United States Patent [19]

Bencic

[11] **3,727,844**

[45] **Apr. 17, 1973**

[54] **DISPENSING APPARATUS**

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[52] **U.S. Cl.** **239/414,** 222/129, 239/434.5

[51] **Int. Cl.**.....**F23d 13/38**

[58] **Field of Search**..... 222/129–129.4, 145; 137/604, 606, 607; 239/113, 414, 445, 457, 506, 581

[56] **References Cited**

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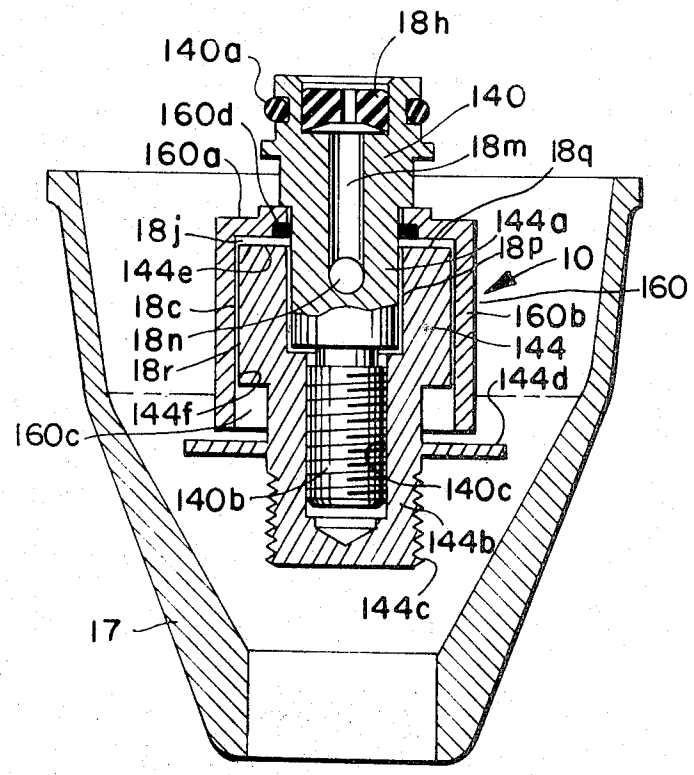
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Assistant Examiner—Larry Martin
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[57] **ABSTRACT**

An adjustable carbonated liquid dispensing nozzle is provided which maintains a high percentage of dissolved carbon dioxide in the liquid being dispensed. The dispensing nozzle is coupled to a control valve which controls the flow of carbonated liquid to the dispensing nozzle. The control valve may also selectively control the flow of one or more other fluids to the dispensing nozzle for mixture with the carbonated liquid. The dispensing nozzle includes an adjustable diffuser having a plurality of members in spaced relation to define flow paths therebetween. Means for maintaining a constant flow rate of carbonated liquid are located upstream of the diffuser. The diffuser is adjustable to provide a variable amount of dissolved carbon dioxide in the dispensed liquid while maintaining a substantially constant flow of liquid. The diffuser includes at least two relatively movable members which define a carbonization control gap therebetween and further includes a gradually increasing transverse area flow path for gradually exposing the carbonated liquid to atmospheric pressure. The carbonization control gap and the flow path cooperate to regulate the percentage of dissolved carbon dioxide in the dispensed liquid.

