CONTAINER AND DISPENSING APPARATUS

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The present invention relates to apparatus for dispensing fluids from containers and, more particularly, the subject application is a continuation-in-part of co-pending application Ser. No. 425,704, filed Jan. 13, 1965.

In general, the present invention encompasses the pressurizing and dispensing components disclosed in said co-pending application in combination with an improved locking assembly which includes cam elements for releasably securing the dispenser to a disposable container.

It is a general object of the present invention to provide an improved dispensing apparatus particularly designed for sequentially dispensing fluids from disposable containers at optimum regulated pressures.

It is a more specific object of the present invention to provide a reusable dispenser having an improved locking and sealing assembly for facilitating attachment to a disposable container.

The above objects as well as others relating more particularly to details of construction and operation will become more fully apparent from the following description when taken with the accompanying drawings, in which:

FIGURE 1 is a perspective view of the dispenser attached to a disposable container;

FIGURE 2 is a sectional view of the dispenser taken along the vertical plane indicated by view line 2—2 of FIGURE 1;

FIGURE 3 is a sectional view of the dispenser taken along the planes indicated by view lines 3—3 of FIGURE 2;

FIGURE 4 is a fragmentary, sectional view taken along the plane indicated by line 4—4 in FIGURE 2; and

FIGURE 5 is a fragmentary, sectional view similar to FIGURE 4 but illustrating an alternative form of the container and locking assembly.

Referring first to FIGURE 1, the complete system includes a disposable container such as a one-gallon can 10 having a lid 11, a dispensing unit 12, and a faucet 14 the latter of which is preferably of the push-button type. Faucet 14 may be connected to the dispenser 12 by a rigid tube 16 as shown in FIGURE 1 or it will be readily understood that tube 16 may be replaced by an elongated, flexible plastic or rubber hose of such length as to permit the filling of glasses held by several persons gathered about a table, bar, or buffet.

As shown most clearly in FIGURE 3, dispensing unit 12 is composed of an integral body 18 including a cylindrical portion 20 and a rectangular head 22. Cylindrical portion 20 forms a cartridge chamber 23 adapted to receive a replaceable CO₂ cartridge 24 which is introduced through open end 26. The cartridge is maintained in position by a threaded cap 28 carrying an O-ring 30 and a plunger 32; the latter being adapted to puncture cartridge 24 when the cap is fully threaded in place. In order to provide maximum safety against the accidental release of high pressure from the cartridge, cap 28 is designed such that threads 34 are securely engaged before O-ring 30 seals against the cylinder walls and, only thereafter, does plunger 32 come into contact with the cartridge.

Conversely, when removing cap 28, the trapped pressure in chamber 23 is released by the disengagement of O-ring 30 before the cap is completely unthreaded from the cylinder.

As further shown in FIGURE 3, head portion 22 of body 18 is provided with a threaded opening 36 adapted to receive a threaded bonnet 38 the latter of which includes a cylindrical portion 40. Head portion 22 is counterbored at 42 so as to provide an annular seat against which the periphery of a diaphragm 44 is adapted to be clamped when cylindrical portion 40 is threaded in place. In order to facilitate rotation of bonnet 38, a slip ring 43 is interposed between the diaphragm and the end of portion 40. A circular backing plate 46 is secured to diaphragm 44 by a rivet 48 so as to provide an abutment for one end of a compression spring 50. The opposite end of spring 50 bears against a disc 52 which, in turn, bears against the rounded end of a set screw 54. The position of set screw 54 is adapted to be adjusted so as to set the biasing force of spring 50 and, when the screw is in its proper countersunk position, it is adapted to be covered by a tamper-proof plastic plug 56. Thus, diaphragm 44 and bonnet 33 form a spring chamber 58 which is open to atmosphere through ports 60.

