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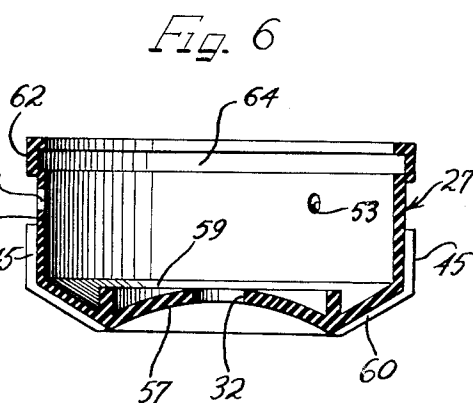
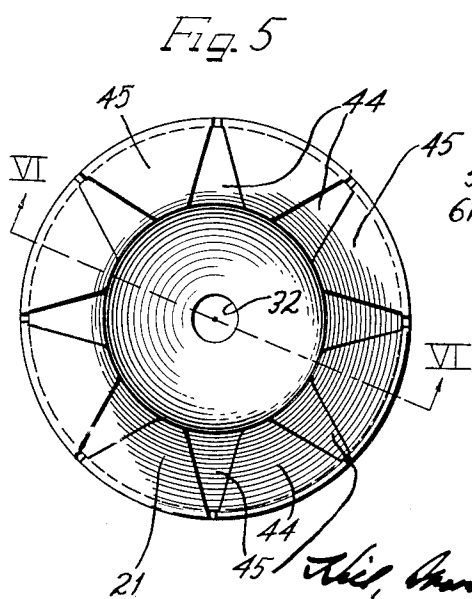
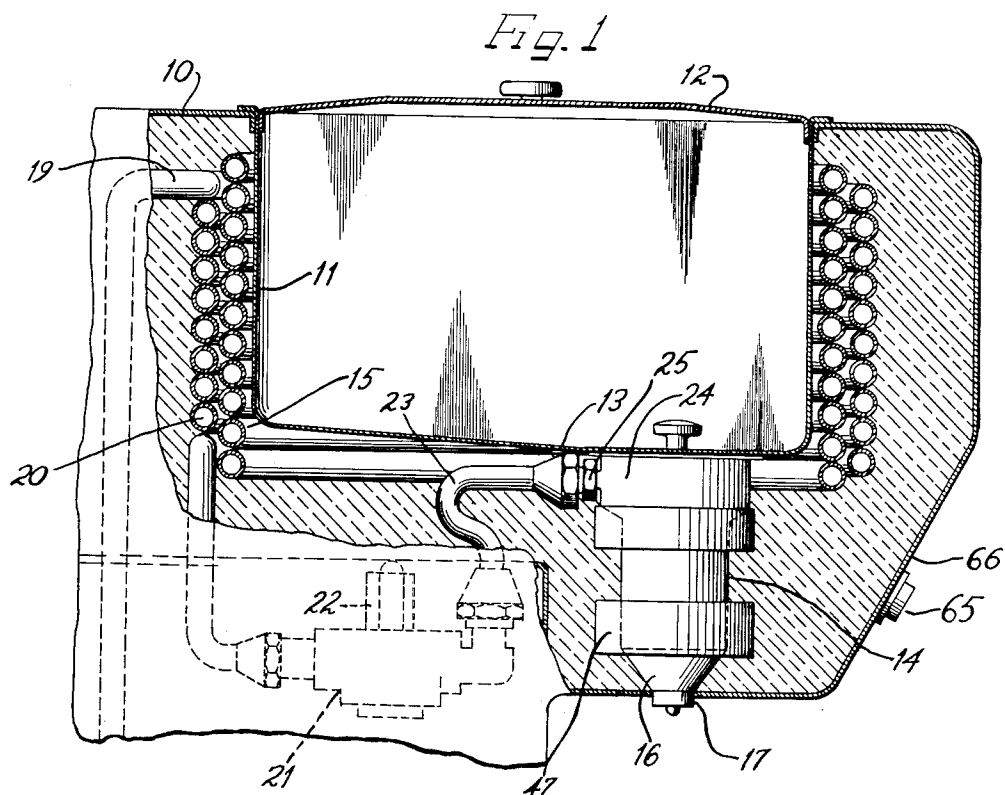
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JUICE CONCENTRATE DISPENSER VALVE