9 Claims, 3 Drawing Figures



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SHEET 1 OF 2

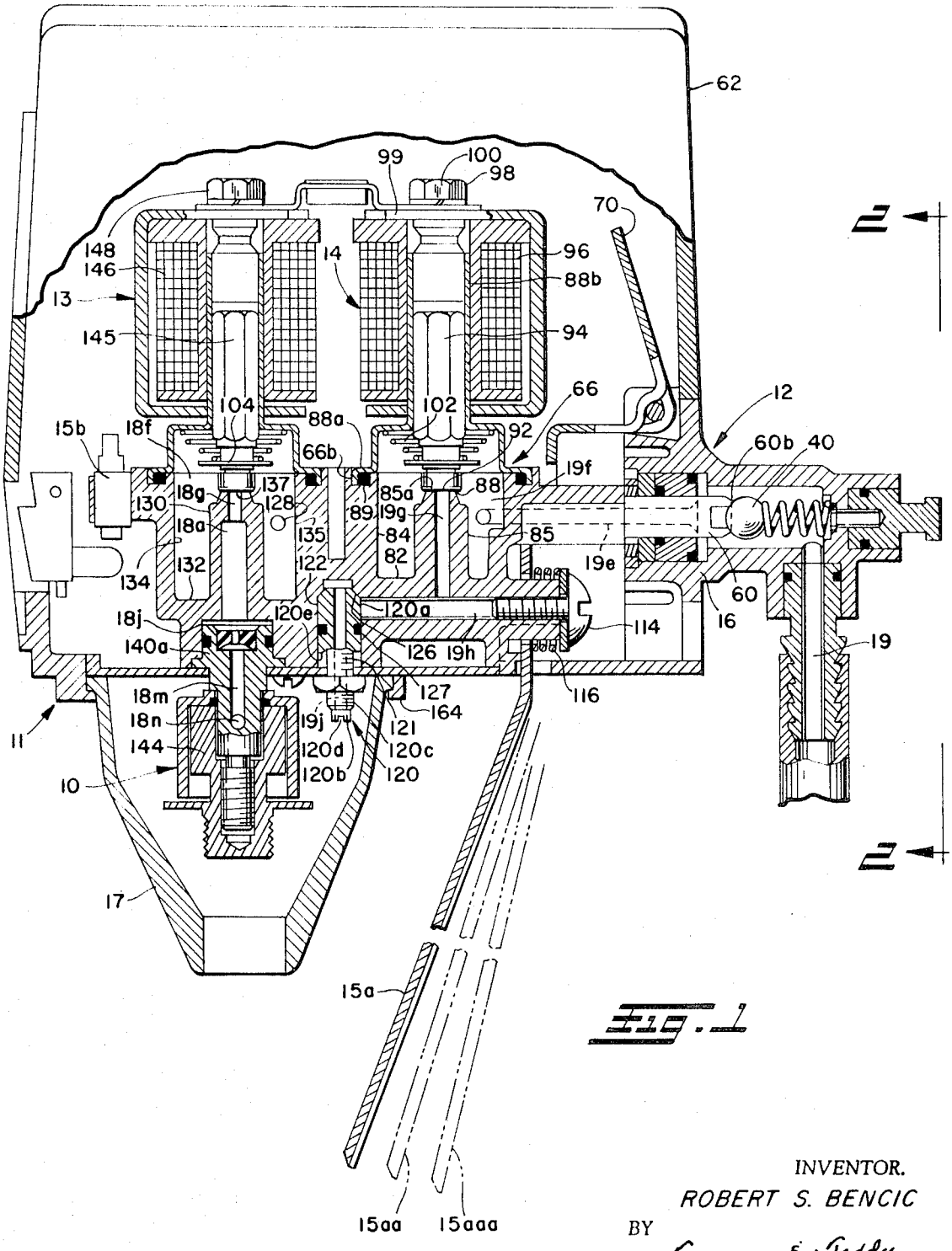


Fig. 1

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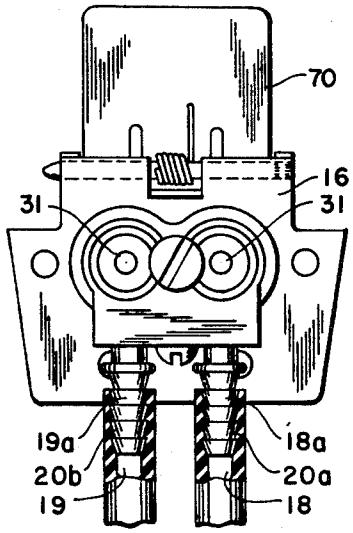


