This invention relates to packages of the type disclosed by the Loven et al. Patent 2,582,262 which issued January 15, 1952.

In this type of package a liquefied gas propellant, including an active ingredient, is contained in a container having an outlet closed by a valve connected to a swingable stem through which a passage is formed. The stem may be swung by finger pressure to open the valve and release the pressure on the propellant which then exerts through the stem, which may be designed to function as a nozzle, the passage through the stem connecting with the propellant through the valve.

This type of package involves the problem of preventing the stem from being inadvertently swung, or otherwise moved so as to open the valve, during shipping and merchandising. Another problem involved by this type is that when the stem is arranged to discharge upwardly the user's finger may become wet when it is used to swing the stem.

One object of the present invention is to produce an assembly providing adequate protection against inadvertent swinging of the stem of this type of package while at the same time providing an operator for use with the stem to protect the user's finger from being wet by the contents of the package. In other words, this object is to overcome the problems noted above. Another object is to provide an attractive and conveniently operated package of the fluid dispensing type in general. A further object is to attain the objectives noted without increasing the manufacturing cost of the package to an impractical degree.

Specific examples of this invention are illustrated by the accompanying drawings in which:

Fig. 1 is a partially sectioned view of a first example, this view showing the package as it is shipped and merchandised;

Fig. 2 is the same as Fig. 1 excepting that it shows only the upper portion of the device, and in this instance the view shows the package as it is used to dispense its contents;

Fig. 3 is an enlarged sectioned view showing a second example in the shipping and merchandising form;

Fig. 4 shows the example of Fig. 3 as the package is used to dispense its contents;

Fig. 5 is a sectioned view showing a third example in the shipping and merchandising form; and

Fig. 6 is the same as Fig. 5 excepting that it shows the package as it is used for dispensing.

It is to be understood that the liquefied gas, which may be Freon or the like, includes an active ingredient such as an insecticide, deodorant and the like, and that the liquefied gas propellant functions to dispense the active ingredient. In doing this the propellant itself is dispersed.

In the example shown by Figs. 1 and 2 the liquefied gas propellant is enclosed under pressure by a can having an upwardly domed can end 2 forming a wall surrounding the swingable stem 3 which connects with the valve which is opened when the stem 3 is swung by finger pressure. The valve construction is shown by Fig. 3 and will be referred to later. The wall formed by the can end 2 extends laterally from the stem 3 since this wall surrounds the stem and extends radially therefrom.

A cup-shaped cap 4 has a bottom 5 through which a hole 6 is formed to receive or pass the stem 3. This cap has a side wall 7 long enough to space the bottom 5 above the top end of the stem 3 when the cap 4 is placed in an inverted position over the stem with the top end or rim of the side wall 7 positioned towards the wall formed by the can end 2 and engaging this wall.

As shown by Fig. 1, the cap in its inverted position protects the stem 3 from contacting anything and being inadvertently swung. As shown by Fig. 2, when the cap is upright with the stem 3 inserted through the hole 6, the cap forms a valve stem operator protecting the user's fingers from being wet by any possible off-spray or dribble.

The described arrangement provides an attractive appearance both when the cap is in its shipping and merchandising position, that is, when the cap is in the dispensing position as shown by Fig. 2. The cross sectioned illustration of the cap shows that its bottom 5 is relatively thick around the hole 6 as compared to the latter's diameter. In other words, the cap is thickened centrally around the hole 6 so that the latter may be made somewhat longer than its diameter. Furthermore, the bottom provides an annular portion or rib 8 projects into the hole 6 and which is proportioned for a force fit on the stem 3. This stem 3 is made with an enlarged bottom portion 9 which the hole 6 fits with a substantially sliding fit, the portion 8 being uppermost when the cap is upright and properly locating the cap relative to the stem 3 by reason of the portion 8 engaging the top or shoulder of the enlarged bottom portion 9 of the valve stem.

The cap 4 is made as an integral molding of any of the available plastics which when in their final form are elastic but relatively rigid. The cap should be rigid enough to maintain its shape and properly perform its functions of protecting the valve stem 3 and permitting swinging of the valve stem when the cap is used as an operator. Since the cap is centrally thickened as described the hole is longer than the hole's diameter so as to provide a firm interconnection between the cap and valve stem without making the cap's wall comparably thick throughout, thus reducing the cap's bulk and cost.

