Oct. 13, 1964 J. M. BERRY 3,152,734

ANGLED SPRAY NOZZLE

Filed April 5, 1962 2 Sheets-Sheet 1

FIG. 1

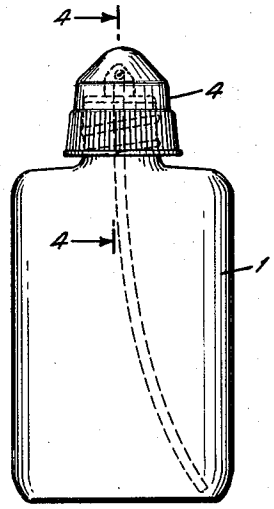
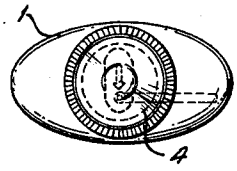


FIG. 2



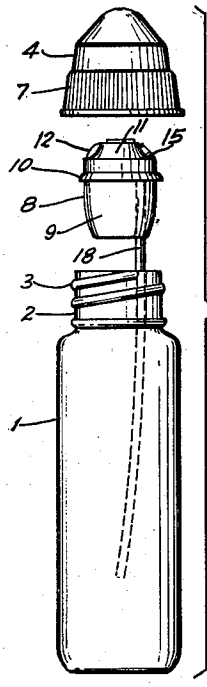


FIG. 3

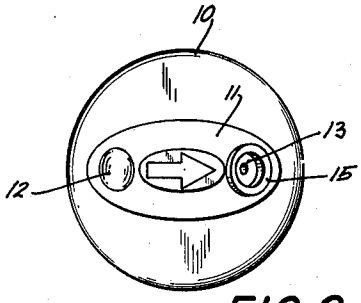


FIG. 8

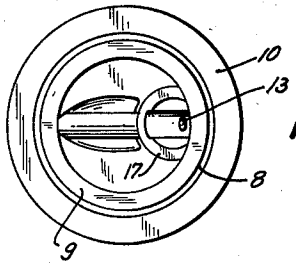


FIG. 9

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ANGLED SPRAY NOZZLE

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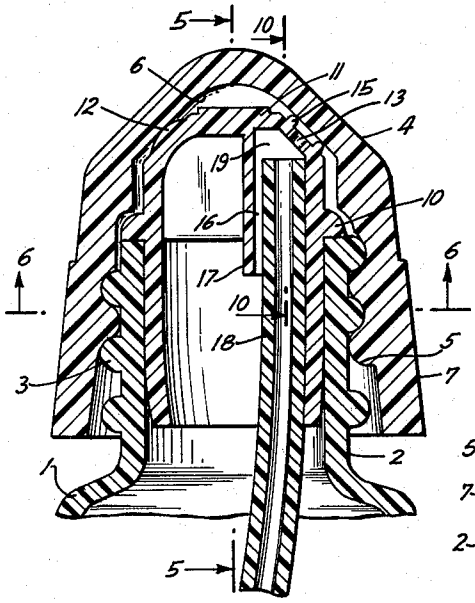