Fig. 2

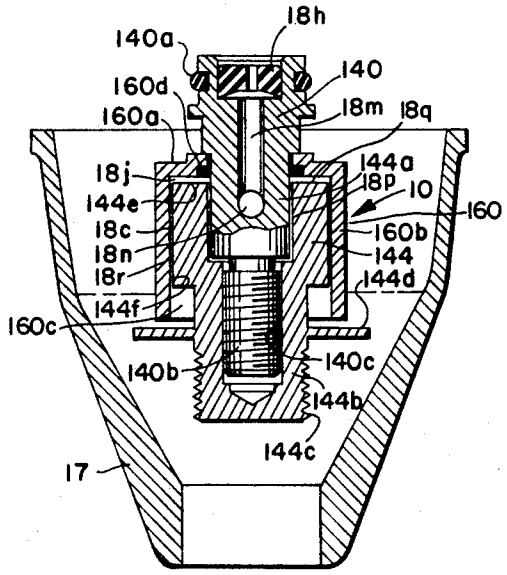


Fig. 3

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DISPENSING APPARATUS

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates in general to dispensing nozzles for dispensing a carbonated liquid which may be postmixed with a second liquid and more particularly to dispensing nozzles having adjustable means to control the percentage of dissolved carbon dioxide in the liquid being dispensed.

2. Prior Art

The valves of the prior art have had various forms of dispensing devices and diffusers to break up the carbonated liquid or soda water in a postmix type of nozzle so that this soda water would readily mix with the flavoring extract. Most of these diffusers tended to break up the soda water so that much of the carbon dioxide in the soda water was lost before the beverage was dispensed into the glass or other container. Under some conditions the drink or beverage tasted flat in contradistinction to one which had a considerable amount of carbon dioxide retained in the liquid. The more carbon dioxide retained in the liquid at the time it is drunk, the more "bite" the beverage has. This dissolved carbon dioxide thus provides a desirable taste sensation to some beverages. Conversely, certain beverages which require a low level of retained carbon dioxide were dispensed with too much "Bite".

Prior attempts to solve this problem have generally involved the use of diffusers having a stack of diffuser discs, an example of which is seen in U.S. Pat. No. 2,989,242. In such diffusers the amount of carbonization was controlled by varying the compression between the various diffuser discs through which the fluid flowed. A serious problem inherent in this type of diffuser involved the variable pressure drop experienced by fluids flowing through the diffuser. The variable pressure drop, caused by varying the compression between the diffuser discs resulted in a corresponding variable flow rate of fluid through the diffuser. Such a result is particularly undesirable in a nozzle of this type which is regulated to mix the carbonated water with a second liquid predicated on a predetermined flow rate of the two liquids. The variable flow rate thus resulted in a leaner or richer drink than is desirable. Such diffusers were also undesirable since they abruptly exposed the carbonated liquid to atmospheric pressure, a condition which led to flashing or rapid decarbonization of the liquid, causing undesirable foaming during mixing and dispensing of the liquid.

SUMMARY OF THE INVENTION

In accordance with the present invention, the disadvantages of the prior art are overcome by an adjustable carbonated liquid dispensing nozzle which provides a predetermined degree of carbonization with a given constant flow rate of the carbonated liquid.

The above is accomplished by providing a nozzle having a valve means for supplying a constant flow rate of carbonated fluid to the diffuser and a diffuser having a zone for controlling the release of carbon dioxide and means for exposing the carbonated liquid to atmospheric pressure with minimal additional loss of carbon dioxide. The zone for controlling the release of carbon dioxide is an adjustable carbonization control gap while the means for exposing the carbonated liquid to atmospheric pressure is a flow path of gradually increasing transverse area. The adjustable carbonization control gap is defined between two relatively movable members of the diffuser. The various members of the diffuser define a first flow path of constant transverse area leading to the control gap and a second flow path of gradually increasing transverse area leading from the control gap to atmosphere for gradually exposing the carbonated fluid to atmospheric pressure. The various members of the diffuser are nested in surrounding relationship and define the fluid flow paths therebetween. The innermost member may have an internal passage leading from the constant flow rate source of carbonated fluid to its outer surface, said passage forming the upstream portion of the first fluid flow path.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic elevational cross-sectional view of the dispensing assembly.

FIG. 2 is an end view of reduced section taken along the lines II—II in FIG. 1.

