United States Patent [19]

Risener

[11] **3,752,362**

[45] **Aug. 14, 1973**

[54] **LIQUID HANDLING METHOD AND APPARATUS**

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[22] Filed: **Dec. 16, 1971**

[21] Appl. No.: **208,856**

[52] **U.S. Cl.** **222/85,** 222/400.7

[51] **Int. Cl.** **B67b 7/24**

[58] **Field of Search** ...222/81–85, 86, 88, 325, 400.7

[56] **References Cited**

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Assistant Examiner—Thomas E. Kocovsky
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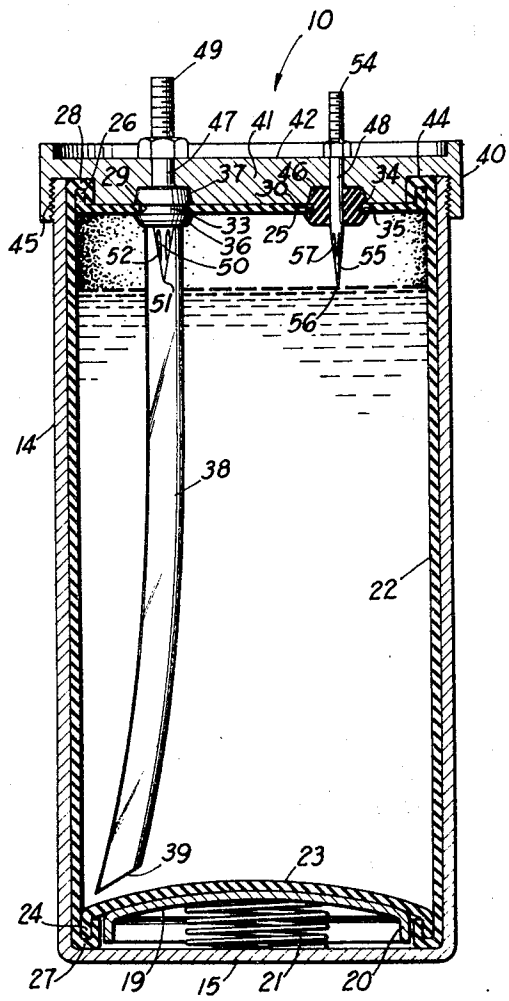
[57] **ABSTRACT**

A liquid handling method and apparatus wherein the apparatus includes an outer container having an open top, a closed disposable inner liner containing a predetermined amount of the liquid positioned within the outer container and having a top capable of being ruptured, and a cover for securing over the outer container, the cover having means to rupture the top of the inner liner to provide a means of withdrawing the liquid.

