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SQUEEZE BOTTLE DISPENSER

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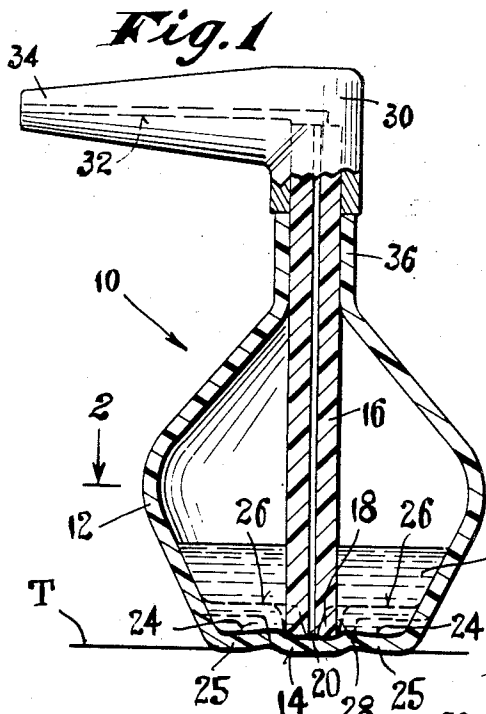
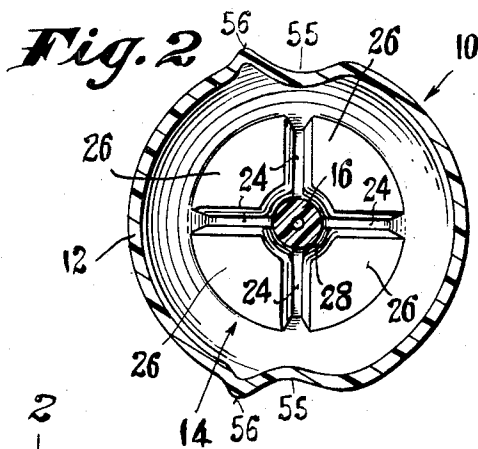
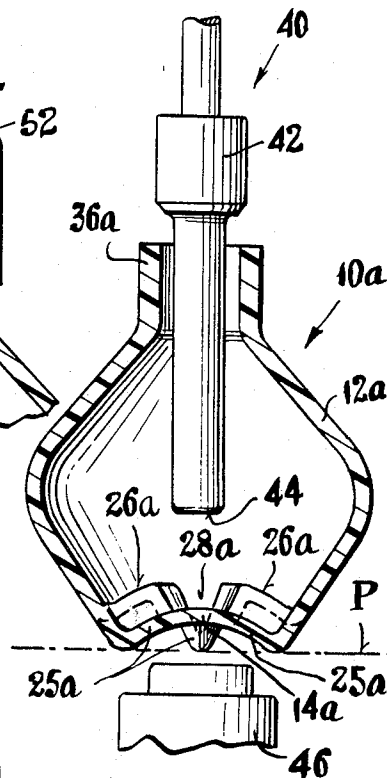
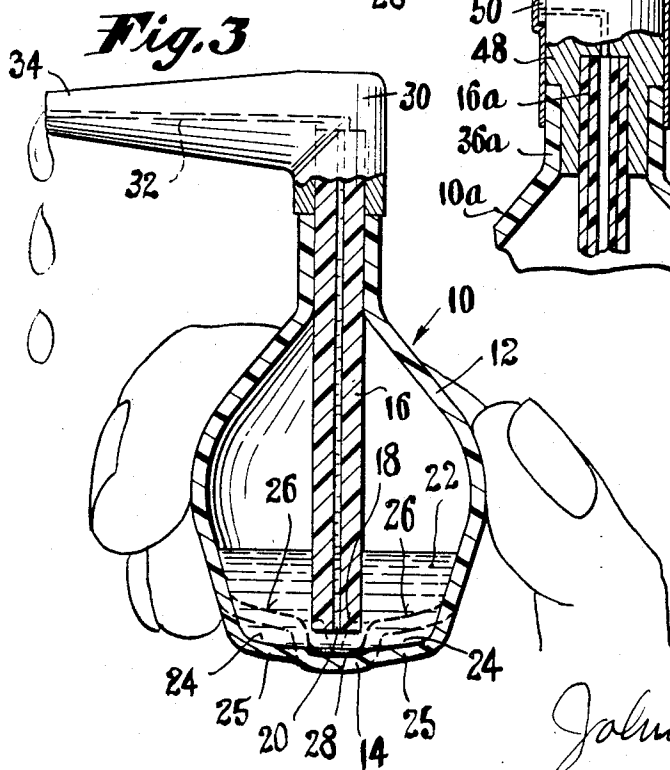
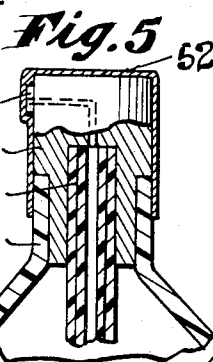