FIG. 3 is an enlarged cross-sectional view of the diffuser.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The diffuser shown generally at **10**, see FIGS. 1 and 3, is herein illustrated and described as utilized with an electric postmix dispenser valve. The diffuser is equally suitable for use with mechanically or pneumatically actuated postmix dispenser valves.

As is well known in the art, postmix dispensers are used to mix a carbonated liquid, such as soda water, with various flavoring syrups or extracts. Mixing of the soda with the syrup occurs adjacent the discharge opening of the diffuser to establish various flavored carbonated beverages.

As shown in FIG. 1 a postmix valve apparatus generally indicated at **11** is attached to an inlet housing assembly generally indicated at **12**. A first passageway **18** and a second passageway **19** each extend from the inlets at the connectors **20***a*, **20***b* respectively, as may be seen in FIG. 2 through the inlet housing assembly **12** to the postmix valve apparatus **11**. From the valve apparatus **11** the passageways **18**, **19** lead to nozzle **17**. Flow of the pressurized fluid in the passageways **18**, **19** is controlled by the solenoid actuated valves **13**, **14** respectively. Actuation of the solenoid valves **13**, **14** may be controlled by a pair of multiposition electric switch means indicated at **15**a and **15**b which, when actuated transmit signals to solenoid **13** or solenoids **13** and **14** in combination to dispense fluid from passage **18** or passages **18** and **19** to nozzle **17** for dispensing carbonated water or a mixed carbonated drink respectively.

The fluid inlet housing assembly **12** comprises a body **16** which may be formed of a suitable material such as a high impact synthetic plastic, for example. In the illustrated embodiment a pair of fluid supply conduits **18***a* and **19***a* are shown attached to a pair of detachable inlet connectors **20***a*, **20***b*. In a typical postmix system the line **19***a* conveys a soft drink syrup under pressure and the line **18***a* conveys carbon dioxide saturated water under pressure. Although FIG. 1 shows only the

second passageway 19, fluid supply line conduit 19*a* up to the solenoid valve 14, it will be understood that the first passageway 18 and fluid supply line conduit 18*a* are constructed in a similar manner and embody the same principles.

The inlet housing assembly 12 will not be described in detail but includes means to attach passages 18 and 19 to source of pressurized liquid soft drink syrup and a source of pressurized carbonated liquid respectively. Details of the inlet housing assembly 12 may be seen in greater detail by reference to copending application Ser. No. 857,692 filed Sept. 15, 1969 and assigned to the assignee of this application. The postmix valve apparatus 11 is retained in operative connection with the inlet housing assembly 12 by means of a releasable connector 70. The valve apparatus may be totally or partially enclosed in a housing 62.

Fluids flow under pressure through passageways 18, 19 into the valve apparatus 11 from inlets such as the hollow projection 60 to outlets in a mixing nozzle 17. This fluid flow through the valve apparatus 11 is controlled initially by first solenoid valve means 13, 14 and finally by a flow rate control second valve means in the mixing nozzle 17 to be described in greater detail below.

In one advantageous beverage dispensing embodiment of my invention two incoming supply lines shown in FIG. 2 at 18*a* and 19*a* convey carbonated water and syrup respectively from a supply means not shown. Each of the different fluids follows a separate path, and are regulated by a separate valve means and flow rate control means.

Referring to FIG. 1 it may be seen that the syrup in passageway 19 flows around an unseated ball check valve 40, through a notch 60*b* in the hollow projection 60, thence through a passageway 19*e* in the projection 60, and on to a valve chamber 19*f* in the solenoid valve means generally indicated at 14.

The valve chamber 19*f* has a lower portion 80 which may be integrally formed with a body 66 and includes a bottom 82 and sides 84. An integrally formed hollow member 85 through which a passageway 19*g* extends is upstanding from the chamber bottom 82 and has an opening 88 in its upper end which opening will generally conform to the size of the passageway 19. A seating surface 85*a* is formed about the opening 88 at a level below the level of the sides 84. Flow through the opening 88 is controlled by a closure disc 92 movable into and out of engagement with the seating surface 85*a*. The movement of this closure disc is advantageously affected by incorporating the disc on the end of an armature 94 in an electric valve actuating mechanism or solenoid, generally indicated at 96.

