REUSABLE AEROSOL DISPENSER

Inventor: Hugh R. King, 1075 First Ave., New York, N.Y. 10022

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Primary Examiner—Robert B. Reeves
Assistant Examiner—Thomas E. Kocovsky

ABSTRACT

A refillable and rechargeable aerosol dispenser adapted for home filling and pressurization as well as refilling and repressurization by the consumer. A removable closure member is provided for sealing off a product-fill opening located in the base of the dispenser container. The removable closure location provides (a) that no modification to conventional aerosol neck structures or dispensing valve assemblies need be made, and (b) that conventional aerosol container design can be simplified by inserting the valve body through the open base and affixing the valve body directly to the container neck. The closure member is readily secured to or removed from the container by simply operated means of either a screw-on closure or a snap-on closure. In the snap-on closure the internal gas or vapor pressure in the container is utilized to secure the closure member in place and thus seal the dispenser container. In one embodiment, the propellant fill valve is secured directly to the closure member to permit pressurization through the base of the container, allowing the top dispensing valve to be of the toggle action type for the dispensing of heavy foams and whips. An optional plunger can be inserted through the base opening after the container is inverted and filled with a viscous or semi-solid product. After securing the closure member to the container, the container is pressurized by connecting a propellant bomb to the propellant fill valve so as to charge the chamber enclosed by the plunger. Actuation of the top dispensing valve causes the plunger to be driven upwards, thereby ejecting the product.

4 Claims, 8 Drawing Figures
REUSABLE AEROSOL DISPENSER

FIELD OF THE INVENTION

This invention relates to the general area of refillable and rechargeable pressurized containers, in particular to aerosol dispensers such as are conventionally used by the consumer to eject various products in spray, foam, or semi-solid and viscous form, but so modified as to permit initial home filling and pressurization as well as refilling and repressurization.

DESCRIPTION OF THE PRIOR ART

It is known that several attempts have been made to design a commercially feasible reusable aerosol dispenser, but all efforts in this direction have heretofore involved an elaborate modification of the standard and accepted aerosol container such as to require cumbersome and relatively expensive additions to the aerosol valve assembly and/or container itself. Where container modification itself has not been extensive, all prior art on closure devices have involved complex and multiple unit retaining rings and valve cups, making the effort and skill in handling such devices far in excess of that normally encountered in other household container closures. Moreover, virtually all designs heretofore of reusable aerosol dispensers have been limited to the spray type without regard to the ejection of heavy foams, whips, or highly viscous and semi-solid products. Finally, prior art indicates no concern over the safe and non-explosive escape of gases in the event of accidental or forced removal of the closure before depressurization.

SUMMARY OF THE INVENTION

It is an object of this invention to provide a simple modification of the conventional pressurized container which makes the manufacture of a reusable home aerosol well within the capabilities of current mass aerosol can production techniques and machinery.

It is another object to provide a container which requires no modification whatsoever to current and standard valves, valve assemblies, or conventional methods of affixing the valve assembly to the container.

It is another object to provide an aerosol dispenser wherein the pressurization of the container is effected by a simple transfer of propellant from a standard and sealed aerosol bomb to the reusable container through conventional valve bodies and/or valve assemblies.

It is another object to provide an aerosol dispenser which facilitates access to the interior of the empty or depressurized container as well as facilitating closure of such container after filling, such that the consumer need handle only a single-unit capping device and with no more difficulty or skill than is common in the closure of other standard household containers.

It is another object to provide an aerosol dispenser having a closure member which can not be accidently or forcefully removed without a prior release of gas or vapor pressure in the container.

It is another object to provide an aerosol dispenser which utilizes a container permitting different but standard valve bodies or assemblies to be affixed to the container during manufacture so as to provide the consumer with the option of dispensing foams, whips, sprays, or viscous and semi-solid products according to the product or usage desired.

It is another object to provide an aerosol dispenser which permits simplification of aerosol can manufacture by extruding or compacting of the basic container in a form which allows the standard valve body to be readily affixed directly to the container.

It is a further object to provide a small purse or travel size reusable aerosol dispenser, for such products as shaving foam and hair spray, which can be economically utilized without the excessive consumer expense that would have heretofore been incurred in the short-term use and disposal of so limited-a-capacity sealed aerosol unit.