Fig. 4



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SQUEEZE BOTTLE DISPENSER

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Continuation-in-part of application Ser. No. 560,681, June 27, 1966. This application July 18, 1966, Ser. No. 565,849

11 Claims. (Cl. 222—211)

ABSTRACT OF THE DISCLOSURE

A self-closing squeeze bottle dispenser having a dip tube extending from its neck to the bottom wall, said bottom wall normally abutting and sealing the bottom end of the dip tube when the dispenser is not being used. When the side walls of the bottle are squeezed, the bottom valving wall moves away from the bottom end of the dip tube whereby the liquid product can be forced out through the tube.

This invention relates to dispensers, and in particular to dispensers made of plastic squeeze bottles.

This application is a continuation in part of my co-pending application Ser. No. 560,681 filed on June 27, 1966, now abandoned, and having the same title.

An object is to provide a squeeze bottle dispenser having the fewest parts, and a dispenser that is economical to manufacture. Another object is a dispenser that does not leak. Another object is a dispenser which will discharge all the liquid, which will stand upright, and is easily and unmistakably operated. Another object is a dispenser that will not leak when it is tilted upside down, or in other positions, using a squeeze bottle that can be made by plastic vacuum forming or blow molding. A feature is that the dispenser is always reliable, is not easily refilled or likely to clog, and readily seals securely. The dispenser can use different liquids, and can be a throw-away dispenser as it has a low cost.

Other objects will become apparent to those skilled in the art when the following description is read in connection with the accompanying drawings, in which:

FIG. 1 is a section on the axis of a squeeze bottle dispenser embodying the invention in one form.

FIG. 2 is a section cut through line 2—2 of FIG. 1.

FIG. 3 is like FIG. 1 but it shows the bottle being squeezed, discharging liquid.

FIG. 4 is a section on the axis of another squeeze bottle made by the invention. The bottle after being made in plastic is being put through a smoothing operation.

FIG. 5 is a section on the axis through the neck of a dispenser which has the bottle of FIG. 4.

The no-leak dispenser in FIGS. 1-3 has a squeeze bottle 10 which has depressible or squeezable side walls 12 that can be pressed inward, see FIG. 3. The bottle 10 is made in accordance with the present invention, generally stated, so that it has a valving wall 14 that will move outward or downward when the walls 12 are pressed inward. The valving wall 14 is the bottom of the bottle 10, although it can be any other wall that moves outward whenever another wall is pressed inward, in response to inward pressure.

What cooperates with the valving wall 14 is a discharge or dip tube 16, such a tube having a bottom inlet end 18 and an inlet opening 20. The end 18 is normally sealing against the valving wall 14, see FIG. 1. By means of the invention, when the walls 12 are squeezed together like in FIG. 3, the valving wall 14 is moved down or out and it uncovers or unseals the inlet opening 20 of the tube 16. Then the liquid 22 in the bottle 10 can be forced up through the tube 16 for discharge from the tube cap.

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When the pressure applied by the fingers is removed from the bottle 10, the valving wall 14 shifts into sealing engagement with the end 18 of the tube 16. The valving wall normally prevents passage of liquid through the tube 16 when engaged as in FIG. 1.