On the opposite side of diaphragm 44, a pressure control chamber 62 is formed by the diaphragm and the counterbored cavity in head portion 22. Control chamber 62 is in communication with cartridge chamber 23 through a central bore 64 the left end of which is counterbored to receive a sintered metallic filter 66. The right end of bore 64 is threaded at 68 so as to receive a stem valve 72 which is of the general type employed in automobile tires. The midportion of valve 72 is forced into sealing engagement with the tapered midportion 70 of bore 64 and the stem 74 is in engagement with rivet 48. Thus, valve 72 controls the passage of CO₂ gas from cartridge chamber 23 to control chamber 62 in accordance with the position of diaphragm 44. It will therefore be apparent that the above described elements within head portion 22 form a pressure reduction and control assembly whereby the high pressure in cartridge chamber 23, which is in the order of 900 p.s.i., is reduced to a regulated dispensing pressure in control chamber 65. Of course, the optimum dispensing pressure varies for different beverages and may range from approximately 15 p.s.i. for cold draught beer to 100 p.s.i. for warm soda.

As further shown in FIGURE 3, control chamber 62 is in communication with a check valve chamber 76 containing a resilient check valve 75 which is retained in position by a press fitted retainer 79. As will subsequently become apparent, the purpose of check valve 75 is to positively prevent the backflow of either gas or liquid into the control valve chamber 62 and valve 72.

Referring now to FIGURE 7, check valve 76 is in communication through passages 82 and 84 with a relief valve chamber 86 containing a resilient ball valve 88. The ball is biased into engagement with seat 87 by a spring 90 which is secured in position by a threaded retainer 92. As will become more fully apparent from the subsequent description, valve 88 is adapted to release excessive pressure in the system in the event of a malfunction in the pressure regulator and/or in the event of undesirable pressure build-up in the container caused by excessive warming of the carbonated beverage contained therein. Valve 88 is set open at pressures of 2 to 5 p.s.i. above the optimum dispensing pressure normally maintained in control chamber 62, whereby the valve insures the drawing of the beverages such as beer with a proper amount of foam or "head."
for an O-ring 106 and the midportion of the stem is formed with a groove 108. In addition, it will be noted that the portion of the stem immediately below groove 108 is of lesser diameter than that of bore 98 such that an annular gas passage is provided about the lower end of the stem. The upper end of stem 94 is provided with radial ports 110 and 112 which are adapted to receive the end portion of an adapter 114 whereby adapter 114 locks the stem in position against both axial and rotary movement. Adapter 114 contains a plurality of ports 116 which connect passage 100 with a passage 118 in the adapter. In addition, adapter 114 includes threads 120, a groove for O-ring 122, a nut portion 124, and threads 126 of the latter of which permit the connection to tube 16.

As further shown in FIGURES 2 and 4, the can lid 11 may be of slightly convex configuration or, alternatively, it may be concave or flat with a central recess as illustrated in co-pending application Serial Number 425,204; cans having either flat or spherical lids being known in the art. Regardless of the specific configuration, the lid is provided with an inner lip 128 defining a rectangular aperture 130 which may be closed and sealed by a removable plug (not shown) when the can is filled with the beverage. In order to attach and seal the dispenser to the can, locking stem 94 carries a rectangular plate 132 having a pair of downwardly sloping cam surfaces 134 and 136, the plate being rigidly secured to the stem as by welding. The length and width of plate 132 are slightly less than the length and width of aperture 130 so that the plate may be easily inserted through the aperture. However, the length of the plate is somewhat greater than the width of the aperture, whereby upon rotation of the plate to the position shown in FIGURE 4, the ends of plate 132 extend beyond the edges of the aperture. In order to seal the dispenser to the can, stem 94 is surmounted by a ring 135 having an annular groove for receiving an O-ring 140. A second O-ring 142 is provided in a groove in the upper surface of the ring whereby the ring is sealed with respect to the exterior surface of the dispenser body but free to rotate with respect thereto.

