PRESSURIZED DISPENSER WITH PROPELLANT BAG


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13 Claims. (Cl. 141—3)

This invention has to do with a package for dispensing fluent material and to a method for charging material to the package.

The use of pressurized dispensing containers for a large variety of products has become widely accepted in many fields, including the dispensing of expanded forms and lathers such as shaving preparations and the like. Liquefied gaseous materials (foams) and propellants are well known for use in such containers. However, the dispensing of foamed products, especially shaving lathers and like preparations, problems of foam quality and uniformity, and exhaustion of product from the container.

For example, the initial portions of shaving cream dispensed from the presently available dispensing containers generally are foams which are rather stiff and/or dry. This undesirable characteristic is attributed to an excess of propellant or foamant with product. To control the intermediate portions so dispensed, however, are foams of desired quality and excellent consistency, since a suitable balance of foamant and product is maintained. The final portions remaining in the container are generally too wet and thin when dispensed to form a foam of desirable quality. Thus, insufficient foamant or propellant remains in the final portions to provide suitable foamed product.

In an effort to overcome the disadvantages of the foregoing character, several modifications have been made of the original “aerosol” containers for dispensing fluent products. One-compartment containers, in which product and propellant are in association in the sole compartment, have given way to two-compartment containers for some products. In the latter, product is contained in a first compartment or section defined by the valve or outlet means and by a bag or diaphragm, for example, which keeps the products separate from a second compartment or section in which the propellant is located. When a propellant or foamant is used together with product in the first section, product is dispensed as a foam.

One particular differential aerosol containers with a propellant-filled bag, is encountered in charging of the bag with propellant. One technique involves filling of a bag with propellant chilled below the boiling point of the latter, and quickly inserting the bag into the container which has already been charged with product. However, as the temperature of the chilled bag increases as the bag is being inserted into the container, the propellant expands. As such, premature expansion of the bag forces product from the container before the container is sealed with suitable valve outlet means. Not only is there loss of product as indicated, but it is necessary to seal and store bags containing chilled or frozen propellant. The technique is both wasteful and cumbersome.

Another technique involves the use of an additional valve or of a filling plug. When a propellant is used with a product, and also in a bag, two separate gassing operations are required in order to charge the container with propellant.

The present invention is directed to modifications which overcome disadvantageous features of prior bag-type aerosol containers.

The present invention provides a device free from the foregoing disadvantages and permits dispensing of a rich, creamy lather of uniform consistency and quality whether the shaping preparation be the initial, intermediate or final portion dispensed from the container. And the present invention also makes possible substantially complete use of the product in the container, such that substantial exhaustion of product is realized. The present invention also makes possible convenient and efficient charging of a container, including simultaneous charging of a product compartment and a propellant compartment with propellant.

Although the devices disclosed and claimed herein are readily adaptable to a wide variety of applications, the invention is particularly useful for dispensing shaving lather. For the sake of simplicity at this part of the application, the novel containers are described with respect to shaving lather. It is to be understood, however, that the present invention can be employed with a wide variety of products, as explained hereinafter.

The invention is described now with reference to the accompanying drawings in which:

FIGURE 1 is a vertical sectional view of a preferred embodiment of a pressurized container of shaving preparation in accordance with the invention;
FIGURE 2 is a sectional elevation of a check valve and bag assembly;
FIGURES 3 and 4 are sectional elevations of the package shown by FIGURES 1 and 2, to indicate removal of product from the package;
FIGURE 5 is a sectional elevation of another preferred embodiment of a pressurized container, and FIGURE 6 is a sectional elevation of a check valve-bag assembly and check valve-dip tube assembly.

Referring more specifically to the drawings, numeral 11 generally designates a dispensing container having a tubular body 12 and a top opening defined by rim 13 adapted to have a normally closed valve 14 sealed thereto. Valve 14 can be staked directly to the container or can, as illustrated, be fastened to a valve fitting 15 which is staked or rolled into pressure-tight engagement with the container at rim 13. Gaskets (not shown) between container 11, valve 14 and fitting 15 are utilized to assure pressure-tight joints.

