March 10, 1964 R. A. LAKE 3,124,275

LIQUID DISPENSING CONTAINER

Filed April 9, 1962 2 Sheets-Sheet 1

Fig. 1.

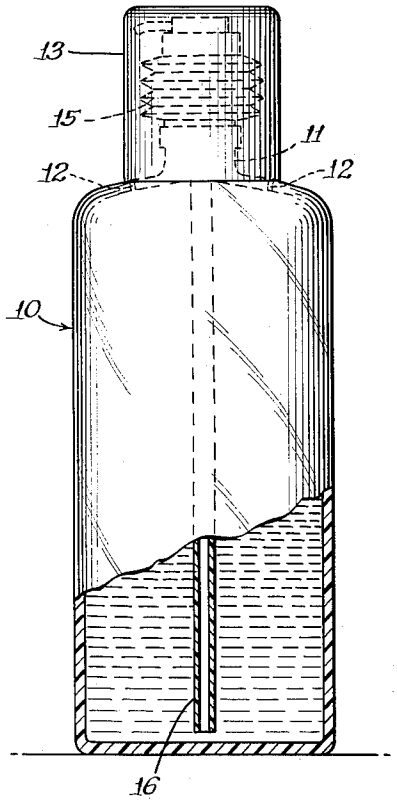
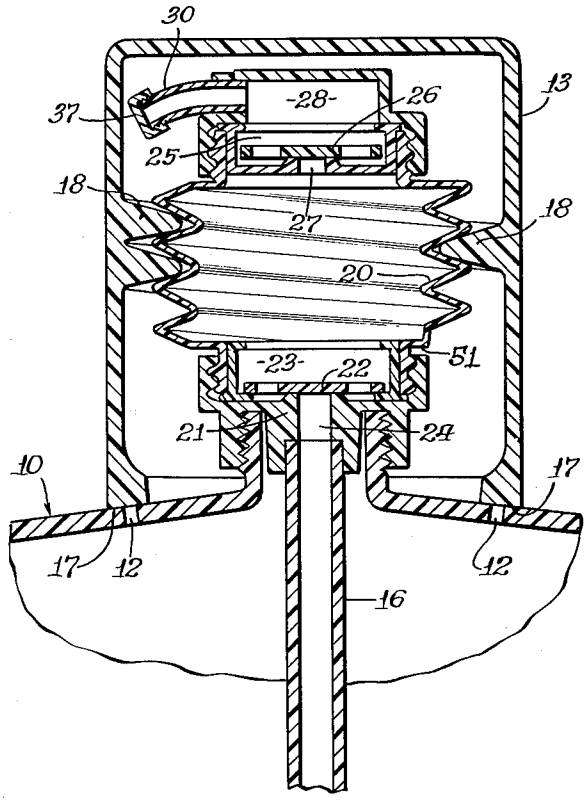


Fig. 2.



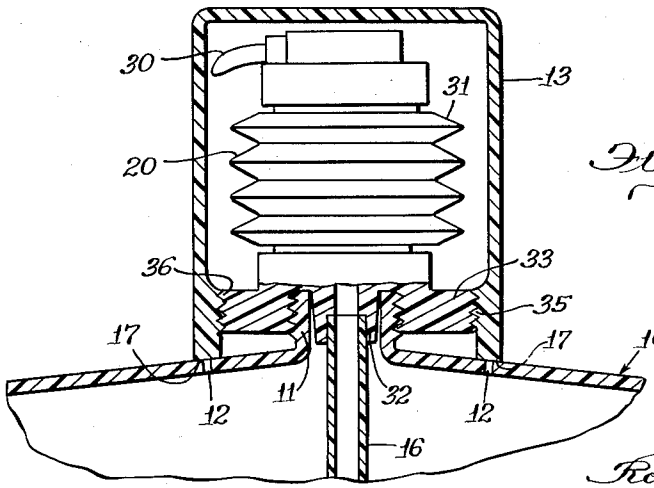


Fig. 3.

