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2,986,306

BEVERAGE DISPENSING SYSTEM

Filed March 24, 1958

3 Sheets-Sheet 1

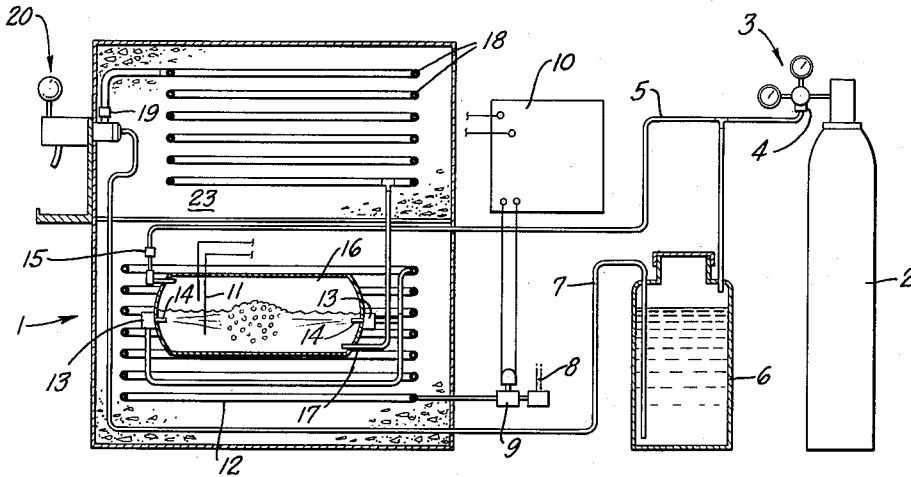


FIG. 1

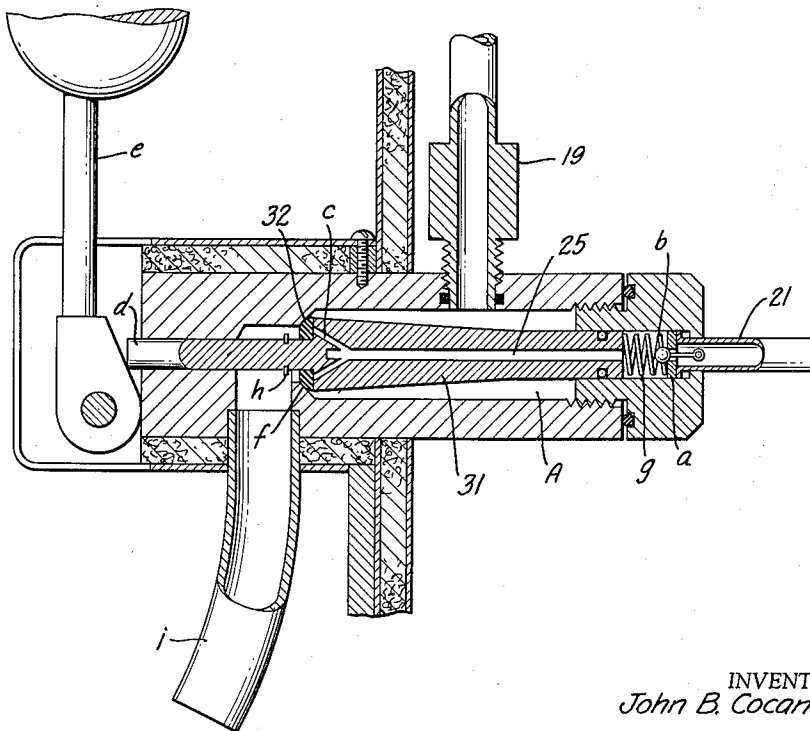


FIG. 2

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3 Sheets-Sheet 2

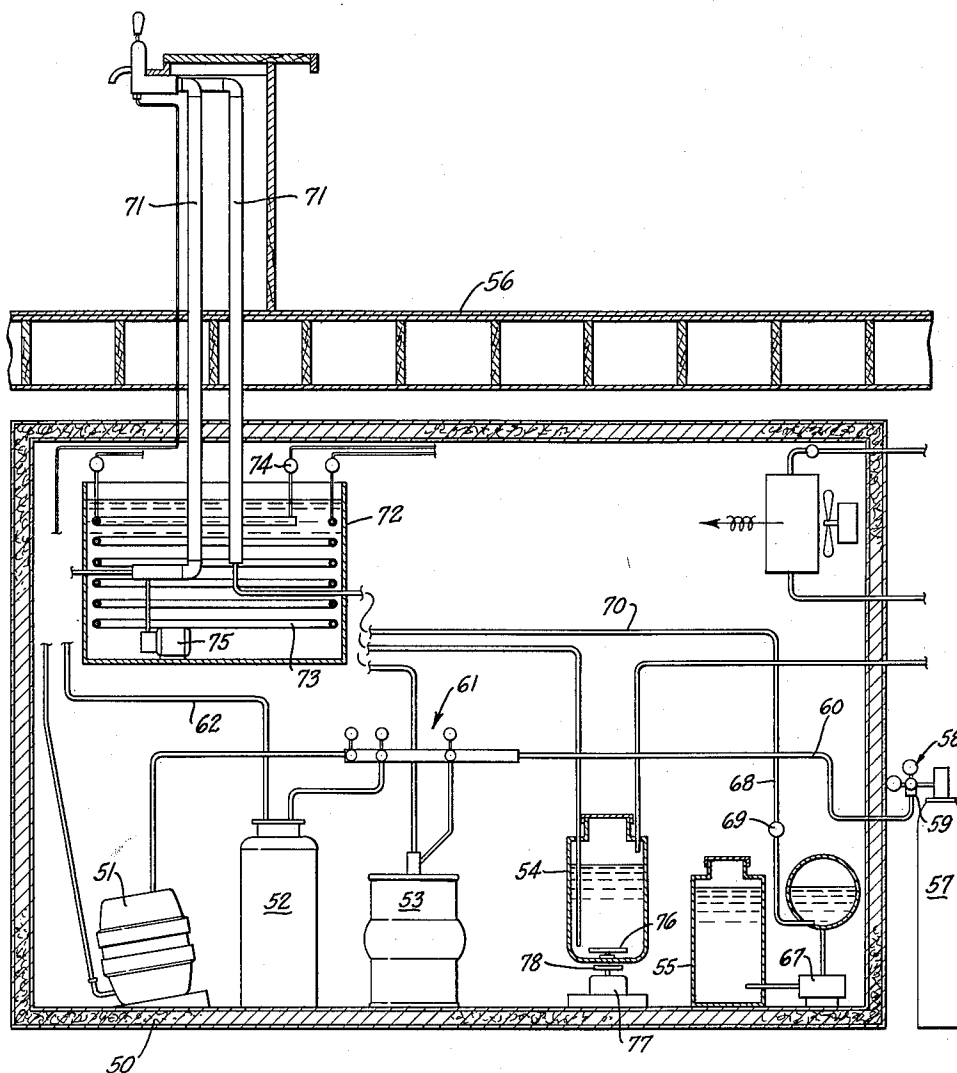


FIG - 3 -

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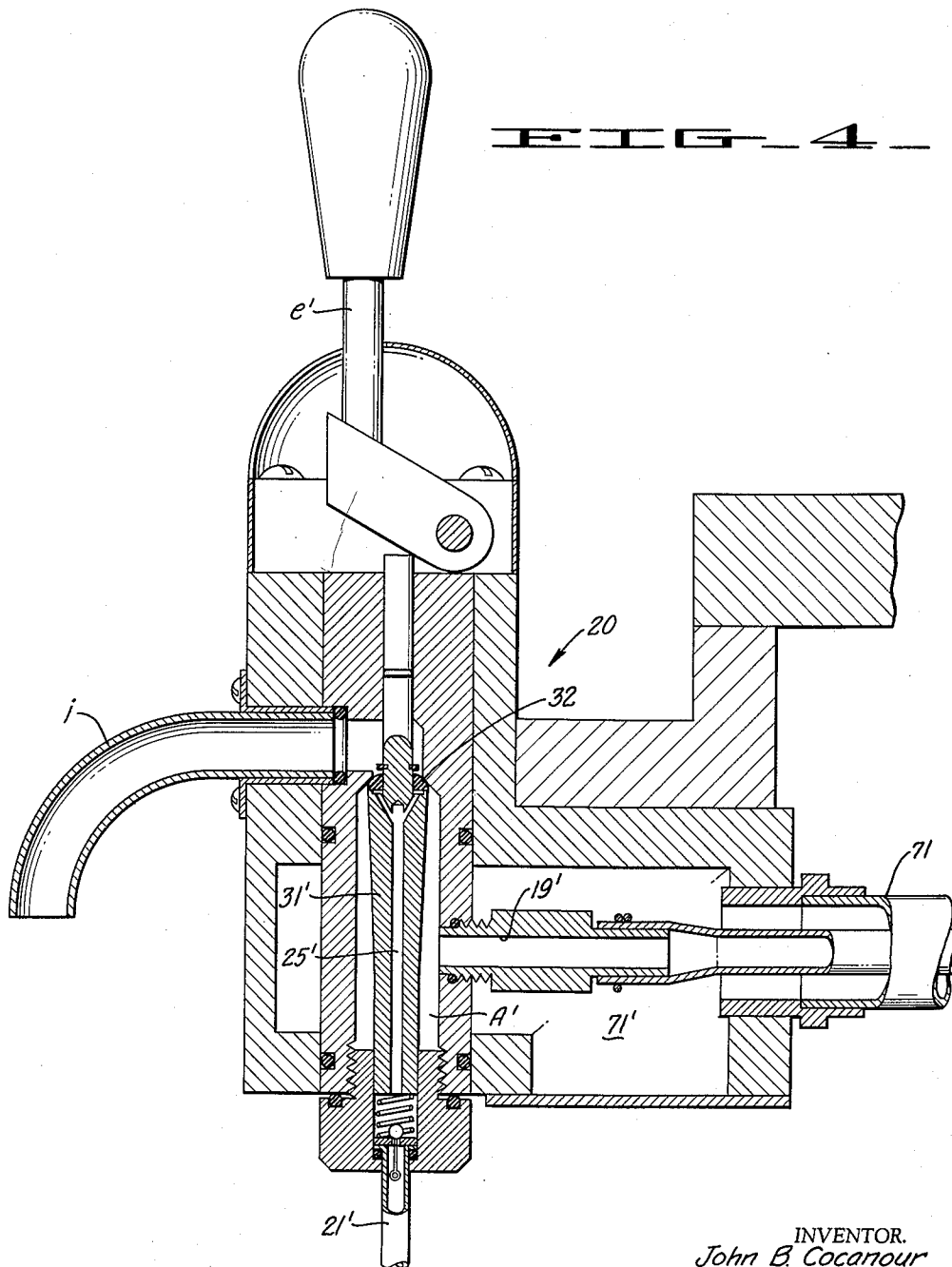
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3 Sheets-Sheet 3



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BEVERAGE DISPENSING SYSTEM

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5 Claims. (Cl. 222—129.1)

The present invention relates to improvements in a beverage dispensing system, and its principal object is to provide a system of the character described which will produce and dispense a high-quality beverage at an improved rate of flow without excessive foaming.

A further object of my invention is to provide a beverage dispensing system which is simple and economic in operation, easy to keep clean, and which will dispense the beverage at the required temperature and the proper volume content of carbon dioxide, whereby excessive foaming is avoided and a properly balanced mixture is obtained directly from the dispensing faucet.

