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MEANS FOR DISPENSING LIQUIDS HAVING LOW BOILING POINTS

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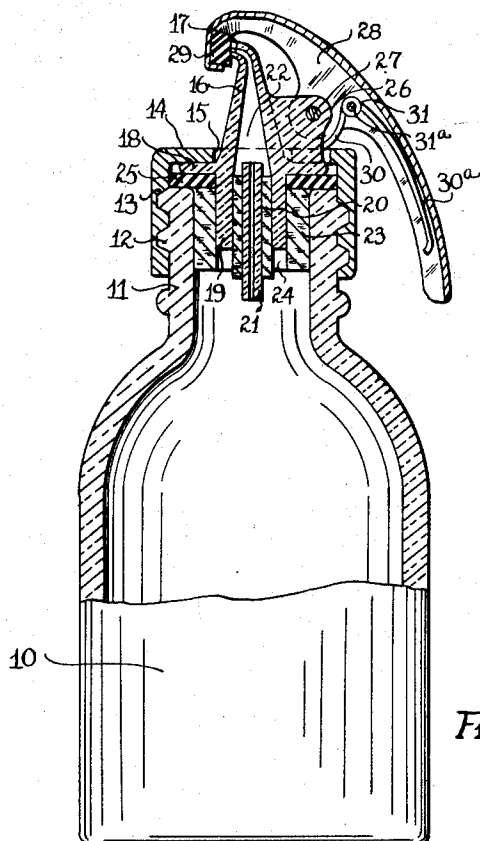


Fig. 1

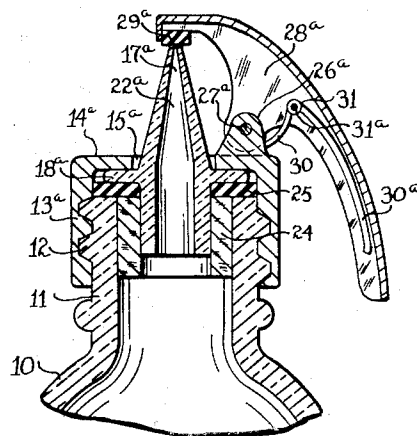


Fig. 2

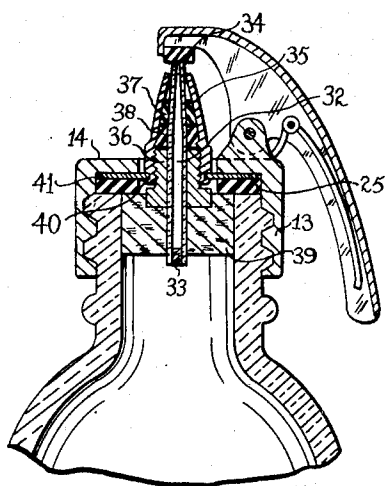


Fig. 3

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MEANS FOR DISPENSING LIQUIDS HAVING
LOW BOILING POINTS

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9 Claims. (Cl. 299—95)

This invention relates to means for dispensing liquids having low boiling points by means of the pressure of the vapor liberated from such liquids at normal atmospheric temperatures, or by the warmth of the hand applied to receptacles containing such liquids. The principal field in which our invention has been employed is the dispensing of ethyl chloride, either alone or admixed with one or more other liquids and in which mixture the ethyl chloride vapor serves as a propellant or carrier for the liquid or liquids admixed therewith.

The dispensing of volatile liquids, such as ethyl chloride, either with or without admixture with other liquids, has been accomplished by means of a receptacle for the liquid or liquids to be dispensed, the receptacle being provided with a cap through which there projects the delivery end of a nozzle element serving to dispense the liquid in the form of a spray or a jet stream, the delivery end of the nozzle element being provided with a capillary outlet—usually from .004 to .010 inch in diameter—this outlet being controlled by a manually operated closure, such, for instance, as is shown in Patent No. 2,313,930, issued March 16, 1943.

