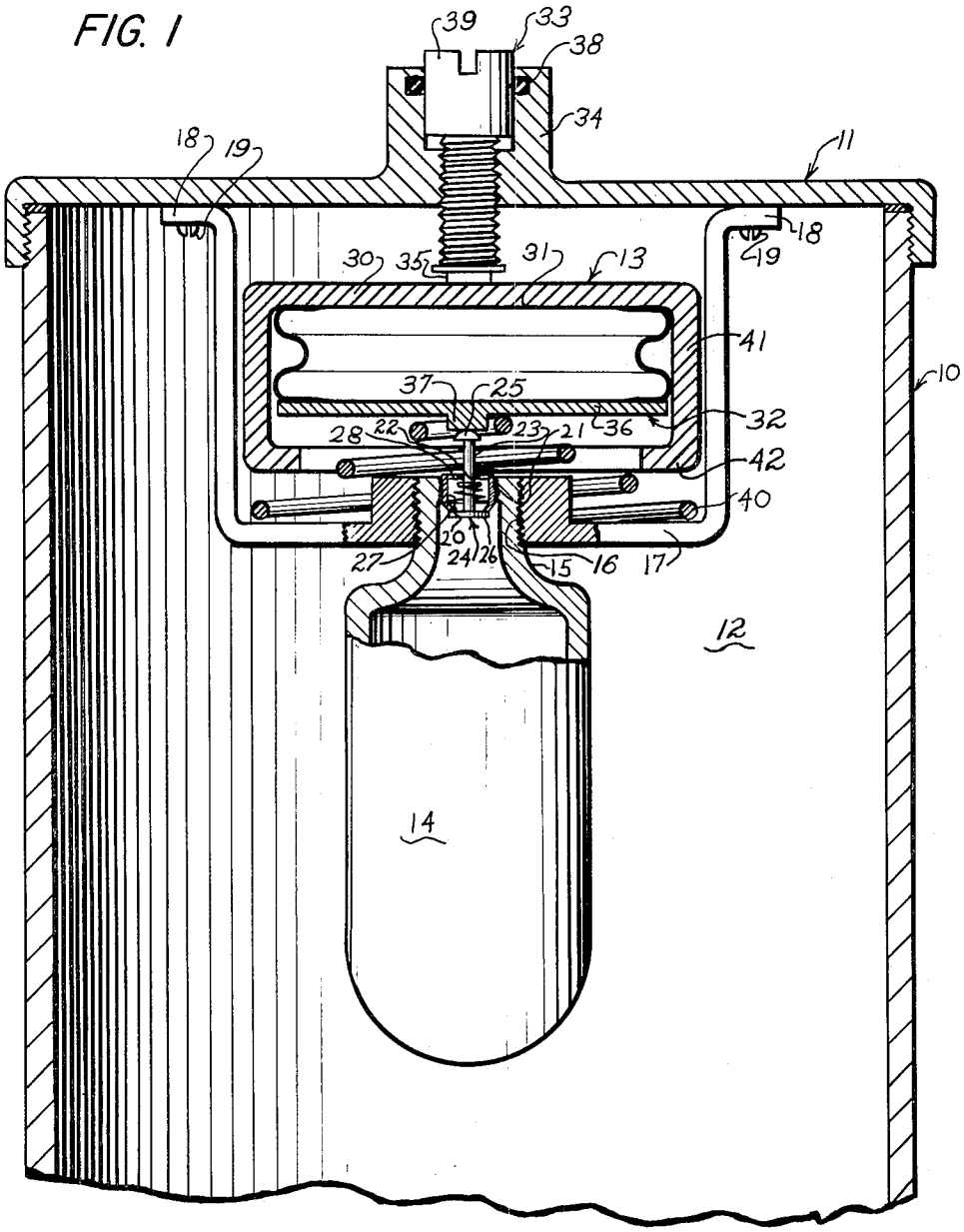
Jan. 11, 1966 R. W. COUFFER 3,228,559

PRESSURIZED BEVERAGE DISPENSER DEVELOPMENT

Filed Sept. 17, 1963

FIG. 1



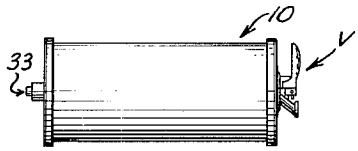


FIG. 2

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PRESSURIZED BEVERAGE DISPENSER DEVELOPMENT

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The present invention relates to pressurized beverage dispensers and more particularly relates to a self contained pressurized dispenser having means for maintaining the contained beverage under a relatively constant pressure even as the beverage is withdrawn from the container.

This invention will find particular utility in a carbonated drink or beer dispenser of a size and shape adapted for use in household refrigerators. Such household dispensers may be constructed in the form of a keg or an oblong can and of a size such that they will fit conveniently on the shelf of a household refrigerator. The keg or can will have a tap valve at one end thereof to provide a means whereby if desired, the contained beverage can be drawn off without removing the keg from its shelf. A safety valve will be provided on the cover to relieve pressure at 50 to 75 p.s.i.

Ideally, such a pressurized dispenser will be a complete self-contained one requiring no external pressurizing device and yet being of very low cost and thus susceptible of high quantity production and distributable on a deposit-for-return basis. The present invention is directed to such a dispenser.

It is recognized that valves used in controlling the rates of flow of highly pressurized gases sometimes tend to freeze-up in use. An assembly constructed in accordance with the present invention however obviates this problem because the pressurized fluid valve is completely immersed within the beverage and the beverage conducts the low temperature away from the valve to prevent such freeze-up.

A bellows assembly is employed in the structure formed in accord with this invention, but unlike other bellows-associated dispensers the bellows of the present invention is so formed and situated in the container that upon bellows failure, the system will fail safe in that none of the beverage will be lost to the atmosphere, nor will any pressurizing fluid be permitted to pass into the beverage after such failure.

