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3,140,052

SPRAY NOZZLE COMPRISING A BASE MEMBER AND A CAP

Filed Jan. 21, 1963

2 Sheets-Sheet 1

FIG. 1

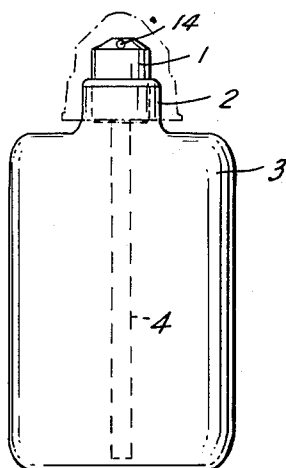
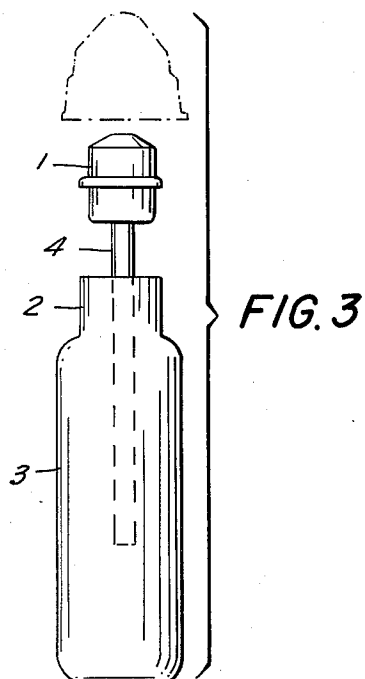
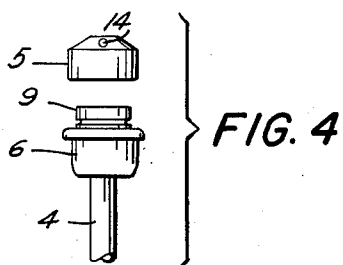
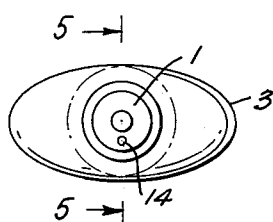