FIG. 4

FIG. 5

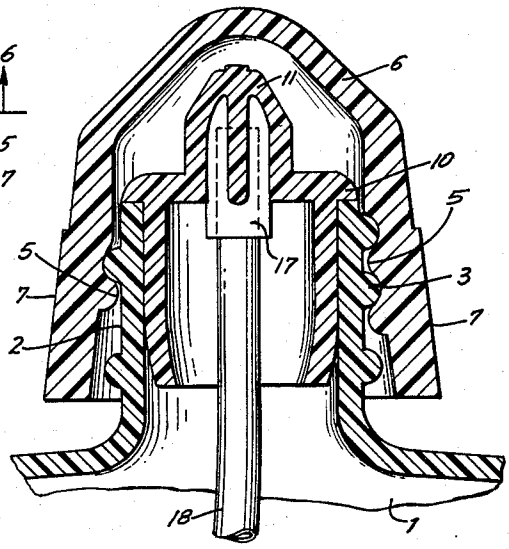


FIG. 6

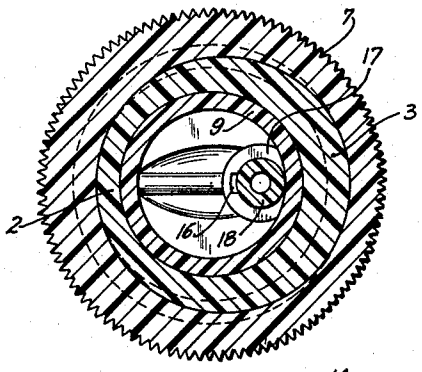


FIG. 10

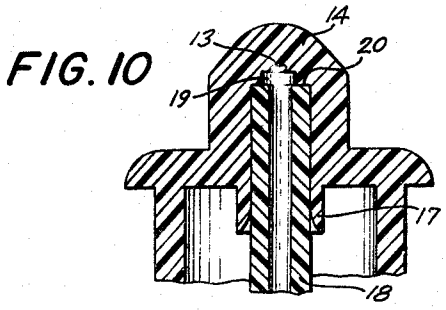
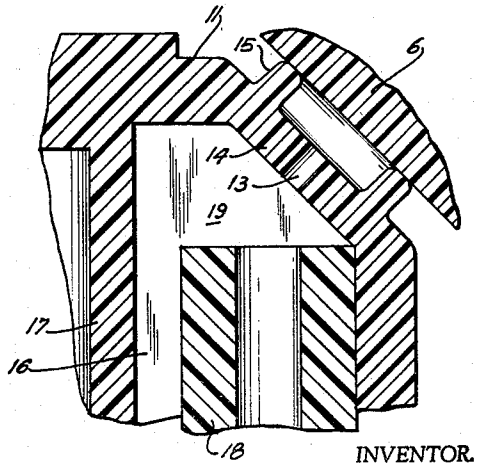


FIG. 7



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ANGLED SPRAY NOZZLE

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8 Claims. (Cl. 222—211)

This invention relates to a new spray nozzle for dispensing liquid from a container in the form of a finely divided spray.

The use of small pocket-size atomizers for dispensing toilet water, insecticides, deodorizers, nasal preparations, mouth refresheners and other liquids in the form of finely divided spray or aerosol, has become increasingly popular in recent years. These devices are usually made of a resilient plastic material such as polyethylene or polypropylene. The necessary air pressure for atomizing the liquid is developed by squeezing the plastic bottle which forces liquid through a tube into a carburizing chamber where it is mixed with air from within the container and the mixture is dispensed at high velocity through a small orifice as a spray or aerosol. Usually the atomizing unit is molded of a plastic material and set into the neck of the squeeze bottle.

Various means of sealing the orifice to prevent leakage of liquid from the bottle have been tried. Most of these are unsatisfactory. When the orifice is closed by direct pressure as by screwing a cap down on it, it has been found that the orifice tends to distort and because of the poor elastic memory of polyethylene and other plastic materials suited to high speed injection molding operations, the orifice remains distorted and a spray of poor quality is thereafter delivered from the bottle. Protection of the orifice by a raised ring surrounding it so that the pressure is upon the ring section rather than on the orifice itself, prevents damage and distortion of the orifice but leads to other difficulties. For instance, when the sealing pressure is applied to a point not directly in line with the axis of the spray plug, it has been found that the plug tends to tilt or change its position within the neck of the bottle. This loosening of the spray plug often results in leakage of the liquid contents from the bottle.

Inasmuch as the spray bottles of the type under discussion must be sold in highly competitive markets, they must be cheap to manufacture and be capable of delivering a high quality spray. The construction about to be described in connection with the description of my invention is such that it is possible to provide a highly effective spray plug which is readily sealed, in which the orifice remains in its original shape without distortion, which remains in axial alignment in the neck of the bottle and does not become tilted or loosened by the action of the closure, and one which can be manufactured on high speed multiple cavity injection molding machines at a very low cost.

In order that the nature of the invention may be more fully understood, reference is made to the drawings in which:

FIGURE 1 is a front view in elevation of an assembled atomizer of the present invention.

FIGURE 2 is a top plan view of the atomizer shown in FIGURE 1.