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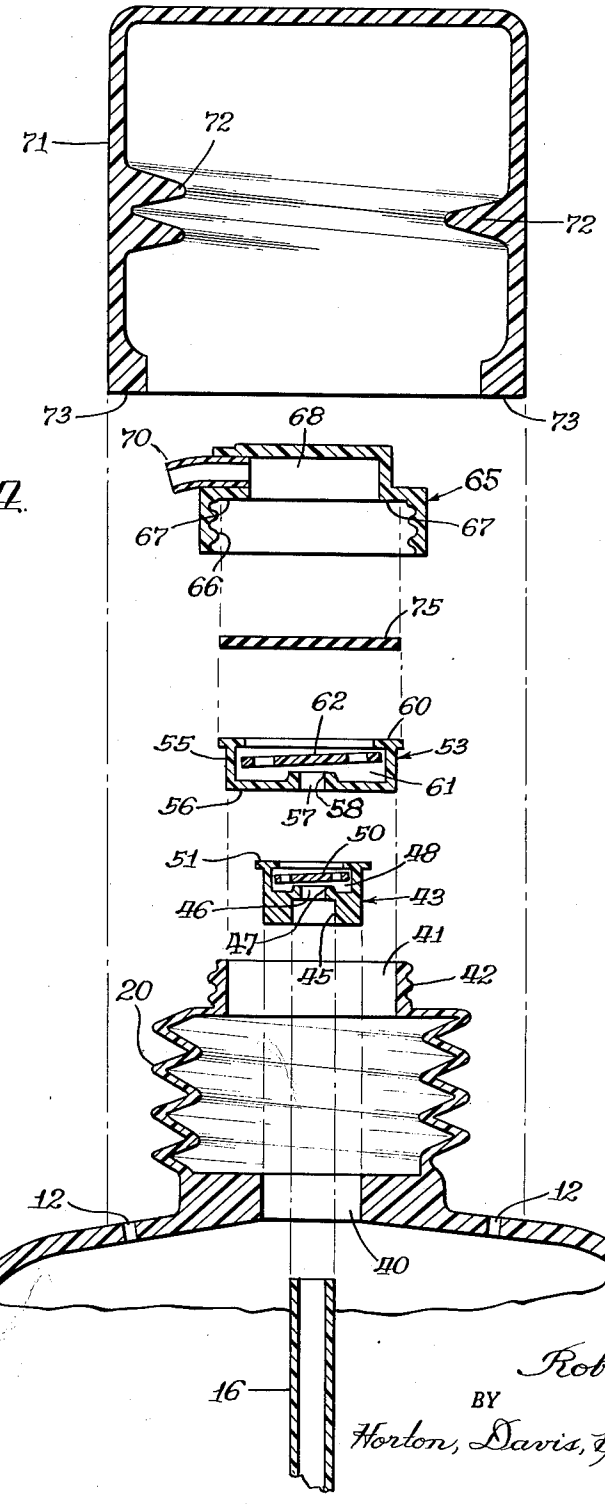

Fig. 4.

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LIQUID DISPENSING CONTAINER

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4 Claims. (Cl. 222—182)

This invention relates to a liquid dispensing container and particularly to a combination of a container, a dispenser and a cap that are inexpensive to manufacture and capable of storing and shipping liquids in a form that is convenient to market and to the ultimate consumer.

