June 1, 1965 B. L. LEVINSON ETAL 3,186,599

DISPENSER FOR LIQUID IN UPRIGHT CONTAINER WITH CONTROLLED ATMOSPHERE

Filed Oct. 15, 1963 3 Sheets-Sheet 1

FIG. 1

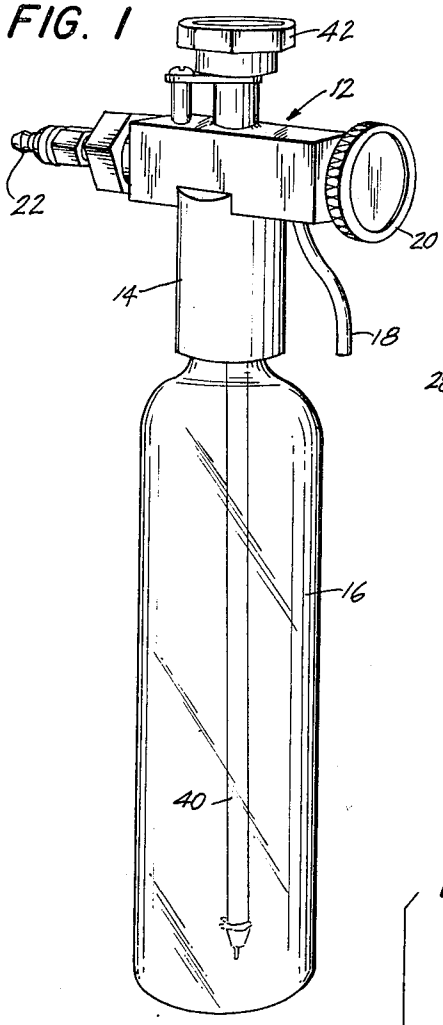


FIG. 2

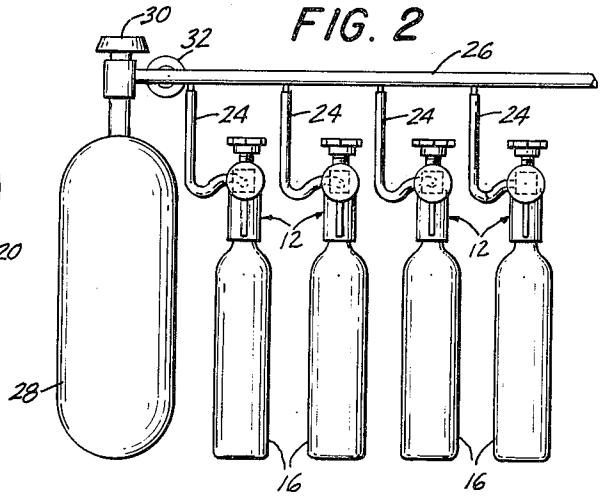


FIG. 3

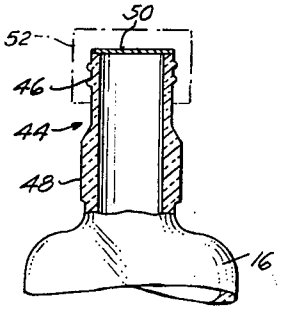


FIG. 4

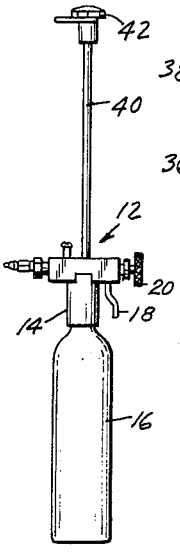
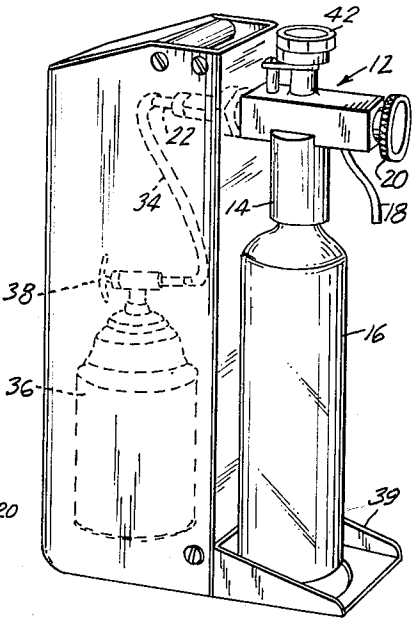


FIG. 5



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Filed Oct. 15, 1963 3 Sheets-Sheet 2