A still further object of the invention is to provide a novel dispensing faucet arranged to properly mix the ingredients of a soft drink right at the beginning of each dispensing operation, while maintaining the ingredients separate during the intervening periods.

Again, it is proposed to provide a low-pressure beverage dispensing system in which the applied dispensing pressure of the CO₂ cylinder is regulated to stay within a range of from twenty-five to forty pounds per square inch (gauge) at temperatures of from 32° to 45° F., with the object of saturating the water with the carbon dioxide at the temperature selected, without exceeding the above pressure range.

And finally, it is proposed to provide a system of the character described in which a liquid and carbonated water are fed through the system in separate paths and under the regulated pressure of the CO₂ gas to reach the valve of the dispensing faucet still in separate relation and to be thoroughly mixed only upon the opening of the faucet and as part of the dispensing operation.

Further objects and advantages of my invention will appear as the specification proceeds, and the new and useful features of my beverage dispensing system will be defined in the claims hereto attached.

The preferred forms of my beverage dispensing system are illustrated in the accompanying drawing forming part of this application, in which:

Figure 1 diagrammatically illustrates one form of my dispensing system intended principally for dispensing a carbonated soft drink including a mixture of syrup and carbonated water;

Figure 2, an enlarged sectional detail view of a dispensing faucet used in the system;

Figure 3, a diagrammatic view illustrating a similar system intended for the dispensing of various soft drinks, beer and the like; and

Figure 4, an enlarged sectional detail view of a faucet used in the latter system.

While I have shown only the preferred forms of my dispensing system, it should be understood that various changes or modifications may be made within the scope of the claims hereto attached, without departing from the spirit of the invention.