FIGURE 3 is a side view in elevation of the atomizer with the cap and the spray plug removed.

FIGURE 4 is a cross sectional view in elevation of the upper part of the atomizer taken along an axial plane represented by lines 4—4 in FIGURE 1.

FIGURE 5 is a cross sectioned view of the upper portion of the atomizer taken along the axial plane represented by lines 5—5 of FIGURE 4 looking in the direction of the arrows.

FIGURE 6 is a cross sectional plan view taken along the line 6—6 of FIGURE 4 looking in the direction of the arrows.

FIGURE 7 is an enlarged cross sectional view of a part of the vertical section of FIGURE 4 showing the orifice construction and the manner in which the cap seals the same.

FIGURE 8 is a plan view of the spray plug shown in FIGURE 3 looking downwardly.

FIGURE 9 is a plan view of the same spray plug looking upwardly.

FIGURE 10 is an enlarged cross sectional view of a part of vertical section of FIGURE 4 taken along the line 10—10 looking in the direction of the arrows.

Referring again to FIGURE 1, it will be seen that the novel atomizer of the present invention comprises a container member 1 which is molded of a resilient material, such as polyethylene, with side walls which can be readily deformed by pressure of the fingers of the user so as to decrease the volume therein and create pressure on the air contained over a body of liquid which may be in the container. Although this material may be of any desired shape, it is preferably of ellipsoidal cross section as shown in FIGURE 2. The particular size and shape of the container is not, however, a part of the present invention since it may be of various configurations.

The neck 2, FIGURE 3, of the container is provided with screw threads 3 adapted to engage interlocking screw threads of a suitable cap 4.

The cap 4 may also be polyethylene or other readily molded plastic material. The screw cap is provided with interior threads 5, as shown in FIGURE 5, matching those of the neck of the container. The upper section 6 of the cap should have a conical configuration as is shown in cross section in FIGURES 4 and 5. The angle of the conical section may vary considerably from about 30° to 60° from the vertical axis, but is preferably about 45° as shown in the drawings. The skirt 7 of the screw cap may be suitably knurled as shown in FIGURE 6 to provide a firm grip when opening or closing the cover.

A spray plug 8, FIGURE 3, of essentially cylindrical configuration which may also be molded of polyethylene or other plastic material which may be deformed slightly when pressure is applied to it, is provided. The lower section 9 of this spray plug may be tapered inwardly as shown to permit easy insertion into the neck of the container. A narrow ring 10 is conveniently molded on the plug to position it properly in the neck of the container and prevent further entry of the plug into the neck of the container from a particular predetermined position.

The upper section 11 of the spray plug is generally ellipsoidal in section as is more clearly shown in FIGURE 8. At opposite ends of the ellipsoidal upper section are a bearing surface 12 and an orifice 13, the construction of which is more clearly seen in FIGURE 4. As will be seen from FIGURE 7 the orifice comprises a small hole 13 through the tapered upper end 14 of the spray plug which is surrounded by a raised circular bearing surface 15 which bears against the inner conical section of the cap 6 when the latter is screwed down as shown in particular in FIGURE 4. The taper of the upper section of the spray plug is substantially the same as the taper of the inner surface of the cap. The raised bearing surface 12 and the bearing surface 15 surrounding orifice 13 are opposite each other and of approximately equal distance from the vertical axis of the spray plug as shown in FIGURE 4 so that when the cap is closed both bearing surface 12 and the annular bearing surface 15 contact the inner conical section of the cap thus effecting closure of the orifice.

The particular construction illustrated is believed to be novel and of very great importance in atomizer devices of the type described. Plastic compositions such as polyethylene, polypropylene and the like which are commonly used in devices of the type under discussion are deformable to some extent when pressure is applied and when an effort is made to close an orifice without an opposing support as is provided by bearing surface 12 of the novel construction shown, the plastic may yield and become distorted and the spray plug may tip slightly to one side and develop a leak. Also, the raised annular construction as shown in the enlarged view FIGURE 7 tends to protect the orifice 13 against the pressure that might otherwise be exerted directly on it. It has been found in practice, for instance, that when pressure is directly applied to the orifice, deformation takes place and when the pressure is removed the orifice tends to remain distorted and as a result a spray of poor quality is obtained when the atomizer is used. As will be seen, therefore, the novel construction of the present invention provides protection for the orifice and support against deformation of the upper section of the spray plug and possible tilting of the plug in the neck of the container.