In one form of the new device the cap has been a molding made of polyethylene. This plastic possesses a known as "elastic memory," meaning that when forcibly deformed, as it is when the cap is force fitted on the stem, it continually attempts to return to its original shape. This has the advantage that the relatively small annular rib 8 continually attempts to return to its original size it had prior to its being force fitted over the stem 3, whereby the cap remains permanently tightened on the stem when the cap is in its operating position as shown by Fig. 2. Furthermore, this permits the annular portion 8 to be made relatively short axially respecting the stem 3, so that the cap may be relatively easily pushed to its Fig. 2 position, whereby to retard inadvertently opening the dispensing valve while the cap is being forced to its operating position by the user. Other plastics than polyethylene have this "elastic memory" characteristic and may be used when their other physical characteristics are appropriate.

The domed can end 2 provides an annular raised portion 10 surrounding the valve stem 3 relatively closely and
which is substantially fitted by the side wall of the cap 4, when the latter is inverted as shown. The top rim of the cup-like cap 4 has a projection in the form of an annular inwardly extending flange or rib 11, and a raised portion 10 of the cap end has an annular recess 12 into which the flange or projection 11 snaps when the cap is inverted and applied as shown by Fig. 1. The relative diameters of the parts 10, 11, and 12 are proportioned to provide a firm snap action which firmly anchors the cap in Fig. 1 position. Since all of the parts of the cap are provided by an integral molding, here again a plastic having "elastic memory" has the advantage of providing maximum security. The snap action described is, of course, a force fit between the parts 10 and 11, the part 11 then snapping into the recess 12. This holding means for the cap is releasable in that rocking force applied to the cap unsnaps the parts.

Referring now to Figs. 3 and 4, it can be seen from Fig. 3 that the valve and valve stem construction is substantially the same as that shown by Fig. 9 of the Loven et al. Patent 2,582,562 and which, of course, is described by that patent. Furthermore, the cap construction is similar to that of the just mentioned Fig. 9, the cap end being closed in this instance by reason of the cap being of the drawn or seamless type, Figs. 1 and 2 showing the seamed type, and by having a recess or cup-like closure wall 13 clamped to its neck 14. This is provided by the cup-like valve head 15 pressed against the bottom of a flexible diaphragm 16 by means of a coil spring 17 with the parts assembled together by a spring cup 18 having its periphery clamped to the bottom of the diaphragm 16 by reason of the contour of the closure wall 13 which also clamps the top of the diaphragm 16. When the stem 3 is swung the valve head 15 is rocked on the bottom of the diaphragm 16 so that fluid may pass from inside the can, here marked 1a, through a passageway 19 and up through the orifice 20 in the tip of the hollow stem 3.

In the case of Figs. 3 and 4 the cap illustrated includes all of the parts previously described, they accordingly being numeralized the same with the letter a used for identification purposes. The main difference is that, due to the shape of the closure wall 13, the side wall 1a of the cap is made to fit inside of the annular raised portion provided by the contour of this closure wall 13. Furthermore, the recess 12a is in this instance formed by a depression formed in the side wall of the closure 13, while the projecting part 11a, on the cap wall 1a, is formed as one or more protruberances, rather than as the annular rib 11 of the first example.

It can be seen from Figs. 3 and 4 that this second example is used just about as described in connection with the first example. The principles are the same, the differences being due to the different kind of can end construction.

In the use of this invention it was found that some persons after properly applying the cap in its valve operating position continued to press down on the cap so hard as to unseat the valve head 15 by downward linear motion and result in inadvertent and premature discharge of the contents of the package. This difficulty is prevented by the form of the invention shown by Figs. 5 and 6. It can be seen from Figs. 5 and 6, in this third example, wherein the similar cap parts are numeralized as before and identified by the letter b, the cap’s side wall 7b is made to fit outside of the closure wall rim 21 clamped over the rim of the mouth 14b formed by the can of the type shown by Figs. 3 and 4. This rim 21 inherently provides the recess 12b corresponding to the recess 12 of the first example. Further, the cap is provided with the snap fitting element 11b corresponding to the first example’s part 11.