These and other objects, which will become apparent from the detailed disclosure and claims to follow, are achieved by the present invention which provides a reusable aerosol dispenser adapted for filling and pressurization by a consumer, including a container having an opening at an end thereof, and a removable closure member for closing off said container opening and adapted with sealing means forming an air-tight seal of the container opening. The closure member is removably secured to the container in sealing engagement therewith, such closure member being readily removable to permit filling or refilling of the container through the opening with the desired product. An aerosol dispensing valve is supported at an end of the container and can additionally function as a propellant fill valve. A propellant transfer device connects the stem of the aerosol dispensing valve in fluid communication with the valve stem of a propellant charging bomb whereby a charging propellant is transferred from the charging bomb to the container, the charging bomb being disconnected from the container when pressure is substantially equalized between the charging bomb and the container.

In one embodiment, a screw-on closure member is provided with a gasket seal which is pressed in sealing engagement with the container as such closure member is secured to the container. In another embodiment, a snap-on closure member includes a gasket seal assembly which acts to seal the opening as a result of the internal gas or vapor pressure in the container, this internal pressure also acting to secure the closure member to the container. In still another embodiment, a propellant fill valve is secured to the closure member to permit pressurization directly through the base of the container. In certain applications, a plunger may be inserted through the base opening after the container is inverted and filled with a viscous or semi-solid product. After securing the closure member to the container, the container is pressurized by connecting a propellant bomb to the propellant fill valve so as to fill a propellant chamber enclosed by the plunger. An aerosol dispensing valve located at the top of the container is actuated to cause the plunger to be driven upwards, thereby ejecting the product through the dispensing valve.

BRIEF DESCRIPTION OF THE DRAWINGS

In the accompanying drawings:

FIG. 1 is a perspective view of a reusable aerosol dispenser made according to the present invention, cut-away to reveal a screw-type bottom closure member, and with a propellant aerosol bomb shown in position for pressurization of the dispenser;
FIG. 2 is an enlarged longitudinal section of the closure member and container, taken substantially along the line 2—2 indicated on FIG. 1; FIG. 3 is an enlarged longitudinal section of the means for interconnecting the propellant bomb valve with the dispensing or propellant fill valve, taken substantially along the line 3—3 indicated on FIG. 1; FIG. 4 is an enlarged horizontal section of a portion of the closure member taken substantially along line 4—4 indicated on FIG. 2; FIG. 5 is a perspective, cut-a-way view of another aerosol configuration made according to this invention and illustrating its adaptation to the pressurized ejection of viscous and semi-solid products; FIG. 6 is an enlarged longitudinal section of the base portion of the aerosol dispenser, taken substantially along the line 6—6 indicated on FIG. 5; FIG. 7 is a perspective cut-a-way view of the bottom portion of a reusable aerosol, illustrating an alternate capping or closure member applicable to containers constructed according to this invention; and FIG. 8 is an enlarged longitudinal section of the closure member and container, taken substantially along the line 8—8 on FIG. 7.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIGS. 1 and 2 designates a container of the general configuration and material common to cans manufactured for the aerosol industry, though not limited to this material, with the exception of a slightly thickened and threaded base indicated at 12 in FIG. 1 and in more accurate proportion to the body of the container 10 shown in FIG. 2. Container 10 includes a rolled neck 13 and an aerosol valve cup assembly 14 including a dip-stick 14a, affixed by conventional methods to the neck 13 during manufacture.

A base closure plug 15 molded of rigid plastic, or alternately, stamped out of metal with rolled threading, is screwed in or out of the base 12 as indicated to provide access to the empty or depressurized interior of container 10 and/or to seal the container 10 for pressurization. A gasket seal 16 is affixed as indicated to the closure plug 15 to provide secure closure of the container 10. The outer edge 17 of the closure plug 15 extends so as to be flush with the outer wall of the container 10 and this edge 17 is knurled or otherwise roughened to provide an easy manual opening and closing.

A conventional sealed aerosol propellant bomb 20 is filled during manufacture with the appropriate propellant and is utilized for direct pressurization of the container 10 through a plastic transfer tube 22 affixed by pressure fitting to the valve 23 of the propellant bomb 20 at the valve stem 23a. Also affixed, or snapped-on, to the propellant bomb 20 is a thin plastic ring 24 that snaps over or on the cup rings 25a and 25b, respectively, of the propellant bomb 20 and the container 10.