The alternative form of locking assembly will now be described with respect to FIGURE 5. In this embodiment, the can is formed with a lid 117 having a triangular aperture 130 and rectangular plate 132 is replaced by a triangular plate 132'. While plate 132' may be provided with cam surfaces corresponding to surfaces 134 and 136, a preferred construction is to provide lid 117 with a plurality of punched depressions or indentations 144 which form cam surfaces depending from the inner surface of the lid. Of course, the dimensions of triangular plate 132' are slightly less than those of aperture 130 whereby the plate may be readily inserted through the aperture when the plate and aperture are angularly aligned. However, rotation of plate 132' to the position shown in FIGURE 5 causes the tips of the plate to extend beneath the edges of the aperture such that the tips engage the cam surfaces formed by indentations 144 and the dispenser is thereby locked and sealed to the container.

The over-all operation of the dispenser is as follows. The user first removes the plug (not shown) sealing the aperture in the container. Dip tube 104 is then inserted through the aperture into the container and the locking plate 132 (or 132') is inserted through the aperture 130 (or 130') such that O-ring 140 engages the upper surface of the container lid surrounding the aperture. Ring 138 is then held stationary while the dispenser is rotated such that the extremities of locking plate 132 (or 132') extend beneath the edges of the aperture. During the rotation of the locking plate, cam surfaces 134, 136 engage the cam and dispenser downwardly with respect to the container lid so that O-ring 140 becomes tightly seated against the upper surface of the lid. Similarly the cam surfaces formed by indentations 144 in the FIGURE 5 embodiment perform the same function as that of cam surfaces 134 and 136.

After the dispenser has been locked and sealed to the container in the manner just described, the unit may be pressurized by introducing cap 28 and inserting a commercially available CO₂ cartridge 24 into chamber 22. Cap 28 is then replaced and pin 32 automatically punctures the end of the cartridge when the cap is fully threaded into the position illustrated in FIGURE 3. As a result, high pressure CO₂ gas is immediately released in chamber 23 and the gas begins to flow through filter 66. Filter 66 operates as a vaporizer in that the porous sintered metal provides a multiplicity of minute expansion orifices permitting passage of gas but preventing the passage of any solid or liquid CO₂. The gas passing through the filter flows through valve 72 which is open at that time since spring biased diaphragm 44 is unopposed by any effective pressure in control chamber 62; the diaphragm thereby engaging stem 74 and holding valve 72 open. The gas continues to flow through flexible check valve 78, chamber 76, passage 82, and around the reduced diameter portion of stem 94 into the top of container 10 thereby pressurizing the container and the beverage therein. The above described flow of gas continues until control chamber 62 and the interior of the container reach a predetermined pressure at which point the predetermined biasing force of spring 50 is overcome, whereupon the diaphragm moves to the right and permits the valve 72 to close. Thus, a regulated pressure is maintained in control chamber 62 and within the container until such time as the withdrawal through dip tube 104, passages 100 and 116, tube 16, and faucet 14 reduces the pressure in chamber 62, wherein diaphragm 44 opens valve 72 so as to admit further gas to the chamber and restore the pressure to its predetermined value. It will therefore be apparent that the regulator is continually regulated so as to maintain an optimum pressure in the system. It will also be apparent that different optimum pressures may be utilized for dispensing different materials by employing various initial settings of set screw 54 which determines the biasing force of spring 50.

So long as the above described pressures in control chamber 62 and can 10 remain below a predetermined maximum value, safety valve 88 remains closed and is not involved in the operation. However, in the unlikely but possible event of a component failure in the pressure regulating system, any increase of pressure in chamber 62 will be communicated through check valve 76 and passages 82 and 84 to chamber 86 and ball valve 88 which will then open and release the undesired pressure. Thus, valve 88 provides a secondary control to positively prevent the occurrence of high pressure from cartridge chamber 23 to can 10 thereby insuring against the danger of the can rupturing under high pressure. In addition to this function, valve 88 also provides for an automatic release of excessive pressure in the event that a warming of the can contents causes an undesired pressure rise in the can itself. This is of particular importance in case of dispensing beverages such as unpasteurized draught beer wherein a warming of the beer is capable of creating undesirable head pressures in the can which tend to cause foaming of the beer if not properly released.