FIG. 6

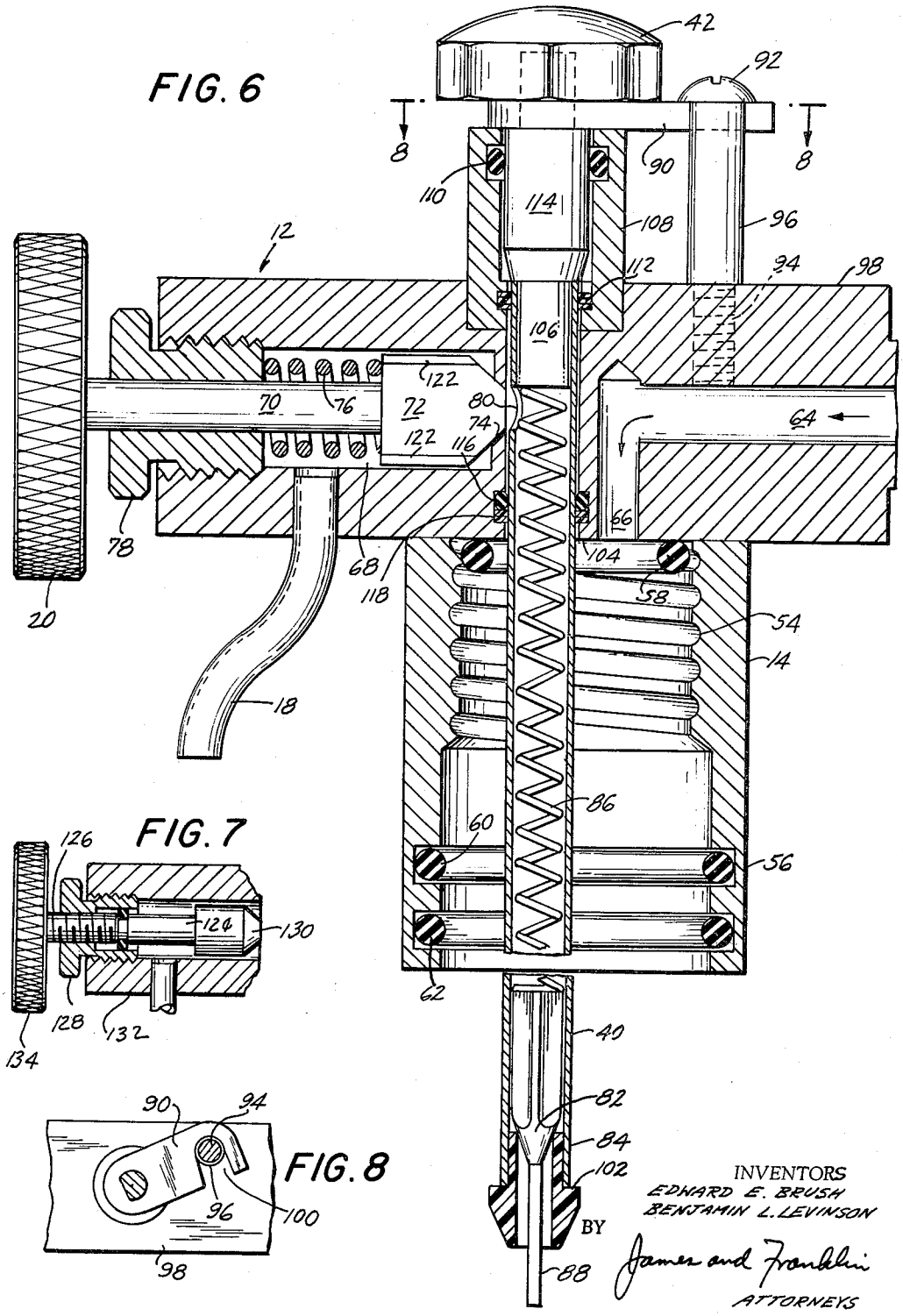


FIG. 7

FIG. 8

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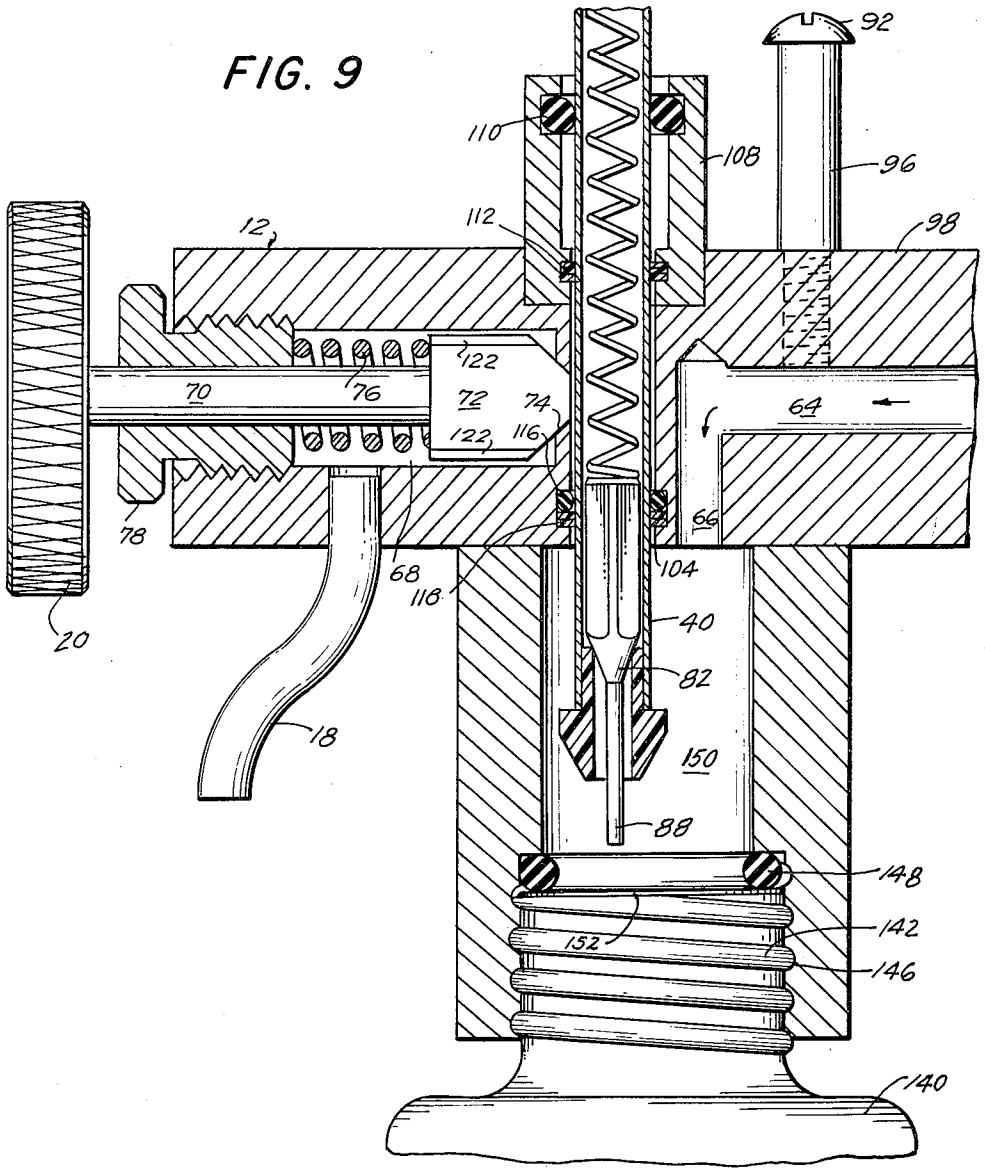
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DISPENSER FOR LIQUID IN UPRIGHT CONTAINER WITH CONTROLLED ATMOSPHERE

Filed Oct. 15, 1963 3 Sheets-Sheet 3

FIG. 9



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DISPENSER FOR LIQUID IN UPRIGHT CONTAINER WITH CONTROLLED ATMOSPHERE

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Filed Oct. 15, 1963, Ser. No. 316,342
12 Claims. (Cl. 222—82)

This invention relates to liquid dispensers, and more particularly to such a dispenser for handling a liquid which is sensitive to exposure to air.

In our prior application Ser. No. 273,495, filed April 16, 1963, and entitled "Positive-Pressure Controlled-Atmosphere Liquid Dispenser," we disclose a bulk liquid dispenser in which the liquid is exposed to a desired or controlled atmosphere, usually an inert gas. The liquid is initially delivered in a bottle having a threaded neck, the end of the neck being sealed by means of an easily penetrable membrane. The membrane is physically protected during shipment by a threaded cap. The bottle and the dispenser receiving the same each has a slip seal part and a pressure seal part, the slip seal taking effect before penetration of the membrane, and serving for the interval until the pressure seal takes effect, and also thereafter.

The dispenser is useful in medical, chemical or other industries dealing with a liquid which must not be exposed to oxygen or air. One common example is a hair dye for use in beauty parlors. In such case, the dispenser may include an array or bank of bottles containing an assortment of different shades or colors, each bottle having its own dispensing spout and valve, but all being supplied with an inert gas from a single tank. This makes it possible to buy the dye in bulk instead of in small individual packages.