9 Claims, 2 Drawing Figures



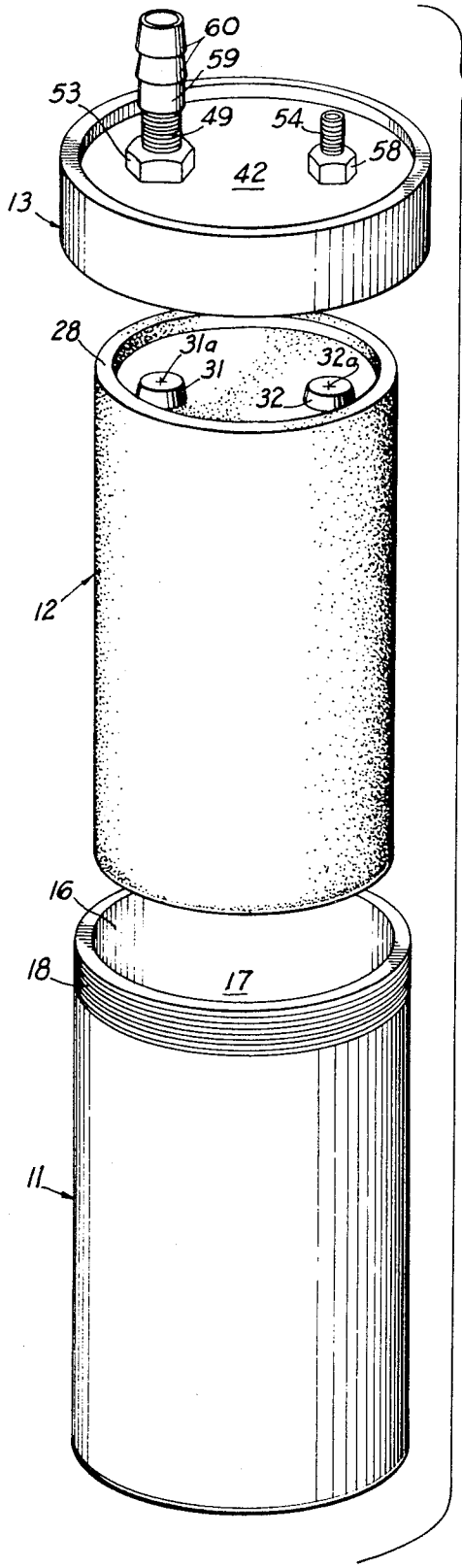

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FIG 1

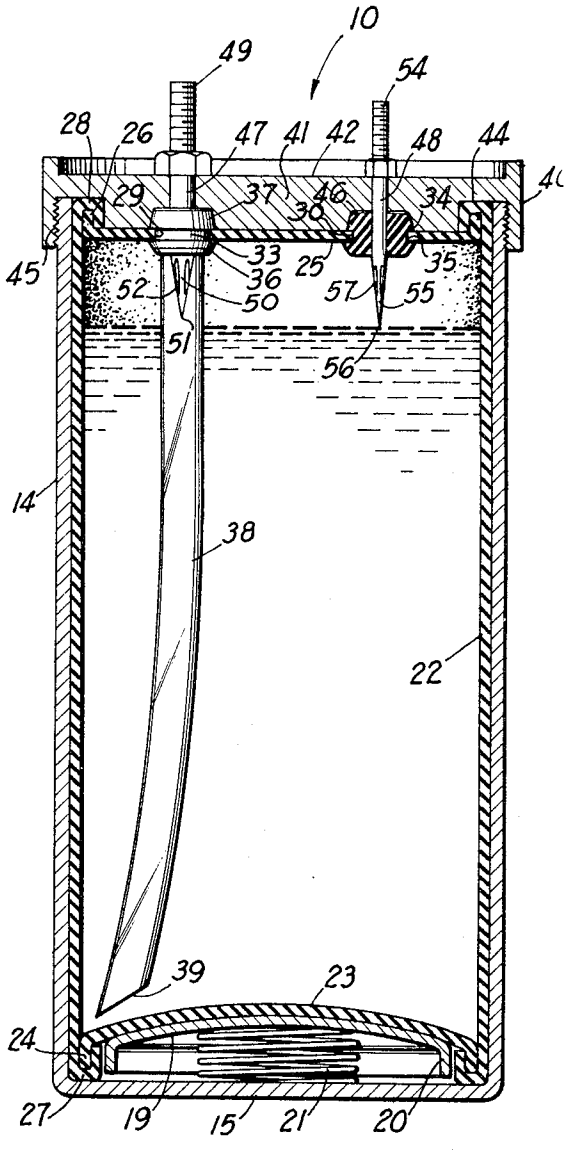
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FIG 2

LIQUID HANDLING METHOD AND APPARATUS

BACKGROUND OF THE INVENTION

This invention relates to a handling system for storing, transporting, and dispensing a liquid which is more particularly adapted to a carbonated liquid.

Transfer tanks are utilized in the beverage industry for storing, transporting and dispensing of a particular liquid, such as beer or syrup or pre-mix. The liquid within the container is usually carbonated, but additional carbonation from an outside source is necessary to enable the dispensing of the liquid from the container.

Typically, the containers are stainless steel, five gallon cylindrical tanks having an inlet for the pressurized gas and an outlet for the liquid. A dispensing mechanism is usually attached to the liquid outlet for incremental removal of the liquid. When the liquid has been evacuated from the container, it is returned to its point of origin where it is cleaned out and reused.