Operation of the valve means is accomplished by solenoid which includes the magnetic core 96 which is energized to move armature 94 including sealing surface 92 upwardly out of engagement with the seat 85*a* to open the passageway 19*g*. To control or limit the vertical movement of the armature 94 in the coil 96 there is provided an adjustable stop 98 that threadedly engages a switch support member 99 and has a nut head 100 projecting thereabove. By rotating the adjustable stop 98 the desired distance between the sealing surface 92 and the seat 85*a* may be fixed to control flow of the fluid through the valve. The valve chamber 19*f* has an upper portion closed by an integral cap structure guide assembly 88. The cap 88 includes a lower portion 88a which depends into a groove 66*b* that extends about the opening of the lower portion 80 of the chamber 19*f*. A suitable seal means 89 affects a fluid type seal between the depending portion 88*a* in the groove 66*b*. An upstanding portion 88*b* of the cap 88 extends into the center of the coil 96 and provides a guide for the armature 94 and serves as an enclosure for the armature 90 and the adjustment means 98 to prevent leakage of fluids into these areas.

A spring 102 positioned between the chamber closure cap 88 and a washer 104 on the armature 94 biases the surface 92 against the seat 85*a* to keep the solenoid valve 14 closed when the coil 96 is not activated. The spring 102 thus assures that positive control is maintained over the fluid flow under all conditions including possible electrical failure.

After the pressurized fluid or syrup has filled the cavity 19*f* and has been allowed to pass the first valve means 14 into the passageway 19*g* it will flow downwardly into a transversely extending passageway 19*h* which has a second valve means or syrup metering valve 120 at one end and a removable screw access cap 114 closing its other end.

The second valve means 120 is positioned in a recess 122 at one end of passageway 19*h* and includes an adjustable metering valve having a hollow stem 121 with a passageway 19*j* extending therethrough that depends into a mixing spout 17 which surrounds the outlet ends of the passageways 18 and 19. The stem 121 has a lower outlet end 120*b* and an upper enlarged inlet end 120*a* with the upper inlet end 120*a* adapted to seat against a seating surface 126 on the control valve assembly body 66 and to thereby open or close the second passageway 19 to the flow of fluid. A depending portion 120*c* is of smaller diameter than the portion 120*a* and is threaded to engage a body bottom retainer plate 67. The depending portion 120*c* includes a slot 120*d* which allows the flow valve 120 to be turned and thus moved into and out of engagement with the seat surface 126 thereby controlling the fluid flow of the fluid from the passage 19*h* through the passage 19*j*. A suitable seal means 127 seals the outer surface of the portion 122 with the passageway 122. A shoulder 120*e* between the portions 120*a* and 120*c* will abut the retainer plate 67 when the metering valve is fully opened. As shown, the metering valve is nearly closed to thereby greatly restrict the flow of syrup through the passageway 19. This simple, detachable second valve means 120 allows accurate control of the syrup dispensed and hence regulates the strength and taste of a carbonated drink. Removal is easily accomplished by unscrewing the screw 68 and detaching the retaining plate 67. For purposes of explanation the portions 19*e*, 19*f*, 19*g*, 19*h* and 19*j* may be referred to as the second portion of the second passageway 19.

The passageway closure means 114 serves a dual function of providing a means whereby a spring 116 may bias the control means 15a away to a position below the mixing spout 17. In a manner similar to that set forth for the syrup or fluid in the second passageway 19, the carbonated water or fluid in the first passageway 18 flows through the inlet housing assembly 12, through a passageway in a male projection

similar to 60 and into a valve chamber 18*f* in the first valve means 13. Inasmuch as the flow path in the passageway 18 to the point of entry into the fluid chamber 18*f* is identical of that of the flow through passageway 19 the description need not be repeated, but will be understood by one skilled in the art.