Referring to the drawings in detail and particularly to the form shown in Figures 1 and 2, the numeral 1 refers to an insulated cabinet which houses a carbonator 16, a

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pre-cooling water coil 12 and a carbonated water restrictor and post-cooling coil 18 and has a self-mixing faucet 20 mounted in the wall thereof.

The cabinet has a storage compartment 23 for storing a quantity of chipped ice to cool and control the temperature of the inlet water and to maintain the temperature of the carbonated water.

It might be well to explain, at this point, that the maximum quantity of CO₂ gas a given volume of water can absorb (at a given water temperature and applied CO₂ gas pressure) is the saturation point of water. The quantity of CO₂ gas absorbed by the water is measured in volumes, as when one cubic foot of water has absorbed three cubic feet of CO₂ gas at zero pounds pressure, it is said to be carbonated to three volumes carbonation.

When water becomes saturated with CO₂ gas, it cannot absorb any more gas unless the CO₂ pressure is increased or the temperature of the water is reduced.

Water, which has been saturated at a given volume carbonation will, if the temperature is kept constant, remain in this saturated state indefinitely, providing the CO₂ pressure is kept at the saturation pressure of its corresponding temperature. Reducing the CO₂ pressure below the above value will maintain the water saturated, but the volumes carbonation will be proportionately reduced.

The volume of CO₂ gas absorbed in one volume of water within the mixing tank 16 of the carbonator, at a given applied CO₂ pressure and temperature is:

Temperature, Degrees F.	Applied CO ₂ Pressure, pounds per square inch—Gauge.
32°	25—30—35—40
35°	4.0—4.6—5.2—5.7
38°	3.7—4.3—4.7—5.3
40°	3.4—3.8—4.3—4.8
45°	3.1—3.5—4.0—4.3

The self-mixing faucet 20 will dispense carbonated water (club soda) of 4.5 volumes at 35° F. temperature and thirty-one pounds pressure or lower, depending on temperature pressure relation. A 4.5 volumes of saturation is not necessary, and 45° is too high to dispense and maintain a quality product. Beverages, such as Cola, Root Beer, Birch Beer and Cherry require carbonation of 3.5 volumes and over. Ginger Ale and Litherated Lemon require 4.0 volumes, and Club Soda, 4 to 4.5; while Grape, Orange and Grapefruit are the few flavors which may be dispensed with little or no carbonation.

Carbonator 16 will carbonate water equal to the carbonation desired in a finished drink.

Referring again to the drawings, a conventional CO₂ cylinder is shown at 2, and its discharge is controlled by a regulator 3. Regulated or delivery pressure can be adjusted up or down without bleeding the CO₂ supply lines indicated at 5. The regulator does this automatically. An internal safety relief valve opens when delivery pressure exceeds any set pressure by more than 15 p.s.i. The relief valve opens at 45 p.s.i., when set at 30 p.s.i., etc. Adjusting the regulator automatically adjusts the relief valve and maintains the constant differential between delivery and relief valve opening pressure.

This regulator is well-known in the market, and is manufactured by the Cornelius Company of 550 39th Avenue, N.E. Minneapolis 21, Minnesota. It will normally be set, in the operation of my system, at a relatively low delivery pressure, substantially within the range of pressures indicated in the above chart.

A check valve 4 is located downstream of the regulating and relieve valve and prevents reverse flow of the product into the mechanism, when gas lines 5 connected

to the product container 6 and carbonator 16 have an internal pressure in excess of regulator delivery pressure.

Next, when the regulator has been set to the desired pressure, say thirty-five pounds, CO₂ gas passes through supply lines 5 to the syrup container 6 and carbonator 16, by way of a check valve 15, which prevents reverse flow of CO₂ gas or carbonated water, when the carbonator 16 may have an internal pressure in excess of that of the syrup container.

Referring to the CO₂ volume chart, with thirty-five pounds in the carbonator, the water will become saturated to a volume of 4.3 at 40° F.

The carbonator may be of conventional construction and operates on the principle of discharging a jet of water into the chamber containing the CO₂ gas.

The water is brought to the carbonator from any suitable source, through pipe 8, controlled by a solenoid valve 9. When the carbonated water in the carbonator drops below the long or lower electrode 11, the liquid level relay 10 closes an electrical circuit and opens the solenoid valve 9 to supply a fresh amount of water. The latter passes through a pre-cooling water coil 12 and check valves 13 into the inlets 14 for the carbonator, from opposite sides, and becomes carbonated to a predetermined CO₂ volume.

