AEROSOL DISPENSING CONTAINER FOR SEPARATELY STORED FLUIDS

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ABSTRACT

An aerosol dispensing container for separately packaging a liquid product and a liquid propellant which comprises an outer container body having an inner container body positioned within the outer container body. The inner container body has an exterior opening and the inner container body and outer container body are joined together at one end. An aperture in the inner container body provides flow communication between the inner and outer container bodies such that propellant vapor may flow from a liquid propellant through the aperture to impose a propellant vapor pressure above a liquid product while the liquid product and liquid propellant are separated from each other.

A mixing valve which includes a valve body having an internal valve passage and a valve stem that is movable within the internal valve passage. A spray orifice is provided which is in flow communication with the valve passage and closure means carried by the valve stem provide an opening or closing of the flow communication between the internal valve passage and the spray orifice. An opening in the valve passage permits the entrance of propellant vapor into the valve passage while a liquid conduit leading to the valve body has a conduit opening into the valve passage with the conduit opening being positioned substantially transversely to the flow path of propellant vapor through the internal valve passage.

Means are provided to bias the valve stem and the closure means to a closed position to block the flow communication between the valve passage and the spray orifice while movement of the valve stem away from its closed position permits the flow of propellant vapor through the valve passage and past the conduit opening to the spray orifice. The flow of propellant vapor past the liquid conduit opening causes a reduction in pressure within the valve passage which draws liquid product through the liquid conduit into the valve passage where the liquid product is mixed with propellant vapor and then discharged through the spray orifice. The conduit opening into the valve passage may be positioned upstream from the closure means carried by the valve stem with propellant vapor being free to enter the liquid conduit when the valve stem is in a closed position.

10 Claims, 7 Drawing Figures
AEROSOL DISPENSING CONTAINER FOR SEPARATELY STORED FLUIDS

BACKGROUND OF THE INVENTION

Many products are dispensed through use of aerosol containers which contain a liquid product and a liquid propellant in a separated condition. Such a container is shown, for example, in U.S. Pat. No. 3,482,738 to Bartels. In such a container, the liquid propellant may be separated from the liquid product by a flexible inner bag with the propellant vapor creating pressure to collapse the inner bag to discharge the liquid product.

Through the use of an inner bag which separates the liquid product and liquid propellant, interfacial mixing of the liquids is prevented. This alleviates foaming problems which can result when two liquids are in contact. Also, it permits the use of a liquid product and a liquid propellant which would be incompatible if they were in contact.

In the aerosol container of the Bartels U.S. Pat. No. 3,482,738, the propellant functions merely by generating pressure which collapses a flexible bag containing the liquid product. However, the propellant is not discharged from the aerosol container along with the product.

It is also known, however, to employ an aerosol container in which a liquid propellant and a liquid product are kept separate and are mixed on aspiration. A container of this type is shown in the Marand et al. U.S. Pat. No. 3,583,604. In the Marand structure, an inner container body contains a liquid propellant with the liquid product maintained separate from a liquid propellant contained within an outer container body which surrounds the inner body and is joined thereto at its neck portion.

In the usage of an aerosol container where a liquid propellant and liquid product are maintained separately and are mixed on aspiration, a partial vacuum may develop in the container body for the liquid product during dispensing of the product. To alleviate this problem, Marand et al. employ a valve structure which provides a return air passage into the container for the liquid product. As liquid product is drawn from the product container, air is, thereby, returned to the product container to prevent formation of a partial vacuum therein.

In use of an aerosol dispensing container, as illustrated by the aforementioned patents, the liquid product is frequently not uniformly dispersed in the form of a spray during aspiration of the product. If, for example, the product is a deodorant, it may be quite important that the product be uniformly dispersed in a spray form during its application. Otherwise, the concentration level of the applied product may be too high which could be quite painful to the user.

A further problem in the use of an aerosol dispenser container, as illustrated by the Marand et al. patent, is the creation of a partial vacuum within the liquid product container as the product is drawn from the container during usage. To alleviate the problem, Marand et al. employ a complex dispensing valve together with a double dip tube to provide three separate passages through the dispensing valve, one for propellant vapor, one for the liquid product being dispensed, and one for return of air to the liquid product container. The complexities of the dispensing valve illustrated by the Marand et al. make its cost relatively high which is a disadvantage for a high-production, low-cost item as required for an aerosol dispensing container.