Filed Sept. 13, 1950

2 Sheets-Sheet 1



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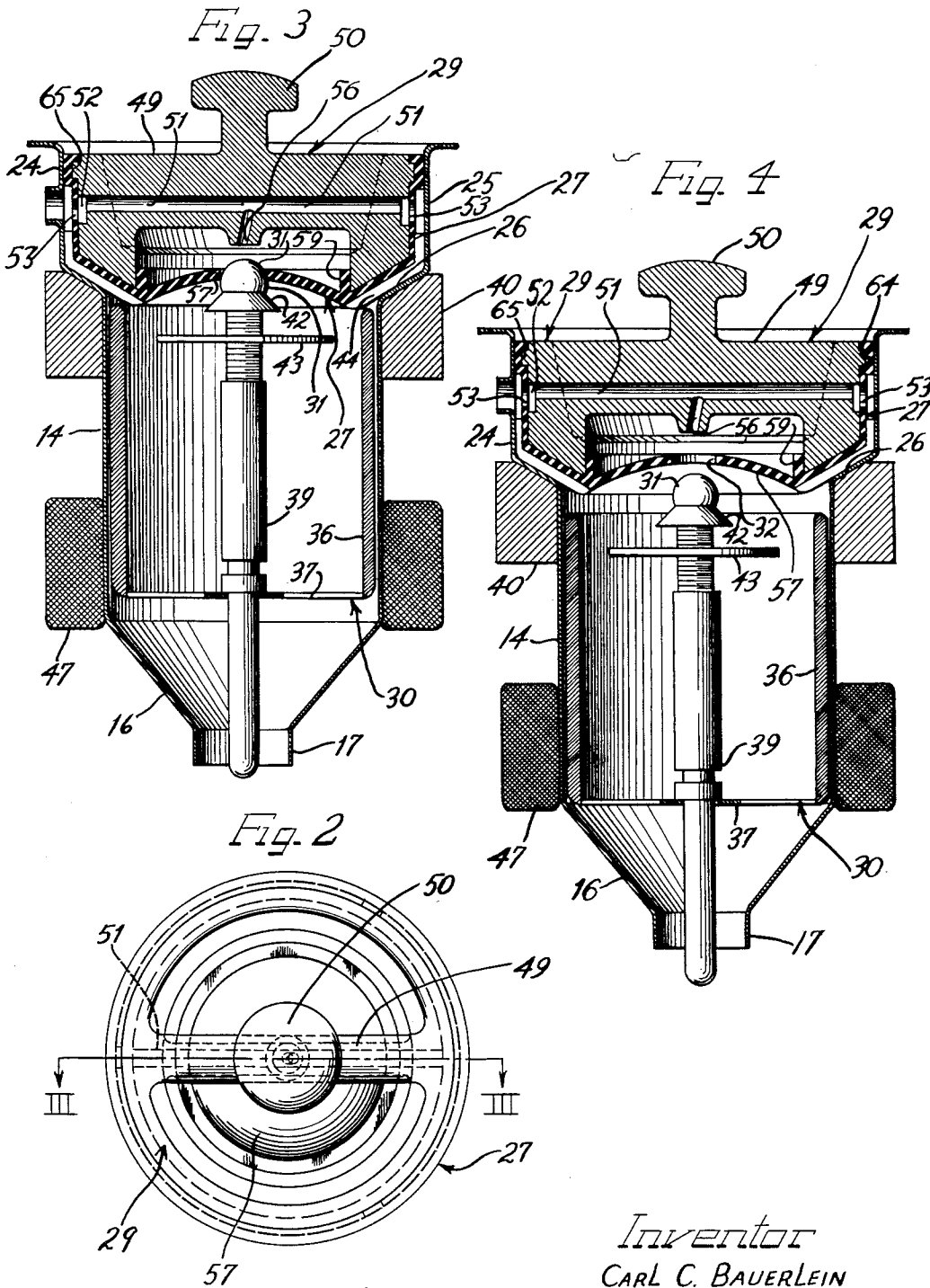
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JUICE CONCENTRATE DISPENSER VALVE

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6 Claims. (Cl. 137—604)

This invention relates to dispensers of a type particularly adapted to dilute concentrates and dispense them in the form of a palatable drink.

It is a prerequisite in dispensers which dilute and dispense concentrates that the concentrate be mixed with and diluted by a measured volume of water and that the diluting and mixing valve for the water and concentrate be of simple construction made from corrosion resistant materials with no passages, shoulders or ridges which cannot readily be cleaned in order to assure freedom from bacteria and comply with health department standards. It is also necessary that the parts of the valve may readily be removed by hand without the use of tools, by simply lifting the parts from the valve chamber.