The annular rib 8b is shifted to the part of the cap forming the central portion of the hole 6b and the thicker portion of the cap around this hole and the base of the cap are proportioned so that the outside of the bottom of the cap engages the top of the rim 21 of the can wall while still preserving the bottom of the cup around the hole 6b well upwardly from the enlarged portion 9 of the valve stem 3. Therefore, no matter how hard the cap is pushed downwardly it is impossible to move the valve stem 3 downwardly so as to inadvertently unseat the valve head 15. The force fit of the rib 8b on the stem is inadequately firm to move the stem down during the rib’s force fitting.

The outside of the cap’s bottom is provided with an annular raised portion 22 which is engageable with the annular rim 21 to effect the above described action, and the raised portion 22 of the cap is of slightly larger diameter than the corresponding raised portion provided by the rim 21. The radial cross section of this rim 21 is externally convex in an upward direction, and the raised portion 22 of the cap also has a radially convex shape as to cross section. Thus the two convex forms interconnect when the cap is as shown by Fig. 6. The effect is that at least the inner peripheral portion of the cap’s raised portion 22 slants inwardly, and at least the outer peripheral portion of the can end’s raised portion formed by the rim 21 slants outwardly. Due to these slanting shapes swinging of the cap, with swinging of the valve stem 3, is possible while both the sliding portions 21 and 22 interengage when the cap is in its upright or operating position. In other words, at diametrically opposite points the part 22 is respectively sliding up-hill and down-hill on the rim 21 so that the cap may have a kind of rocking or swinging action. This action coincides with the swinging or rocking of the stem for the cap and stem to work cooperatively.

It can be seen from the foregoing that in all instances this invention provides what is in effect an invertible cap which functions to protect the valve stem during shipping and merchandising of the package and which may be placed upright on the stem by the use of the finger operator for the valve stem. The discharge is upwardly which is an advantage in some instances, such as when the package is of the deodorizer type.

I claim:

1. A dispensing valve assembly including a swingable stem having a passage therethrough, a valve connected to said stem to be opened by swinging of said stem to dispense fluid through the latter, a wall surrounding said stem and extending laterally therefrom, a cup-shaped cap having a bottom through which a hole is formed to receive said stem with a sliding fit and having a side wall long enough to space said bottom above said stem when said cap is placed in an inverted position thereover with said side wall’s top end facing towards said wall, and means for releasably holding said cap in said position, said cap being adapted to be positioned upright on said stem with the latter positioned through said hole in said cap’s bottom.

2. A dispensing valve assembly including a swingable stem having a passage therethrough, a valve connected to said stem to be opened by swinging of said stem to dispense fluid through the latter, a wall surrounding said stem and extending laterally therefrom, a cup-shaped cap having a bottom through which a hole is formed to receive said stem with a sliding fit and having a side wall long enough to space said bottom above said stem when said cap is placed in an inverted position thereover with said side wall’s top end facing towards said wall, and means for releasably holding said cap in said position, said cap being adapted to be positioned upright on said stem with the latter positioned through said hole in said cap’s bottom, said cap’s bottom around said hole having a greater thickness than the diameter of said hole so that the latter has a length which is greater than its diameter.

3. A dispensing valve assembly including a swingable stem having a passage therethrough, a valve connected
to said stem to be opened by swinging of said stem to
dispense fluid through the latter, a wall surrounding
said stem and extending laterally therefrom, a cup-
shaped cap having a bottom through which a hole is
formed to receive said stem with a sliding fit and having a
side wall long enough to space said bottom above said
stem when said cap is placed in an inverted position
thereover with said side wall's top end facing towards
said wall, and means for releasably holding said cap in
said position, said cap being adapted to be positioned
upright on said stem with the latter positioned through
said hole in said cap's bottom, said cap's bottom around
said hole having a greater thickness than the diameter
of said hole so that the latter has a length which is
greater than its diameter and said bottom providing a
portion in said hole proportioned for a force fit on said
stem.