The nozzle elements employed with dispensing apparatus of the character described have been formed from metal, but considerable difficulty as well as time-consumption has been encountered in providing the delivery ends of these nozzle elements with capillary outlets by the usual drilling operation.

One manner of overcoming the above objections to the use of metal is to form the nozzle elements each as a continuation of a tube of glass or similar plastic material and, because of the fragility of the exposed exterior portions of the nozzle elements which are thus formed, due largely to the small diameters of such exposed portions, the latter have been protected against breakage by providing the caps with metal sleeves which enclose all but the extreme delivery ends of said nozzle elements; and in order to provide a hermetic seal between the interiors of the said sleeves and the portions of the nozzle elements which are surrounded thereby, portions of the nozzle elements which are surrounded by the sleeves have been metallized and the metal surfaces of the nozzle elements and sleeves have been united by means of solder.

Also, where the nozzle elements are made of glass or similar plastic material, the delivery ends of the same have been protected by means of bosses projecting from the central portions of

caps secured to the tops of the receptacles containing the volatile liquid, with the receiving portions of the nozzle elements mounted in and extending through stoppers of cork fitting tightly in the tops of the bottle necks. However, it has been found difficult to provide a suitable seal against the escape of the contents of receptacles containing these volatile liquids by the use of cork as the material from which the stoppers are formed, due to the porosity of this material. While rubber has been recognized as a compressible, resilient material which will form such an efficient seal, ethyl chloride will be contaminated by contact therewith to an extent which will render it unacceptable for use for medicinal and antiseptic purposes. Furthermore, its longevity will be impaired by its contact with some of the volatile liquids which may be employed in the dispensing receptacles, and especially by ethyl chloride.

By the embodiments of our invention disclosed herein, we are enabled to provide receptacles, containing volatile liquids of the character referred to, with nozzle elements formed of glass or other plastic material and at the same time to furnish such receptacles with efficient and long-enduring seals against the unintentional escape of liquid therefrom, utilizing rubber as the compressible resilient material for the seals; and, when necessary to preserve the chemical purity of ethyl chloride when the latter is the volatile liquid to be dispensed, preventing contact of the same with this sealing material.

We accomplish this object in and through the construction and arrangement of the parts shown in the drawings hereof, wherein Fig. 1 represents a sectional elevational view of a receptacle having a nozzle element and a closure for said receptacle constructed in accordance with our invention; Fig. 2 a sectional view through the neck portion of a receptacle, such as shown in Fig. 1, and showing a modified form of nozzle element and receptacle-closure; and Fig. 3 a view similar to Fig. 2 and showing a further modification of the nozzle element and the receptacle-closure means.

Describing by reference characters the parts shown in Fig. 1, 10 denotes a receptacle for volatile liquid which may be made of glass or other suitable material and which is provided with a neck 11 having an external thread 12 thereon for the reception of the internally threaded skirt 13 of a cap having a top 14. The cap is provided with a central opening 15 through which there projects the upper or delivery portion 16 of a

nozzle element. The delivery portion of the nozzle element is upwardly tapered and is shown as provided with a capillary outlet 17. Its extreme outer end is shown herein as deflected, as a convenient means for imparting a desired direction to the jet stream or spray issuing from the capillary outlet. Intermediate of its ends, the nozzle element is provided with a flange 18 extending at right angles therefrom and being of sufficient diameter to overlap the inner surface of the neck 11. Below this flange the nozzle element is extended in the form of a skirt 19, preferably cylindrical in shape. Within the lower end of the skirt is a sleeve 20, which is resistant to the liquid within the receptacle 10 and which is preferably formed of cork. Extending centrally through the said sleeve and forming a tight fit therewith is a capillary tube 21, preferably of glass and having an internal diameter less than the diameter of the outlet 17 whereby, in connection with the expansion chamber 22 which is provided between the top of the tube 21 and the outlet 17, the contents of the receptacle 10 may be delivered as a spray.

