve 25. However, upon release of the pushbutton switch 44, the solenoid valve 25 will again close as neither of the windings 40' or 41'' of the valve 25 will then be energized.

The rotation of the selector switch arm 45 to the contact 47 and the closing of the pushbutton switch 44 energize the solenoid of valve 27 to open and hold the valve 27 in the opened position as long as the selector switch 43 is in that position.

The contact 47 is also connected to one side of the winding 42 of the solenoid for the associated gas or fluid valve 33 via a lead 56. The opposite side of the winding 42 is interconnected directly to the right side of the transformer secondary winding via the lead 57. Consequently, as soon as the switch 43 is moved to the number 2 position, namely, contact 47, the circuit to the winding 42' of valve 31 opens and the circuit to the winding 42 of valve 33 is closed to directly open and hold the valve 33 through the use of the single winding. The valves 31, 33 and 35 merely permit the entrance of gas to the kegs or barrels of beer and may be spaced from the barrels and beer proper such that any heat which is generated will not adversely affect the beer as it is withdrawn or stored. For example, applicant has satisfactorily operated such a system as shown in the drawings employing liquid valves having a holding current producing approximately 5 watts at 12 volt alternating current input. The gas solenoid valves on the other hand employed approximately 10 watts at 12 volts alternating current.

In summary, the setting of the selector switch 43 at the tap chest determines which barrel 8, 9 or 10 will be connected to the discharge header or manifold 11 by selectively connecting the holding current winding 41, 41' or 41'' of the valves 25, 27 and 29 respectively to the power supply secondary winding 38 and simultaneously connecting the corresponding gas valve windings 42, 42' or 42'' of valves 31, 33 and 35 respectively to the secondary winding 38. The pushbutton release switch 44 connects all of the high current actuating or opening windings 40, 40' and 41'' of the liquid valves 25, 27 and 29 directly across the complete 24-volt secondary winding 38. The dual winding construction may be such that only a single one of the valves 25, 27 and 29 is moved to the open position. Further, if all liquid valves should open, only one gas valve 31, 33 or 35 is open to discharge beer from a single barrel and upon release of switch 44, all but the one liquid valve closed.

The high current operating and low current holding design as previously noted is particularly important in connection with the liquid valves to insure that they will properly operate under all applied pressures, but will not adversely heat the beer. Heating of beer causes the CO₂ gas to leave solution in the form of bubbles and foam and generates "wild" beer.

Referring particularly to FIG. 3, an alternative and preferred direct current operating circuit is illustrated employing direct current solenoids for the respective liquid valves 25, 27 and 29 and for the related gas valves 31, 33 and 35. Corresponding elements in the circuits of FIG. 2 and 3 are similarly numbered for simplicity and clarity of explanation.

The circuit of FIG. 3 is particularly advantageous in that both the liquid and the gas valves can satisfactorily be held in the open position with as little as 2 volts direct current input and consuming approximately only three-quarters watts. Consequently, this circuit produces a very minimal and essentially nonexistent heating of the associated equipment and is particularly satisfactory for the discharging of beer and similar carbonated liquids.

Referring particularly to FIG. 3, the input transformer 36 essentially corresponds to that of FIG. 2 and includes the center tapped secondary 38 providing essentially 12 volts between the center tap and each of the opposite ends. A rectifier assembly 56 is connected to the output of the transformer secondary 38 to establish a pair of low-voltage direct current supply leads 57 and 58. In the illustrated embodiment of the invention, assembly 56 includes a pair of similarly polarized diodes 59 and 60 interconnected between the opposite ends of the secondary winding and to the one DC lead 50. The center tap 39 is connected to the other 57 and thus provide the direct current supply. The direct current leads 57 and 58 are selectively connected through a current lead control unit 61 and the selector switch 43 to energize the related liquid and gas valves.