To get out of the bottle 10 the last amount of liquid 22, and to have a good base on the bottle for standing it upright, the wall 14 has ribs as in FIG. 2, making interior grooves 24. The underside of the bottom wall 14 shows ribs 25. Looking at FIG. 2, the wall 14 shows a number of pie-shaped lands or raised areas 26 between the grooves 24. At the center of the wall 14 there is a shallow central frusto-conical well 28, where the inlet end 18 of the tube 16 is located. The well 28 is a valve seat for the end 18. Because the walls of the well 28 slope, they wedge the end 18. This makes a tight seal with little force needed.

FIGURES 2 and 3 show that the radially inner tips of the lands 26 are guiding surfaces that nest the end 18 of the tube 16. The end 18 is always therefore in a central position, even when disengaged from the wall 14. In FIG. 1 the wall is generally flat, but in FIG. 3 it is convex downward or concave upward. In FIG. 3 the liquid 22 will run through the grooves 24 into the well 28 so the last amount is used. The clearance space in FIG. 3 between the bottom end 18 of the tube 16 and the wall 14 is greatly exaggerated, for clear viewing. Actually, the space between the wall 14 and the bottom of the tube 16 can be five or ten thousandths of an inch or so. This makes it possible to discharge all of the liquid. The liquid 22 will run in the grooves 24 to the well 28 as the bottle gets empty. From the grooves 24, the liquid can all collect in the well 28 and then go out through the tube 16, moving up to the cap 30.

Because of the bulging shape of the side walls 12, the squeezing of these, which tends to straighten them, will automatically cause the bottom valving wall 14 to move away from the tube 16. Only a little movement is needed to let the liquid 22 flow upward in the tube 16 and out the bottle 10.

In FIGS. 1 and 3 the discharge cap 30 is carried by the top of the tube 16. This cap has a horizontal discharge bore 32 in which the liquid travels to the orifice 34. The tube 16 is rigid in the neck 36.

The tube 16 can be very small, and also the bottle 10, making a "one-shot" dispenser. The tube 16 is called a "capillary tube."

When the bottle 10 is made of plastic, the valving wall 14 is made with an upward convexity, see FIG. 4. Here the container 10a is like the container 10 but it has a larger neck 36a. Corresponding parts of the bottle 10a have similar numbers but with suffixes a. In FIG. 4 the bottle 10a when upright can rest on the four bottom ribs 25a, which touch the reference plane P. In FIG. 1, the bottom ribs 25 rest on a table T or similar surface.

After forming the bottle 10 or 10a, a smoothing operation is used to make the hole of the neck very smooth, and also to make the bottom of the well 28 very smooth so that good seals are made with the tube 16. The smoothing is done by a forming tool 40 in FIG. 4. The tool 40 is a mandrel with a sizing head 42 slightly larger than the hole of the neck 36a and with a smoothing bottom surface 44 slightly smaller than the well 28a. When the proper parts of the bottle 10a are warm and soft, the inserted mandrel 40 will do the forming. An anvil 46 can engage the exterior of the bottom wall 14a to back it up. The mandrel surface 44 applies pressure to the bottom of said well 28a to smooth it, and the sizing head 42 smooths out the hole in the neck 36a. The mandrel 40 can turn and be heated fairly hot.

See FIG. 5. A plastic stopper 48 is pressed in the neck

36a of the bottle 10a and supports the tube 16a. The tube 16a can be made of inner and an outer plastic tube fitted together to provide stiffness without requiring great thickness of the walls of the individual tubes. The stopper 48 has a spray orifice 50.

A plastic shrink seal membrane 52 can be applied over the cap 48 and neck 36a of the bottle 10a to prevent leakage or evaporation during shipping and shelf life. The consumer tears off the shrink membrane 52 before using the dispenser.