There are a number of drawbacks with these types of transfer tanks. The major disadvantage is their high cost which is primarily due to their being constructed of stainless steel. Also, their recycling period is relatively short. It is estimated that a tank will last for approximately fifty uses or about two years. This short life span is the result of mishandling in transport, use, and in the cleaning stages. This short life span necessitates the construction of around one million new tanks a year.

Many devices, such as the beverage dispenser disclosed in U.S. Pat. No. 3,195,779 issued on July 20, 1965 to Stanley Nicko, have been developed in the past to overcome these difficulties, but they have proven to be inadequate.

SUMMARY OF THE INVENTION

Briefly described, the present invention includes a three-portion liquid handling apparatus. The first portion is a rigid outer cylindrical container which has a closed bottom and an open top. A spring-biased positioning member is disposed within the container on its bottom. The second portion of the apparatus is a disposable inner liner containing the particular beverage or liquid which is positioned within the container in engagement with the spring-biased member. The liner has a top with two penetrable sealing elements disposed therethrough, one sealing element for the entry of pressurized gas from an outside source and the other element for the exit of the liquid from the liner. The third portion of the apparatus is a closure member which is adapted to be secured over the open top of the outer container. The closure member has a lower end surface provided with depending, hollow, perforate puncture elements in alignment with the sealing elements so that when the closure member is secured to the outer container, the puncture elements rupture the respective sealing elements to allow entry of the pressurized gas into the inner liner and to allow withdrawal therefrom of the liquid.

It is therefore a primary object of the present invention to provide a new and improved liquid handling method and apparatus.

Another object of this invention is to provide a liquid handling method and apparatus which utilizes an inner liner for a liquid which can be disposed of when the liquid has been withdrawn therefrom.

A further object of this invention is to provide a liquid handling apparatus employing a disposable inner liner with penetrable sealing elements disposed through its top for liquid exit and pressurized gas entry.

Another object of this invention is to provide a closure member for a liquid handling apparatus which is adapted to be secured over an outer container and having a lower surface with depending rupture elements for penetrating the liquid exit sealing element and the pressurized gas entry sealing element on the top of a disposable inner liner containing the liquid which is positioned within the outer container.

A further object of the present invention is to provide a liquid handling apparatus which eliminates any need for cleaning maintenance since the liquid is contained within a disposable liner.

An object of the present invention is to provide a liquid handling apparatus which eliminates the need of returning any portion thereof to the liquid production plant for liquid refill.

Another object of the present invention is to provide a liquid handling apparatus comprising a disposable inner liner for the liquid having a liquid conduit depending from the top of the liner into the liquid and formed as an integral part of the liner.

An object of the present invention is to provide a liquid handling apparatus with a closure member provided with means for attaching thereto a liquid dispensing means for withdrawing the liquid from the tank and a means for regulating the entry into the tank of pressurized gas from an outside source to provide pressure for dispensing the liquid.

An object of the present invention is to provide a liquid hanling apparatus which employs a handling inner liner within which the liquid is stored and transported and which is secured within a container adapted to dispense the liquid when it is desired to withdraw the liquid.

Another object of the present invention is to provide a liquid handling apparatus which is economical to manufacture, reliable in operation and is durable.

Still other objects and advantages of the present invention will become apparent after reading the accompanying description of the selected illustrative embodiment of the invention with refernece to the attached drawing wherein like reference characters have been used to refer to the like parts throughout the figures of drawing, and wherein:

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is an exploded perspective view of the present invention; and

FIG. 2 is a cross-sectional elevational view of the invention.

DESCRIPTION OF THE ILLUSTRATIVE EMBODIMENT

The liquid handling apparatus **10** comprises an outer container **11**, an inner liner **12** and a top closure member **13**. The outer container **11** has a cylindrical side wall **14**, an integrally formed bottom wall **15** and an open top **16**. The side wall **14** and bottom wall **15** define an inner chamber **17**. A first locking means comprising threads **18** are circumferentially disposed around a portion of the side wall **14** adjacent the top **16**. The container **11** is preferably constructed of a rigid material, such as stainless steel.