In general the pressurized beverage dispenser which forms the subject of the present invention comprises a container which defines a beverage-containing chamber and which has a pressurized fluid bottle mounted within the chamber. The pressurized fluid bottle may contain a gas such as CO_2 under pressures in the realm of 1200 p.s.i. A valve is associated with the bottle to control the flow of CO_2 therefrom and this valve is actuated as a function of the pressure of the beverage contained within the said chamber.

Beverage pressure is sensed and valve actuation effected by a bellows which has one end seated on a bellows platform and which has its opposite end cooperable with the valve to control actuation thereof. The bellows is completely immersed within the beverage but only the valve cooperable end thereof is movable and directly exposed to the beverage; the opposite end being held rigidly on the bellows platform.

The bellows itself contains a fluid which remains under a relatively constant pressure so that bellows end wall movement (and thereby valve actuation) is effected only when a differential pressure exists across the said end wall. Obviously then the pressure of fluid within the bellows

can be determinitive of the pressure to which the beverage will be subject.

In addition to the foregoing, the bellows platform is adjustably mounted within the chamber so that by varying the position of the platform within the chamber the beverage pressure point at which valve actuation will be effected will also be varied. Still further, this adjustable mounting feature permits the bellows to be held out of engagement with the valve so that closure of the valve will be assured during transit.

In view of the foregoing it is a principle object of the present invention to provide an improved self-contained pressurized beverage dispenser having means for maintaining the contained beverage under a relatively constant pressure even as the beverage is withdrawn from the container.

It is another object of the present invention to provide a pressurized beverage dispenser of the type above described which can be produced readily and at low cost and which is designed so that the pressurizing fluid control valve will not freeze up in use.

Another object of the invention resides in a provision of such a dispenser which employs a pressurized bellows assembly for controlling the flow of pressurizing fluid to the beverage in accordance with the pressure of the beverage and which, upon breakage, will fail safe so that none of the beverage will be lost to the atmosphere.

