Sept. 25, 1956 W. F. ROBB ET AL 2,764,453

SPRAY VALVE AND CLOSURE ASSEMBLY

Filed April 13, 1955 2 Sheets-Sheet 1

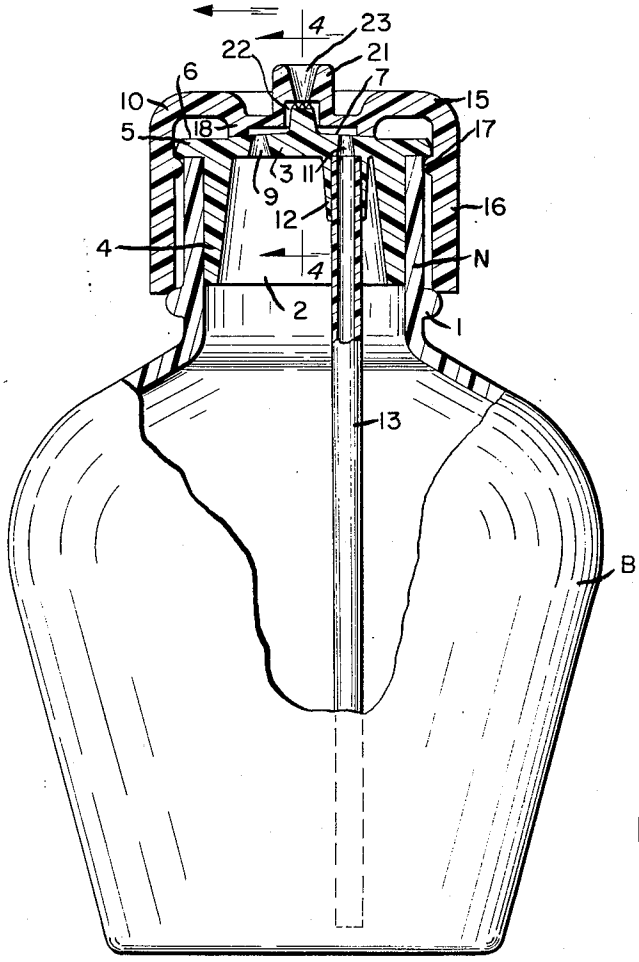


FIG. 1.

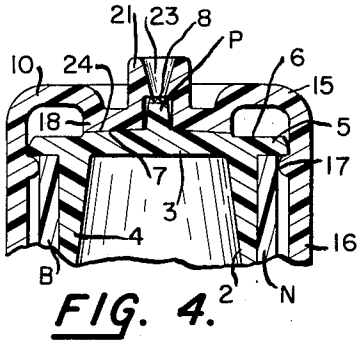


FIG. 4.

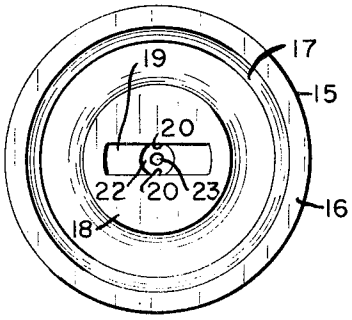


FIG. 3.

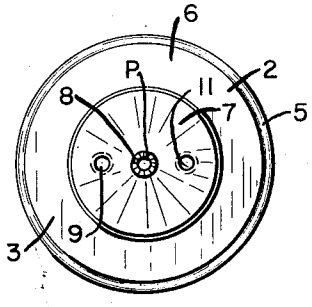


FIG. 2.

INVENTORS.
WAYNE F. ROBB
BERT W. MYER, JR.
BY
Philip H. Sheridan
ATTORNEY

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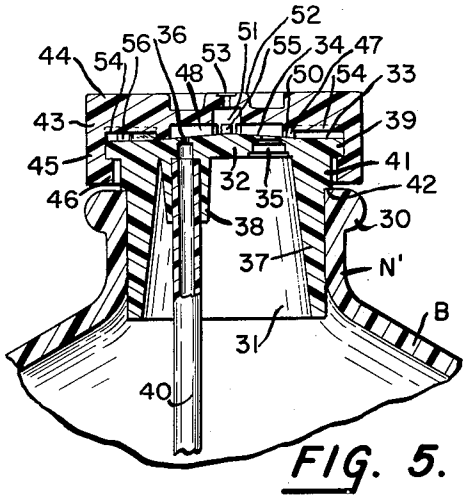


FIG. 5.