SUMMARY OF THE INVENTION

In accord with the present invention, we have provided an aerosol dispensing container in which a liquid product and a liquid propellant are separately packaged to prevent contact between the two liquids. The dispensing container includes an outer container body and an inner container body positioned within the outer container body. The inner and outer container bodies are joined together at one end and an aperture is provided in the inner container body. The aperture provides flow communication between the inner container body and the outer container body for propellant vapor to impose a propellant vapor pressure above the liquid product. The propellant vapor pressure above the liquid product assists in the aspiration of the liquid product through a spray orifice. Also, however, the aperture provides a vapor pressure within the product container to prevent formation of a partial vacuum within the product container during usage.

Preferably, a plurality of apertures are provided in a narrowed neck portion of the inner container body. The apertures may be uniformly spaced about the circumference of the neck portion to provide uniform flow of propellant vapor through the apertures. The apertures are of a size which permits the flow of propellant vapor while inhibiting the flow of liquid product if, for example, the container is in an inverted position.

In a combined form, the aerosol dispensing container may include a valve means which is positioned in an exterior opening from the inner container body. A fluid conduit is provided which leads to the valve means with the conduit having an opening into an internal valve passage which is open to the inner container body. A spray orifice is provided in communication with the valve passage and a closure member is positioned between the valve passage and spray orifice. The closure member is movable from a closed to an open position to provide communication between the valve passage and spray orifice. On movement of the closure member to an open position, propellant vapor flows through the valve passage past the fluid conduit opening which is positioned transversely to the flow of propellant vapor. This causes a reduction in pressure within the valve passage with product liquid, thereby, being drawn into the valve means through the liquid conduit to mix with the propellant vapor. The mixture is then expelled through the spray orifice.

The liquid conduit opening into the valve passage is preferably positioned upstream from the closure member, i.e., between the closure member and the inner container body. Thus, propellant vapor is free to enter the internal valve passage and to flow into the liquid conduit even when the valve means is closed. This equalizes the pressure within the fluid conduit to prevent the formation of a liquid leg within the conduit. Thus, when the valve means is moved to its open position, the liquid product is uniformly admixed with propellant vapor in forming a spray discharge.

THE DRAWINGS

In illustrating the invention, reference is made to the accompanying drawings in which:

FIG. 1 is a partial side sectional view of an aerosol dispensing container with an inner container body posi-
tioned within an outer container body to separate a liquid propellant from a liquid product;

FIG. 2 is a detailed side sectional view of the dispensing valve used in the aerosol dispensing container shown in FIG. 1.

FIG. 3 is a side sectional view of the aerosol dispensing valve of FIG. 2 with the valve moved to an open position for dispensing liquid product in the form of an aerosol spray;

FIG. 4 is a bottom view taken along the line 4—4 of FIG. 2 to illustrate a slot in the valve stem which permits the passage of propellant vapor into an internal valve passage;

FIG. 5 is a partial sectional view of another embodiment of the invention in which a liquid product is dispensed by being drawn through a liquid conduit passing through a side opening in an inner container body;

FIG. 6 is a top view taken along the lines 6—6 of FIG. 5 to illustrate the position of an external valve for addition of a liquid product through a side wall of the outer container body, and

FIG. 7 is a bottom view taken along the lines 7—7 of FIG. 5 illustrating the position of a valve in the bottom of the outer container body for injecting a liquid propellant into the inner container body.

DETAILED DESCRIPTION

As shown in FIG. 1, an aerosol container 2 is formed from an outer container body 4 and an inner container body 6. The bottom of the container body 4 may be closed by a container bottom 8 joined to the container body 4 through a conventional double seam 7.

A valve 9 of conventional construction in the bottom 8 may be used for addition of a liquid propellant 11 which is separated from a product liquid 13 by the inner container body 6. A container top 10, which may be joined to the wall of the outer container body 4 by any suitable means, includes a neck portion 14 positioned in contiguous relation to a neck portion 12 of the inner container body 6.