With the normal position of FIG. 1, the force of gravity can never cause the liquid 22 to leak out. If the bottle is turned upside down, the liquid will be at the neck 36, so it still cannot run out through the tube 16. Also, the tube 16 is sealed by the valving wall 14. If the bottle is on a side, the liquid 22 by filling somewhat less than half of the bottle, will still have a level that is below the opening 20 of the tube 16. Under all circumstances, gravity cannot make the liquid run out through the tube. An additional safeguard is that the opening 20 is closed by the valving wall 14 most of the time.

In FIG. 1 the valving wall 14 presses hard against the bottom end of the tube 16 because when the bottle 10 is made, the valving wall 14 is very convex, like in FIG. 4. In FIG. 1 the tube 16 is pressing hard against the valving wall 14 and has straightened or flattened the wall. The strong pressure causes a good seal.

This squeeze-bottle dispenser is very simple and effective, and has a particularly simple closure valve to prevent leakage. No leaks occur, besides, when the bottle is partly filled to a level less than half. The seams in the neck and well are ironed out by the qualifying operation seen in FIG. 4. A tight press-fit is made between the tube 16 and the neck 36, or between the tube 16a and the cap 48 which has a tight fit with the neck 36a. Leakage is mostly eliminated, as a rule.

The side wall 12, see FIG. 2, has finger hollows 55 and bumps 56. These act as grips and tell the user that he is holding the dispenser right, for pointing the spray away from his arm.

From the foregoing description it will be apparent that many modifications will present themselves to those skilled in the art without departing from the spirit of this invention.

Having thus described the invention, what is claimed is:

1. A squeeze bottle dispenser for liquids which includes a squeeze bottle having a top neck portion and a depressible wall which can be pressed inward, and having a bottom wall to stand on, and a discharge passage means including a dip tube extending from the bottle neck portion downward to a point near the bottom wall to receive the liquid from the bottom of the bottle and discharge the same, said bottom wall of the bottle being imperforate and exposed to the dip tube and to the entire interior of the bottle, said bottom wall comprising a valving wall which moves outward when the depressible wall is pressed inward, and valve means for controlling the flow of liquid through the discharge passage means, said valve means being normally closed by the valving wall and being opened when the valving wall moves downwardly, said

valve means including a valve part directly engaging and abutting said bottom wall and having force exerted on it by the bottom wall when the valve means is in the closed condition.

2. The article set forth in claim 1, in which the dip tube constitutes the said valve part, said tube having an inner inlet end with an inlet opening that is normally in direct sealing engagement with the bottom valving wall of the bottle, said valving wall uncovering and unsealing said inlet opening when the wall moves outward as the depressible wall is pressed inward whereby liquid in the bottle can be forced out through the dip tube for discharge, said valving wall normally preventing passage of liquid through the tube when engaged across the inner end of the tube.

3. The article set forth in claim 2, in which the bottom wall of the bottle has inward projections disposed around the inlet end of the discharge tube, for holding the end against side movement.

4. The article set forth in claim 2, in which the bottom wall of the bottle has a well in which the discharge tube is received and which collects most of the last portions of the liquid in the bottle.

5. The article set forth in claim 4, in which the bottom wall has grooves in it, leading to said well.

6. The article set forth in claim 5, in which the grooves in the bottom wall are formed by exterior ribs, on which the bottle can rest.

7. The article set forth in claim 2, in which the bottom wall of the bottle tends to be convex upward, said tube pressing the bottom wall downward.

8. The article set forth in claim 2, in which the depressible wall is the side wall of the bottle, said side wall bulging outward and having finger hollows, said side wall having bumps at corresponding edges of the hollows to indicate the front of the dispenser.

9. The article set forth in claim 1, in which the dip tube is of plastic substance and is made of inner and outer separate tubes fitted together so that there is stiffness without requiring thickness in the walls of the individual tubes.

10. The article set forth in claim 4, in which the walls of the well are sloped and wedge the end of the discharge tube to effect a tight seal therewith while using little force.

11. The article set forth in claim 1, in which the valve means is disposed at said valving bottom wall and at the bottom end of said dip tube and is actuated by said bottom wall, for controlling the flow of liquid through the bottom end of said dip tube in response to movement of the bottom wall as effected by operation of the depressible wall.

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