In our prior application the bottle of liquid is used in inverted position, and one object of the present invention is to provide a dispenser which fulfills the objects and advantages of that dispenser, but which uses the bottles in convenient upright position. An ancillary object is to eliminate the need for a check valve which is needed when the container is inverted.

For a container in upright position we employ a dip tube extending down to or near the bottom of the bottle. In accordance with a feature and object of our invention, the dip tube is made slidably retractable so as not to prematurely perforate the membrane of the bottle when mounting a new bottle in its holder. During subsequent use in its down position the dip tube is in flow communication with a valved passage leading to the dispensing spout.

In accordance with a further feature and object of the present invention, the flow of the liquid to the valved passage is prevented until the dip tube is in its down position. This is accomplished in either and preferably both of two ways. One is that the dip tube has a side aperture which does not come into registration with the flow passage unless and until the dip tube is locked in down position. Another is that the lower end of the dip tube preferably has a normally closed foot valve, and additional means for opening the foot valve when the dip tube is in down position.

Another object of the invention is to provide a holder and a mating bottle in a different form in which the bottle may have an ordinary short threaded neck, devoid of a special slip seal portion.

To accomplish the foregoing general objects, and other more specific objects which will hereinafter appear, our invention resides in the liquid dispenser elements and their relation one to another, as are hereinafter more

particularly described in the following specification. The specification is accompanied by drawings in which:

FIG. 1 is a perspective view showing a holder and bottle received thereby, embodying features of the invention;

FIG. 2 is a simplified or schematic elevation showing how a bank of dispensers may be supplied with a protective gas from a single tank;

FIG. 3 is a section through the neck portion of one form of bottle used in the dispenser;

FIG. 4 is an elevation drawn to greatly reduced scale, and shows how the dip tube may be retracted when mounting a new bottle in the holder;

FIG. 5 is a perspective view showing a portable holder with a small expendable or throw-away can of gas;

FIG. 6 is a fragmentary vertical section through the working portion of the holder, drawn to enlarged scale;

FIG. 7 is a fragmentary section corresponding to the left end of FIG. 6, and showing the use of a screw valve instead of a pull valve;

FIG. 8 is a fragmentary horizontal section taken in the plane of the line 8—8 of FIG. 6; and

FIG. 9 is a vertical section similar to FIG. 6, but showing a modified form of the invention using a bottle having no slip seal neck portion.

Referring to the drawing, and more particularly to FIG. 1, the holder generally designated 12 includes a socket 14 receiving the neck of a container or bottle 16 carrying a liquid which is to be dispensed from a spout 18 under control of a handle 20. There is provision for a gas connection at 22.

Referring now to FIG. 2, a cabinet dispenser may be provided with a series of holders 12 carrying a like series of containers 16, the rear ends of the holders being connected through pipes 24 to a common pipe or manifold 26, the latter being supplied with gas from a tank 28 controlled by a valve 30. A pressure reducing valve 32 is also provided to bring the pressure down to a desired small value, say five pounds per square inch. It will be understood that the array of bottles may have a lesser or greater number than is shown, and that different forms of cabinet may be provided. No cabinet is here illustrated, but some forms have been suggested in our prior application mentioned above.

Referring now to FIG. 5, we there show a small portable dispenser intended for use with a single bottle. The holder 12, the bottle 16, the spout 18, and the dispensing valve handle 20 correspond to those previously described. In this case the gas connection 22 is connected by a flexible tube 34 to a small expendable or throw-away can of gas 36. Discharge from the can is controlled by a valve handle 38. The base, if extended forward as shown at 39, is cut away to freely pass the bottle.

Reverting to FIG. 1, the dispenser includes a dip tube 40 which reaches substantially all of the way to the bottom of the bottle. This dip tube communicates with the spout 18 when the valve 20 is opened. In accordance with the present invention the dip tube 40 is retractable, and for this purpose it has a handle 42 at the top. In FIG. 4 the dip tube 40 has been pulled upward before loading a new bottle 16 into the socket 14.

Referring now to FIG. 3 of the drawing, the bottle 16 has a long neck 44 with a threaded portion 46 at the upper end, and a slip seal portion 48 which is located between the threaded portion 46 and the body of the bottle. The bottle is sealed by means of a thin easily penetrable membrane 50, and a conventional protective screw cap 52 may be applied over the membrane, as suggested in broken lines in FIG. 3. This protects the membrane during shipment and storage, and is removed just prior to loading the bottle in the holder. The membrane may be a metal foil

or a plastic film which is resistant to attack by the particular liquid in the bottle.