The transfer tube 22 is so designed, as illustrated in FIG. 3, that the downward pressure exercised in the snapping of the propellant bomb 20 onto the container 10 by means of the plastic ring 24 will depress both the stem 23a and thus open the valve 23 of the propellant bomb 20, and also depress the valve stem 26a of the valve 26 of container 10, thus allowing the transfer of propellant from the bomb 20 to the container 10. When the gas or vapor pressure between the container 10 and the propellant bomb 20 is equalized, the transfer of propellant will cease and the propellant bomb 20 can be snapped off. A standard aerosol actuator is then placed on the stem 26a of valve 26 and the container 10 is ready for use.

Before such pressurization, of course, the container 10 will have been filled with the desired product and the closure plug 15 properly mounted. Since the product fill will occupy the greater portion of the interior of the container 10, it is apparent that only a small amount, as is desired, of propellant will transfer from the bomb 20 to the container 10 before the aforesaid equalization of pressure completes the transfer.

A small channel 27, indicated in FIG. 4 in horizontal section, is cut or molded into the threaded side of closure plug 15 to provide a safety exit for the pressurized vapor or propellant in the event the closure plug 15 is unsealed accidentally or forcefully while the container 10 is still under pressurization. Any breaking of the aforesaid seal or unseating of the gasket 16 will instantaneously release through the channel 27 any internal vapor or gas pressure before the closure plug 15 can be completely uncrewed or removed, thus preventing any violent or explosive ejection of material. This channel 27 also provides an open port between the interior of the container 10 and the outside air until the closure plug 15 is securely screwed in and gasket is seated, thus preventing the pressurization of the container 10 until the closure plug 15 is properly secured.

Referring now to FIGS. 5 and 6, there is shown another embodiment of an aerosol container 30 made according to this invention, wherein the bottom closure plug 31 includes a propellant fill valve 32 such that the container 30 is pressurized through the base rather than through the top as is the case in the device shown in FIG. 1.

Container 30 is illustrated as containing a plastic plunger 33 which is inserted through the open bottom end of the container 30 before the setting of the base closure plug 31 and after a fill of viscous or semi-solid product in the upper portion 34 of the container 30. After closure, the container 30 is pressurized by snapping on a standard propellant bomb 20 by means of the heretofore described plastic ring 24, with the propellant bomb 20 now held in an upright position as illustrated so that only gas or vapor pressure, as opposed to liquified propellant, is transferred into chamber 35 enclosed by the plastic plunger 33. A bellows-type plunger arrangement, not shown, can be used to insure complete segregation between the propellant chamber and the dispensed product. Since in this configuration virtually no propellant escapes during use of the container 30, it is unnecessary to transfer any liquified propellant such as is required to maintain vapor pressure in the configuration of container 10 shown in FIG. 1, where the propellant is mixed with and propelled with the product. In the container 30 shown in FIG. 5, the vapor pressure created in chamber 35 under pressurization is sufficient to force the plastic plunger 33 upwards in container 30 when the standard toggle action valve 36 is manually opened by displacement from the vertical, thus ejecting the viscous product in portion 34 through the orifice 37 in valve 36.

The vapor pressure transfer from the propellant bomb 20 to the aforesaid chamber 35 is effected through the valve 23 of the propellant bomb 20 connected to the valve 32 of the container 30 by means of
a simple plastic transfer tube 22 hereinbefore described as attached to the propellant bomb 20. Also, as previously described in connection with the device of FIG. 1, the pressure exercised in the snapping of the propellant bomb 20 onto the container 10 or container 30 by the plastic ring 24 is sufficient to effect the desired propellant transfer.

It will be noted that both the body of the toggle action valve 36 and the body of the propellant transfer valve 32 are standard assemblies readily available in the aerosol industry. In both cases however, these valves are directly seated in the container 30 housing. This has the advantage of eliminating the labor and materials otherwise required in first seating the valve body in a valve cup, as is conventionally done, and then affixing the valve cup to the container housing. The transfer valve 32 is simply snap-forced into the plastic housing 38 of the closure plug 31. If the plug 31 is of stamped metal, then valve 32 is clamped in by the conventional method of seating this type of valve into the standard valve cup. Similarly, the toggle action valve 36 is force-seated into the open hole 39 at the top of the container 30 in the same manner as this type valve is conventionally force-seated into a standard valve cup.

The result of this economy and simplification is that the total of the container 30 upper housing, apart from the closure plug 31, can be stamped out or extruded in one piece, eliminating the conventional rolled-neck operation, so that it is ready for the simple insertion of the valve 36. This has not been possible heretofore since the insertion of the valve body must be made from inside the container top, which is impossible in the conventional sealed bottom can.