From the outlet 17 carbonated water passes through restrictor coil 18 to the self-mixing faucet inlet 19 and into the chamber A surrounding the mixing valve stem or plunger 31, up to the washer 32, and remains there until the faucet valve is opened.

Referring now to the syrup container 6, a supply of syrup enters the supply line 7, which has an internal pressure the same as the carbonator 16, and enters, through intake 21, a syrup metering orifice *a* and a check valve *b*, into the axial conduit 25 in the valve stem with its tapering orifice *c*, until it reaches the washer 32 where it remains until the valve is opened.

The valve stem 31 is operated by means of an extension *d* which projects through the washer 32 and in turn is operated by means of a handle *e*. The faucet housing has a tapered valve seat *f* against which the washer 32 rests. The washer has a diameter substantially the same as that of the valve stem, but smaller than that of the surrounding chamber so that when the washer is forced backward, carbonated water may flow around the same.

The extension *d* has a collar or pin *h* mounted a short distance forwardly of the washer in normal position.

In operation, with the conduit 25 filled with syrup and the surrounding chamber A filled with carbonated water, both under the same pressure, when the extension *d* is pushed backward by the handle *e*, and against the resistance of a spring *g*, it will first separate the forward end of the valve stem from the washer to allow the syrup to discharge into the chamber, and immediately thereafter, through the collar *h*, will push the washer from its seat to allow the mixture of syrup and carbonated water to escape past the rim of the washer and to discharge through the outlet *i*.

The mixture of carbonated water and syrup should preferably be in the proportion of five to one, or any other desired mixture, depending upon the size of the metering orifice *a*, or size and length of the restrictor coil 18. Also, increasing or decreasing the regulator pressures will change the rate of flow of the water and the syrup, but the ratio will change only slightly if the pressure change is only five to ten pounds.

This is important, since it allows the CO₂ volumes of water to be changed without upsetting the mixing ratio.

After the carbonated water and syrup are mixed, a finished beverage passes out of the spout. The temperature, mixture, CO₂ volumes and flow are easily controlled.

It will be noted that the salient features of my invention are, apart from the specific faucet construction:

(1) Low pressure at the regulator, the pressure being substantially within the range of pressures indicated in the chart and being calculated to cause water carbonated to the saturation point at the selected temperature to discharge through the faucet without excessive foaming. For instance, if a CO₂ volume saturation of 4.3 is desired at a temperature of 40° F., the proper pressure would be thirty-five pounds.

(2) Maintaining the pressure throughout the system, on both water and syrup, up to the final discharge.

(3) Pre-cooling the water before it enters the carbonator.

(4) Restricting the flow of the carbonated water.

(5) Metering out the syrup.

(6) Intense mixing at the point of discharge.

It is further proposed to use a similar beverage dispensing system in connection with drinks which do not require carbonation. In this form, an insulated cabinet 50 is shown as housing various containers marked 51 to 55, containing beer (51), syrup (52), beer (53), pulpy liquid (54) and plain or conditioned water (55).

These containers are variously connected for dispensing through faucets mounted above the floor 56, only one of the faucets being shown.

Outside the cabinet is shown a cylinder 57 containing a CO₂ or nitrogen supply under pressure. A pressure regulator 58 is provided as previously described, followed by a check valve 59, downstream.

When the regulator has been set to a desired pressure, CO₂ or nitrogen passes through supply line 60, a second regulator 61 to any one of the containers 51, 52 or 53, say to 52 holding a syrup. The internal pressure in this container forces syrup through supply line 62 to the syrup intake 21' of the faucet 20' (Figure 4), and the syrup passes through the conduit 25' in the valve stem 31' to the washer 32' where it remains until the valve of the faucet is opened.

The water supply tank 55 has means for maintaining a supply of water therein, and a pump 67 pumps water from the tank through the conduit 68 and the regulator 69 which passes a regulated supply of water through the line 70. A portion of said line is surrounded by a cooled water conduit 71 and finally terminates in the valve inlet 19' and the chamber A' surrounding the valve stem 31' to bring the water up against the washer 32' where it remains until the faucet is opened.

The faucet, shown in Figure 4, is of substantially similar construction to that of Figure 2, and primed numbers and letters have been applied to corresponding parts.

When the lever handle *e'* pushed the extension *d'* of the valve stem inwardly, the stem first recedes from the washer and immediately thereafter the washer recedes from the valve seat and the syrup and the water are mixed in the manner previously described and pass out of the spout *i*. To get the desired mixture, the water regulator 69 is set to a desired flow and the regulator 61 is set to a desired syrup mixture.