It is, therefore, an object of my invention to provide a mixing and dispensing valve arranged with a view toward utmost simplicity in construction and operation with the operating means for the valve on the outside of the valve chamber out of the path of the concentrate and water being mixed.

Another object of my invention is to provide a new and improved dispenser of a simplified and novel construction and arrangement utilizing a permanent magnet on the outside of the valve chamber as the return spring of the valve.

A still further object of my invention is to provide a novel and improved form of valve for dispensers for concentrates so arranged that the parts thereof may readily be removed by hand for cleaning without the use of tools.

A still further object of my invention is to provide a new and improved form of dispenser valve utilizing a flexible flow control member which also forms a seal for the valve chamber.

A still further object of my invention is to provide a novel and improved form of dispenser valve for juice concentrates including a mixing and flow characterizing head having a flexible flow control member extending across the bottom and along the side wall of the head wherein the flow passageways for the water for diluting the juice concentrate are in the form of open grooves on the walls of the flexible flow control member.

A still further object of my invention is to provide an efficient form of flow control valve wherein the valve member is in the form of an armature rectilinearly moved to an open position upon the energization of an electric magnet and wherein the electrical center of the magnet is so located with respect to the valve chamber that the armature will automatically come to a stop as it reaches that center prior to engagement with a solid abutment or stop.

These and other objects of my invention will appear from time to time as the following specification proceeds and with reference to the accompanying drawings, wherein:

Figure 1 is a fragmentary partial diagrammatic view in side elevation of a dispenser constructed in accordance

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with my invention, with certain parts thereof broken away and certain other parts shown in section;

Figure 2 is a top plan view of a mixing and flow characterizing valve constructed in accordance with my invention;

Figure 3 is a transverse sectional view of the mixing and flow characterizing valve shown in Figure 2 and taken substantially along line III—III of Figure 2, showing the valve in a closed position;

Figure 4 is a view somewhat similar to Figure 3 but showing the valve in an open position;

Figure 5 is a bottom plan view of a flow control diaphragm constructed in accordance with my invention; and

Figure 6 is a transverse sectional view of the flow control diaphragm taken substantially along line VI—VI of Figure 5.

In Figure 1 of the drawings I have shown a portion of a liquid dispenser for diluting various types of concentrates, and more particularly for diluting juice concentrates to the normal consistency of the juice of the fresh natural fruit and delivering a cool uniformly mixed juice for drinking purposes. This dispenser may include a casing 10 having a container or tank 11 for the juice concentrate mounted therein adjacent the upper end thereof and open at the top thereof. The tank 11 may be of a generally cylindrical form closed by a cover 12 and having a sloping bottom 13. The bottom 13 slopes uniformly to a valve chamber 14 flush with said bottom and depending therefrom. The tank 11 and valve chamber 14 may be made from a corrosion resistant material, such as stainless steel, and besides resisting corrosion of fruit juices such as lemon juice are also free from all shoulders or recesses within which bacteria may breed. The metal tank 11 is shown as being encircled by refrigerating coils 15 to maintain the temperature of the juice concentrate sufficiently low to prevent the breeding of bacteria therein. It should be understood that the tank 11 and valve chamber 14, being made of metal, and being well insulated may aid the refrigeration coils 15 to retain the temperature of the concentrate low enough to prevent the breeding of bacteria for some time after the refrigerating unit is shut off.

The valve chamber 14, as herein shown, is of a generally cylindrical formation having an upper flange which may be recessed within the bottom of the tank 11 and be welded or soldered thereto, and having an inverted frusto-conical open bottom portion 16 converging to a delivery nozzle 17.

The casing 10 may also have a compressor, motor and condenser (not shown) for a refrigerating unit, which may be contained therein.

It should here be noted that suitable temperatures at which the juice concentrate may be maintained have been found to be from 25° to 32° F., although it may be maintained at higher or lower temperatures as long as the concentrate will flow relatively freely or is sufficiently cold to prevent the breeding of bacteria, it being understood that the freezing temperature of the concentrate is much lower than that of water, the freezing temperature of concentrated fruit juices being in the neighborhood of 18° F.