As mentioned previously, electric switches 15*a* and 15*b* are multiposition switches. Switch 15*a* may be moved to position 15*aa* whereat actuation of solenoid 13 occurs or to position 15*aaa* whereat actuation of solenoids 13 and 14 occurs. Switch 15*a* may thus be utilized to dispense either carbonated water or a mixed carbonated beverage. This feature is well known in the art and forms no part of the present invention. An opening 128 schematically illustrates the entry of the fluid from the line 18 into the chamber 18*f*. The chamber 18f includes a portion 130 integrally formed in the valve body 66 which may be of cylindrical configuration having a bottom 132 and sides 134. A hollow member 135 therein is similar to the upstanding portion 85 of the first valve means except that the passageway portion 18*h* through an upper opening 137 is smaller than a passageway portion 18*h* through the remainder thereof. This difference is required to maintain sufficient pressure in chamber 18*f* to prevent carbon dioxide from leaving the carbonated liquid.

As shown in FIG. 1 the particular configuration and depth of the chamber 18*f* may be designed in accordance with the fluid to be controlled. Thus, where, as here, the fluid will be carbonated water, the chamber 18*f* may be of a deeper size than the chamber 19*f*.

A valve actuating means 146 identical to the valve means 96 may be provided for the valve 13. This structure again includes an armature 145 activated by a coil 146 and moved upwardly against a spring bias to a point controlled by an adjustment means 148. Inasmuch as this is identical with that described for the first valve 14 the description will not be repeated but will be understood by one skilled in the art.

Once past the solenoid valve 13 controlled opening 137, the carbonated fluid in passage 18 continues through passage portion 18*g* into passage cavity 18*j* which contains flow control washer 18*h* (see FIGS. 1 and 3). The cross sectional area of the aperture of the flow control washer 18*h* will vary inversely to the fluid pressure applied at the inlet side to maintain a substantially constant rate of flow therethrough over a wide range of pressure variations as is more fully described in U.S. Pat. No. 2,891,578. Flow control washer 18*h* is located at the inlet to diffuser assembly 10 and maintains a substantially constant flow rate of fluid thereto.

The diffuser assembly 10 includes an inner member or diffuser mount 140 which is mounted to body portion 66. The inner member is sealed by an "O" ring as at 140*a*. Once past the flow control washer 18*h*, the carbonated fluid flows through axial bore 18m and out radial bore 18n to the outer periphery of the diffuser mount 140. The diffuser mount also includes an axially downwardly depending portion 140b which carries external threads as at 140*c*.

Surrounding the inner member 140 is an intermediate or capillary member 144. The upper portion of the capillary member 144 includes an upwardly opening cup shaped cavity 144*a* which surrounds the inner member adjacent the opening to bore 18*n* in a spaced relation thereto. The lower portion 144*b* capillary member 144 includes a hollow cylindrical portion with internal threads which sealingly engage threads 140*c* allowing axial upward or downward adjustment of member 144 relative to the diffuser mount 140. The lower portion 144*b* may include external knurls or a headed portion 144*c* to facilitate the axial adjustment.

The space between members 140 and 144 provides passage portion 18*p* leading from bore 18n to the top of cavity 144*a*. It is important to note at this time that passage portions 18*m*, 18*n* and 18*p* are of equal cross sectional or transverse area, and thus because they conduct a constant flow rate of fluid no pressure drop is experienced in these passages. As is well known in the art, in the absence of a pressure drop carbonated fluid will maintain a constant level of dissolved carbon dioxide gas therein and hence no loss of carbon dioxide gas is experienced through passages 18*m*, 18*n* and 18*p*. The lower portion of intermediate member 144 also carries a deflector baffle 144*d*.

Surrounding the intermediate member 144 in spaced relation therefrom is outer member or capillary shroud 160. Capillary shroud 160 is in the shape of downwardly opening cup and includes base portion 160*a* and wall portion 160*b*. At its upper and central most portion base 160*a* is mounted to and sealingly engages inner member 140 at "O" ring seal 160*d*. The radially outer portions of base 160*a* and the opposed radial lip surface 144*e* of the intermediate member 144 from an adjustable flow control gap 18*q* therebetween. The space between the outer periphery of the capillary member 144*f* and the inner surface of wall portion 160*b* due to the tapered relationship therebetween form a gradually increasing transverse area passage 18*r* to the opening to atmosphere at 160*c*.