Referring now to FIG. 6 of the drawing, the holder 12 has a socket 14 with a threaded part 54 and a slip seal part 56. The socket further has a main gasket 58 which bears against the end of the bottle neck with a pressure seal. The slip seal part 56 provides a preliminary seal as the bottle is being put into the socket, and before the upper end of the neck reaches the gasket 58. The slip seal may be provided in different ways, some of which are described in our pending application previously referred to. In the present case the slip seal part is provided with O rings 60 and 62 which receive the cylindrical part 48 (FIG. 3) of the bottle neck.

The gas inlet passage which is connected to the gas tank is shown at 64, and leads into the top of the socket at 66. A liquid discharge passage 68 leads to the spout 18, under control of the dispensing valve. In this case the valve handle 20 is connected by means of a valve stem 70 to a valve plug 72 which closes against a tapered seat 74. The illustrated valve is a pull valve which is normally closed by means of a compression spring 76, this being disposed between the valve plug 72 and a threaded bushing 78. In effect the dispensing valve is in the discharge passage 68 to control the flow of liquid to spout 18.

The retractable dip tube 40 is downwardly slidable through the socket and through the bottle to the bottom of the bottle. When in its down position it comes into flow communication with the liquid discharge passage 68. For this purpose the side wall is provided with a hole 80 which registers with the valve seat when the dip tube is in the down position shown in FIG. 6, but not when it is raised as shown in FIG. 4.

The dip tube also is provided with a valve 82, most conveniently located near its bottom end, and therefore conveniently referred to as a foot valve, to distinguish it from the dispensing valve. In the present case the valve plug is tapered and closes downward against a valve seat 84. The valve is normally closed by resilient means, here shown as a relatively long compression spring 86 carried inside the dip tube 40. An additional means is provided to open the foot valve 82 when the dip tube is in down position, and in the present case this is simply a contact pin 88 projecting from the lower end of the valve plug 82, and so dimensioned that it engages and is raised by the bottom of the bottle when the dip tube is pushed to its down position.

The dip tube is preferably locked in down position and in proper orientation, and for this purpose it is provided with a lock member 90 which may be turned beneath and held by the head 92 of a lock screw 94, the threaded lower end of which is screwed into the main horizontal block 98 of the holder 12. A spacer tube 96 surrounds the exposed upper end of the screw.

The configuration of the lock member 90 is better shown in FIG. 8. It has an open-ended transverse slot 100 which may be moved to or away from the lock stud 94, 96. When it engages the stud, as shown in FIGS. 6 and 8, the dip tube is held down and also is properly oriented to register the side opening 80 of the dip tube with the flow passage 68 and/or the dispensing valve seat 74.

The lower end of the dip tube 40 (FIG. 6) preferably carries a stop 102 which prevents removal of the dip tube when it is pulled upward. The stop takes effect when the annular stop ledge 102 bears against the portion 104 of the block 98 immediately surrounding the dip tube.

The structure employed may vary considerably in detail. As here illustrated the upper end of the dip tube is permanently secured to and closed by a shank 106 which in turn carries the lock member 90 and the handle 42. The main block 98 of the holder has a seal housing 108 secured thereto, as by means of silver solder, and the seal housing carries an O ring 110, and a spiral bushing ring 112. The upper portion 114 of the shank 106 preferably is enlarged somewhat in diameter, thereby protecting the O ring 110 against possible abrasion by the side hole 80 of the dip tube when the dip tube is being raised and lowered.

The dip tube may be additionally sealed below the dispensing valve by means of an O ring 116, and if desired this may be supplemented by a spiral bushing ring 118. The socket 14 is fixedly secured to the block 98, as by means of silver solder, and the same applies to the upper end of spout 18. The valve plug 72 may be thinned or fluted as shown at 122, for free passage of liquid. Alternatively it may be reduced in diameter.

A modified form of valve is shown in FIG. 7, this being a screw valve instead of a pull valve. More specifically, the valve stem 124 is threaded at 126 and is received in a bushing which is internally as well as externally threaded. The inner end of the valve stem again has a valve plug 130. The valve stem is sealed within bushing 128, as by means of an O ring 132. The handle 134 is rotated instead of being pulled.

A variant form of the dispenser is next described with reference to FIG. 9 of the drawing. In this case the bottle 140 has a conventional short threaded neck 142. The holder block 98, lock stud 96, seal housing 108, dip tube 40, spout 18, dispensing valve 20, and foot valve 82 all correspond to and may be the same as those previously described in connection with FIG. 6. The socket 144 however differs from that previoulsy described in that it has only a threaded part 146, located at the lower end of the socket. An O ring 148 provides a pressure seal, and is the only seal. Neither the bottle nor the socket has a slip seal portion. The socket 144 has a chamber 150 above the threaded portion of the socket, the chamber 150 being adequate in height to receive the lower end portion of the dip tube 40 and its contact pin 88 when the dip tube is raised. Thus the bottle may be screwed all the way into the socket until the compression seal 148 takes full effect, without penetrating the sealing membrane 152. It is only by pushing the dip tube down that the sealing membrane 152 is broken.