The present dispenser also provides a second safety feature in that the area and force of engagement of diaphragm 44 by bonnet 38 is such as to permit the edges of the diaphragm to pull away from annular seat 42 in the event of an extreme pressure build up in chamber 62. Thus, even in the event of excessive valve 72 was totally defective and permitted unobstructed flow of high pressure gas into chamber 62 at a rate faster than could be released by valve 88, the diaphragm 44 would pull out of clamped engagement and permit pressure release through ports 60.

It should also be noted that the likelihood of a failure in the pressure control assembly is substantially reduced.
by the fact that filter 66 and check valve 78 effectively isolate the assembly from all harmful foreign matter.
Thus, neither dirt nor the liquid being dispensed can enter the assembly and cause sticking of the valve or other malfunction of the assembly. In addition, filter 66 and valve 78 perform a sanitary function in preventing the dispensed beverage from becoming trapped in the assembly.

From the foregoing description, it will be apparent that the present invention accomplishes all of the objects set forth hereinbefore and that it provides a dispensing system which is miniaturized, economical, reliable, safe, and easy to operate. Of course, it is to be understood that the foregoing description of a single embodiment of the invention is intended to be illustrative rather than exhaustive of the principles of the invention and that numerous changes and modifications may be made therein without departing from the true scope of the invention as defined in the following claims including all patentable equivalents thereof. For example, it will be readily apparent that the invention is in no way limited to rectangular or triangular apertures and locking plates since oval or other noncircular configurations are equally operative. In addition, it will be equally apparent that the cam surfaces may be provided on either the locking plate or the interior surface of the lid regardless of the particular geometrical configuration of the plate and aperture. Similarly, numerous other modifications will become readily apparent to those skilled in the art.

What is claimed is:

1. A dispensing unit comprising: a body containing a source of high pressure gas, a pressure regulator assembly having an inlet and an outlet, said inlet being connected to said source of high pressure gas, a stem partially received in said body having a portion extending externally of said body, a dip tube attached to the external end of said stem, a locking plate secured to said stem externally of said body, said locking plate being of noncircular configuration, gas passage means extending from the outlet of said regulator assembly to a point adjacent said locking plate, fluid passage means extending through said stem and body for conducting fluid from said dip tube to the exterior of said body, and sealing means connected to said dispensing unit and positioned for sealing engagement with the external surface of a container wall when said dispensing unit is secured to a container by said locking plate.

2. The dispensing unit as claimed in claim 1 including a plurality of cam surfaces on said locking plate.

3. The dispensing unit as claimed in claim 1 including a ring surrounding said stem externally of said body and adjacent said locking plate, said ring having a lower surface extending parallel to the plane of said locking plate, an annular groove in said lower surface, and an O-ring partially disposed in said groove forming said sealing means.

4. The dispensing unit as claimed in claim 2 including a plurality of cam surfaces on said locking plate.

5. In combination, a dispensable container having a neckless lid, a noncircular aperture in said lid, a plurality of depressions in said lid adjacent the edges of said aperture, said depressions forming cam surfaces on the interior surface of said lid, a dispensing unit attached to said container, a source of compressed gas within said unit, a pressure regulator within said unit having an inlet and an outlet, said inlet being in communication with said source of compressed gas, a locking element secured to said unit, said locking element being of noncircular configuration and being slightly smaller than said aperture whereby said element is insertible through said aperture when said element and said aperture are in a first angularly aligned position, the relative size and configuration of said element and said aperture being such that said element extends beneath the edges of said aperture and engages said cam surfaces upon relative rotation of said element and aperture to a nonaligned position, gas passage means communicating with the outlet of said regulator and passing through said aperture to the interior of said container, and fluid passage means for dispensing fluid from said container, said fluid passage means extending through said locking element, and sealing means connected to said unit and positioned for sealing engagement with the external surface of said container lid surrounding said aperture when said unit is secured to said container by said locking element.

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