Aug. 5, 1952 W. E. VENSEL 2,606,070

LIQUID SPRAY CAP AND THE LIKE

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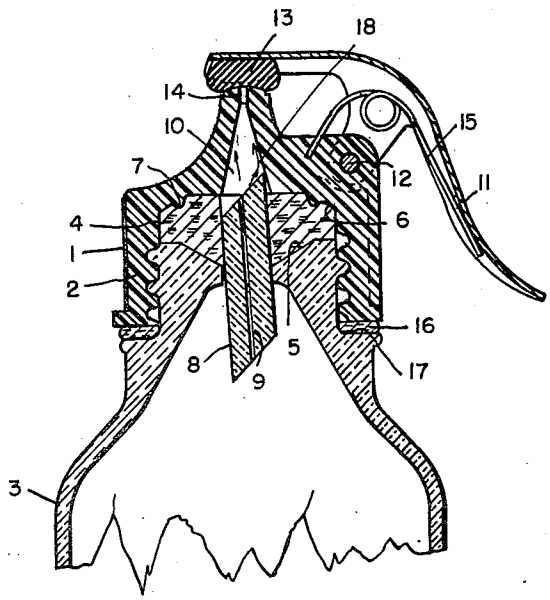


Fig. 1

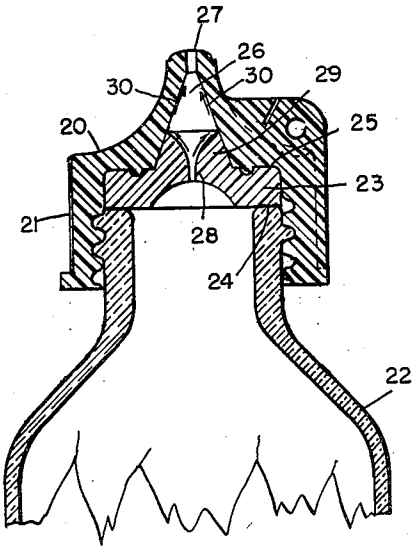


Fig. 2

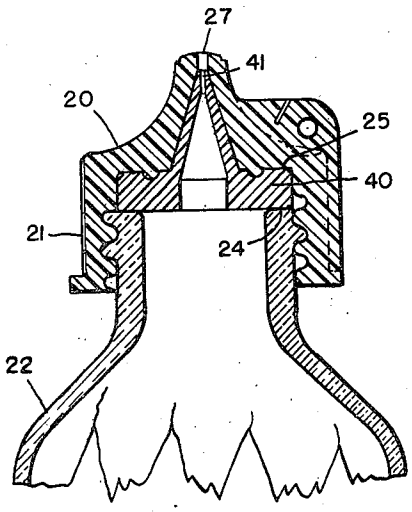


Fig. 4

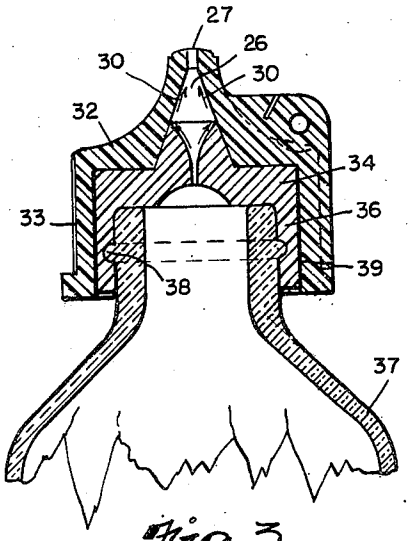


Fig. 3

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LIQUID SPRAY CAP AND THE LIKE

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4 Claims. (Cl. 299—95)

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The present invention relates generally as indicated to liquid spray caps and more particularly to certain improvements in spray caps of the general type disclosed in my Patent No. 2,378,451, dated June 19, 1945, and in my co-pending application, Serial No. 735,886, filed March 20, 1947, now abandoned, for dispensing in spray form low boiling point liquids which are contained in bottles or other containers to which said caps are adapted to be secured.

The spray cap assembly disclosed in the aforesaid patent includes a discharge orifice therethrough which is formed with an intermediate expansion chamber portion, an outer portion leading from one end of the expansion chamber portion to the exterior of the cap assembly and an inner portion leading into the other end of the chamber portion from within the bottle, such inner portion being of smaller diameter than such outer portion. The provision of such a discharge orifice in the cap assembly has been found to be desirable in the effecting of fine spraying of the liquid from the bottle to which said cap assembly is secured.

The spray caps disclosed in the aforesaid pending application, among other things, include the further feature of misalignment of the inner and outer portions of the discharge orifice whereby to improve the spraying efficiency.