A supply pipe 19 for diluting water may enter the casing 10 through the wall thereof (not shown) and may extend upwardly through said casing to a position adjacent the top of the cooling coils 15. The pipe 19 may then be coiled around the outside of said cooling coils in spaced relation with respect thereto as indicated by reference character 20. The supply pipe 19 is shown as being connected at its delivery end with a constant delivery solenoid operated valve 21 arranged to deliver a uniform volume of water upon the energization of a

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solenoid 22 controlling operation of said valve. The valve 21 may be of any well known form delivering a constant volume of water upon energization of a solenoid and is no part of my present invention so need not herein be shown or described in detail. A pipe 23 leads from the discharge end of the valve 21 to an enlarged upper shouldered portion of the valve chamber 14 and is connected thereto through a wall 24 thereof by means of a fitting 25 secured to said wall. The wall 24 terminates in a generally frusto-conical shoulder 26 upon which a flow control and sealing diaphragm 27 of a mixing and flow characterizing head 29 normally rests during operation of the dispenser.

A valve member 30 having a central upwardly projecting characterized valve element 31 is slidably mounted in the valve chamber 14 beneath the flow characterizing head 29. The valve element 31 is movable into position to engage an orifice 32 of the diaphragm 27 and block the flow of concentrate therethrough. Said valve element is herein shown as being spherical but may be of any characterized form to restrict the orifice 32, and provide a characterized flow therethrough when the valve is in an open position and the head of concentrate on the diaphragm 27 moves said diaphragm toward said valve element. The valve member 30 is herein shown as having a generally cylindrical wall 36 slidably guided within the valve chamber 14 and as having a spider 37 extending across the lower end thereof and forming a support for a plunger 39 having the valve element 31 mounted on its upper end and herein shown as being mounted thereon. The plunger 39 depends from the spider 37 through the nozzle 17 and affords a means for opening the valve by hand against a permanent magnet 40, serving as a retaining spring for the valve.

The valve element 31 is herein shown as having a characterized upper end portion engageable with the orifice 32 to block the flow of fluid therethrough and as having a depending frusto-conical skirt 42 extending laterally from said valve element to deflect the juice concentrate onto a mixing table 43. The mixing table 43 is herein shown as being threaded on the plunger 39 beneath the skirt 42, and receives the concentrate discharged through the orifice 32 and water discharged angularly along the shoulder 26 through passageways 44—44 formed between the inner peripheries of the walls 24 and 26 of the valve chamber 14 and the diaphragm 27. The diaphragm 27 is spaced from the walls 24 and 26 by means of generally triangular ribs 45—45 extending from said diaphragm and having their bases along the periphery of said diaphragm and forming passageways therebetween diverging toward said mixing table.

The permanent magnet 40 is herein shown as being of an annular form encircling the valve chamber 14 and engaging the under side of the frusto-conical wall 26 thereof. Said magnet may be made from "Alnico" or any other suitable alloy having high magnetic properties and retaining these properties over indefinite periods of time, and serves as a return spring for the valve, located entirely outside of the valve chamber, out of the way of the fluid passing therethrough.

The valve member 30 may be made from a magnetic type of stainless steel which will resist the corrosive action of the juices passing therethrough. One such type of magnetic steel which has been found to be satisfactory and which resists the corrosive action of the juices including lemon juice is a No. 430 magnetic type of stainless steel, although this particular steel need not be used as there are various other types of such steel which may also be suitable.

An electromagnet 47 encircles the valve chamber 14, adjacent the lower end thereof just above the conical wall 16, and when energized moves the valve member 30 and valve element 31 into the open position shown in Figure 4. The electromagnet 47 is so located along the outside of the valve chamber 14 with respect to the

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permanent magnet 40, that the magnetic forces acting on the valve member 30, which is the armature of the solenoid, will balance prior to engagement of said valve member with the bottom portion 16 of the chamber 14 when said electromagnet is energized and said valve member will automatically come to a stop prior to engagement with said converging wall portion. The electromagnet 47 thus not only serves to open the valve but is also balanced with the permanent magnet 40 to arrest travel of the valve member or armature 30 so that it cannot move any further under the impulse of said electromagnet. The valve member 30 will thus come to a stop before it positively engages any fixed abutment in the valve chamber such as the frusto-conical bottom portion 16 thereof. This eliminates all chattering of the valve and assures a quiet and positively opening valve, it being understood that travel of the valve member 30 in an opposite direction is arrested by the rubber diaphragm 27, which acts as a cushion for the valve during valve closing movement.