Yet another object of the present invention resides in the provision of a pressurized beverage dispenser employing a beverage immersed bellows and including also manual means for disabling the bellows to assure valve closure during container transport. Another and important object of the invention resides in the provision of manual means for adjustably mounting the bellows within the chamber so that the beverage pressure point at which valve actuation is effected can also be varied.

These and other objects and advantages and features of the present invention will become apparent from time to time as the following specification proceeds and with reference to the accompanying drawing, wherein:

FIGURE 1 is a fragmentary vertical sectional view through a pressurized beverage dispenser constructed in accordance with the principles of the present invention and showing the bellows assembly and the associated pressurizing fluid bottle in detail; and

FIGURE 2 is a side elevational view of the beverage dispenser.

The container **10** is fragmentarily shown in the drawing as having an end cap **11** threadedly mounted thereon. As noted above, the container **10** may be designed in the form of a keg if desired for use in dispensing beer and in such event may be of a size suitable for placement on the shelf of a household refrigerator. In such an instance, the container **10** will be provided at one end or the other with a tap valve "V," such as is shown in FIGURE 2, so that the contained beverage can be drawn off without removing the container from its position on the refrigerator shelf.

The container **10** and associated end cap **11** serve to define a beverage containing chamber **12** having a bellows assembly **13** and pressurized fluid bottle **14** mounted therein.

The pressurized fluid bottle **14** may contain carbon dioxide or any other pressurizing fluid suitable to the character of the beverage contained within the chamber **12**. In the case of keg-type beer dispensers proportioned for use in a household refrigerator, the bottle **14** will preferably contain liquid carbon dioxide under a pressure of approximately 1200 p.s.i. The bottle **14** has its neck **15** threadedly mounted within a central threaded bore **16** formed in a supporting strap or stirrup **17** which

stirrup has its outturned end **18** mounted on and rigidly secured to the cap **11** by means of mounting screws **19**.

A valve fitting **20** is threadedly mounted within the neck **15** of the bottle **14** at the mouth **21** thereof and has a ported transverse wall **22** to slidably receive the shank **23** of valve member **24** therethrough. The valve member **24** has an enlarged head **25** formed on the upper end thereof and a flat valve head **26** formed on the opposite end thereof. The valve head **26** is cooperable with an annular seat **27** which is formed on the fitting **20** and which faces the interior of the bottle **14**. As a result of this disposition of parts and the fact that the fluid within the bottle **14** is under very high pressure, the internal bottle pressure will normally tend to seat the valve head **26** on its seat and prevent the escape of any fluid from the bottle to the chamber **12**. Ports **28** are formed within the transverse wall **22** and permit fluid to flow into the chamber **12** when the valve head **26** has been unseated.

The bellows assembly **13** is the means by which pressure of the beverage within the chamber **12** is sensed and actuation of valve member **24** is effected.

The bellows assembly **13** comprises generally a bellows platform **30** having the end wall **31** of a bellows **32** seated thereon. The bellows platform **30** is itself rotatably mounted on the innermost end of an adjustment screw **33** which, in turn, is threadedly mounted in and guided by the boss **34** formed integrally with and centrally of the end cap **11**. As previously mentioned, a rotational mounting is provided at **35** so that rotation of the adjustment screw **33** need not effect rotation of the platform **30**. Since such a rotational mounting is well understood by those skilled in the art however it is not shown in detail.

As also previously noted, the end wall **31** of bellows **32** is seated on the platform **30**. The opposite end wall **36** of the said bellows is formed of metal or other nonyielding material and has an enlarged boss **37** formed integrally therewith and depending therefrom in the center thereof. The boss **37** abuts the head **25** as the uppermost end of the valve member **24** so that expensive bellows movement will be transmitted to the valve member to unseat the valve head **26** from the seat **27** and permit the escape of CO_2 from the bottle **14**.