One object of the present invention is to provide in a spray cap assembly of the character indicated, a novel means for effecting misalignment of the inner and outer portions of the discharge orifice.

Another object of this invention is to provide a spray cap assembly in which the surface of the expansion chamber portion through which the inner portion of the discharge orifice enters such chamber is so disposed as to induce a flow of the liquid therealong in the form of a thin sheet whereby more effective volatilization thereof is effected for creating a pressure in the expansion chamber to discharge the liquid and to more intimately mix with the liquid to produce a very fine spray.

Another object of this invention is to provide a spray cap assembly which can be assembled on a conventional threaded mouth glass bottle.

Another object of this invention is to provide a spray cap assembly which is designed to be permanently secured on a bottle of a simple form without a threaded mouth, such spray cap assembly rendering the bottle non-reusable as is desirable with certain liquids.

Another object of this invention is to provide

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a simple form of dispensing cap assembly adapted to shoot out the liquid in a jet or stream form.

Other objects and advantages will become apparent as the following description proceeds.

To the accomplishment of the foregoing and related ends, said invention, then, comprises the features hereinafter fully described and particularly pointed out in the claims, the following description and the annexed drawing setting forth in detail certain illustrative embodiments of the invention, these being indicative, however, of but a few of the various ways in which the principle of the invention may be employed.

In said annexed drawings:

Figs. 1 to 4 are cross section views diametrically through a corresponding number of different forms of dispensing cap assemblies as secured to bottles adapted to contain the liquids to be dispensed through the discharge orifices formed in said cap assemblies, the orifice closure lever having been omitted in each of the cap assemblies shown in Figs. 2 to 4.

Referring now to the drawing, and first more specially to Fig. 1, the cap assembly comprises a cap body 1 having an internally threaded skirt 2 in threaded engagement with the threaded mouth of a bottle 3; a compressible or deformable packing ring 4 such as cork, for example, clamped between the upper end surface 5 of the bottle and the opposed surface 6 of said body, the latter preferably being conical and being formed with a rib 7 adapted to be imbedded into the upper end of the ring 4 to assure a fluid-tight seal; a length of capillary or thermometer tube 8 extending through said ring 4 and having an orifice 9 therethrough leading from the interior of the bottle to the conical expansion chamber 10 formed in said body 1; and a thumb or finger-operated lever 11 pivotally connected to said body by the pin 12, said lever carrying a rubber-like plug 13 adapted to be seated over the outer end of the discharge orifice 14 which leads through the body from the apex of the chamber 10 as by means of the torsion spring 15 which has its opposite ends bearing on the lever 11 and engaged in an opening in the body.

As a precaution against the possibility of leakage of fluid, gasket 16 is clamped between the lower end of skirt 2 and a collar 17 formed on the bottle 3.

The orifice 9 is preferably smaller in diameter than the orifice 14 and because of the expansion chamber 10 between such orifices, the Fig. 1 cap assembly retains the desirable features of the above-referred-to patent construction.

In order to insure a more efficient spraying ac-

tion upon operation of the lever 11 to unseat the plug 13 and upon positioning of the bottle in a horizontal or inverted position, the upper end of the tube 8 is cut on a bias as shown, whereby when the body 1 is screwed onto the bottle 3, the engagement of the upper end of the tube 8 with the conical wall of the expansion chamber 10 will cause the tube 8 to be tilted so that the central orifice 9 will be misaligned with respect to the orifice 14, this contributing to the improvement in the spraying action as outlined in the aforesaid pending application, due to the turbulence created in the chamber 10 by the liquid shooting from the orifice 9 against the conical wall of the expansion chamber. Moreover, because of the bias cutting of the upper end of the tube 8, the liquid which issues from the orifice 9 will flow as a very thin sheet-like stream along the upper end surface of the tube and the conical wall of chamber as indicated by the arrows 18 in Fig. 1, whereby to effect volatilization of a greater volume of liquid and to allow the volatilized liquid under pressure in the expansion chamber 10 to force the liquid through the discharge orifice 14 and to intimately mix with such liquid to produce a very fine spray.

The spray cap assembly illustrated in Fig. 2 comprises a cap body 20 of somewhat the same form as that illustrated in Fig. 1 and having a skirt 21 threaded over a conventional one-piece bottle 22 and a unitary packing and orifice ring 23 clamped between the opposed surfaces 24 and 25 of the bottle and cap body. Said body 20 is formed with a conical expansion chamber 26 and a discharge orifice 27 leading from the apex of such chamber to the exterior of said body.