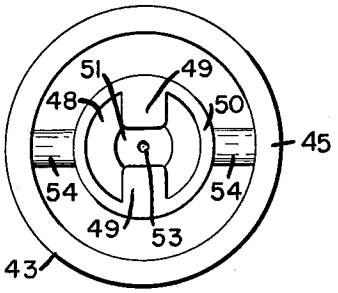


FIG. 6.

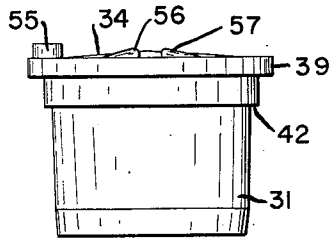


FIG. 7.

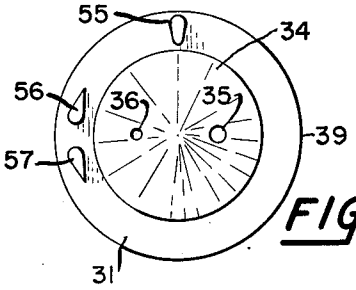


FIG. 8.

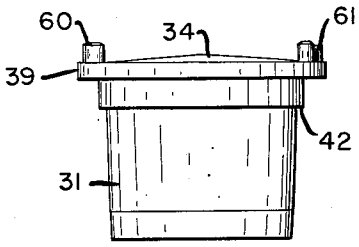


FIG. 9.

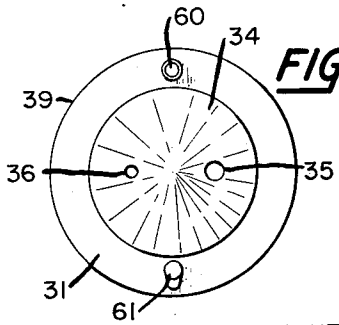


FIG. 10.

INVENTORS.
WAYNE F. ROBB
BERT W. MYER, JR.
BY Philip H. Sheridan
ATTORNEY

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SPRAY VALVE AND CLOSURE ASSEMBLY

Wayne F. Robb and Bert W. Myer, Jr., Denver, Colo., assignors, by mesne assignments, to Yorker & Sons, Inc., a corporation of Colorado

Application April 13, 1955, Serial No. 501,054

12 Claims. (Cl. 299—89)

This invention relates to dispensing and particularly to the atomizing or spraying in mist form of liquid from a pliable container. The plastic assemblies of this invention may contain for dispensing a wide variety of liquids, such as perfumes, astringents, lotions, anti-perspirant solutions, medicines and insecticides and the like.

There are available many prior art atomizing devices comprising a flexible or deformable container having a closure assembly with means associated with the container for causing air and liquid commingling and atomization of the liquid upon squeezing the bottle or container. However, to the best of our knowledge, no such atomizing structure has been included or combined with the spray closure which also forms a part of the shut-off valve.

Therefore, it is one of the objects of this invention to provide an improved closure for a pliable liquid container which includes liquid atomizing structure.

Further, it is an object of this invention to provide a liquid dispensing structure comprising a deformable container and a closure which forms a part of a shut-off valve for the liquid and which includes atomizing structure wherein the liquid, upon deforming the container, may commingle with air from the container and issue in the form of a mist.

Yet another object of the invention is to provide a liquid dispensing structure of the type described in the preceding paragraph including an insert between the closure and container, said insert and closure having cooperating working surfaces providing a liquid seal during discharge of the liquid or storage of the container.

Still another object of the invention is to provide a dispensing structure of the type described having means permitting rotation of the closure relative to the insert and bottle and means associated with the insert and closure for determining whether the closure is in condition for discharge or storage.

It is also an object of this invention to provide a dispensing structure including a pliable container, an insert and a closure having liquid atomizing structure, said insert having means associated therewith to cooperate with the atomizing structure and improve atomization of the liquid.

Finally, it is an object of this invention to provide a liquid dispensing structure comprising a deformable container, an insert and a closure member which may be readily manufactured at a relatively cheap cost and which may be utilized in a simple manner for dispensing liquid in the form of a mist.