4. A dispensing valve assembly including a swingable
stem having a passage therethrough, a valve connected
to said stem to be opened by swinging of said stem to
dispense fluid through the latter, a wall surrounding
said stem and extending laterally therefrom, a cup-shaped
cap having a bottom through which a hole is formed to
receive said stem with a sliding fit and having a side wall
long enough to space said bottom above said stem when
said cap is placed in an inverted position thereover with
said side wall's top end facing towards said wall, and
means for releasably holding said cap in said position,
said cap being adapted to be positioned upright on said
stem with the latter positioned through said hole in
said cap's bottom, said cap's bottom around said hole
having a greater thickness than the diameter of said hole
so that the latter has a length which is greater than its
diameter and said bottom providing a portion in said
hole proportioned for a force fit on said stem, said cap
being made of plastic having elastic memory.

5. A dispensing valve assembly including a swingable
stem having a passage therethrough, a valve connected
to said stem to be opened by swinging of said stem to
dispense fluid through the latter, a wall surrounding said
stem and extending laterally therefrom, a cup-shaped
cap having a bottom through which a hole is formed to
receive said stem with a sliding fit and having a side wall
long enough to space said bottom above said stem when
said cap is placed in an inverted position thereover with
said side wall's top end facing towards said wall, and
means for releasably holding said cap in said position,
said cap being adapted to be positioned upright on said
stem with the latter positioned through said hole in
said cap's bottom, said cap's bottom around said hole
having a greater thickness than the diameter of said hole
so that the latter has a length which is greater than its
diameter and said bottom providing a portion in said
hole proportioned for a force fit on said stem, said cap
being made of plastic having elastic memory.

6. A dispensing valve assembly including a swingable
stem having a passage therethrough, a valve connected
to said stem to be opened by swinging of said stem to
dispense fluid through the latter, a wall surrounding
said stem and extending laterally therefrom, a cup-
shaped cap having a bottom through which a hole is
formed to receive said stem with a sliding fit and having a
side wall long enough to space said bottom above said stem when said cap is placed in an inverted position thereover with said side wall's top end facing towards said wall, and means for releasably holding said

cap in said position, said cap being adapted to be position-
ioned upright on said stem with the latter positioned
through said hole in said cap's bottom, said wall being provided with an annular raised portion surrounding said stem and the outside of the bottom of said cap being pro-
vided with an annular raised portion engageable with said wall's raised portion and of slightly larger diameter than the latter, the interengaging surfaces of said portions being substantially convex in radial cross section.

7. A dispensing valve assembly including a swingable
stem having a passage therethrough, a valve connected
to said stem to be opened by swinging of said stem to
dispense fluid through the latter, a wall surrounding said
stem and extending laterally therefrom, a cup-shaped cap
having a bottom through which a hole is formed to re-
ceive said stem with a sliding fit and having a side wall
long enough to space said bottom above said stem when
said cap is placed in an inverted position thereover with
said side wall's top end facing towards said wall, and
means for releasably holding said cap in said position,
said cap being adapted to be positioned upright on said
stem with the latter positioned through said hole in
said cap's bottom, said wall being provided with an ann-
ular raised portion surrounding said stem and the out-
side of the bottom of said cap being provided with an
annular raised portion engageable with said wall's raised
portion and of slightly larger diameter than the latter, at
least the inner peripheral portion of said cap's raised
portion slanting inwardly and at least the outer peripheral
portion of said wall's raised portion slanting outwardly
so that said cap may swing to swing said stem while both said portions interengage when said cap is in said upright
position.

8. A dispensing valve assembly including a swingable
stem having a passage therethrough, a valve connected
to said stem to be opened by swinging of said stem to
dispense fluid through the latter, a wall surrounding said
stem and extending laterally therefrom, a cup-shaped cap
having a bottom through which a hole is formed to re-
ceive said stem with a sliding fit and having a side wall
long enough to space said bottom above said stem when
said cap is placed in an inverted position thereover with
said side wall's top end facing towards said wall, and
means for releasably holding said cap in said position,
said cap being adapted to be positioned upright on said
stem with the latter positioned through said hole in
said cap's bottom, said wall being provided with an annular
raised portion surrounding said stem and the outside of
the bottom of said cap being provided with an annular
raised portion engageable with said wall's raised portion
and of slightly larger diameter than the latter, at least
the inner peripheral portion of said cap's raised portion
slanting inwardly and at least the outer peripheral portion
of said wall's raised portion slanting outwardly so that
said cap may swing to swing said stem while both said
portions interengage when said cap is in said upright
position, said stem having a shoulder and said portions
being proportioned to space said cap's bottom above said
shoulder when said portions interengage.

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