As has already been pointed out, the bellows **32** is filled with a fluid under pressure. For a bellows adapted for use in a household type pressurized beer dispenser, the bellows may have an end wall **36** with a diameter of about three inches and with a seven square inch surface area and under such circumstances the pressure of fluid within the bellows may be under a pressure of 15 to 20 p.s.i.

If the bellows internal pressure is 15 to 20 p.s.i. and the liquid CO_2 pressure is approximately 1200 p.s.i. the beverage within chamber **12** will be maintained under pressure of 10 to 12 p.s.i.

It is well understood of course that desired pressures for beers vary with the types of carbonations of the beers and with the temperatures under which the beer is stored. The system which we have here disclosed can of course be modified by increasing the pressure of fluid within the bellows, increasing the surface area of the end wall **36** of the bellows, or decreasing the surface area of the valve head **26** in order to raise the pressure level of the beverage within the chamber **12**. Obviously pressure level of the beer in chamber **12** could be lowered also.

The adjustment screw **33** however provides a means whereby the pressure level of valve actuation can be varied manually after the bellows assembly has been installed. It will be observed that and O-ring **38** is seated within the boss **34** in surrounding relationship to the head **39** of the screw **33** to provide a positive fluid seal. By tightening down the screw **33** as is shown in the drawing, the fluid within the bellows will be placed under greater compression and valve unseating will therefore take place at a higher beverage pressure level than if the screw were moved longitudinally upwardly from the position shown.

When the force of pressurized fluid within the bellows **32** acting downwardly on the end wall **36** exceeds the combined upward force of beverage pressure within the chamber **12**, a spring **40**, and the pressure of CO_2 within the bottle **14** acting upwardly on the valve member **24**, the head **26** will be unseated from the seat **27** and CO_2 will escape from the bottle through the ports **28** and into the chamber **12**. When the pressure of the beverage within chamber **12** has increased to such a point that the sum of its upwardly directed force on the end wall **36** and the upwardly directed force of the pressurized CO_2 on the valve member **24** and the upwardly directed force of the spring **40** exceeds the downwardly directed force of the pressurized fluid within bellows **32**, the valve member **24** will again be seated. Such action will take place each time beverage is drawn off the container.

The conical compression spring **40** is interposed between the stirrup **17** and the end wall **36** of the bellows **32** to aid in assuring quick shutoff of the valve member **24** should there for some reason be a failure of the bellows **32**.

In addition, it is very important to note that a plurality of legs **41** extend along the side of the bellows **32** and have inturned fingers **42** which extend over the under surface of the end wall **36**. The spacing between the inner surface of the platform **30** and the inner surface of the inturned fingers **42** is such that when the platform **30** is in the normal operating position shown in the drawing bellows movement will not be interfered with. It will be noted however that by rotating the adjustment screw **33** within the boss **34** the platform **30** can be moved axially in the direction of the inner surface of the end cap **11** and that such movement can be effected to an extent sufficient to cause the inner surfaces of the fingers **42** to engage the periphery of the end wall **36** and move the boss **37** thereof out of engagement with the head **25** of valve member **24**. When such movement is effected a positive closure is provided for the gas bottle **14**. Such an adjustment will of course be desirable when the container is to be shipped from one place to another to assure that there will not be an undue buildup of pressure in the chamber **12** caused by extreme temperature variances and rough handling. Once the container has reached its destination the adjustment screw **53** can then be screwed down to approximately the position illustrated in the drawing and the bellows assembly will then be operational.

In addition, separate means are provided for initially charging the interior of the container with CO_2 so that the bottled gas need not be employed for this purpose. A simple time-type valve can be mounted on the container for this purpose and when the bottle is initially mounted on the container the bellows assembly can be adjusted to its transport position to prevent opening of the valve **24**.

It will be understood that this embodiment of he presen invention has been used for illustrative purposes only and that various modifications and variations in the invention may be effected without departing from the spirit and scope of the novel concepts thereof.