A valve, generally designated as 16, is positioned at the top of the inner container body 6 and includes a liquid conduit 18 which extends from the valve 16 into the product liquid 13. A plurality of holes or apertures 20 are positioned uniformly about the circumference of the narrowed neck portion 12 of the inner container body 6 to permit the flow of propellant vapor from the liquid propellant 11 into the inner body 6 to impose a propellant vapor pressure above the liquid product 13.

In utilizing the aerosol dispensing container 2 of FIG. 1, it is essential that the propellant vapor be compatible with the product liquid. As an example, the liquid product is preferably in the form of an aqueous system while the propellant is a hydrocarbon propellant such as butane, propane, or isobutane which is relatively insoluble in the liquid product and is lighter than the liquid product.

Turning to FIG. 2, the inner container body 6 has a deformable lip 22 which defines an external opening 30. In assembling the aerosol dispensing container 2, the inner container body 6 may be conveniently snapped in place by deforming the lip 22 so that it snaps over the neck portion 14 of the outer container body 4. As shown, the container top 10 includes a raised cap portion 24 which encloses a plug member 26 and a seal member 28. The plug member 26 and seal member 28 may collectively be referred to as the valve body.

An internal valve passage 34 within the plug member 26 accommodates a valve stem 32 which is reciprocable within the passage. A liquid passage 29 through the plug member 26 terminates at a liquid conduit opening 33 which is positioned transversely with respect to the flow path of propellant vapor through the internal valve passage 34. A stem 31 extending from the side of the plug number 26 provides the exterior opening for the liquid passage 29 and the liquid conduit 18 may be fixed in place by securing it over the stem 31.

The valve stem 32 is normally held in a raised position, as shown in FIG. 2, by a coil spring 38 which bears against a shoulder 36 formed at the bottom of the internal valve passage 34. The valve stem 32 is slidably supported within a lower slide opening 40 and an upper slide opening 42 and an enlargement or closure member 44 on the valve stem 32 bears against the bottom surface of the seal member 28 when the valve stem 32 is in its raised position. This provides a closure which prevents flow of propellant vapor past the contact area between the enlargement 44 and seal member 28. As shown, the upper portion of the coil spring 38 bears against the undersurface of the enlargement 44.

A longitudinal passage 46 is formed within the valve stem 32 with a side opening 44 passing through the wall of the valve stem 32 into the longitudinal passage 46. A spray head, generally designated as 50, is positioned at the top of the valve stem 32 and includes a body portion 52 having a recess 54 therein and a passage 56 which leads to a spray nozzle 58. The recess 54 is sized to provide snug fitting engagement between the recess and the upper portion of the valve stem 32.

With the valve stem 32 biased upwardly by the coil spring 38, as shown in FIG. 2, the valve is in a closed position. A slot 35 in the outer surface of the valve stem 32 permits the flow of propellant vapor into the valve passage 34, even when the valve is closed. With the valve closed, the arrows shown in FIG. 2 depict the flow of propellant vapor upwardly through the slot 35, into the valve passage 34, and then into the liquid passage 29 and liquid conduit 18. Since the pressure of the propellant vapor within the liquid conduit 18 is the same as the pressure of propellant vapor over the surface of the product liquid 13, the pressure within the conduit 18 is equal to that in the inner container body 6. Thus, the level of liquid product within conduit 18 is maintained at the same level as the level of liquid product 13 in the inner container body 6.

FIG. 3 illustrates the functioning of the dispensing valve when the spray head 50 is pushed downwardly, e.g., by the user's finger, in the direction of the arrow A. When the spray head 50 is depressed downwardly, the undersurface of the spray head body 52 bears against the upper surface of the cap 24 and the spray 38 is compressed. Also, the side opening 48 is moved downwardly within the internal valve passage 34 so that propellant vapor is free to enter the side opening. The propellant vapor then moves, as shown by the arrows in FIG. 3, into the side opening 48 and up the longitudinal passage 46 for discharge through the spray nozzle 58. As the propellant vapor moves past the liquid conduit opening 33, which is positioned in a generally transverse direction to the flow of propellant vapor, there is a reduction in pressure at the liquid conduit opening which draws liquid product up the liquid con-
duit 18 and into the valve passage 34 where it is mixed with the propellant vapor. The mixture of propellant vapor and liquid product is then conveyed upwardly to the spray nozzle 58 for ejection in the form of a uniform dispersion of the liquid product in admixture with the propellant vapor.