Other objects and advantages of this invention will become apparent upon considering the following detailed description in conjunction with the drawings wherein like numerals throughout represent similar parts and wherein:

Figure 1 is a side elevational view of a liquid container embodying one form of this invention, part of the container and its closure assembly being shown in section;

Figure 2 is a top plan view of the insert or plug valve shown in Figure 1;

Figure 3 is a bottom view of the cap member shown in Figure 1;

Figure 4 is a sectional view taken on the lines 4—4 of Figure 1;

Figure 5 is a side elevational view similar to that of Figure 1 but illustrating a second form of the invention;

Figure 6 is a bottom view of the cap member shown in Figure 5;

Figure 7 is an elevational view of the insert or plug valve of Figure 5;

Figure 8 is a top view of the insert of Figure 7;

Figure 9 is an elevational view of a third modified form of insert or plug valve; and

Figure 10 is a top view of the insert of Figure 9.

The dispensing bottle or receptacle B illustrated in connection with each of the several embodiments of this invention comprises essentially a hollow container having a neck N or N'. The bottle B is preferably made from a pliable material, one that can be molded such as polyethylene or other well known flexible synthetic plastics, and comprises a self-sustaining and form retaining container that may have transparent or opaque characteristics. The only real considerations relative to the type of material used to construct the bottle B is that it be pliable so that squeezing may cause dispensing of the liquid cosmetics or the like which are generally contained within a bottle of the configuration illustrated. The closure assemblies constituting the essential features of this invention and which will be hereinafter described in detail are preferably made of a transparent or opaque synthetic plastic, such as polyethylene, which is flexible but preferably somewhat more rigid than the material of bottle B.

Referring in detail to Figures 1 to 4, inclusive, wherein one form of the invention is illustrated, the neck N is provided with a bead 1 and the portion of neck N above this bead preferably has a smooth exterior surface, although such is not necessary. Numeral 2 represents an insert or plug valve having a top wall 3 and a depending annular skirt 4 adapted to be received wedgingly or by press fit within the neck N and with the flange 5 resting on the top of the neck. Preferably the skirt 4 is bowed outwardly whereby the interior surface of the neck and the skirt 4 form a liquid seal. The wall 3 has a top annular surface 6 which is flat and a working surface 7 which is tapered upwardly and inwardly towards the center of the plug 2. Extending vertically upwardly from the center of the wall 3 is a post or projection P of generally circular configuration and preferably slightly tapered upwardly, said post being provided in its top surface with radial grooves forming ridges 8. Also depending from wall 3 is a second hollow annular skirt or socket 12 which is adapted to receive and support, as shown, a flexible hollow tube 13 through which passes liquid upon deforming, by squeezing action, the bottle B. There are provided two vertically extending passages or openings 9 and 11 in wall 3, the latter of these passages communicating with tube 13 when it is supported in socket 12. Although plug valve 2 may be detached from neck N, for all practical purposes, due to skirt 4, it is integral therewith when in position.

The cap member 15 is of substantially circular inverted U-shape or cup-shaped with the annular leg 16 being provided on its interior surface with a bead 17. The base 10 of the cup-shaped member 15 has depending therefrom an annular member or depression 18 provided

with a slot 19 of rectangular configuration. Centrally of the base 10 is an extension 21 and centrally of the member 18 and extension 21 is a bore 22 of circular shape, except for the straight side walls thereof represented by numeral 20. Communicating with bore 22, which preferably has its interior surface, including walls 20, slightly tapered upwardly, is a discharge opening 23 in extension 21. Actually, the post P, if slightly tapered, has a varied diameter only slightly less than the tapered walls 22 but considerably less than the diameter of the rest of bore 22.

With the insert 2 in place in neck N, cap 15, which is somewhat flexible, is snapped over the flange 5 with the result that bead 17 is positioned as shown in Figure 1. Flange 5 and neck N form a bearing for bead 17, thereby permitting rotation of the cap 15 with respect and relative to bottle B and insert 2, but without vertical displacement of the cap. When the cap is snapped in position, the bottom surface 24 of depression 18 provides a working seal surface with surface 7 and preferably to increase this action, surface 24 may be tapered downwardly and outwardly from the center thereof.