FIG. 2



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2 Sheets-Sheet 2

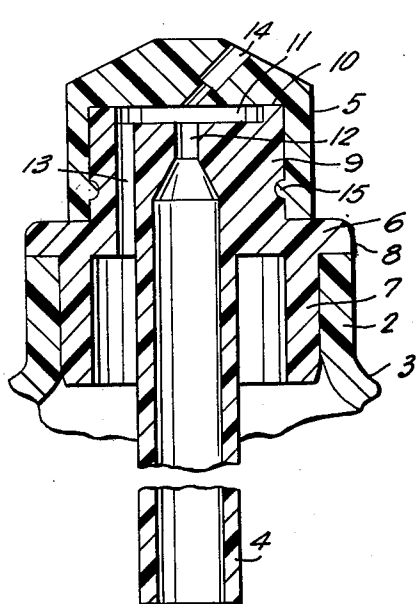


FIG. 5

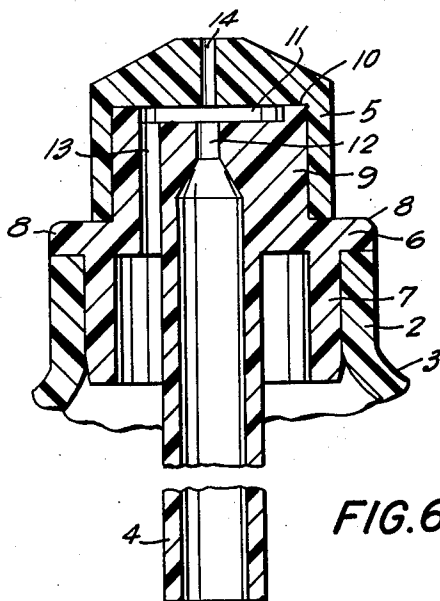


FIG. 6

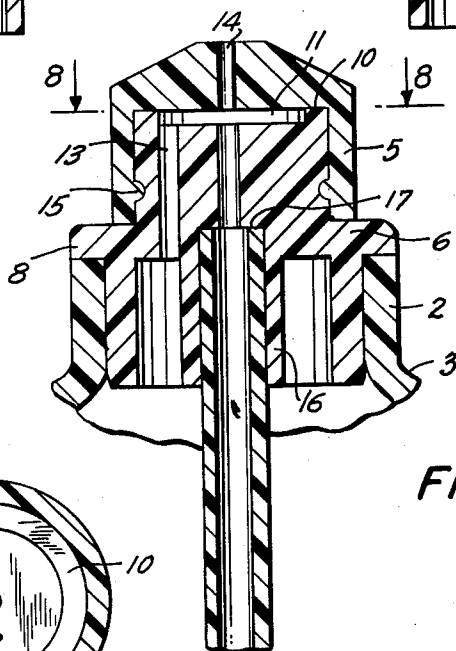


FIG. 7

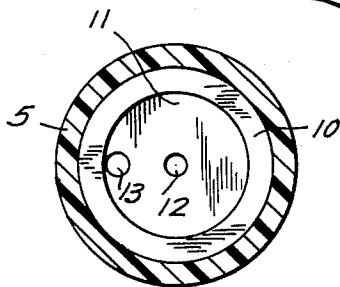


FIG. 8

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SPRAY NOZZLE COMPRISING A BASE MEMBER AND A CAP

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6 Claims. (Cl. 239—327)

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 refreshers, and other liquids in the form of finely divided spray 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 container. Liquid in the container is forced through a dip tube extending downwardly to the bottom of the container into an atomizing chamber where it is mixed with air from the container which enters the atomizing chamber through another passageway. The mixture of air and liquid is dispensed at high velocity through a small orifice leading from the chamber as a spray or aerosol. Usually the atomizing unit is molded of a plastic material and set into the neck of the squeeze bottle container.

Ordinarily the unit is assembled by inserting the dip tube, which is a short tube of flexible plastic material such as polyethylene, into a molded passageway leading to the atomizing chamber. This passageway is also provided with channels which permit air to pass from the space above the liquid in the container into the carburizing chamber. When the dip tube is fully inserted into the passageway, the inserted end forms a part of the wall of the carburizing chamber.

When properly designed and when the dip tube is correctly positioned in the passageway, a satisfactory spray can be obtained from these spray nozzles. Unfortunately, however, experience has shown that many of these spray nozzles give unsatisfactory results when first assembled and this condition worsens with time. Studies of the cause of the development of poor spraying characteristics with nozzles which have been satisfactory at times led to the discovery that the dip tube, which is held by friction in the passageway, is improperly seated when first assembled or has slipped part-way out of its original position as a result of jarring connected with packaging, shipping, and handling the assembled unit.

The present invention is directed to a new type of spray nozzle which can be produced of molded plastic material at a low cost and which can be quickly assembled to provide an atomizing chamber of fixed characteristics whereby the spraying characteristics of the nozzle are not impaired with subsequent handling. As a result it is possible to produce a low cost spray nozzle which will maintain its excellent spraying characteristics.

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

FIGURE 1 is a front view in elevation of an assembled atomizer with a cap shown in phantom;

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

FIGURE 3 is a side view in elevation with the spray nozzle of the present invention withdrawn from the neck of the container;

FIGURE 4 is an elevational view showing the novel atomizer head of the present invention disassembled;

FIGURE 5 is a cross-sectional view in elevation of a

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form of the spray nozzle of the present invention with parts of the container and dip tube cut away;

FIGURE 6 is, similarly, a partial cross-sectional view in elevation with parts cut away of another form of the spray nozzle;

FIGURE 7 is also a cross-sectional view in elevation of another form of the spray nozzle of the present invention; and

FIGURE 8 is a cross-sectional view of the assembled spray nozzle looking in the direction of the arrows 8—8 of FIGURE 7.

As will be seen from FIGURE 1, the spray nozzle 1 is inserted in the neck 2 of a container 3. A dip tube 4 extends downwardly to the bottom of the container as shown.

As will be seen from FIGURE 4, the spray nozzle consists of only two parts, a cap 5 and a base 6. In a preferred form the dip tube 4 is an integral and molded part of the nozzle assembly as shown in FIGURES 5 and 6.

As will be seen from inspection of FIGURE 5, the main body of the spray nozzle 6 has a cylindrical skirt 7 which plugs into the neck 2 of the container 3 so that the spray nozzle is held in place by friction. The outwardly extending flange 8 provides a seat to prevent entry of the body section any further into the neck of the bottle. This outwardly extending flange also extends inwardly on its upper face a distance to provide a seat for the cap 5. The upper section of the base plug 9 is cylindrical and terminates at the top 10 with an annular ring, the inner walls of which together with cap 5 forms an atomizing chamber 11. The dip tube 4, which is an integral part of the base 6, leads to the atomizing chamber to deliver liquid from the bottom of the container to the atomizing chamber through passageway 12. An air passageway 13 is provided as shown to permit air to pass from the upper part of the container into the atomizing chamber 11.

