

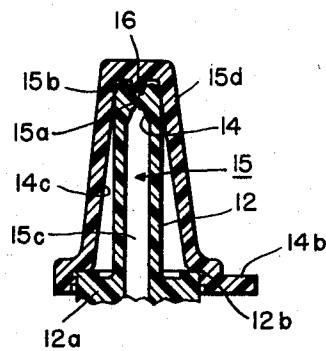
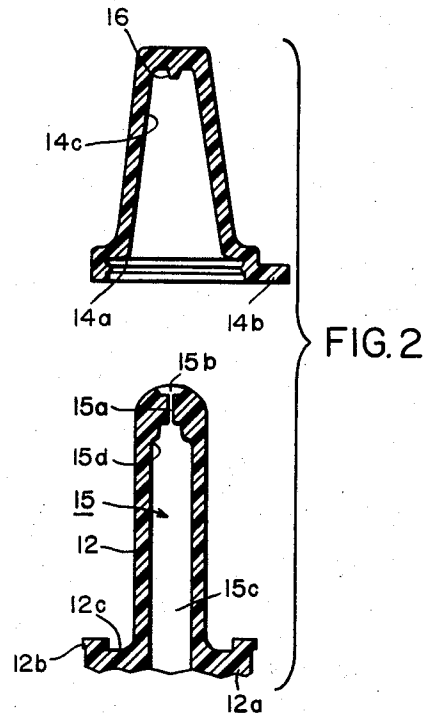
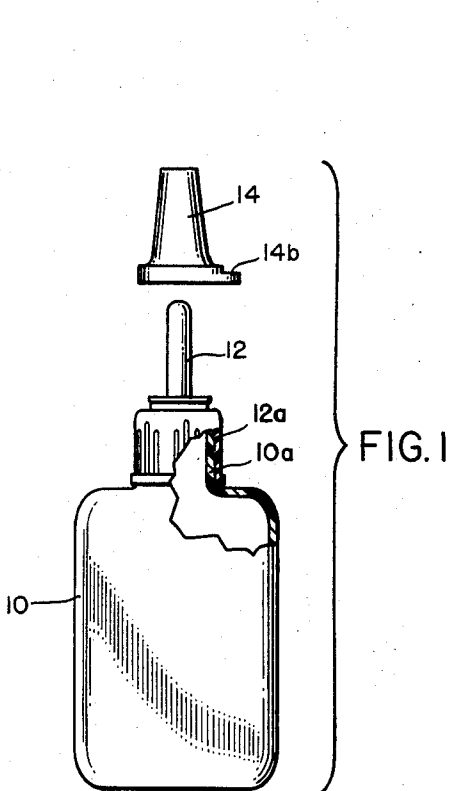
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FLEXIBLE CONTAINER

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2,896,237

FLEXIBLE CONTAINER

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1 Claim. (Cl. 15—136)

This invention relates to containers for liquids of the type commonly referred to as "squeeze bottles" which, as is well known, are commonly made of a flexible plastic material, such as polyethylene, and particularly with the type of container that is adapted to dispense the liquid therein when the container is inverted and squeezed.

While such containers are quite convenient to use and have been widely accepted, they heretofore have had certain disadvantages. One disadvantage is that, when the container is inverted, droplets of the liquid ooze out, even before pressure is applied to the container. This can be particularly annoying when the container is accidentally laid or knocked on its side or when it is attempted to locate the dispensing opening of the container over a particular point before dispensing the liquid. Another disadvantage is that the caps provided for covering the dispensing openings have not been particularly effective in sealing off the dispensing openings. Consequently, when pressure is accidentally applied to the container, as by dropping the container, the liquid is often dispensed into the cap and may even leak out the cap.

The container of the present invention eliminates the above disadvantages while providing other advantages as will be apparent from the following description when read in conjunction with the accompanying drawings wherein:

Fig. 1 is an elevational view, partly in section, of a container, with the cap removed, formed in accordance with the present invention.

Fig. 2 is an enlarged sectional view of the dispensing tip of the container of Fig. 1, with the cap removed, and

Fig. 3 is an enlarged sectional view similar to that of Fig. 2, but showing the cap attached.

As shown in Fig. 1, the container of the present invention comprises a hollow body 10 of suitable flexible resilient material, such as polyethylene, and an elongated tip 12 through which liquid may be dispensed from the body by inverting the container and manually squeezing the body. The tip 12 is conveniently secured to the body 10, such as by means of an internally threaded integral base 12a which threads onto an externally threaded neck 10a of the body 10. A snap-on cap 14 covers the tip 12 when liquid is not being dispensed from the container. As best shown in Figs. 2 and 3, the cap 14 is releasably secured to the container by engagement of an integral resilient lip 12b on the base 12a in an internal groove 14a adjacent the base of the cap 14. The cap 14 may be easily removed by applying pressure to the underside of an integral tab 14b which extends outwardly from the base of the cap 14.

As best shown in Figs. 2 and 3, the tip 12 is provided with an internal passageway 15 through which the liquid passes from the body 10. In accordance with the invention, the passageway 15 is restricted at 15a adjacent the outer end to a capillary diameter and for a length thereof such that the liquid will not pass therethrough under the head of liquid in the container when the container is inverted. This prevents passage of the liquid therethrough except when the body 10 is manually squeezed. It has

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been found that restriction of the passageway to a diameter of approximately 0.015" over a length of approximately $\frac{1}{8}$ " is effective for this purpose for a container having an over-all height of approximately $3\frac{3}{4}$ " and containing a liquid having a viscosity of between 6 to 15 centipoises at approximately 20° C., as measured in a Brookfield viscometer, and a surface tension of approximately 34 dynes/cm.