The mixing and flow characterizing head 29 may be formed or molded from one of the well known thermoplastic materials and is shown as being of a generally annular formation having a bridge 49 extending diametrically thereacross and as having a diametral passageway 51 extending therethrough and opening to opposite sides of said head. A hand grip 50 projects upwardly from the central portion of the bridge 49 to enable said flow characterizing head to be readily removed from the valve chamber 14 by hand for cleaning. Said mixing and flow characterizing head has an annular passageway 52 extending therearound and opening to the periphery thereof and communicating with opposite ends of the diametral passageway 51. The annular passageway 51 also communicates with ports 53—53 in the wall of the diaphragm 27. The diametral passageway 51 is of a smaller cross sectional area than the cross sectional area of the annular passageway 52 and has a jet 56 leading downwardly therefrom adjacent the transverse center thereof and directing a high velocity jet of water through the orifice 32 of the valve element 31, scavenging said orifice and valve element of juice concentrate and pulp contained therein and also aspirating the juice concentrate through said orifice.

The high velocity jet is attained by the venturi effect obtained by the difference in cross-sectional area between the passageways 51 and 52 resulting in the discharge of a high velocity jet of water through the orifice 32 onto the valve element 31.

The diaphragm 27 may be formed preferably by molding from a suitable elastic material such as rubber, neoprene, or any other similar material and is herein shown as having a central semi-spherical flow control diaphragm portion 57 extending upwardly within the open portion of the head 29 which has the orifice 32 extending through the center thereof. An upright annular flange 59 extends upwardly from the outer margin of said central diaphragm portion and is seated within the inner wall of the mixing and flow characterizing head 29. The diaphragm 27 also has a frusto-conical bottom portion 60 extending from the outer margin of the diaphragm portion 57 along the frusto-conical bottom of the mixing head 29 to the outer margin thereof, and terminating into a vertical wall portion 61 extend-upwardly therefrom along the outer wall of the head 29 to a position near the top of said head. The upper end of the wall portion 61 is ribbed or flanged, as indicated by reference character 62, and has an annular recess 64 formed on the inner side thereof engageable with an annular rib 65 extending around the periphery of the mixing head 29 a slight distance beneath the top thereof and serving to retain said diaphragm to said mixing head with the flange 62 in sealing engagement with the wall of the valve chamber 14. The diaphragm 27 thus completely encloses the portion of the mixing head 29 exposed to the valve chamber 14, and

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besides serving as a flow control member also performs a sealing and a flow guiding function, rendering the use of separate sealing rings and closed passageways unnecessary and guiding the water discharged into the valve chamber 14 through the passageways 44—44 formed by the ribs 45—45.

Referring now to Figure 4, it will be observed that when the electric magnet coil 47 is energized the valve element 31 will move downwardly to fully open the orifice 32 of the diaphragm 27 and permit the flow of juice concentrate through said orifice under the scavenging and aspirating effect of the high velocity jet discharged through the jet passageway 56. As, however, the head of concentrate on a semi-spherical diaphragm portion 57 of the diaphragm 27 increases, said diaphragm portion will flex downwardly and the orifice 32 will move toward the valve element 31. In a contrary manner, as the concentrate is dispensed without being replaced, the diaphragm will flex in an opposite direction away from the valve element 31. The cross sectional flow area of the orifice 32 will thus increase or decrease as the head of concentrate thereon varies, maintaining the volume of concentrate discharged through said orifice uniform regardless of the amount of concentrate in the tank 11.

The electro-magnets 22 and 47 of the valves 21 and 30 may be simultaneously energized by pressure of the finger on a pushbutton 65 on an outside wall 66 of the casing 10. When the electro-magnets 22 and 47 are energized, the valves 21 and 30 will simultaneously open and deliver a uniform volume of water to dilute and mix with a uniform volume of concentrate delivered through the orifice 32. One suitable proportion of water to concentrate may be approximately three-fourths water to one-fourth concentrate. It is of course obvious that this proportion may vary for different concentrates.

When the two valves 21 and 30 are open, water under pressure may enter the chamber 14 and may flow downwardly along the wall thereof in the passageways 44—44 between the ribs 45—45, for discharge onto the top of the mixing table 43. Water may also enter the annular passage 52 through the ports 53—53 and pass along the restricted passageway 51 for discharge through the jet passageway 56 in the form of a high velocity jet directed through the orifice 32 and onto the valve element 31. This will scavenge concentrate and pulp from said mixing head and will also aspirate the concentrate through said orifice for distribution by the valve element 31 and skirt 42 onto the mixing table 43 for mixture with water discharged onto said mixing table through the passageways 44—44. From thence the mixed juice and concentrate may pass down the inside of the cylinder 36 through the open spider 37 for discharge through the nozzle 17.