The liquid valves 25, 27 and 29 in the embodiment of FIG. 3 are direct current solenoid actuated units each having a single winding, respectively identified as windings 62, 62' and 62''. The solenoid actuated liquid valve 27 is of a type having a suitable winding, constructed to withstand a momentary high surge of current to positively actuate the solenoid valve to its open position. It is constructed with the winding holding the solenoid valve open with the reduced voltage and relatively little current. The gas valves 31, 33 and 35 may be similar solenoid actuated units each having a corresponding winding similarly identified by the numbers 63, 63' and 63''. The ends of all windings 62 and 63 are connected to one DC lead 58. The opposite ends of the windings are selectively connected in circuit through the selector switch 43 and the control unit 61. Thus, for valves 25 and 35, the corresponding end of the windings 62' and 63' are interconnected by a common lead 64 to the second contact 46 of the selector switch unit 43. Similarly, the ends of the windings 62 and 63 of valves 27 and 33 are connected by a common lead 64' to the contact 47 and the corresponding ends of the windings 62'' and 63'' of valves 29 and 31 are similarly connected by a common lead 64'' to the contact 48.

The contact arm 45 of the selector switch unit 43 is interconnected to the center tap lead via the control unit 61. The pushbutton start switch 44, corresponding to the start switch of FIG. 2, forms a part of unit 61. The pushbutton switch 44 is connected directly between lead 57 and arm 45 such that closing of the switch applies the voltage appearing between the DC leads 57 and 58 directly across the paralleled windings of a liquid valve and a related gas valve. In the illustrated position, the power is applied directly across the windings 62 and 63 of valves 27 and 33 to open the valves. The wattage and power input is substantially greater however than that required to hold the valves open.

In accordance with the illustrated embodiment of the invention, unit 61 includes a variable potentiometer or resistor 65 connected in parallel with the pushbutton switch 44. The movable tap 66 of the resistor 65 is connected directly to the DC lead 57 and to the one side of the normally opened pushbutton switch 44. The resistor has its one end connected to opposite side of the normally opened pushbutton switch 44 and to arm 45. Consequently, the positioning of the tap 66 with respect to the connected end of the resistor 65 determines the resistance connected across the normally opened contacts and/or connected between the DC lead 57 and the contact arm 45.

When the pushbutton switch 44 is released and opens, the resistance between the tap 66 and the connected end of the resistor 65 is connected in series between the DC supply lead 57 and the contact arm 45. Therefore, when the pushbutton switch unit 44 is opened, the current supplied to the windings 62 and 63 is substantially reduced. However, as previously noted, the holding current level of the valves is substantially less than the opening current level, and consequently the smaller current maintains the open valves in the open position. The voltage applied to the valves has been reduced to 2 volts direct current with a reduction in power to three-quarters watts. As a result, there is essentially no heating of the valve structure and the associated beer.

The illustrated solenoid control system has been found to provide a very simple readily and reliable system which may be maintained and installed at a relatively low cost.

I claim:

1. A dispensing system for a plurality of carbonated liquid containers having a liquid discharge means connected to a common header means and a fluid input means for forcing of the liquid therefrom and which is successively dispensed through said common header means, comprising a plurality of first individual liquid valve means connected to the corresponding discharge means of said containers, a second plurality of second individual fluid valve means connected to the corresponding input means of said containers, remote control means connected to said first and second valve means to selec-

tively and simultaneously actuate the corresponding first and second valve means for any one container, said liquid valve means including operating means responsive to an opening current to open the valve and a reduced holding current to hold the opened valve in the open position, a power supply connecting means, a selector switch means for selectively connecting the operating means of one of said liquid valve means to the power supply connecting means for supplying holding current to said liquid valve means for holding the valve open without adverse heating of the liquid and a second switch means for momentarily connecting the operating means of said one liquid valve means to the power supply connecting means for supplying open current to said one liquid valve means to open the valve means.

2. The release system of claim 1 wherein said power supply connecting means includes a low voltage connection and a high voltage connection, said selector switch selectively connecting the operating means of one of said liquid valve means to the low voltage connection of the power supply connecting means, and said second switch momentarily connecting the operating means of said one valve means to the high voltage connection of the power supply connecting means.