In operation, assuming a liquid cosmetic is contained within bottle B, the cap member 15 is rotated, or conditioned by turning in one direction, such as the direction of the arrow, until the parts assume the position shown in Figure 4 with surface 24 being over and closing apertures 9 and 11. If the bottle B is now squeezed, the surface 24 will prevent liquid traveling up tube 13 from passing through hole 11 and surface 24 will also cover aperture 9. However, when the cap 15 is rotated in the opposite direction and conditioned so that slot 19 is positioned over openings 9 and 11, as in Figure 1, then, upon squeezing the container B, the liquid will pass through passage 11 into slot 19 and air, from the top of the bottle, will pass through opening 9 into slot 19. The air and liquid from slot 19 will be forced upwardly, due to pressure on bottle B, into bore 22 and thence to discharge passage 23. Also, the air and liquid, during this travel from slot 19 are mixed and issue from opening 23 in the form of a spray, but the ridges 8 are instrumental and effective in increasing or improving the mixing as to break up the liquid and cause proper atomization and spray characteristics. It should be noted that surface 24 including the part thereof defining slot 19 provides with tapered surface 7 a seal to assure that no liquid or air will escape towards the exterior surface of neck N.

As mentioned, with the parts positioned as in Figure 1 the liquid may be dispensed in the form of a spray and, as is believed obvious, air is always available for travel through aperture 9. By referring to Figures 1 and 3, it should be clear that a 90 degree rotation of the cap 15 in either direction will result in closing of ports 9 and 11 and prevention of dispensing and, of course, 180 degree rotation of the cap from the position shown in Figure 1 will also condition the construction for dispensing. It should be stated that bead 1 actually has no real function other than to form a rest for leg 16, but it has been illustrated as many commercially available bottles include such a bead.

Now, considering the modified form of Figures 5 to 8, inclusive, the pliable bottle B has a neck N' provided with an annular bead 30 at the top of its exterior surface. Plug valve or insert 31 is substantially the same as the insert 2 of Figure 1 in that it is provided with an annular top 32 having a flange 39, flat and tapered annular surfaces 33 and 34, a depending skirt 37, and a socket 38 for supporting flexible tube 40 which may be made of plastic or rubber or the like. Passageway 36 communicates with hollow tube 40 and opening or passageway 35 permits air to pass upwardly from the bottle B. It is to be noted that insert 31 is provided with a slightly enlarged annular portion 41 forming a flange 42 which rests on the top of neck N' when skirt 37 is press

fit therein. Also, for reasons that will become apparent, flat surface 33 is provided with a boss 55 and lugs 56 and 57, each of the latter being tapered upwardly from surface 33 and towards each other but providing a space therebetween that is designed to be about equal to the width of ribs 54. If desired, insert 31 could have a post with ridges thereon for increasing atomization, such as post P of Figure 1.

The cap 43 is also cup-shaped with a top annular wall 44 and an annular leg 45 having adjacent its tip an inwardly extending bead-like flange 46. A circular shaped member or depression 47 is provided with an enlarged relieved area 48 communicating with bore 51 and discharge opening 53 in extension 52 and adapted to communicate with passageways 35 and 36. Numeral 50 represents the annular working seal surface which may be slightly tapered to form with surface 34 a liquid and air seal. The surface 50 also includes two diametrically opposed wings 49 which may or may not be tapered inwardly and upwardly towards the center of cap 43, but in any event the wings are shaped to close off passages 35 and 36 when in a certain position. Between the depression 47 and leg 45 there is provided the diametrically opposed ribs 54 which are for a purpose that will be hereinafter described.

With the cap snapped over flange 39, the latter forms a bearing for bead-like member 46 whereby the cap may be rotated relative to the bottle B and insert 31 and in all positions of rotation of the cap surfaces 50 and 34 form a liquid and air seal. Ribs 54 are adapted to be manually snapped over lugs 56 and 57 and temporarily locked in the space between said lugs and in this position the user can be assured that, upon squeezing bottle B, liquid and air will mix and comingle in area 48 and issue from discharge opening 53 in the form of a mist. Referring to the position of the parts of Figure 1, the mist may be ejected as the left rib 54 looking at Figure 6 is temporarily locked between lugs 56 and 57. Upon manually rotating cap 43 with relatively slight force in either direction for 90 degrees, the rib 54 that was locked snaps out from between lugs 56 and 57 and the boss 55 strikes one or the other of ribs 54, the boss being of such a size that it cannot readily snap or pass over a rib. In this latter position, the user can be assured that the wings 49 are over the apertures 35 and 36 to prevent air and liquid from entering chamber 48.