The materials used for the dispenser may vary according to the chemical characteristics of the liquid being dispensed. For most purposes the holder is made of stainless steel, except for the sealing gaskets and valve parts which preferably are made of a fluorocarbon plastic. In the present case, the O rings are preferably made of a product called Viton commercially available from E. I. du Pont de Nemours & Co., Inc. However, the O rings could be made of Teflon, but in such case are preferably of a type cored with rubber to make the same more resilient. The dispensing valve plug 72 is preferably made of Teflon, its valve seat 74 being stainless steel. The foot valve plug 82 is made of stainless steel, and its seat 84 is made of Teflon. The Teflon insert may be enlarged as shown, to provide the stop ledge 102 previously referred to. All compression springs shown are made of stainless steel.

The gas used is selected to be inert and/or compatible with the liquid being dispensed. One suitable gas is nitrogen, and in FIG. 2 the steel tank 28 may be a conventional commercially-available nitrogen tank. This is returned empty when receiving a new filled tank from a supplier. This supply is at high pressure, say 2200 p.s.i., but reduced to five or possibly ten p.s.i. by pressure regulator 32.

In the case of the small expendable gas container 36 shown in FIG. 5, the gas may be that commercially known as Freon. One preferred form uses a mixture of eighty-eight percent Freon #11 and twelve percent Freon #12, the container being a fifteen ounce container which is commercially available at slight cost. Differently described, the container 36 carries a liquefied halogen gas, and in one specific case the gas is a mixture of CCl_2F_2 and CCl_3F. This mixture is inert and compatible with most liquids, and provides a good protective atmosphere

for the liquid. The cost of the gas is very slight, because the single small (15 ounce) container shown serves to dispense over eleven hundred fifty ounces of the liquid being dispensed. The pressure is usually seven p.s.i.

In the particular case shown, the glass bottle of liquid holds sixteen ounces, and is about two and one-half inches in diameter and ten inches long. However it could be a quart, or a gallon or other size, and it need not be made of glass. When adding a new bottle to a holder the valve 30 (FIG. 2) or the valve 38 (FIG. 5) is closed to prevent free escape of gas while there is no bottle in the holder.

The spiral bushings 112 and 118 are made of Teflon. They act as bearings for the dip tube. In all cases the O rings and the bushings and valve plugs are made of a material compatible with the liquid being dispensed. For some liquids a synthetic rubber such as Buna may serve the purpose.

It is believed that the construction and method of use of our improved dispenser for liquids in upright containers, kept under controlled atmosphere, as well as the advantages thereof, will be apparent from the foregoing detailed description. It will also be apparent that while we have shown and described the invention in several preferred forms, changes may be made without departing from the scope of the invention as sought to be defined in the following claims. In the claims the reference to "threaded" for the bottle neck and socket is not intended to exclude other known interlock or anchor means which serve the same purpose.

We claim:

1. A bottle holder forming part of a positive-pressure controlled-atmosphere liquid dispenser, for use with a bottle having a neck with a threaded portion adapted to receive a bottle cap, the end of the bottle being sealed independently of the bottle cap by a thin easily penetrable membrane, said holder including a socket having a threaded part dimensioned to receive the threaded neck of the bottle, a gas inlet for connection from a gas tank to the socket, a spout, a liquid discharge passage leading through the holder to the spout, a dispensing valve for said passage and a retractable dip tube downwardly slidable through the socket, the top end of said dip tube being closed and having an operating knob, the lower end of said dip tube serving to rupture the membrane, the side of said dip tube near its upper end having an opening which when the dip tube is in down position comes into flow communication with said liquid discharge passage.

2. A positive-pressure controlled-atmosphere liquid dispenser comprising a bottle having a neck with a threaded portion adapted to receive a bottle cap, the end of the bottle being sealed independently of the bottle cap by a thin easily penetrable membrane, and a holder for said bottle, said holder including a socket having a threaded part dimensioned to receive the threaded neck of the bottle, a gas inlet for connection from a gas tank to the socket, a spout, a liquid discharge passage leading through the holder to the spout, a dispensing valve for said passage, and a retractable dip tube downwardly slidable through the socket and bottle to the bottom of the bottle, the top end of said dip tube being closed and having an operating knob, the lower end of said dip tube serving to rupture the membrane, the side of said dip tube near its upper end having an opening which when the dip tube is in down position comes into flow communication with said liquid discharge passage.