FIG. 4 taken along lines 4—4 of FIG. 2 illustrates the cross sectional configuration of the slot 35 in the surface of the valve stem 32. As shown, the slot 35 may conveniently be formed as a V-shaped notch in the outer surface of valve stem 32.

In the aerosol dispensing container illustrated in FIGS. 1—4, the liquid product 13 is maintained within the inner container body 6 and is separated from the liquid propellant 11 within the outer container body 4. In this embodiment of the invention, the propellant conduit 18, which may, for example, be made of a flexible plastic material, is positioned within the inner container body 6. The liquid product 13 and liquid propellant 11 are, thus, separated by the inner container body 6. However, as the liquid propellant 11 vaporizes, the propellant vapor is free to pass through the holes or apertures 20 to impose a propellant vapor pressure above the liquid product 13.

The general principles of the invention, illustrated in FIGS. 1—4, may also be utilized in a second embodiment of the invention shown in FIGS. 5—7. With reference to FIG. 5, an aerosol container 60 includes an outer container body 62 and an inner container body 64 which are joined at their neck portions in the same manner described previously. A container bottom 66 may be joined to the outer container body 62 through a conventional double seam 63 with the inner container body 64 including a stem 68 that is joined to a valve 70 of conventional design protruding through the container bottom 66.

A liquid propellant 74 may be introduced into the inner container body 64 through the valve 70 and stem 68. A liquid product 72 within the outer container body 62 may be introduced into the outer body through a valve 82 of conventional design positioned in any convenient location in the wall of outer container body 62. A dispensing valve, generally designated by numeral 76, and having a spray head indicated generally by numeral 86, may be positioned in an external opening into the inner container body 64. The illustrated valve 76 and spray head 86 have the same configuration as previously described for the valve 16 and spray head 50 shown in FIGS. 1—4.

A liquid conduit 78 is connected to the valve 76 in the same manner described previously, and the conduit 78 passes through an aperture 80 in the inner container body 64 to extend into the product liquid 72 within the outer container body 62. A plurality of holes 84 are positioned about the neck portion of the inner container body 64. Thus, propellant vapor from the liquid propellant 74 is free to pass through the holes 84 to impose a propellant vapor pressure above the liquid product 72.

As described, it can be seen that the embodiment of the invention shown in FIG. 5 functions in substantially the same manner as the embodiment shown in FIGS. 1—4. The point of difference is that the liquid propellant 74 is within the inner container body 64 while the liquid product 72 is within the outer container body 62 in the embodiment of FIG. 5. However, in the embodiment of FIG. 1, the liquid product 13 is maintained within the inner container body 6 while the liquid propellant is within the outer container body 4.

In each embodiment, the liquid propellant is separated from the liquid product while propellant vapor is free to pass into the region above the liquid product to impose a propellant vapor pressure above the liquid product. Also, in each embodiment, the propellant vapor may be free to pass into an internal valve passage within the dispensing valve and into a liquid conduit leading to the dispensing valve to equalize the pressure within the liquid conduit. This arrangement assists in providing a sprayed mixture of propellant vapor and liquid product which is substantially uniform and does not vary from one application to the next depending upon how much product liquid may have been left in the liquid conduit following the previous application. Further, in each of the embodiments, the flow path for propellant vapor within the dispensing valve is approximately transverse to the liquid conduit opening into the internal valve passage. This arrangement provides for more uniform aspiration of the liquid product by a reduction in pressure caused by movement of the propellant vapor past the liquid conduit opening.