23 denotes a cork stopper which is fitted tightly within the neck 11 with its upper end preferably flush with the top of the neck and which has a bore 24 with which the skirt 19 forms a close contact. In order to prevent the escape of liquid through the cork stopper 23, due to the porosity of the latter, a gasket 25 of compressible resilient material, preferably rubber, is interposed between the flange 19 and the top of the cork stopper and the top of the bottle neck. It will be evident that, by the adjustment of the cap along the threads 12, the top of the cap will cause the flange 18 to exert a downward pressure on top of the gasket, compressing the latter against the top of the bottle neck, thereby to form an effective seal against the escape of any liquid which might penetrate the cork. As the compression of the gasket against the top of the bottle neck and stopper is effected through the pressure of the flange 18, caused by the adjustment of the cap along the external threads of the neck, it will be evident that this compression is effected without any relative rotary movement between the gasket and the surfaces between which it is compressed. This results in greatly prolonging the life of the gasket. Due to the fact that only a limited amount of vapor can penetrate the stopper and contact the gasket, the sealing means which we employ is capable of withstanding usage over a prolonged period of time.

The nozzle element comprising the parts 16—19 may have a fulcrum lug 26 molded therewith, and in which lug there is mounted a pivotal support 27 for a curved lever 28, which lever is provided at one end with a sealing means 29 adapted to engage the outlet 17. 30 and 30^a denote the arms of a spring having a coil 31 therebetween mounted on a pin 31^a supported by said lever, one of the arms engaging the under surface of the lever and the other of said arms engaging the lug 26.

The operation of the foregoing dispensing apparatus will be readily understood. When it is desired to dispense liquid from the receptacle, the operator holds the same in his hand, with the result that the heat imparted thereby to the liquid within the receptacle causes an evolution of vapor from the liquid, the pressure of which vapor is sufficient, when the closure 29 is removed from the outlet 17 by operating the lever 28, to cause liquid to be dispensed through the nozzle, by tilting the receptacle sufficiently to enable the

bottom of the capillary tube 21 to be covered by said liquid.

Liquid will be delivered from the outlet 17, either in the form of a jet stream or a spray, dependent upon the relative diameters of the capillary passage in the tube 21 and the capillary outlet 17. If desired, the member 21 may be extended substantially to the bottom of the receptacle 10, thereby making it unnecessary to tilt the receptacle in order to enable liquid to be supplied to and from the nozzle element.

In Fig. 2, we have shown a modification of the sealing means and nozzle element shown in Fig. 1, wherein the delivery portion 16^a of the nozzle is not deflected and wherein the cork sleeve 20 and the capillary tube are omitted, which will cause the liquid to be delivered from the outlet 17^a as a jet stream. In practice, the same means for closing the delivery outlet 17^a will be employed as in Fig. 1, except that the fulcrum lug 26^a may be formed on the cap and the upper end of the closure-carrying lever will not be deflected in order to enable the closure element to contact the delivery outlet.

In Fig. 3 there is shown a still further modification of our invention wherein, instead of forming the flange which is carried by the nozzle element as a part of the duct through which liquid is dispensed in the form of a jet stream or a spray, it is carried by a guard element or sleeve having a nozzle tube of small diameter therein and for the protection of which against breakage the guard is deemed necessary.

In this view, 32 denotes a nozzle tube of small diameter which may have capillary material 33 in the lower end thereof when it is desired to dispense the liquid in the form of a spray, as well as to serve as a filter for the liquid passing there-through. The upper or delivery end 34 of this nozzle tube projects slightly above and beyond the upper end of a tapered guard sleeve 35. The nozzle tube is removably secured within this guard sleeve by means of a stuffing box comprising a nut 36, which is threaded into the bottom of the sleeve 35 and which is provided with a bore for the reception of the nozzle tube, and packing rings 37, 38 of compressible material, such as rubber, surrounding the tube. These rings will be compacted between the tube and the sleeve by adjustment of the nut, thereby to prevent escape of liquid around the portion of the tube which projects above the nut.