The cap is provided with an atomizing orifice 14 which may be inclined at an angle from the axis of the plug as shown in FIGURE 5, or directed in the direction of the axis as shown in FIGURES 6 and 7. The dimensions of the liquid passageway, the air passageway, the atomizing chamber, and the discharge orifice on the cap bear a critical relationship to each other which must be determined for each particular size of atomizer. In a small hand model of the type frequently seen in use, the orifice 14 may be from .025 to .060 inch in diameter, the air passageway 13 from .030 to .060 inch in diameter, and the liquid passageway 12 from .032 to .050 inch in diameter. The diameter of the atomizing chamber may be 1/4 to 3/8 inch and its height from .020 to .040 inch.

As will be seen from inspection of FIGURE 6, the spray nozzle is assembled by simply pressing the cap of resilient plastic down on the upper cylindrical portion of the base. The depth of the atomizing chamber is determined and fixed by the abutment of the lower cylindrical portion of the cap against the inwardly projecting ledge on the cylindrical portion of the plug. To assure a tighter fit and guard against the possibility of loosening of the plug and with the development of a carburizing chamber of a different capacity, an inwardly projecting ring 15 may be provided on the cap so as to fit into a mating complementary depression in the base as shown in FIGURE 4. Obviously, the projecting ring may be molded on the base and the corresponding grooves formed in the cap.

As will be seen from the foregoing description, the two-piece plug can be readily molded from polyethylene, rubber, or other resilient material on conventional molding machines at low cost to provide an atomizing

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plug in which the several critical parts; the air passageway, the liquid passageway, the jet orifice, and the volume of the carburizing chamber are in a fixed relationship which, when once determined by the design of the mold from which the parts are made, cannot be changed after the spray nozzle is assembled. Accordingly, the spray nozzle will deliver a uniform spray from the time it is first assembled until the contents within the container have been exhausted.

In view of the fact that the dip tube may be of considerable length in some cases, it might be desirable to make this of a conventional piece of plastic tubing as at present. To achieve the benefits of the present invention and still have an inserted dip tube, the construction shown in FIGURE 7 may be employed. In this case the dip tube is simply inserted in a passageway formed in the base of the plug by the cylindrical walls 16 which terminate at a point 17 which is some distance from the carburizing chamber. In this design slippage of the dip tube does not unbalance the critical conditions necessary to obtain a uniform spray.

What is claimed is:

1. A spray nozzle for dispensing aqueous solutions in the form of fine particles which comprises a base member and a cap, the base member being of one piece of molded plastic material having a lower tubular portion adapted to fit in the neck of a container, a flange outwardly extending from said lower tubular portion to rest against the upper portion of the neck of a container in which it may be placed and to position the base therein, a second tubular portion extending above said flange member and being of lesser diameter than the greatest diameter of said flange and terminating at the upper end in a flat surface of annular configuration providing a recessed, unobstructed circular mixing chamber, said recessed chamber being provided with two small passageways extending through said base member permitting passage of fluids therethrough into said mixing chamber,

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said cap member being adapted to fit closely over the upper portion of said base and having tubular side walls adapted to abut against the flat upper surface of the flange, the lower inner surface of the cap forming the top surface of said mixing chamber, a small passageway extending from said lower inner surface through said cap to its outer upper surface to provide an atomizing orifice.

2. A spray nozzle in accordance with claim 1 in which the atomizing orifice passageway of the cap is disposed at an angle from the axis of the spray nozzle.

3. A spray nozzle in accordance with claim 1 in which the atomizing orifice passageway of the cap is disposed along the axis of the spray nozzle.

4. A spray nozzle in accordance with claim 1 in which the base member has a dip tube inserted therein in an enlargement of the fluid passageway leading to the atomizing chamber and held therein by friction.

5. A spray nozzle in accordance with claim 1 in which one of the passageways extending through said base member is enlarged at a short distance from the atomizing chamber and an extension of the base provides a dip tube extending beyond the lower tubular portion of the base for a distance sufficient to reach the bottom of a container in which the base member may be inserted.

6. A spray nozzle in accordance with claim 1 in which the cap member has an annular projection on the inner surface of the tubular portion adapted to engage a circular groove molded in the upper tubular portion of said base member and hold said cap in place.

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