The purpose of using a toggle action valve, such as 36 in container 30, is that these valves provide an orifice 37 of sufficient size to permit the ejection of semi-solid and heavily viscous products, as opposed to the standard spray and foam valves, such as 23 or 32. It is important to note, however, that container 30 can also be operated without the use or insertion of the plastic plunger 33, in cases where a large-orifice, toggle action valve 36 is desired for the injection of a heavy foam or whip. In this case, however, where the propellant is mixed with and ejected with the product, the vertical positions of the propellant bomb 20 and the container 30 would be reversed from the position illustrated during pressurization with both in and upside-down position, in order to effect a transfer of liquified propellant as well as vapor.

It is apparent from the foregoing that this invention also allows in another application the complete elimination from container 30 of the toggle valve assembly 36 and the closure of hole 39, such that both pressurization and aerosol fluid ejection takes place through standard valve 32, so that the closure plug 31 becomes in effect the cap or top of container 30.

Having described the application of this invention to, first, the construction of a reusable home aerosol dispenser for the spray and foam ejection of various liquid products, illustrated in FIGS. 1 through 4 by dispenser 10, and secondly, the construction of a reusable home aerosol dispenser for the ejection of semi-solid, viscous and heavy whip products, illustrated in FIGS. 5 and 6 by dispenser 20, reference is now made to FIGS. 7 and 8 illustrating another type of closure and closure method which is applicable to and can, if desired, be substituted for the screw-type closure 15 in container 10 and the screw-type closure 31 in container 20. It is to be noted that while the device shown in FIGS. 7 and 8 represent the aforesaid closure as applied to the bottom of a container 40, it should be apparent that said closure is equally adaptable to a top closure of the aerosol container.

The reference numeral 40 generally denotes an aerosol container generally of the types shown in FIGS. 1 and 5, but having the removable closure embodied in the cut-away bottom view of container 40. The container 40 includes a narrow, turned-in flange 44 at the open end through which a tubular gasket 42 fits when the cap 41 is placed in a position of closure, said cap 41 being firmly affixed to the lower end of gasket 32. The outside diameter of gasket 42 is equal to the diameter of the opening in container 40 defined by flange 44 with the exception of a raised circumferential sealing bead 45 protruding from the outer surface of gasket 42, such that this bead 45 must be depressed to force the gasket fully through flange 44 during closure, said force causing the gasket 42 with its affixed cap 41 to snap onto container 40. Gasket 42 has mounted within it a tubular gasket support piston 43 with a flat disc top 46 that extends over and is secured to the rim of gasket 42, said top 46 having a diameter also equal to such outside diameter of gasket 42 so that insertion can be made through the opening of flange 44.

Container 40 is designed to narrow or decrease in diameter at point 47 so as to cause such outside rim of gasket 42 to abut or be contiguous with the inner surface of container 40 at said point 47. The tubular body of gasket support piston 43 fits snugly but freely within gasket 42 such that when propellant pressure indicated by arrow 48 inside container 40 presses on the upper surface of piston top 46, forcing the piston to the position indicated by dotted line 49, then the upper portion of gasket 42 will buckle and be compressed into the area defined by dotted line 50, said compression thus providing a solid seal between gasket 42 and the inner face of flange 44 as well as prohibiting the further movement or expulsion of the cap 41 and gasket 42 assembly from container 10. The movement of piston 43 to position 49 restricts the compression of sealing bead 45 so that said bead 45 provides sufficient resistance against expulsion through flange 44 to result in the aforesaid buckling and compression of gasket 42 during the start of pressurization, which in turn prevents any subsequent compression or unsnapping of bead 45 under increased and final pressurization. When the propellant pressure is removed from within the container 40, the gasket 42 recovers its original tubular form so that the cap and gasket assembly can be readily unsnapped.

It is to be pointed out that applicant's technique of utilizing the internal aerosol pressure both to seal the container and simultaneously to secure a removable closure for said container, is not intended to be restricted to the particular gasket or container construction herein illustrated. Rather, it should be apparent that any and all applications of the aforesaid technique to pressurized containers fall within the scope of this invention.

Finally, it is important to note that conventional aerosols are constructed of metal rather than rigid plastic largely because of the problems of container shelf-life under pressurization due to the porosity breathing of plastic. However, since most applications of this inven-
tion are designed for relatively short-term and intermittent home use and re-use, there appears to be no reason from the functional standpoint, why containers made according to this invention could not be molded from appropriate plastic materials.