The lower end of the sleeve 35 is provided with an annular recess 40, for the reception of the flange 41, which cooperates with the cap 13, 14 and the gasket 25 and cork stopper 39 in the same manner as do the corresponding parts in Figs. 1 and 2. The top of the stopper is recessed in order to receive the lower end of the nut 36, and the tube 32 extends downwardly through the said stopper.

For convenience of description, the dispensing receptacle has been assumed to be positioned as shown in the drawing hereof, and the terms "top," "bottom," "upwardly" and "downwardly" have been employed in connection with the receptacle and the other dispensing elements; but the fact that we have used such terms in the specification and/or claims does not indicate an intention to limit thereby the scope of our invention.

While we have referred hereinbefore to ethyl chloride as one of the volatile liquids which may be employed with advantage in our dispensing device, it will be understood that other volatile liquids may be employed therein, such, for instance,

as methyl chloride or di-chloro-mono-fluoro-methane.

Having thus described our invention, what we claim is:

1. Means for dispensing liquids having low boiling points, said means comprising a receptacle for liquid having a neck, a nozzle element provided with a capillary delivery outlet and having a flange extending outwardly therefrom intermediate of the top and bottom thereof, a cap secured to the neck of the said receptacle and adjustable longitudinally thereof and having an opening in the top thereof for the accommodation of the delivery portion of the nozzle element, a gasket of leakproof resilient material interposed between the flange and the top of the neck of the receptacle, the upper portion of the said flange being adapted to be engaged by the under surface of the top of the cap whereby the adjustment of the cap along the neck of the receptacle will compress the said gasket, and movable closure means for controlling the capillary discharge outlet from the nozzle element.

2. Means for dispensing liquids having low boiling points, said means comprising a receptacle for liquid having a neck, a closure for said receptacle comprising a stopper fitted within the said neck and composed of material not detrimentally affected by contact with the liquid within said receptacle, a nozzle element provided with a capillary delivery outlet and communicating through said stopper with the receptacle, said nozzle element having a flange extending outwardly therefrom intermediate the top and bottom thereof, a cap secured to the neck of the said receptacle and adjustable longitudinally thereof and having an opening in the top thereof for the accommodation of the delivery portion of the nozzle element, a gasket of leakproof resilient material interposed between the flange and the top of the neck of the receptacle and the stopper therein, the upper portion of the said flange being adapted to be engaged by the under surface of the top of the cap whereby the adjustment of the cap along the neck of the receptacle will compress the said gasket, and movable closure means for controlling the capillary discharge outlet from the nozzle element.

3. Means for dispensing liquids having low boiling points, said means comprising a receptacle for liquid having a neck, a nozzle element having a capillary delivery outlet at its upper end and provided with a flange extending outwardly therefrom intermediate the top and bottom thereof, a cap secured to the neck of said receptacle and adjustable longitudinally thereof and having an opening in the top thereof for the accommodation of the upper delivery portion of the nozzle element, a gasket of leak-proof resilient material interposed between the flange and the top of the neck of the receptacle, the upper portion of the said flange being adapted to be engaged by the under surface of the top of the cap whereby the adjustment of the cap along the neck of the receptacle will compress the said gasket, movable closure means for controlling the capillary discharge outlet from the nozzle element, and a stopper for the neck of said receptacle through which the lower portion of the nozzle element extends.

4. In the liquid dispensing means set forth in claim 1, the nozzle element being made of plastic material and having formed therewith a fulcrum lug, and the movable closure means for control-

ling the capillary discharge outlet from the nozzle being pivotally mounted upon the said lug.