Packaging that makes a product attractive and easy to use by the consumer is very important in increasing the sales of that product. Liquid products must be marketed in containers that are suitable to contain liquids, and preferably in containers that are not so fragile that they break during shipping, handling or use. The containers should be capable of easy sealing, easy opening and in many cases, easy re-sealing, and the size and shape of the container should be such that it is readily handled. In those uses where a liquid container is too large to be easily lifted by a consumer or where small amounts of liquid are occasionally dispensed from a relatively large capacity, it is desirable to provide some ready means of dispensing the liquid as part of the container. Without intending any limitation, for example, in liquid dishwashing detergents, a small amount such as a "capful" of detergent is employed from a bottle containing many such capfuls. The use of this material requires unscrewing the cap, measuring the appropriate amount of liquid into it, adding the liquid to the dishwater, and screwing the cap back onto the bottle. The latter job is usually preceded by an annoying step of rinsing of extra detergent from the cap. As an alternative to this, flexible bottles closed with caps having small holes are employed and by turning the bottle upside down and squeezing the bottle, a squirt of detergent is dispensed into the water, but in this method of use, the amount that is used cannot be measured, and a wasteful overabundance of detergent is usually employed.

Dispensing pumps which also act as the container closure have been used. Such a pump is desirable, because it forms a dispensing means which also acts as a closure and the simple operation of the pump dispenses the liquid without the necessity of opening and closing the container. They are usually designed to dispense the proper amount of liquid and therefore prevent wasting the product. Since a pump dispenser must contain a vent so that air can displace the pumped liquid, it is usually necessary to seal the container with a separate cap to prevent leakage through the vent during shipping, and to provide the pump as a separate item to be installed by the consumer.

The present invention is a novel combination including a plastic bottle or other appropriate container having an opening in the top such as an ordinary bottle neck to which a flexible bellows is connected in liquid-tight relationship. The bellows is provided with inlet and outlet valves to form a pump. The pump is adapted with a tube that extends from the inlet valve into the container.

The combination also includes one or more vent holes adjacent the container opening which permit air to enter the bottle to displace the liquid that is being pumped. The combination also includes threads or other means for holding a rigid cap in place to enclose completely the pump bellows and to form a liquid-tight seal with the vents when it is screwed or otherwise fastened in place.

The combination of this invention can best be explained with reference to the accompanying drawings which illustrate several presently preferred embodiments of the invention and are intended as illustrative rather than limiting on its scope.

FIG. 1 is an elevation view partly in section of a container embodying this invention;

FIG. 2 is a partial elevation view in cross-section illustrating an embodiment in which the cap and bellows portions act cooperatively;

FIG. 3 is a partial elevation view partly in section of another embodiment of this invention; and

FIG. 4 is an exploded partial view, partly in section illustrating an embodiment in which the pump bellows is formed as a portion of the bottle.

A container **10** is shown in the form of a bottle made of plastic, glass or other suitable material. The container has a threaded neck **11** and vent holes **12**. FIG. 1, which illustrates the overall appearance of the combination, illustrates a cap **13** and, in phantom, a pump assembly designated generally as **15**. Leading into the pump assembly is an inlet tube **16** which extends to the bottom of the container **10**.

The details of one embodiment of the pump assembly are best shown in FIG. 2. In FIG. 2 the pump assembly is covered with a cap **13** which encloses the bellows and other external structure of the pump and which, when in place, has a sealing surface **17** forming a closure over the vent holes **12**. Protruding threads **18** extend from the interior surface of the cap **13** to engage the bellows **20**, which in the embodiment shown in FIG. 2, consists of helical or thread-like corrugations of flexible plastic material instead of the usual disc-like or circular corrugations.

The inlet tube **16** opens into a valve housing **21** which forms a seat for a disc **22** that is free to rise and fall within a valve chamber **23**. An inlet **24** opens beneath disc **22**. In a similar valve chamber **25**, a disc **26** is free to rise and fall, opening and closing a discharge port **27**. The valve mechanism acts as a double check valve such as used in most positive displacement pumps. When the bellows is depressed, disc **26** rises expelling air or liquid as the case may be from the diminished volume within the bellows. The action exhausting the bellows causes a pressure which forces disc **22** to seat more firmly. When the bellows expands, a vacuum is created which pulls disc **26** firmly against its seat and causes liquid from within container **10** to lift disc **22** and fill the expanding chamber within the bellows **20**. The next depression of the bellows causes the liquid to be ejected through chamber **28** and discharge spout **30**.