Although the above description is directed to a preferred embodiment of the invention, it is noted that other variations and modifications will be readily apparent to those skilled in the art and, therefore, may be made without departing from the spirit and scope of the present invention.

What is claimed is:
1. In combination, a reusable aerosol dispenser adapted for filling and pressurization by a consumer, and a charging device for pressurizing said dispenser, comprising:
   a. a container having an opening at an end thereof;
   b. a removable closure member for closing off said container opening, said closure member adapted with sealing means forming an air-tight seal of said container opening;
   c. securing means for removably securing said closure member to said container and in sealing engagement therewith; said closure member being removable to permit filling of the container through said opening with the desired product, said closure member and said securing means constituting a single unit capping device for said container;
   d. said closure means and said securing means comprising an internal flange extending annularly around said container opening, a flexible tubular gasket adapted for fitting within said opening and adjacent said internal flange, an annular retaining cap affixed to one end of said tubular gasket which provides an outwardly turned shoulder for said tubular gasket, a closure top being affixed to the other end of said tubular gasket, an annular sealing bead on said tubular gasket extending around the outer circumference of said tubular gasket and located inward from the ends of said gasket, said annular sealing bead being adapted to be depressed to permit said bead to be forced past the internal flange on said container to a position whereby said annular sealing bead snaps into position and is held by said internal flange, with said internal flange fitting between said annular sealing bead and said retaining cap whereby the internal gas or vapor pressure of said container acts to both seal said container by pressing said annular sealing bead against the container walls and to simultaneously secure said closure member to said container;
   e. an aerosol dispensing valve means supported at the top end of said container;
   f. a charging device including a propellant charging bomb having an aerosol bomb valve for dispensing a propellant under pressure; and
   g. propellant transfer means for connecting the stem of said aerosol dispensing valve means in fluid communication with the stem of said bomb valve whereby a charging propellant is transferred from said charging bomb to said container, said charging bomb being disconnected from said container when pressure is substantially equalized between said charging bomb and said container; whereby said closure member is removed as a single unit from said container to permit the filling or refilling of said container with a desired product prior to pressurization of said container.
2. Apparatus as recited in claim 1, further comprising a narrowed annular neck portion on said container adjacent the container opening, said narrowed neck portion abutting with the outside rim of said tubular gasket near the end where said closure top is affixed to said gasket.
3. Apparatus as recited in claim 2, wherein said tubular gasket has mounted within it adjacent the gasket inner wall a tubular support piston connected at one end to said closure top, said support piston fitting tightly against, but freely within said gasket, whereby when propellant pressure is exerted against said closure top from within said container, said support piston will move axially relative to said gasket as said gasket becomes deformed, said support piston acting to maintain said sealing bead against the container walls.
4. In combination, a reusable aerosol dispenser adapted for filling and pressurization by a consumer, and a charging device for pressurizing said dispenser, comprising:
   a. a container having an opening at an end thereof;
   b. a removable closure member for closing off said container opening, said closure member adapted with sealing means forming an air-tight seal of said container opening;
   c. securing means for removably securing said closure member to said container and in sealing engagement therewith; said closure member being removable to permit filling of the container through said opening with the desired product, said closure member and said securing means constituting a single unit capping device for said container;
   d. means for removably securing said closure member to said container comprising thread means extending a circle or partial circle around the opening in said container, mating threads extending around or partially around the periphery of said closure member, and an annular sealing gasket extending around said periphery and affixed to said closure member, said sealing gasket being seated at the base of said threads on said closure member, whereby said closure member forms an air-tight seal with said container upon screwing said closure member onto said container, and said closure member can be readily removed by unscrewing said closure member to permit refilling of said container with desired product;
   e. said closure member of said container including a channel cut axially across the threads of said closure member, said channel being closed off by said sealing gasket while said closure member is seated in the opening in said container, and said channel being opened to permit the escape of pressure through said channel when said seal is broken by unscrewing the closure member prior to depressurization;
   f. an aerosol dispensing valve means supported at the top end of said container;
   g. a charging device including a propellant charging bomb having an aerosol bomb valve for dispensing a propellant under pressure; and
   h. propellant transfer means for connecting the stem of said aerosol dispensing valve means in fluid communication with the stem of said bomb valve
whereby a charging propellant is transferred from said charging bomb to said container, said charging bomb being disconnected from said container when pressure is substantially equalized between said charging bomb and said container; whereby said closure member is removed as a single unit from said container to permit the filling or refilling of said container with a desired product prior to pressurization of said container.

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