5. Means for dispensing liquids having low boiling points, said means comprising a receptacle for liquid having a neck, a closure for said receptacle comprising a stopper fitted within the said neck and composed of material not detrimentally affected by contact with the liquid within said receptacle, a nozzle element having a skirt fitted within the said stopper and provided with a flange extending outwardly therefrom above the said skirt and having a capillary delivery outlet beyond the said flange, a cap secured to the neck of the said receptacle and adjustable longitudinally thereof and having an opening in the top thereof for the accommodation of the delivery portion of the nozzle element, a gasket of leakproof resilient material interposed between the flange and the top of the neck of the receptacle and the stopper therein, the upper portion of the said flange being adapted to be engaged by the under surface of the top of the cap, whereby the adjustment of the cap along the neck of the receptacle will compress the said gasket, and movable closure means for controlling the capillary discharge outlet from the nozzle element.

6. Means for dispensing liquids having low boiling points, said means comprising a receptacle for liquid having a neck, a nozzle element having a skirt and provided with a flange extending radially outwardly therefrom intermediate of the top and bottom thereof and having a capillary delivery outlet above the said flange, a sleeve of material not detrimentally affected by the material in the receptacle fitted within the said skirt, a tube fitted within the said sleeve and having a capillary passage for receiving liquid from the receptacle and discharging the same into the delivery portion of the said nozzle element, a cap secured to the neck of the said receptacle and adjustable longitudinally thereof and having an opening in the top thereof for the accommodation of the delivery portion of the nozzle element, a gasket of leakproof resilient material interposed between the flange and the top of the neck of the receptacle, the upper portion of the said flange being adapted to be engaged by the under surface of the top of the cap whereby the adjustment of the cap along the neck of the receptacle will compress the said gasket, and movable closure means for controlling the capillary discharge outlet from the nozzle element.

7. Means for dispensing liquids having low boiling points, said means comprising a receptacle for liquid having a neck, a closure for said receptacle comprising a stopper fitted within the said neck and composed of material not detrimentally affected by contact with the liquid within said receptacle, a nozzle element having a skirt fitted within the said stopper and provided with a flange extending outwardly therefrom above the said skirt and having a capillary delivery outlet beyond the said flange, a sleeve of material not detrimentally affected by the material in the receptacle fitted within the said skirt, a tube fitted within the said sleeve and having a capillary passage for receiving liquid from the receptacle and discharging the same into the delivery portion of the said nozzle element, a cap adjustably secured to the neck of the said receptacle and having an opening in the top thereof for the accommodation of the delivery portion of the nozzle element, a gasket of leakproof resilient material interposed between the flange and the top of the neck of the receptacle and the stopper therein, the upper

portion of the said flange being adapted to be engaged by the under surface of the top of the cap whereby the adjustment of the cap along the neck of the receptacle will compress the said gasket, and movable closure means for controlling the capillary discharge outlet from the nozzle.

8. Means for dispensing liquids having low boiling points, said means comprising a receptacle for liquid having a neck, a closure for said receptacle comprising a stopper fitted within the said neck and composed of material not detrimentally affected by contact with the liquid within said receptacle, a nozzle element comprising a tube having a capillary discharge outlet having its lower portion fitted within the said stopper and communicating with the receptacle, a guard sleeve surrounding the upper portion of the said tube and provided with a flange extending outwardly therefrom, a cap secured to the neck of the said receptacle and adjustable longitudinally thereof and having an opening in the top thereof for the accommodation of said guard sleeve, means for securing the said tube within the guard

sleeve with the delivery end thereof exposed, a gasket of leakproof resilient material interposed between the flange and the top of the neck of the receptacle and the stopper therein, the upper portion of the said flange being adapted to be engaged by the under surface of the top of the cap whereby the adjustment of the cap along the neck of the receptacle will compress the said gasket, and movable closure means for controlling the capillary discharge outlet from the nozzle element.

9. In the means for dispensing liquids set forth in claim 8, the means for securing the tube within the guard sleeve comprising a nut threaded into the bottom of said guard sleeve and through which the said tube extends and packing material surrounding the said tube above the said nut and adapted by adjustment of the latter to be compacted between the external surface of the tube and the internal surface of the guard sleeve.

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