Disposed within chamber 17 is a positioning means for the liner 12 and comprises a convex-shaped dish or engaging element 19 with an annular flange 20 depending from its outer perimeter. Secured to the underside of the dish 19 is a helical coiled spring 21. The spring 21 is not secured to the bottom wall 15 so as to allow the dish 19 to be freely rotatable within the chamber 17.

The liner 12 has a cylindrical side wall 22 with a diameter which is slightly less than the inner diameter of container 11 so that the liner 12 fits snugly within chamber 17. The liner 12 has a bottom end 23 with an annular depending flange 24 upon its perimeter. Bottom end 23 has a convex cross-sectional shape which is complementary to the shape of dish 19. The liner 12 is further provided with a top 25 which has an upwardly projecting annular flange 26 upon its perimeter.

Side wall 22 is fixedly secured to bottom wall 23 and top 25 by return bending or crimping the lower and upper ends of the wall 22 upon the annular flanges 24 and 26, respectively. This crimping thus provides the liner 12 with an annular bottom ring 27 and an annular top ring 28. The construction of the liner 12 provides for a secure fitting if there is an increase in pressure within the interior of the liner 12.

The side wall 22, bottom wall 23 and top 25 are preferably constructed of layers of cardboard fibers, rope or cording, and wax. Additionally, the inner surfaces of the liner 12 have a foil layer (not shown) for sanitary purposes.

Disposed through openings 29 and 30 in the top 25 are frangible sealing elements 31 and 32 adapted to be penetrated by means which are discussed in detail hereinafter. These elements 31 and 32 are constructed of a resilient material, such as rubber or soft plastic, and are scored or notched on their tops by X-shaped marks 31*a* and 32*a*, respectively. Sealing element 31 is for the exit of liquid from the inner liner 12 and sealing element 32 is for the entry into the liner 12 from an outside source of pressurized gas, such as carbon dioxide. Each element 31 and 32 is substantially in the form of a circular plug having an annular peripheral groove or collar portion 33 for receiving the top 25 of liner 12 around the corresponding openings 29 and 30. Annular flanges 34 and 35 project outwardly from elements 31 and 32 above and below grooves 33 for retaining the elements 31 and 32 in their respective openings 29 and 30. To aid in insertion of the elements 31 and 32 into openings 29 and 30, the lower portion of the elements 31 and 32 is in the form of a downward tapering, beveled, frustoconical surface 36 adjacent lower flange 35. Surface 37 is provided on the tops of the elements 31 and 32 which project above surface 25, with surface 37 having a beveled, frustoconical shape which tapers upwardly from flange 34. Preferably, the grooves 33 are of a slightly larger outside diameter than openings 29 and 30 so that the elements 31 and 32 are compressed when inserted into their respective openings 29 and 30. In this manner, the elements 31 and 32 form a liquid-tight and gas-tight seal with the corresponding opening.

The elements 31 and 32 are shown in FIG. 2 as having a one-piece body, but it is understood that they could also be constructed with an imperforate diaphragm or frangible member axially disposed within the elements 31 and 32 in alignment with the grooves 33. Another embodiment of the apparatus 10 could be that top 25 is constructed totally of a frangible material, thereby eliminating the necessity of elements 31 and 32 or their like.

Depending from the bottom end of the surface 36 is a liquid conduit 38, preferably a plastic tube, with an outer diameter which is approximately equal to the diameter of 33. The conduit 38 is cut off at its lower end adjacent the bottom end 23 along a diagonal or inclined surface 39 so as to conform to the slope of bottom end 23.