When storing, shipping or otherwise handling the container **10**, the cap **13** is maintained in place by causing threads **18** to engage the corrugations of bellows **20**. When screwed on tightly, the bellows will be extended and the resiliency of the bellows will force sealing surface **17** tightly over the vent holes **12** to prevent any leakage of liquid through the vent holes. When the cap is unscrewed and removed prior to use, the vent holes are uncovered so that air may enter the container to displace the liquid that is pumped, and the bellows will no longer be rigidly held in extended condition but will be free to be contracted and expanded.

FIG. 3 illustrates another embodiment of this invention. In FIG. 3, the bellows **31** is the conventional type of bellows with circular rather than spiral corrugations. The bellows **31**, however, operates similarly to the bellows **20** in that expansions and contractions cause the operation of inlet and outlet check valves to discharge a stream of liquid through spout **30**. In the embodiment shown in FIG. 3, the valve housing **32** is provided with a radially extending flange **33** which extends beyond the radial extent of either the bellows **31** or the discharge spout **30**. This flange terminates in threads **35** which are

formed and positioned to engage internal threads 36 on the interior of the cap 13. As may be seen from the drawings, the tight engagement of threads 35 and 36 will cause the sealing surface 17 of the cap 13 to form a liquid-tight seal with the vents 10. In the embodiment shown in FIG. 3, the discharge spout 30 has a fused or sealed end. When extremely rough handling is anticipated, a spout made of soft plastic may have its end sealed to prevent any leakage during handling and it may be opened prior to use by snipping the end off with scissors. The end of spout 30 may also be threaded to receive a small cap 37 for this purpose, as shown in FIG. 2, which cap may be removed and thrown away by the ultimate consumer.

FIG. 4 illustrates an embodiment of this invention wherein various of the elements of the combination are formed as a single integral piece. In FIG. 4, a flexible plastic bottle 10 has an opening 40 surrounded by a helical bellows 20 which is integral with the bottle 10 and formed at the same time of the same or of compatible material and as a part of the bottle structure. The upper opening 41 in the bellows 20 is larger in diameter than lower opening 40 and it is threaded with threads 42 on the outside. The inlet valve body 43 includes an enlarged lower opening 45, a restricted lower opening 46 and a valve seal 47 in an enlarged chamber 48 in which the valve disc 50 operates. An upper ledge-like flange 51 prevents disc 50 from leaving chamber 48.

The outside diameter of valve 43 is such that it may be pressed with some difficulty into the opening 40 and the extent that it enters opening 40 is limited by flange 51 engaging the material around the opening. Before installing the valve 43, inlet tube 16 is installed in enlarged opening 45.

With opening 41 being substantially larger than opening 40, the valve 43 may easily be installed after filling bottle 10. Installation of valve 43 is effected, for example, by contracting the bellows 20 and pressing valve 43, with whatever force is necessary, into opening 40 until the flange 51 engages the material surrounding opening 40.

The outlet valve, designated generally as 53 consists of cylindrical sidewalls 55 of a diameter to fit closely, but not necessarily tightly within opening 41, and a lower disc-like element 56. The element 56 is formed with an opening 57 in the center thereof which opening is surrounded on the top by a raised valve seat 58. An upper flange 60 forms a chamber 61 in which a valve disc 62 operates, and flange 60 also forms a shoulder to engage the upper portion of the opening 42 to prevent valve 53 from entering bellows 20.

An internally threaded closure element 65 is adapted to be engaged with threads 42. The closure element 65 has internal threads 66 and an inwardly protruding shoulder 67 which engages the flange 60 of valve 53 and presses it tightly against the material surrounding opening 41. When thus assembled a chamber 68 is formed from which spout 70 provides an outlet.