In the embodiment shown, the tapered relationship is achieved by providing the cup shaped cavity of capillary shroud 160 with an upwardly decreasing cross-sectional diameter. The same result may be obtained by providing the outer periphery of capillary member 144 with a downwardly decreasing cross-sectional diameter. Of course, any structural relationship providing a gradually downwardly increasing transverse area fluid flow path 18*r* will achieve the desired result.

It is at adjustable control gap 18*q* that a pressure drop directly proportional to transverse area occurs. By adjusting the axial position of capillary member 144 on screw thread 140*c* this gap may be adjusted and thus the level of dissolved carbon dioxide controlled. As the carbonated fluid flows through gap 18*q* a predetermined amount of carbon dioxide gas is permitted to leave the liquid. From gap 18*q* the carbonated liquid flows down passage 18*r* and is gradually exposed to atmospheric pressure at 160*c* which prevents flashing of the carbon dioxide gas leaving the liquid and also prevents undesirable foaming of the liquid. The gradually increasing transverse area passage 18*r* permits a minimum of carbon dioxide to leave the fluid which may, of course, be compensated for by adjustment of carbonization control gap 18*q* thus providing a dispensed carbonated liquid with the desired level of dissolved carbon dioxide therein. As the carbonated liquid leaves opening 160*c* it impacts on baffle 144*d* which directs the flow to the inner sides of nozzle 17 where it may or may not, depending on the position of

switches **15***a* and **15***b*, mix with the flavoring syrup from **120***d* and then smoothly flow out the spout.

OPERATION

Upon opening of valve seat **137** by solenoid valve **13** which is controlled by electric switch **15***b*, the operation of the present invention is as follows.

Carbonated liquid flows through passage **18***g* and through control washer **18***h* at a constant rate of flow into the diffuser **10**. The fluid then flows through bores **18***m* and **18***n* into passage **18***p* which leads to the carbonated fluid to carbonization control gap **18**q. By maintaining a constant flow through equal transverse area passages **18***m*, **18***n* and **18***p* a constant pressure in maintained in the passages and thus no carbon dioxide leaves the fluid. Fluid leaving passage **18***p* flows through adjustable control gap **18***q* where the amount of escaping carbon dioxide gas is controlled by adjustment of the transverse area of the gap. The larger the transverse area of the gap, the larger the pressure drop and thus the more dissolved carbon dioxide which will leave the fluid. It may thus be seen that simple axial adjustments of capillary member **144** relative to capillary shroud **160** on threads **140***c* will serve to give an adjustable level of dissolved carbon dioxide gas at a constant rate of flow of carbonated liquid.

From gap **18***q* the fluid is gradually exposed to atmospheric pressure as it flows down gradually increasing transverse area path **18**r to atmosphere at **160***c*. Having thus gradually released the liquid to atmosphere uncontrolled bubbling and foaming of the liquid is eliminated. As the fluid leaves **160***c* it impinges upon deflector baffle **144***d* which directs the fluid flow to the sides of nozzle **17** whereat it may mix with the fluid, if any, which has flowed through path **19** and then smoothly flows from the nozzle **17**.

Although this invention has been described in its preferred form with a certain degree of particularity, it is understood that the present disclosure of the preferred form has been made only by way of example and that numerous changes in the details of construction and the combination and arrangement of parts may be resorted to without departing from the spirit and the scope of the invention as hereinafter claimed.