The closure member 13 is preferably constructed of a rigid material such as stainless steel and comprises an annular outer ring 40 whose inner diameter is slightly greater than the outer diameter of container 11. Axially disposed midway within the ring 40 is a top portion 41 with a top surface 42 and a bottom surface 43. A U-shaped groove 44 is circumferentially disposed through the bottom surface 43 adjacent the exterior of ring 40. The width of groove 44 is slightly greater than the combined widths of side wall 14 and top ring 28. The depth of groove 44 is sufficient to fully encompass the top ring 28 so that bottom surface 43 and top 25 are in engaging relationship to form a gas-tight and liquid-tight seal when the closure member 13 is secured over container 11. On the outer wall surface of the groove 44 adjacent to the exterior of ring 40 there is provided a second locking means comprising threads 45 which are complementary to threads 18 on the container 11. It is understood that the locking means could be of any suitable design, such as clamps or latches.

The bottom surface 43 is further provided with frustoconical-shaped openings 46 which are in alignment with sealing elements 31 and 32 and are of sufficient dimensions to be complementary to surface 37 on the sealing elements 31 and 32 so as to fully engage and surround the portions of the elements 31 and 32 which project above the top 25.

Disposed through top portions 41 in alignment with openings 46 are openings 47 and 48. Opening 47 is of a larger diameter than opening 48 and is adapted to receive therethrough a rupture or penetrating means for withdrawal of the liquids within liner 12. The liquid rupture means comprises an elongated, hollow, cylindrical tube 49 with an inwardly tapering bottom portion 50 which terminates in a sharp end point 51. Disposed through bottom portion 50 adjacent point 51 are a plurality of openings 52. The portion of the tube 49 which projects above surface 42 is provided with circumferentially extending threads so that the tube 49 may be secured into position by means of a bolt 53. Opening 48 is adapted to receive a rupture or penetrating means which is similar in design to tube 47, i.e., a tube 54 with bottom portion 55, end point 56, openings 57 and being secured into position by bolt 58. It is understood, of course, that tubes 48 and 54 could be of the same dimensions.

As shown in FIG. 1, the top of tube 49 has positioned thereon a piece of plastic tubing 59 which is provided with a double flanged top portion 60 for ready connection of the tube 49 to any liquid dispensing means (not shown) which is familiar to the beverage industry. Tube 54 is adapted to receive thereon a suitable pressure regulator means (not shown) to control the flow of carbon dioxide from an outside source (not shown) through tube 54 into the inner liner 12.

OPERATION

The apparatus 10 can be adapted for the dispensing

of substantially all liquids, including beer, but will be described with reference to the fountain beverage industry. The liner **12** can be fabricated at the beverage filling plant since it can come from the manufacturer without the bottom **23** or top **25** inserted into position. The side wall **14** can be collapsed for easy storage until it is utilized. Once assembled, liner **12** is a rigid construction. It is also understood that another embodiment of liner **12** could be that it is formed in a one-piece design, preferably constructed of a plastic-type material, having a frangible top or having frangible sealing elements therethrough.

The liquid introduced into the liner **12** can be in syrup form or can be a pre-mix. Both of these liquids contain carbonation so that when the liner **12** is filled with the liquid substantially to the level as shown in FIG. **2** and the top **25** is securely inserted, a gas head develops within the space between the liquid top and the top **25.** This is usually a 10-pound head pressure for a syrup when the liquid reaches room temperature. With the top inserted, a gas-tight and liquid-tight container is thus formed for the liquid. If desired, a flat troughed band suitable for crimping can be placed over top ring **28** to insure a proper seal. The liquid can be transported to and stored at its point of destination until such time as it is desired to withdraw the liquid.

At such withdrawal time, the liner **12** is placed within chamber **17** so that the bottom ring **27** engages the top surface of bottom wall **15** and the underside of bottom **23** engages the top of dish **19.** The positioning means thus acts as a safety mechanism in that if the liner **12** is accidentally dropped within chamber **17** instead of being gently placed therein, the spring-biased dish **19** cushions the liner **12** to prevent its rupture.