The position of the exterior valve 82 with respect to the dispensing valve 76 is illustrated in FIG. 6 which is a top view taken along the lines 6—6 of FIG. 5. As shown, the valve 82 may be positioned in the neck portion of the wall of the outer container body 62 adjacent the top of the dispensing container 60. With the aerosol dispensing container 60 maintained in a normally upright position, the valve 82 is, thereby, more protected from damage during shipment and storage of the container 60.

Similarly, as shown in FIG. 7, which is a bottom view taken along the lines 7—7 and FIG. 5, the valve 70 may be positioned at the center of the container bottom 66. With the container bottom 66 having a domed configuration, the valve 70 may, thereby, be recessed and protected from accidental damage during shipment and storage.

We claim:
1. An aerosol dispensing container for separately packaging a liquid product and a liquid propellant comprising:
an outer container body;
an inner container body positioned within said outer container body;
said inner container body having an exterior opening;
said inner container body and said outer container body being sealed together adjacent said exterior opening;
an aperture in said inner container body providing flow communication for the passage of propellant vapor between said inner and outer container bodies;
said aperture being positioned adjacent the seal between said inner and outer container bodies;
said inner container body being closed to flow communication with said outer container body except through said aperture;
valve means sealingly positioned in said exterior opening;
said valve means having an open and a closed position;
said valve means providing an internal passage which communicates with an upper region of said inner container body;
3,869,070

7 a dip tube leading from said valve means to convey liquid product to said valve means;
said dip tube being closed to flow communication with the liquid propellant such that the liquid
product is maintained separate from the liquid propellant as the liquid product is conveyed to said valve
means through said dip tube;
said dip tube having an upper end opening in communication with said internal passage;
said upper end opening positioned with respect to said internal passage such that propellant vapor
flows past said upper end opening with said valve means in its open position,
whereby, with said valve means in its closed position
and said container charged with liquid and
liquid propellant, propellant vapor passes through
said aperture to impose a propellant vapor pressure
above the liquid product while the liquid product
is separated from the liquid propellant and, with
said valve means in its open position, propellant
vapor flows into said internal passage from said
upper region of the inner container body while li-
quid product is drawn up through said dip tube by
flow of propellant vapor past said upper end open-
ing with the liquid product and propellant vapor
being mixed in said valve means and then being dis-
charged through said open valve means.

2. The aerosol dispensing container of claim 1
wherein
said inner container body includes a narrowed neck
portion adjacent said exterior opening;
said outer container body includes a narrowed neck
portion;
said inner and outer container bodies are sealed to-
gether at their narrowed neck portions, and
the aperture in the inner container body is positioned
in the neck portion of the inner container body.

3. The aerosol container of claim 2 including a plu-
rality of apertures in the narrowed neck portion of said
inner container body, and
said apertures being spaced circumferentially about
the neck portion of the inner container body.

4. The aerosol container of claim 1, wherein said
inner container body is flexible.

5. The aerosol container of claim 1 including
valve means in said outer container body for inser-
tion of a liquid propellant into the outer container
body.

6. The aerosol dispensing container of claim 1 includ-
ing:
a spray orifice in communication with said internal
passage;
a closure member positioned between said passage
and said orifice;
said closure member being movable from a closed to
an open position to provide controlled flow com-
unication between said passage and said orifice, and
said upper end opening of said dip tube in communi-
cation with said internal passage at a point posi-
tioned upstream from said closure member such
that propellant vapor is free to flow from said
upper region into said internal passage and into
said upper end opening with said closure member
in its closed position.

7. The aerosol container of claim 6, including
a movable stem in said valve means;
an axial opening in the lower portion of said stem to
permit flow of propellant vapor into said internal
valve passage, and
said closure member cooperating with said stem in
controlling the flow communication between the
internal passage and spray orifice.

8. The aerosol container of claim 1 including a lower
region within said inner container body;
said dip tube having a lower end opening, and
said lower end opening positioned within said lower
region.

9. The aerosol container of claim 1 including a lower
region within said outer container body;
said dip tube having a lower end opening, and
said lower end opening positioned within said lower
region.

10. The aerosol container of claim 9 including
valve means in said outer container body for inser-
tion of a liquid product into the outer container
body.

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