The embodiment of the invention illustrated in Figures 9 and 10 merely relates to a slight change in the insert 31. Instead of lugs 56 and 57, the annular flat face 33 is provided with diametrically opposed bosses 60 and 61 which are of a size that they cannot readily snap or pass over ribs 54. Depending upon the position of cap 43 when it is snapped over flange 39, in operation, upon rotating the cap in one direction until each boss 60 and 61 strikes a rib 54 the openings 35 and 36 will be closed by the wings 49 and upon rotation in the opposite direction until each of said bosses strikes a different rib 54 the ports 35 and 36 will be in communication with area 48. Obviously the user will be able to detect, by feel, whether the closure assembly is in condition for storage or discharge.

From the foregoing it will be seen that this invention is one well adapted to attain all the ends and objects hereinabove set forth, together with other advantages which are obvious and which are inherent to the structure of the several embodiments. It will be understood that certain features and subcombinations are of utility and may be employed with reference to other features and subcombinations and this is contemplated by and is within the scope of the claims. As many alterations may be made of the invention without departing from the scope thereof, it is to be understood that all matter herein set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. A dispensing structure comprising a pliable chambered body for containing a liquid to be dispensed and being provided with a neck portion, the liquid within the body normally being maintained at a level to provide an air pocket thereabove, a plug supported in said portion and having a top surface with separate air and liquid ports extending therethrough and communicating with the interior of the body, a closure cap mounted for rotation relative to said plug and said portion, said cap having a working surface cooperating with said top surface to provide a liquid and air seal for said ports, a relieved area in said working surface and cap and a discharge bore in said cap communicating with said area, means within the body for conveying the liquid to said liquid port upon sufficient deformation of the body, both the liquid and air being under pressure at their respective ports when the body is deformed sufficiently, said area being of a size whereby when said cap is rotated a first predetermined amount the ports will separately communicate with said area and air and liquid under pressure from the body will be mixed in said area so that discharge from the bore will be in the form of a spray, and whereby when the cap is rotated a second predetermined amount the working surface will seal said ports.

2. A dispensing structure as defined in claim 1 wherein said relieved area is a slot of substantially rectangular configuration.

3. A dispensing structure as defined in claim 1 wherein the working surface and the top surface comprise mating tapered surfaces.

4. A dispensing structure as defined in claim 1 wherein a post is upstanding from said top surface, said post having ridges at the top thereof and extending through said area into the bore.

5. A dispensing structure as defined in claim 1 wherein said cap and plug have additional means cooperating during rotation of said cap for determining if said ports are open or closed by the working surface.

6. A dispensing structure as defined in claim 5 wherein said additional means includes at least one rib on the interior of said cap and at least one boss-like member on the plug.

7. A dispensing structure as defined in claim 5 wherein said additional means includes at least one rib on the interior of said cap and a pair of boss-like members on said plug, said members being tapered upwardly from the plug towards each other and spaced apart a distance for receiving the rib therebetween by snap action upon rotation of said cap.

8. In a dispensing structure having a deformable chambered body for containing liquid and a neck portion provided with an insert having a top surface and separate air and liquid ports therethrough communicating with the interior of said body, the liquid within the body normally being maintained at a level to provide an air pocket thereabove, a cap member adapted to be mounted on said insert and neck portion for rotation relative thereto, said cap having a working surface for cooperating with said top surface to provide a liquid and air seal for said ports, a relieved area in said cap and working surface and a discharge bore in said cap communicating with said area, means within the body for conveying the liquid to said liquid port upon sufficient deformation of the body, both the liquid and air being under pressure at their respective ports when the body is deformed sufficiently, said area being of a size whereby when said cap is rotated a first predetermined amount the area will separately communicate with the ports and air and liquid under pressure from the body will be mixed in said area and bore so that discharge from the bore will be in the form of a spray and whereby when the cap is rotated a second predetermined amount the working surface will seal the ports.

9. In a dispensing structure of the type described in claim 8 wherein the area is a rectangular shaped slot.

10. In a dispensing structure of the type described in claim 8 wherein the working surface is annularly shaped with inwardly directed and diametrically opposed wings.

11. A dispensing structure of the type defined in claim 8 wherein the working surface forms with the top surface an air and liquid seal between the insert and cap member regardless of the position of said area.

12. A dispensing structure of the type defined in claim 11 wherein the insert includes a hollow annular skirt depending from the top surface and engaged with the interior of the neck portion in liquid and air seal relation.

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