I claim as my invention:

1. A beverage dispenser comprising:

a container having a tap valve for withdrawing beverage therefrom and defining a beverage-containing chamber,

a pressurizing fluid vessel mounted on said container and having an orifice opening from the interior thereof to said chamber,

a valve member cooperable with said orifice and movable longitudinally to control the rate of fluid flow therethrough,

a bellows support,

a sealed bellows defining a closed chamber filled with a control fluid under pressure and mouned at one end on said bellows support and having its other end engageable with said valve member,
said other end of said bellows having its outer surface exposed to the beverage within said chamber,
whereby pressure differential across said other end of said bellows causes said other end to move said valve member to control fluid flow through said orifice, and
means limiting the degree of movement of said other end of said bellows relative to said orifice.

2. A beverage dispenser constructed in accordance with claim 1 wherein said last-named means includes a manually adjustable element extending exteriorly of said container and connected to said bellows support to move the support toward or away from said vessel.

3. A beverage dispenser comprising:
a container having a tap valve for withdrawing beverage therefrom and defining a beverage-containing chamber,
a pressurizing fluid vessel mounted on said container and having an orifice opening from the interior thereof to said chamber,
normally closed valve means at said orifice for controlling the flow of pressurized fluid therethrough,
a bellows support,
a sealed bellows defining a closed chamber filled with control fluid under pressure and mounted at one end on said bellows support and having its other end cooperable with said valve means to effect actuation thereof,
said other end of said bellows having its outer surface exposed to said beverage within said chamber,
whereby a predetermined pressure differential across said other end of said bellows causes said other end to open said valve means to permit fluid flow through said orifice, and
means limiting the degree of movement of said other end of said bellows relative to said valve means.

4. A beverage dispenser comprising:
a container having a tap valve for withdrawing beverage therefrom and defining a beverage-containing chamber,
a pressurizing fluid vessel mounted on said container and having an orifice opening from the interior thereof to said chamber,
normally closed valve means at said orifice for controlling the flow of pressurized fluid therethrough,
a bellows support,
a sealed bellows defining a closed chamber filled with control fluid under pressure and mounted at one end on said bellows support and having its other end cooperable with said valve means to effect actuation thereof,
said other end of said bellows having its outer surface exposed to said beverage within said chamber,
whereby a predetermined pressure differential across said other end of said bellows causes said other end to open said valve means to permit fluid flow through said orifice, and
means limiting the degree of movement of said other end of said bellows in a valve opening direction.

5. A beverage dispenser comprising:
a container having a tap valve for withdrawing beverage therefrom and defining a beverage-containing chamber,
a pressurizing fluid vessel mounted on said container and having an orifice opening from the interior thereof to said chamber,
normally closed valve means at said orifice for controlling the flow of pressurized fluid therethrough,
a bellows support,
a sealed bellows defining a closed chamber filled with control fluid under pressure and mounted at one

end on said bellows support and having is other end cooperable with said valve means to effect actuation thereof,
said other end of said bellows having its outer surface exposed to said beverage within said chamber,
whereby a predetermined pressure differential across said other end of said bellows causes said other end to open said valve means to permit fluid flow through said orifice, and
means limiting the degree of movement of said other end of said bellows in each of two directions.

6. A beverage dispenser comprising:
a container having a tap valve for withdrawing beverage therefrom and defining a beverage-containing chamber,
a pressurizing fluid vessel mounted on said container and having an orifice opening from the interior thereof to said chamber,
normally closed valve means at said orifice for controlling the flow of pressurized fluid therethrough,
a bellows support,
a sealed bellows defining a closed chamber filled with control fluid under pressure and mounted at one end on said bellows support and having its other end cooperable with said valve means to effect actuation thereof,
said other end of said bellows having its outer surface exposed to said beverage within said chamber,
whereby a predetermined pressure differential across said other end of said bellows causes said other end to open said valve means to permit fluid flow through said orifice, and
manually adjustable means extending exteriorly of said container and cooperable with said other end of said bellows to limit the degree of movement thereof.