3. A positive-pressure controlled-atmosphere liquid dispenser comprising a bottle having a neck with a threaded portion adapted to receive a bottle cap, the end of the bottle being sealed independently of the bottle cap by a thin easily penetrable membrane, and a holder for said bottle, said holder including a socket having a threaded part dimensioned to receive the threaded neck of the bottle, a gas tube for connection from a gas tank to the socket, a spout, a liquid discharge passage leading through the holder to the spout, a dispensing valve for said passage, a retractable dip tube downwardly slidable through the socket and the bottle to the bottom of the bottle, the top end of said dip tube being closed and having an operating knob, the lower end of said dip tube serving to rupture the membrane, the side of said dip tube near its upper end having an opening which when the dip tube is in down position comes into flow communication with said liquid discharge passage, and a stop at the lower end of said dip tube to prevent removal of the dip tube when it is pulled upward before mounting a new bottle in the holder.

4. A positive-pressure controlled-atmosphere liquid dispenser comprising a bottle having a neck with a threaded portion adapted to receive a bottle cap, the end of the bottle being sealed independently of the bottle cap by a thin easily penetrable membrane, and a holder for said bottle, said holder including a socket having a threaded part dimensioned to receive the threaded neck of the bottle, a gas inlet for connection from a gas tank to the socket, a spout, a liquid discharge passage leading through the holder to the spout, a dispensing valve for said passage, a retractable dip tube downwardly slidable through the socket and bottle to the bottom of the bottle, the top end of said dip tube being closed and having an operating knob, the lower end of said dip tube serving to rupture the membrane, the side of said dip tube near its upper end having an opening which when the dip tube is in down position comes into flow communication with said liquid discharge passage, a normally closed foot valve at the bottom of said dip tube, and means to open the foot valve when the dip tube is in down position.

5. A positive-pressure controlled-atmosphere liquid dispenser comprising a bottle having a neck with a threaded portion adapted to receive a bottle cap, the end of the bottle being sealed independently of the bottle cap by a thin easily penetrable membrane, and a holder for said bottle, said holder including a socket having a threaded part dimensioned to receive the threaded neck of the bottle, a gas inlet for connection from a gas tank to the socket, a spout, a liquid discharge passage leading through the holder to the spout, a dispensing valve for said passage, a retractable dip tube downwardly slidable through the socket and bottle to the bottom of the bottle, the top end of said dip tube being closed and having an operating knob, the lower end of said dip tube serving to rupture the membrane, the side of said dip tube near its upper end having an opening which when the dip tube is in down position comes into flow communication with said liquid discharge passage, a foot valve at the bottom of said dip tube, resilient means normally closing said foot valve, a contact means for engaging the bottom of the bottle to open the foot valve when the dip tube is in down position, a releasable lock means to lock the dip tube in down position, and a stop at the lower end of said dip tube to prevent removal of the dip tube when it is pulled upward.

6. A bottle holder forming part of a positive-pressure controlled-atmosphere liquid dispenser, for use with a bottle having a relatively long neck with a threaded portion at the end of the neck adapted to receive a bottle cap, and a slip seal portion between the threaded portion and the body of the bottle, the end of the bottle being sealed independently of the bottle cap by a thin easily penetrable membrane, said holder including a socket having a threaded part dimensioned to receive the threaded neck of the bottle, and a slip seal part, the socket having a gasket to receive the end of the bottle neck with a pressure seal, the slip seal part providing a seal as a bottle is being put into the socket before the neck end reaches the gasket, a gas inlet for connection from a gas tank to the socket, a spout, a liquid discharge passage leading through the holder to the spout, a dispensing valve for said passage, and a retractable dip tube downwardly slidable through the socket, the top end of said dip tube being closed and having an operating knob, the lower end of said

dip tube serving to rupture the membrane, the side of said dip tube near its upper end having an opening which when the dip tube is in down position comes into flow communication with said liquid discharge passage.

7. A positive-pressure controlled-atmosphere liquid dispenser comprising a bottle having a relatively long neck with a threaded portion at the end of the neck adapted to receive a bottle cap, and a slip seal portion between the threaded portion and the body of the bottle, the end of the bottle being sealed independently of the bottle cap by a thin easily penetrable membrane, and a holder for said bottle, said holder including a socket having a threaded part dimensioned to receive the threaded neck of the bottle, and a slip seal part, the socket having a gasket to receive the end of the bottle neck with a pressure seal, the slip seal part providing a seal as the bottle is being put into the socket before the neck end reaches the gasket, a gas inlet for connection from a gas tank to the socket, a spout, a liquid discharge passage leading through the holder to the spout, a dispensing valve for said passage, and a retractable dip tube downwardly slidable through the socket and bottle to the bottom of the bottle, the top end of said dip tube being closed and having an operating knob, the lower end of said dip tube serving to rupture the membrane, the side of said dip tube near its upper end having an opening which when the tube is in down position comes into flow communication with said liquid discharge passage.