The extreme outer end 15b of the passageway 15 is tapered to receive an integral tapered plug 16 which projects from the interior end of the cap 14. The plug 16 is slightly longer than the length of the tapered outer end 15b of the passageway 15. The inner surface 14c of the cap 14 is tapered to a minimum diameter less than the diameter of the end of the tip 12. The internal length of the cap 14 from the groove 14a to the base of the plug 16 relative to the length of the tip 12 from lip 12b to the outer end of the tip is such that, when the cap is placed over the tip 12 and attached to the container, three distinct seals are provided. The first seal is provided by pressure of the end of the plug 16 on and over the outer end of the restricted passageway 15a. The second seal is provided by wedging engagement between the tapered surface of the plug 16 and the tapered surface of the outer end 15b of the passageway 15, and the third seal is provided by wedging engagement between the end of the tip 12 and the tapered inner surface 14c of the cap 14. This sealing at three points effectively prevents accidental loss of liquid from the container when the cap is engaged. Both the cap 14 and the tip 12 are made of a suitable resilient material, such as polyethylene, to permit sufficient compression thereof to insure proper sealing. The cap 14 and tip 12 are conveniently formed by a molding operation.

Tapered portion 15b and enlarged portion 15c of passageway 15 may be formed during molding. The restricted portion 15a, because of its minute diameter, is formed by a piercing operation after the tip has been molded. In accordance with the invention, the enlarged portion 15c is joined to restricted portion 15a by a portion 15d of gradually decreasing diameter. It has been found that, when such a connecting portion is provided, droplets of liquid on the outer end of the tip 12 will be sucked back through the passageway when pressure on the body 10 is released, thereby preventing such droplets from running down the tube 12. If such connections are formed by a sharp corner, it has been found that such droplets will not be sucked back through the passageway 15 when pressure on the body is released.

A groove 12c provided in the upper surface of the base 12a of the tip 12 serves to catch and prevent any excess liquid, which is left on the side of the tip after dispensing, from flowing down on the body 10.

One feature of the "squeeze bottle" of the present invention is that elongated tip 12 provides an applicator for spreading the liquid in the bottle on a flat surface. Thus, when a drop of material such as a liquid antiseptic is squeezed from the bottle so as to remain on the tip, the liquid may thereafter be spread as a thin film over a surface such as the skin. The bottle therefore serves the dual purpose of dispensing and applying its contents. To achieve this effect, tip 12 must be elongated and that the outermost portion of the base of the tip, such as lip 12b, should not interfere with the use of the tip as an applicator. It has therefore been found desirable to have tip 12 extend about $\frac{5}{8}$ to $1\frac{1}{2}$ inches above lip 12b and to have the outermost portion of lip 12b extend outwardly far enough to allow space for groove 12c, yet not so far as to interfere with the use of tip 12 as an applicator, such as an outer diameter of about $\frac{1}{2}$ inch.

From the above description it can be seen that the present invention provides an improved "squeeze bottle."

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While one embodiment of the invention has been shown and described, it will be appreciated that modifications can be made therein without departing from the spirit and scope of the invention. For example, while the tip is shown threaded onto the body, other methods of attachment may be used, such as by providing a shank in the end of the tip having a press fit with the interior of the neck of the body. Similarly the cap may be releasably secured to the container in other ways, such as by threads provided on the cap and the container.

Having described our invention, we claim:

A dispensing container for liquids comprising a hollow body of flexible resilient material; an elongated tip section secured to the top of said body and extending outwardly therefrom, said tip section having a substantially rounded outer end; a liquid dispensing passageway extending longitudinally through said tip section, said passageway being restricted at the outer end thereof to a diameter and for a length thereof such that when said container is inverted liquid will not flow through said restricted passageway except when the hollow body is squeezed, said rounded outer end of said tip section defining a circular recess concentric with the axis of said passageway, said recess having an inwardly directed tapered wall, said tapered wall having substantially larger mean diameter than the diameter of said restricted passageway; a hollow cap adapted to fit over and cover said tip section; a tapered circular plug positioned in the bottom of the closed end of the cap adapted to engage the wall of said tapered recess when said cap is in place, said plug having a taper greater than that of the taper of the wall of said recess so as to

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have a wedging engagement therewith; an outwardly directed tapered surface positioned on the inner wall of the cap, said tapered surface adapted to engage the outer periphery of the extreme end of said tip section and having a diameter slightly less than the diameter of the outer end at the line of engagement therewith so as to have a wedging action with said tip end, said wedging engagements provide inwardly directed wedging action to clamp the outer periphery of the tip and outwardly directed wedging action to clamp the inner periphery of the tapered opening, each wedging action opposed to the other to form a double annular tip seal; and locking means positioned below said annular seal for securing said cap to said container at the base of said tip section to effect a second seal and simultaneously cause engagement of the tapered surface of said cap against the outer periphery of the end of said tip and the tapered plug against the tapered wall of said recess in a single capping operation.

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