In this case, the ring 23 is preferably molded from a deformable rubber-like plastic material such as polyethylene which can be molded at very low pressure whereby not to cause bending or breaking of the small diameter core pin which is necessary for the formation of the discharge orifice portion 28 which, as previously indicated, is smaller than the discharge orifice 27. The molding of the ring 23 effects considerable economies as compared with the cost of the cork packing ring 4 which must be "specie cut cork" to assure efficient sealing thereby and the cost of the tubing 8 and cutting of the latter at an angle as shown.

Said ring 23 has a conical extension 29 fitting within the chamber 26 in said cap bottle 20. The discharge orifice portion 28 is flared outwardly as shown whereby the liquid passing therethrough will flow as a very thin annular stream along the flared wall and along the conical wall of chamber 26 as indicated between arrows 30 for discharge in the form of a very fine spray from orifice 27 by the volatilized liquid pressure in chamber 26 and within such stream. By reason of the design and material used for the ring 23, a conventional threaded mouth bottle may be used and no other sealing gasket need be employed nor any severe clamping pressure need be applied which would excessively distort the ring 23 and the discharge orifice 28 therethrough.

As in the Fig. 1 cap assembly, that illustrated in Fig. 2 will have attached thereto the pivotal closure lever 11 for closing the outer discharge orifice portion 27 when the device is not in use.

In Fig. 3 is shown a spray cap assembly which is substantially the same as that illustrated in Fig. 2, and therefore similar reference characters have been used to designate the same elements whereby to eliminate the necessity of repeating in detail the description of the construction and operation. As an added feature, the Fig. 3 cap assembly has a cap body 32 formed with a skirt 33 having a smooth inside wall. In addition, the combination packing ring and orifice member 34 is formed with an integral skirt 36 adapted to have a snug fit over the cylindrical end portion of the bottle 37, said bottle being provided with a peripheral rib 38 therearound to bulge the skirt 36 thereat and to form a relatively high pressure sealing area at such rib 38. After the ring 34 has been slipped over the end of the bottle 37, a suitable plastic cement indicated at 39 may be applied at one or more points around the skirt 36 before forcing the cap body 32 into place. This cap assembly further simplifies the bottle construction and enables a predetermined rotative relation between the cap assembly and the bottle as is desirable in instances wherein the bottle is of non-circular cross section.

The cap assembly disclosed in Fig. 4 comprises a cap body 20, which is the same as that illustrated in Fig. 2, threadably secured on a bottle 22 also the same as that shown in Fig. 2. The only difference between the Fig. 4 and Fig. 2 cap assembly is that in the former the ring member 40 extends all the way up to the orifice 27, the orifice 41 at the upper end of said ring being of smaller diameter than the orifice 27 whereby the liquid will issue from the bottle in a jet or stream form in the absence of the expansion chamber 26 between the discharge orifice portions 41 and 27. As in the Figs. 2 and 3 constructions, the vapor pressure of the liquid within the bottle will effect sealed engagement between the conical extension of the ring with the conical wall of the expansion chamber in the cap body.

Other modes of applying the principle of the invention may be employed, change being made as regards the details described, provided the features stated in any of the following claims or the equivalent of such be employed.

I, therefore, particularly point out and distinctly claim as my invention:

1. A cap assembly for dispensing a volatile liquid from a container to which said assembly is adapted to be secured, said assembly being formed with a discharge orifice therethrough which includes an intermediate expansion chamber portion and inlet and outlet orifices through which liquid from such container is adapted to enter and to be discharged from such portion respectively, the wall of such portion encircling such inlet orifice being substantially inclined with respect to a plane normal to the longitudinal axis of the discharge orifice to cause liquid to flow along such wall in a thinly spread out form to thereby facilitate volatilization of the liquid in such expansion chamber portion for building up pressure for the discharge of liquid and volatilized liquid mixture from such portion through such outlet orifice.

2. The cap assembly according to claim 1 further characterized in that there is a tubular insert in said cap assembly having a bore therethrough forming such inlet orifice through which the liquid enters the expansion chamber portion and having an end cut on a bias to define such inclined wall.

3. The cap assembly according to claim 2 further characterized in that the cap assembly comprises a cap body having a conical recess forming a wall of such expansion chamber portion opposed to the wall defined by the inclined end of said tubular insert, such outlet orifice through

which the liquid is adapted to be discharged from such expansion chamber portion being contained in said cap body at the apex of such conical recess, and a resilient packing ring surrounding said tubular insert and adapted to be clamped between said cap body and such container.

4. The cap assembly according to claim 3 further characterized in that said tubular member is adapted to be urged endwise into engagement with such conical recess into a position with such inlet orifice through said insert misaligned with respect to such outlet orifice portion at the apex of such conical recess.

WILBUR E. VENSEL.

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