3. The release system of claim 1 wherein said operating means of said liquid valve means includes an opening winding and a holding winding, said power supply connecting means having a low voltage connection and a high voltage connection, said selector switch selectively connecting one of said holding windings to the low voltage connection of the power supply connecting means, and said second switch momentarily connecting said opening winding of the valve means to the high voltage connection of the power supply connecting means.

4. The release system of claim 1 wherein said operating means of said liquid valve means are dual winding solenoids having a holding winding and an opening winding, said fluid valve means are gas valves having a single winding solenoid the said single winding being an opening and holding winding and said first selector switch means is connected to simultaneously energize the holding winding and the opening and holding winding for the corresponding liquid and fluid valves for any one container, and said second switch is connected momentarily energizing the opening winding of all said liquid valves.

5. The release system of claim 4 having a power supply connecting means including a transformer having a tapped secondary, the holding windings being connected in series with the selector switch across a portion of the secondary and the opening winding of the liquid valves being connected in series with the second switch across the complete secondary.

6. A dispensing system for a plurality of carbonated liquid containers having a liquid discharge means connected to a common header means and fluid input means for forcing of the liquid therefrom and which is successively dispensed through said common header means, comprising a plurality of first individual liquid valve means connected to the corresponding discharge means of said containers, a second plurality of second individual fluid valve means connected to the corresponding input means of said containers, remote control means connected to said first and second valve means to selectively and simultaneously actuate the corresponding first and second valve means for any one container, said liquid valve means includes an opening winding and a holding winding, said windings being wound to require simultaneous energization of the windings to open the valve means, a power supply connecting means having a low voltage connection and a high voltage connection, a selector switch to selectively connect one of said holding windings to the low voltage connection of the power supply connecting means, and a second switch for momentarily connecting said opening winding of the valve means to the high voltage connection of the connecting means.

7. A dispensing system for a plurality of carbonated liquid containers having a liquid discharge means connected to a

7

common header means and a fluid input means for forcing of the liquid therefrom and which is successively dispensed through said common header means, comprising a plurality of first individual liquid valve means connected to the corresponding discharge means of said containers, a second plurality of second individual fluid valve means connected to the corresponding input means of said containers, remote control means connected to said first and second valve means to selectively and simultaneously actuate the corresponding first and second valve means for any one container said liquid valve means being solenoid actuated liquid valves having a winding means responsive to an opening current to open the valve and responsive to a substantially lower holding current to hold an opened valve in the open position without adverse heating of the liquid and the fluid valve means are solenoid actuated gas valves, a power supply connection means including a transformer having a tapped secondary, a rectifying means connected to said secondary to establish a direct current output, a voltage reducing means interposed between the rectifying means and the selector switch, said remote control means including a first selector switch connected to simultaneously connect the corresponding liquid and fluid valves for any one selected container across said rectifying means in series with said voltage reducing means for energization of the corresponding liquid and fluid valve means from said direct current output with said liquid valve energized with said holding current, and a second switch connected in parallel with said voltage reducing means for momentarily establishing the

8

opening current for energizing the opening of the liquid valve for said selected container.

8. A dispensing system for a plurality of carbonated liquid containers having a liquid discharge means connected to a common header means and a fluid input means for forcing of the liquid therefrom and which is successively dispensed through said common header means, comprising a plurality of first individual liquid valve means connected to the corresponding discharge means of said containers, second fluid valve means connected to the corresponding input means of said containers, said liquid valve means including electrically actuated operating means responsive to a selected opening current to open the valve and responsive to a selected holding current to hold the opened valve in the open position without adverse heating of the liquid, a power supply connecting means having a low voltage connection and a high voltage connection, a selector switch for selectively connecting the operating means of one of said liquid valve means to the low voltage connection of the power supply connecting means, and a second switch for momentarily connecting the operating means of said one valve means to the high voltage connection of the power supply connecting means.

9. The release system of claim 8 wherein said high and low voltage connection means are defined by a series voltage dropping resistor connected in series with said selector switch and said second switch is connected across said resistor.

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