Finally, a cap 71 is provided with inwardly projecting elements 72 that are positioned and formed to engage the helical grooves in bellows 20 to form a threaded closure for all of the portions which in combination become the bellows pump. The lower annular surface 73 of the cap 71 is positioned to form a liquid seal with the vents 12 formed in bottle 10 adjacent the bellows 20.

The structure of FIG. 4 operates the same as the structures of FIGS. 2 and 3. By causing bellows 20 to expand and contract, liquid is pumped from bottle 10 and discharged through spout 70. Air enters bottle 10 through vents 12 to displace the pumped liquid. When no liquid is needed, the cap 71 is screwed onto the helical grooves in bellows 20 and it completely encloses the entire pump assembly as well as sealing vents 12.

A gasket 75 is shown between the valve 53 and the closure 65. This gasket may be employed during shipping to prevent any possibility of leakage from bottle 10. Prior to use by a consumer, closure 65 will be unscrewed, gasket 75 removed and discarded, and closure 65 reassembled. The gasket 75 may be of the usual material for gaskets such as cork, plastic, rubber, laminated paper or the like.

It is evident that many modifications of this invention may be made within its general concept, and it is intended therefore that the invention be limited in scope only by the appended claims.

What is claimed is:

1. A device for containing and dispensing liquids comprising in combination

(1) a liquid container of flexible material having an outlet therein,

(2) a flexible pump bellows formed integrally with the walls of said container in surrounding relation with said outlet and having a helically corrugated wall,

(3) said bellows having an open end larger in diameter than said container outlet,

(4) a first check valve means formed to pass through the open end of said bellows and mounted over said container outlet,

(5) second check valve means mounted adjacent the open end of said bellows,

(6) closure means over the open end of said bellows and including a discharge conduit passing through the wall thereof, and

(7) a substantially cylindrical cap formed with one open end and having internal thread-like projections adapted to connectively engage the helical corrugated wall of said bellows whereby the cap may be threaded onto and over said bellows to force said open end thereof against the walls of the container.

2. A device for containing and dispensing liquids comprising in combination

(1) a liquid container of flexible material having an outlet therein and a vent adjacent said outlet,

(2) a pump bellows having a helically corrugated wall formed integrally with said container and surrounding said outlet,

(3) said bellows having an open end larger in diameter than said container outlet and formed with a peripheral wall having outside threads,

(4) a first check valve formed to pass through the open end of said bellows and mounted over said container outlet,

(5) a second check valve mounted over the open end of said bellows,

(6) a closure means having internal threads connectively engaged with the outside threads on said peripheral wall and including a portion adapted to engage said second check valve and hold it over the open end of said bellows, said closure means enclosing an internal chamber,

(7) a spout communicating with said chamber, and

(8) a cap including internal projections formed to engage the helical wall of said bellows in threading relationship and having an annular surface formed to engage the walls of the container and make a liquid-tight seal with said vent, said cap being large enough in internal diameter to enclose said closure means, said spout and said bellows.

3. A device for containing and dispensing liquids comprising in combination, a liquid container having an outlet, a bellows-type pump mounted over said outlet and having collapsible bellows formed with corrugated walls surrounding said outlet, a substantially cylindrical rigid cap open at one end and formed with internal projections adapted to connectively engage the said corrugated walls of said bellows whereby said cap may protectively enclose said pump and the open end thereof may be forced against the walls of the container to maintain the said bellows extended.

4. A device for containing and dispensing liquids com-

prising in combination, a liquid container having an outlet and a vent adjacent said outlet, a bellows-type pump mounted over said outlet and having collapsible bellows formed with helically corrugated walls surrounding said outlet, and a rigid cap open at one end and having interior projections which cooperatively engage the said helical corrugation of said bellows in threading relationship whereby said cap may be threadingly advanced over said pump toward said container to force the open end thereof against the walls of said container and seal over said vent.

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