I claim:

1. An adjustable carbonated liquid dispenser comprising:
   - a nozzle;
   - a diffuser within said nozzle, said diffuser comprising:
     - an inner member having a passageway therethrough, said passageway including an inlet for connection to a source of carbonated liquid and an outlet leading to the outer periphery of said inner member, a flow control washer means disposed in said inlet for maintaining a substantially constant rate of fluid flow therethrough;
     - an intermediate member surrounding said inner member in spaced relation thereto and defining a first fluid flow cavity therebetween, said first fluid flow cavity and said passageway being of equal transverse area throughout, said intermediate member having an endface adjacent the outlet of said first fluid flow cavity;
     - an outer member surrounding the end face and outer periphery of said intermediate member in spaced relation thereto, said outer member and the outer periphery of said intermediate member defining a second fluid flow cavity therebetween, said second fluid flow cavity opening to the outlet from said nozzle and having a gradually increasing transverse area towards the outlet from said nozzle, said outer member and the end face of said intermediate member defining an adjustable control gap therebetween, said control gap interposed in series between said first and second fluid flow cavities; and
     - means for relative movement between said intermediate and outer members for adjustment of said control gap.

2. The dispenser of claim **1** wherein said members are coaxially aligned, said intermediate member threadably mounted to said inner member and said outer member fixedly mounted to said inner member, said means for relative motion between said intermediate and outer member comprising means for rotating said intermediate member about its threaded axis.

3. The dispenser of claim **1** additionally comprising a second outlet within said nozzle adjacent the outlet therefrom for supplying a second fluid for mixing with the dispensed carbonated liquid.

4. The dispenser of claim **2** wherein said intermediate member carries a deflector baffle interposed the second fluid flow cavity and the outlet from the nozzle for deflecting fluid flow from said second cavity to the sides of said nozzle.

5. An adjustable valve for dispensing carbonated fluid comprising:
   - a nozzle;
   - a diffuser within said nozzle, said diffuser comprising:
     - an inner member having a passageway therethrough for receiving and transmitting carbonated fluid under pressure,
     - an intermediate member substantially coaxial with said inner member having an upwardly opening cup shaped cavity therein, said upwardly opening cavity surrounding said inner member in spaced relation thereto and defining a first fluid flow path therebetween, said first fluid flow path and said passageway being of equal area throughout, said upwardly opening cup shaped cavity having a radially extending surface at the lip thereof;
     - an outer member control gap substantially coaxial with said intermediate member having a downwardly opening cup shaped cavity therein, said downwardly opening cavity opening to the outlet of said nozzle and surrounding said intermediate member in spaced relation therefrom defining a second fluid flow path therebetween, said second fluid flow path having a gradually increasing transverse area towards the outlet of said nozzle, the base of said downwardly opening cup shaped cavity and said radially extending surface defining an adjustable control gap therebetween, said adjustable gap interposed in series between said first and second fluid flow paths, and

means to axially slide said intermediate member relative to said outer member for adjustment of said adjustable control gap.

6. The apparatus of claim 5 wherein said intermediate member is threadably engaged with said inner member and said outer member is fixedly engaged with said inner member, said means for adjusting said control gap comprising rotation of said intermediate member about its threaded axis.

7. The apparatus of claim 5 wherein said intermediate member carries a deflecting baffle interposed said second fluid flow path and said outlet of said nozzle for deflecting fluid from said second fluid flow path to the inner sides of said nozzle.

8. Dispensing apparatus for adjustably controlling the dissolved carbon dioxide content of a carbonated liquid supplied to said apparatus under constant pressure and flow rate comprising:

a. a fixed, inner member having a passage of constant, transverse area therein, said passage having an inlet communicating with said liquid and an outlet;

b. an intermediate, movable, cup-shaped member receiving said inner member in spaced relation thereto and defining a first cavity of constant transverse area therebetween, said area equal to the transverse area of said passage, said outlet communicating with said first cavity, said intermediate member having an open end terminating in an exposed, radially-extending edge;

c. an outer, fixed, cup-shaped member having effectively closed and open ends and receiving said intermediate member in spaced relation, said closed end and said edge defining an adjustable second cavity communicating with said first cavity, said outer and intermediate member further defining a third cavity in spaced relation therebetween and communicating with said second cavity, said transverse area of said third cavity gradually increasing;

d. means to adjust the area of said second cavity by relative movement between said intermediate and said outer members.

9. Apparatus as defined in claim 8 wherein that portion of said inner member which extends into said intermediate member is cylindrical, said intermediate member threadably secured to said inner member, said outer member fixed in sealing relationship to said inner member.

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