Water or coolant is circulated around the valve to maintain proper temperature at all times. The water in the conduit 71 is cooled in a refrigerated fixture, water cooler or tank 72, with cooling coils 73 cooled by a refrigeration condensing unit.

Water or coolant temperatures are controlled by a temperature control 74. A circulating pump 75 supplies water through one leg of the conduit 71 and the water flows in and around the valve as at 71', and back, through the other leg, to the tank 72.

The container 54, which is intended for dispensing a beverage which has quantities of pulp therein, such as crushed orange, grapefruit juice, tomato juice, and the like, is preferably provided with an agitator or mixer 76, driven magnetically, through a motor 77 and a magnet 78.

It will be understood that the valve 31 may be readily

changed to dispense a pre-mixed beverage by merely eliminating the axial conduit 25 and its connection 21. The manufacturer may, for instance, furnish interchangeable valves, with or without the conduit 25, thus allowing the user to readily change from pre-mix to post-mix and vice-versa.

The features shown in the two forms of my invention may, of course, be combined in various ways, such, for instance, as introducing the carbonating feature of the first form into the second form.

I claim:

1. A self-mixing faucet for a beverage dispensing system, comprising a housing having an outlet and a feed passage connected thereto, with a valve seat arranged in the feed passage and leading to the outlet, a washer adapted for seating on the seat and having a diameter smaller than that of the passage, a plunger movable in the passage and forming an annular chamber therewith leading to the valve seat, and having spring means for urging the same upon the washer and the latter upon its seat, the plunger having an axial conduit with orifices leading to the washer, and means for successively pushing the plunger and the washer away from the valve seat to allow liquids fed through the conduit and the chamber under pressure to mix at the valve seat and to pass through the outlet.

2. A self-mixing faucet for a beverage dispensing system, comprising a housing having an outlet and a feed passage connected thereto, with a valve seat arranged in the feed passage and leading to the outlet, a washer adapted for seating on the seat and having a diameter smaller than that of the passage, a plunger movable in the passage and forming an annular chamber therewith leading to the valve seat, and having spring means for urging the same upon the washer and the latter upon its seat, the plunger having an axial conduit with orifices leading to the washer, and means for successively pushing the plunger and the washer away from the valve seat to allow liquids fed through the conduit and the chamber under pressure to mix at the valve seat and to pass through the outlet, the latter means comprising a reduced extension of the plunger projecting through the valve seat and operable for first pushing the plunger away from the washer to open the orifices to the chamber and to thereafter push the washer from the seat to open the chamber to the outlet.

3. A self-mixing faucet as defined in claim 2, in which the housing has an orifice controlling access to the conduit, with a check valve for said orifice preventing back flow from said conduit.

4. A beverage dispensing system comprising, a faucet having a mixing valve therein, means for feeding carbonated water to said mixing valve under pressure, means for feeding syrup to said valve under pressure, and a common regulator controlling the pressures in the carbonated water and syrup feed means so as to feed the carbonated water and syrup to said mixing valve at the same pressure, said mixing valve comprising a housing having an outlet and a feed passage connected to said means for feeding carbonated water, with a valve seat arranged in the feed passage and leading to the outlet, a washer adapted for seating on the seat and having a diameter smaller than that of the passage, a plunger movable in the passage and forming an annular chamber therewith leading to the valve seat, and having spring means for urging the same upon the washer and the latter upon its seat, the plunger having an axial conduit with orifices leading to the washer and with said conduit connected to said means for feeding syrup, and means for successively pushing the plunger and the washer away from the valve seat so as to first uncover said orifices and permit the syrup under pressure to mingle with the carbonated water in the annular chamber at the same pressure and then move the washer away from the valve seat and allow the intermingling liquids to pass through the outlet.

5. In a beverage dispensing system having feed lines delivering syrup and carbonated water at the same pressure, a mixing valve comprising a housing providing an internal chamber adapted for connection to the carbonated water feed line, a valve seat connecting said chamber to an outlet, said mixing valve being formed with means providing a passageway adapted for connection to the syrup feed line and terminating in a valve seat opening into said chamber, a valve member formed for closing off both of said valve seats in the closed position of the mixing valve, and means for displacing said valve member sequentially from said syrup feed line seat and from said outlet seat so as to permit the syrup and carbonated water to intermix in the chamber at the same pressure and thereafter flow in mixed condition through the outlet seat.

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