The ellipsoidal configuration of the upper section of the spray plug, most conveniently seen in FIGURE 8, is an important feature of the present invention in that it enables quick and accurate assembly of the plug in the spray bottle either by hand or with automatic machinery. With the particular shape shown, the operator or inspector can determine instantly whether or not the orifice is pointed in the correct direction. When the upper section is round, as in some conventional spray plugs, there is no quick and ready means for determining the orientation of the orifice when the plug is inserted in the bottle. An indexing means such as an arrow molded on the top of the plug as shown in FIGURE 8 may further aid in determining the direction of the spray. The flat top of this arrow may be colored, if desired.

The novel spray plug of the present invention has additional advantages which make it more effective. As will be noted, in particular from FIGURE 4, there is an air passage 16 which is provided by a groove formed in a gripping channel 17 molded in the plug. Inserted in this channel is a tube 18 which carries liquid from the bottom of the container to the atomizing, or carburizing, chamber 19 where it may be mixed with air forced through the passageway 16 by pressure on the bottle. This combination of airway, liquid tube and carburizing chamber are more or less conventional in atomizers of the type being described. However, the particular construction which is illustrated in FIGURE 4 and in the enlarged view in section in FIGURE 7 is novel and results in a better atomizing device which can be made at a lower price.

As will be noted from the drawings, particularly FIGURE 4, the carburizing chamber is formed, in part, by a thin side wall of the conical section of the spray plug in which the orifice is located. The liquid supply tube is inserted in the gripping channel 17 adjacent to the side wall of the plug, as shown. This is very important from a manufacturing point of view in that it has been found from experience in molding spray plugs from polyethylene that it is difficult to mass produce spray plugs of conventional type where the channel is in the center of the plug and the passageway through the orifice is of substantial length. The orifice is formed by a small pin in one of the mold sections. This pin must be retracted into the body of the mold before the molded plug can be withdrawn or ejected from the mold. When a long channel is required, the retractable pin must be of considerable length and it is easily damaged. As a result, great difficulty is encountered in maintaining each pin in proper alignment in multiple cavity molds. Because of the off-center construction shown in the drawings, the retractable pin can be very short and can be maintained in proper alignment with ease. As a result a spray plug can be molded more economically and with few rejects due to defects in the orifice.

FIGURE 10 which is a partial cross-sectional view taken along the line 10—10 of FIGURE 4 is intended to show abutment 20 which is molded into the atomizing plug to serve as a stop whereby the liquid outlet tube 18 may be accurately positioned. This abutment is not clearly shown in any of the other figures.

I claim:

1. A spray plug for dispensing liquids into the atmosphere as a fine spray which comprises a tubular member adapted to fit within the neck of a container, an annular ring on the outer surface of said tubular member to position the plug in the neck of a container, the upper end of said tubular member being closed and having a frusto conoidal configuration, a raised bearing surface surrounding and protecting an orifice in said conoidal section from direct contact with a sealing member, a second bearing surface on said conoidal portion of the tubular member, said second bearing surface being located in a vertical plane passing through the axis of said tubular member and said first named bearing surface and being located on the opposite side of the axis from said first bearing surface, the two bearing surfaces being at a substantially equal distance from said axis.

2. In combination, a container of deformable plastic material, a spray plug, and a screw cap, a neck on said container having screw threads on the outer surface thereof, a tubular spray plug fitting within the neck of said container having an annular ring on the outer surface of said tubular member to position the plug in the neck of the container, the upper end of said tubular member being closed and having a frusto conoidal configuration, a raised bearing surface surrounding and protecting an orifice in said conoidal section from direct contact with a sealing member, a second bearing surface on said conoidal portion of the tubular member, said second bearing surface being located in a vertical plane passing through the axis of said tubular member and said first named bearing surface and being located on the opposite side of the axis from said first bearing surface, the two bearing surfaces being at a substantially equal distance from said axis, a screw cap with internal screw threads adapted to fit over the screw threads on the neck of the container, said screw cap having a conoidal configuration on its inner and uppermost end, said conoidal surface being adapted to bear upon the bearing surfaces of the oppositely disposed bearing surfaces on said plug thereby holding the spray plug in position in the neck of the container and sealing the orifice on said conoidal surface.