8. A positive-pressure controlled-atmosphere liquid dispenser comprising a bottle having a relatively long neck with a threaded portion at the end of the neck adapted to receive a bottle cap, and a slip seal portion between the threaded portion and the body of the bottle, the end of the bottle being sealed independently of the bottle cap by a thin easily penetrable membrane, and a holder for said bottle, said holder including a socket having a threaded part dimensioned to receive the threaded neck of the bottle, and a slip seal part, the socket having a gasket to receive the end of the bottle neck with a pressure seal, the slip seal part providing a seal as the bottle is being put into the socket before the neck end reaches the gasket, a gas inlet for connection from a gas tank to the socket, a spout, a liquid discharge passage leading through the holder to the spout, a dispensing valve for said passage, a retractable dip tube downwardly slidable through the socket and bottle to the bottom of the bottle, the top end of said dip tube being closed and having an operating knob, the lower end of said dip tube serving to rupture the membrane, the side of said dip tube near its upper end having an opening which when the dip tube is in down position comes into flow communication with said liquid discharge passage, and a stop at the lower end of said dip tube to prevent removal of the dip tube when it is pulled upward before mounting a new bottle in the holder.

9. A positive-pressure controlled-atmosphere liquid dispenser comprising a bottle having a relatively long neck with a threaded portion at the end of the neck adapted to receive a bottle cap, and a slip seal portion between the threaded portion and the body of the bottle, the end of the bottle being sealed independently of the bottle cap by a thin easily penetrable membrane, and a holder for said bottle, said holder including a socket having a threaded part dimensioned to receive the threaded neck of the bottle, and a slip seal part, the socket having a gasket to receive the end of the bottle neck with a pressure seal, the slip seal part providing a seal as the bottle is being put into the socket before the neck end reaches the gasket, a gas inlet for connection from a gas tank to the socket, a spout, a liquid discharge passage leading through the holder to the spout, a dispensing valve for said passage, a retractable dip tube downwardly slidable through the socket and bottle to the bottom of the bottle, the top end of said dip tube being closed and having an operating knob, the lower end of said dip tube serving to rupture the membrane, the side of said dip tube near its upper end having an opening which when the dip tube is in down position comes into flow communication with said liquid discharge passage, a normally closed foot valve at the bottom of said dip tube, and means to open the foot valve when the dip tube is in down position.

10. A positive-pressure controlled-atmosphere liquid dispenser comprising a bottle having a relatively long neck with a threaded portion at the end of the neck adapted to receive a bottle cap, and a slip seal portion between the threaded portion and the body of the bottle, the end of the bottle being sealed independently of the bottle cap by a thin easily penetrable membrane, and a holder for said bottle, said holder including a socket having a threaded part dimensioned to receive the threaded neck of the bottle, and a slip seal part, the socket having a gasket to receive the end of the bottle neck with a pressure seal, the slip seal part providing a seal as the bottle is being put into the socket before the neck end reaches the gasket, a gas inlet for connection from a gas tank to the socket, a spout, a liquid discharge passage leading through the holder to the spout, a dispensing valve for said passage, a retractable dip tube downwardly slidable through the socket and bottle to the bottom of the bottle, the top end of said dip tube being closed and having an operating knob, the lower end of said dip tube serving to rupture the membrane, the side of said dip tube near its upper end having an opening which when the dip tube is in down position comes into flow communication with said liquid discharge passage, a foot valve at the bottom of said dip tube, resilient means normally closing said foot valve, a contact means for engaging the bottom of the bottle to open the foot valve when the dip tube is in down position, a releasable lock means to lock the dip tube in down position, and a stop at the lower end of said dip tube to prevent removal of the dip tube when it is pulled upward before mounting a new bottle in the holder.

11. A positive-pressure controlled-atmosphere liquid dispenser as defined in claim 2, in which the holder has two vertically spaced seals through which the dip tube is axially slidable, one of said seals being located above and the other of said seals being located beneath the opening in the side of the dip tube when the dip tube is in its down position.

12. A positive-pressure controlled-atmosphere liquid dispenser as defined in claim 2, in which the holder has two vertically spaced O ring seals through which the dip tube is axially slidable, one of said seals being located above, and the other of said seals being located beneath, said liquid discharge passage, and also above and beneath the opening in the side of the dip tube when the dip tube is in its down position.

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