It will be understood that modifications and variations may be effected without departing from the scope of the novel concepts of the present invention.

I claim as my invention:

1. A valve comprising a valve chamber, a valve member mounted in said chamber for slidable movement therealong, a valve seat adjacent one end of said chamber for engagement with said valve member, an annular permanent magnet encircling said valve chamber adjacent one end thereof and biasing said valve member into engagement with said valve seat, an electro-magnet encircling said valve chamber in spaced relation with respect to said permanent magnet and selectively energizable to move said valve member against said permanent magnet to an open position out of engagement with said valve seat, and the electrical center of said electro-magnet being located at a predetermined distance from the lower end of said valve chamber and so located with respect to the magnetic center of said permanent magnet as to automatically stop movement of said valve member into an open position prior to engagement with the end of said chamber.

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2. A mixing valve comprising a valve chamber, a valve member slidably mounted in said chamber for movement therealong and having a central valve element, a valve seat in said chamber adapted to be engaged by said valve element, an annular permanent magnet encircling said chamber adjacent the upper end thereof and biasing said valve element into engagement with said valve seat, an electro-magnet encircling said valve chamber adjacent the lower end thereof and selectively energizable to move said valve member against said permanent magnet out of engagement with said valve seat, said valve member having a plunger forming a support for said valve element on one end thereof and having an opposite end depending from said valve chamber to permit opening of the valve by hand.

3. In a dispenser valve for concentrates, an open ended valve chamber, a passageway through a wall of said chamber for the discharge of water thereinto, a flow characterizing head seated in said chamber having a central open portion for the flow of liquid therethrough by gravity and also having a flexible sealing and flow control diaphragm seated in the open portion of said chamber and extending upwardly therein, with a central orifice for the flow of concentrate therethrough, said flow control diaphragm also extending along the bottom of said chamber and having a wall portion extending along the wall of said head in sealing engagement with the wall of said chamber and having a plurality of spaced ribs forming passageways opening to the wall of said chamber and communicating with the passageway through the wall of said chamber and conducting water discharged therethrough for mixture with the concentrate flowing through said orifice.

4. In a dispenser valve for concentrates, a valve chamber, a flow characterizing head seated in said chamber, said head having an open central portion for the flow of liquid therethrough by gravity and having a passage defining member extending across the open portion thereof having a discharge jet leading therefrom to discharge a high velocity jet through the central portion of said head, a passageway for water leading into said chamber through a wall thereof and a sealing and flow control diaphragm extending across the open portion of said head and having a central orifice for the flow of concentrate therethrough by gravity, said flow control diaphragm also extending outwardly along the bottom of said head and upwardly along the wall thereof and having a plurality of flow passageways leading through its wall and communicating with said passage defining member for supplying water thereto for discharge through said discharge jet.

5. A dispenser valve for concentrates comprising a valve chamber, a valve member slidably movable along said chamber and having a central valve element, a passageway for water leading into said chamber adjacent the upper end thereof, a flow characterizing head seated in said chamber in the region of said water passageway and having an open central portion for the passage of concentrate therethrough, an apertured flexible diaphragm extending across the bottom of said open central portion of said head and upwardly along opposite sides thereof, the apertured portion of said diaphragm forming an orifice movable toward and from said valve element in accordance with the head of fluid thereon to effect a uniform flow of fluid through said flow characterizing head, and said diaphragm also having a flanged wall portion having sealing engagement with said valve chamber and having outwardly opening flow passageways extending along said wall portion and cooperating with the wall of said chamber to conduct water for admixture with the concentrate flowing through said orifice.

6. A dispensing valve for concentrates comprising an open ended valve chamber, a valve member slidably movable along said chamber and having a centrally disposed valve element, a flow characterizing head seated in said

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chamber, said head having an open central portion having a flexible flow control diaphragm extending thereacross having a central flow orifice leading therethrough and movable toward and away from said valve element by the head of fluid on said diaphragm to provide a uniform flow through said flow characterizing head regardless of variations in the head of fluid on said diaphragm, said diaphragm also extending along the bottom and upwardly along the side of said flow characterizing head into sealing engagement with the wall of said valve chamber, a passageway for water leading into said chamber beneath the sealing surface between said diaphragm and chamber, a bridge extending across said head and having a flow passageway therein with a discharge jet directed toward said central flow orifice, and a flow passageway through the side wall of said diaphragm in communication with said water passageway in said bridge.

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