3. A spray plug in accordance with claim 1 in which a cross section taken on a plane at right angles to the axis of the upper conoidal section is of oblong configuration and the bearing surfaces are on the longest axis of said oblong.

4. A spray plug in accordance with claim 1 in which the uppermost part of the conoidal section bears a flat indexing means indicating the position of the orifice.

5. A spray plug in accordance with claim 1 in which the lower section of the tubular plug is tapered inwardly to provide easy insertion of the plug in the neck of a container.

6. A spray plug for dispensing liquids into the atmosphere as a fine spray which comprises a tubular member adapted to fit within the neck of a container, an annular ring on the outer surface of said tubular member to position the plug in the neck of a container, the upper end of said tubular member being closed and having a frusto conoidal configuration, a raised bearing surface surrounding and protecting an orifice in said conoidal section from direct contact with a sealing member, a second bearing surface on said conoidal portion of the tubular member, said second bearing surface being located in a vertical plane passing through the axis of said tubular member

and said first named bearing surface and being located on the opposite side of the axis from said first bearing surface, the two bearing surfaces being at a substantially equal distance from said axis, a tube gripping channel molded in the interior of said tubular member adjacent to the wall thereof and in an axial plane passing through said orifice, a tube inserted in said channel, the said gripping channel being essentially circular in configuration except for a relatively small section which is of greater diameter to provide an air channel with the circular tube inserted therein, a transverse ledge in the upper part of said channel forming a barrier beyond which the tube cannot pass, the upper section of the tube gripping channel above the said ledge forming an atomizing chamber into which air from the air passageway and liquid from the tube may commingle, a thin section of the conoidal shaped portion of the tubular member having the circular bearing surface and orifice forming a part of the wall of said atomizing chamber.

7. In combination, a container of deformable plastic material, a spray plug, and a screw cap, a neck on said container having screw threads on the outer surface thereof, a tubular spray plug fitting within the neck of said container having an annular ring on the outer surface of said tubular member to position the plug in the neck of the container, the upper end of said tubular member being closed and having a frusto conoidal configuration, a raised bearing surface surrounding and protecting an orifice in said conoidal section from direct contact with the screw cap, a second bearing surface on said conoidal portion of the tubular member, said second bearing surface being located in a vertical plane passing through the axis of said tubular member and said first named bearing surface and being located on the opposite side of the axis from said first bearing surface, the two bearing surfaces being at a substantially equal distance from said axis, a screw cap with internal screw threads adapted to fit over the screw

threads on the neck of the container, said screw cap having a conoidal configuration on its inner and uppermost end, said conoidal surface being adapted to bear upon the bearing surfaces of the oppositely disposed bearing surfaces on said plug thereby holding the spray plug in position in the neck of the container and sealing the orifice on said conoidal surface, a tube gripping channel molded in the interior of said tubular spray plug member adjacent to the wall thereof and in an axial plane passing through said orifice, a tube inserted in said channel, the said gripping channel being essentially circular in configuration except for a relatively small section which is of greater diameter to provide an air channel with the circular tube inserted therein, a transverse ledge in the upper part of said channel forming a barrier beyond which the tube cannot pass, an atomizing chamber formed by the section of the tube gripping channel above the said transverse ledge and formed in part by a thin section of the conoidal upper part of the plug lying beneath the annular ring surrounding the orifice through which air and liquid may be ejected from the atomizing chamber under pressure as a fine spray.

8. The combination of the character set forth in claim 7 in which the frusto conoidal upper section of the spray plug has a longer diameter through the two bearing surfaces than at right angles thereto, providing a means of positioning the plug in the neck of a container in a desired orientation relative to the vertical axis of the plug.

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