The closure member **13** is then positioned over the container **11** such that the points **51** and **56** are in alignment with the scores or notches **31a** and **32a** on the top surface **37** of the sealing elements **31** and **32** and are in stressing engagement with same. The closure member is then firmly and steadily pushed downward to that tubes **49** and **54** rupture or penetrate through sealing elements **31** and **32,** respectively. The ring **40** is then turned so as to secure closure member **13** over container **11** by means of threads **18** and **45.** As the closure member **13** is rotated, the liner **12** also rotates within chamber **17** since the rupture means has pierced the sealing elements **31** and **32.** The freely rotatable dish **19** aids in the rotation of the liner **12.**

When the closure member **13** is fixedly secured over container **11,** the tubes **49** and **54** will have fully penetrated their respective sealing elements **31** and **32** so that openings **52** are located within the liquid conduit **38** and openings **57** are located over the liquid surface, as shown in FIG. **2.** At this time, the liquid dispensing means can be attached to tubing **59** and the pressure regulating means can be secured to tube **54.**

Carbon dioxide is introduced into liner **12** through tube **54** and openings **57** to provide pressure for dispensing the liquid. The liner is so constructed so as to withstand from 40–60 pounds per square inch of pressure, 40 p.s.i. needed to remove beverage syrup and 60 p.s.i. necessary to withdraw a pre-mix from the liner **12.** The liquid travels up through conduit **38** into openings **52,** out tube **49** and into the dispensing means to incrementally deliver the liquid.

It can therefore be seen that the apparatus **10** provides for a new and improved liquid handling system which is particularly useful in the beverage industry. Since the liquid is contained within liner **12,** there is no need for recycling the container **11** back through the liquid filling plant as is now done with the present transfer tanks which do not employ an inner liner. The liquid can be stored in, transported within and dispensed from the same liner **12** and when the liquid has been completely withdrawn, the liner **12** can be thrown away and a new liner **12** can be inserted within container **11.** It may be possible to adapt present transfer tanks to the present invention by removing their tops, mounting securing means thereon and thus form a container **11.**

The present invention may be modified in the details of the construction without departing from the inventor's concept which is set out in varying scope in the appended claims.

What is claimed is:

1. An apparatus for dispensing liquid comprising in combination, a first cylindrical container having an open top and a closed bottom, a second cylindrical container adapted to be snugly received in said first container so as to provide a liner therefor, said second container having a closed top provided with two spaced frangible sealing elements, a liquid conduit depending from one of said sealing means to a point adjacent the bottom of said second container and a closure means adapted to be sealingly secured over the top of said first container and having a plurality of depending rupture means adapted to be placed in registry with said frangible sealing means and when pressed downwardly on said sealing means, to rupture them, said rupture means comprising pointed tubular elements, one of which, after such rupture, will be placed in communication with the interior of said liquid conduit, while the other will be placed in communication with the top portion of said second container, to provide a passage for introducing gas under pressure to expel liquid from said second container.

2. Apparatus as in claim **1** wherein each of said sealing elements is provided with a central marking to facilitate proper positioning of said rupture means with respect to said sealing elements.

3. Apparatus as in claim **1** wherein said second container has a bottom closure which is outwardly concave and inwardly convex and said liquid conduit has an open lower end which is cut off on an incline so that it generally parallels the inner surface of said bottom closure.

4. Apparatus as in claim **3,** further including a dish-shaped member fitted between the concave bottom surface of the second container and the bottom of the first container and having its convex outer surface fitting snugly within said concave bottom surface and a compression spring bearing against the bottom of said first container and the interior of said dish-shaped member for cushioning said second container in said first container and for permitting free rotational movement of said second container in said first container.

5. Apparatus as in claim **4** including means for firmly holding said closure means in position and said first container.

6. Apparatus as in claim **5** wherein said last-mentioned means comprises engaging screw threads on said closure and container.

7. Apparatus as in claim **6** wherein said sealing means comprise plugs of elastic material which are compressed and inserted into openings in the top wall of

said second container, said openings being slightly smaller than the normal size of said plugs.

8. Apparatus as in claim **7** wherein said rupture means are provided above and adjacent their pointed ends with openings providing communication between the exterior and interior of said rupture means.

9. Apparatus as in claim **8** wherein the tops and side walls of said second container are crimped together to provide an annular ring and said closure means is provided with a downwardly opening groove which embraces said ring and the upper edge of the wall of the first container when said closure and containers are in assembled condition.

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