7. A beverage dispenser comprising:
a container having a tap valve for withdrawing beverage therefrom and defining a beverage-containing chamber,
a pressurizing fluid vessel mounted on said container and having an orifice opening from the interior thereof to said chamber,
normally closed valve means at said orifice for controlling the flow of pressurized fluid therethrough,
a bellows support,
a sealed bellows defining a closed chamber filled with control fluid under pressure and mounted at one end on said bellows support and having its other end cooperable with said valve means to effect actuation thereof,
said other end of said bellows havings its outer surface exposed to said beverage within said chamber,
whereby a predetermined pressure differential across said other end of said bellows causes said other end to open said valve means to permit fluid flow through said orifice, and
manually adjustable means extending exteriorly of said container and cooperable with said other end of said bellows to limit the degree of movement of said other end of said bellows in each of two directions.

8. A beverage dispenser comprising:
a container having a tap valve for withdrawing beverage therefrom and defining a beverage-containing chamber,
a pressurizing fluid vessel mounted on said container and having an orifice opening from the interior thereof to said chamber,
normally closed valve means at said orifice for controlling the flow of pressurized fluid therethrough,
a bellows support,
a sealed bellows defining a closed chamber filled with control fluid under pressure and mounted at one end on said bellows support and having its other end cooperable with said valve means to effect actuation thereof,

said other end of said bellows having its outer surface exposed to said beverage within said chamber,

whereby a predetermined pressure differential across said other end of said bellows causes said other end to open said valve means to permit fluid flow through said orifice, and

manually adjustable means extending exteriorly of said container and cooperable with said other end of said bellows to limit the degree of movement of said other end of said bellows in at least one direction.

9. A beverage dispenser comprising:

a container having a tap valve for withdrawing beverage therefrom and defining a beverage-containing chamber,

a pressurizing fluid vessel mounted on said container and having an orifice opening from the interior thereof to said chamber,

a valve member cooperable with said orifice and movable longitudinally to control the rate of fluid flow therethrough,

a bellows support including a platform,

a sealed bellows defining a closed chamber filled with a control fluid under pressure and mounted at one end on said bellows support platform and having its opposite end engageable with said valve member,

said opposite end of said bellows having its outer surface exposed to the beverage within said chamber,

whereby pressure differential across said opposite end of said bellows causes said opposite end to move said valve member to control fluid flow through said orifice, and

manually adjustable means extending exteriorly of said container for varying the position of said platform relative to said orifice.

10. The dispenser recited in claim **9** wherein means are engageable with said opposite end of said bellows for disengaging same from said valve member to render said bellows ineffective in actuating said valve member.

11. A beverage dispenser comprising:

a container having a tap valve for withdrawing beverage therefrom and defining a beverage-containing chamber,

a pressurizing fluid vessel mounted on said container

and having an orifice opening from the interior thereof to said chamber,

a valve member cooperable with said orifice and movable longitudinally to control the rate of fluid flow therethrough,

a bellows support including a platform,

a sealed bellows defining a closed chamber filled with a control fluid under pressure and mounted at one end on said bellows support platform and having its opposite end engageable with said valve member,

said opposite end of said bellows having its outer surface exposed to the beverage within said chamber,

whereby pressure differential across said opposite end of said bellows causes said opposite end to move said valve member to control fluid flow through said orifice,

a bellows caging member extending from said platform about said bellows and over said one end thereof,

said caging member having finger means spaced from said platform a distance sufficient to permit a limited degree of movement of said one end of said bellows relative to said platform, and

manually adjustable means extending exteriorly of said container for varying the position of said platform and caging member relative to said orifice.

12. The dispenser recited in claim **11** wherein said caging member is movable by said adjustable means to a point wherein said caging member finger means impinges said one end of said bellows and disengages it from said valve member.

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