Valve stem 16 is fitted with a spout 17 and a button 18. When button 18 is manually depressed, it forces the valve 14 to open and permits dispensable material to be expelled through the valve stem 16 and out through the spout 17. The base 19 of valve 14 can have attached thereto a dip tube 20 which can extend close to the bottom of the container, and tube 21. The lower end of tube 21 is fitted with check valve 22, shown in detail in FIGURE 2, and has secured thereto bag 23.

As illustrated in FIGURE 2, check valve 22 can be formed of tube 21a, which fits securely within the inner wall of tube 21, and valve cup 24 having stem 25. Spring 26 secures valve cup 24 to tube 21. As bag 23 is charged with propellant through tube 21 and check valve 22, valve cup 24 is forced away from valve members 27 such that propellant flows thereby into the bag. When sufficient propellant has been charged to the bag 23, the flow of propellant through tube 21 is discontinued; then the greater pressure exerted by the propellant force valve cup 24 away from the bag and toward valve members 27 the cup and members form a tight seal. Thus, no propellant can be lost from bag 23 once it has been charged thereto.

A closure member 28 is staked and rolled into pressure-tight engagement with the tubular body 12 at the end opposite valve 14.

Bag 23 separates the interior of container 11 into a first or product section 29, and a second or propellant section 30 in bag 23. The first section 29 is filled with a shaving preparation having dispersed therein a liquefied gaseous material or propellant capable of expanding upon
release to the atmosphere and causing the shaving preparation to foam. The composition of the shaving preparation, including the liquefied gaseous material dispersed therein, as well as its physical and chemical properties, can vary widely and is set forth in greater detail herein. However, regardless of the particular composition of the shaving preparation and of the liquefied gaseous material, it is beneficial for producing excellent foam that the ratio (weight) of the propellant to shaving preparation be from about 1:100 to about 12:100, preferably 2:100 to 3:100 for a hydrocarbon propellant and preferably 6:100 to 9:100 for a halogenated propellant. Moreover, a sufficient quantity of the dispensable product is utilized to fill the first section 29 of the container 11 in order that substantially no head space exists therein at any time from initial charging to final dispensing of product. That is, there should be essentially no space unoccupied by product in the first section 29 in order that no liquefied gaseous material can return to the gaseous state within product section 29 of container 11; this insures that the ratio of liquefied gaseous material or propellant to shaving preparation in container 11 remains substantially constant from initial charging to final dispensing. With this ratio remaining so constant, uniformity of dispersed product is realized.

A second section 30 of the container 11 is that of bag 23. The second section 30 is filled with propellant, the exact composition of which can vary widely and is described in detail hereinbelow. However, propellant utilized is capable of maintaining a substantially constant pressure in the package from manufacture or assembly until product is exhausted from the package. Bag 23 can be made of any suitable flexible, impervious material such as natural or synthetic rubber; and plastic compositions such as the following: MYLAR, a polyester composition; LEXAR, a duPont fluorocarbon; SCOTCHPAK, a polyester with a polyethylene laminate, and an aluminized form thereof, each a product of Minnesota Mining and Manufacturing Company; ACLAR and CAPRAN, a fluorocarbon and a polyamide, respectively, of General Chemical; SARAN, a vinyl chloride polymer of Dow Chemical; KODAR, a polyester of Eastman Kodak; AZDZ, a phenoxy composition of Union Carbide; and AVISCO R—18, a vinyl copolymer-coated cellophane of American Viscose.

In the new containers of this invention, the pressure due to the weight of bag section 29 is at least preferably greater than, the pressure of propellant section 30 when container 11 is fully charged and ready for final dispensing of product therefrom. For example, a shaving preparation containing propellant can be in product section 29 at about 55 pounds per square inch gauge (p.s.i.g.), and the propellant can be contained in section 30 at a pressure of about 45 p.s.i.g. At this point, bag 23 is restrained from flexing to any substantial amount. As product is released from product section 29 through dip tube 20 and valve 14 to spout 17, product with propellant leaves the container and the pressure within product section 29 becomes approximately 45 p.s.i.g. The vapor pressure decrease of about 10 p.s.i.g. is caused by expelling entrapped or entrained air in the product, as the first portions of product are dispensed from container 11. When approximately one-third to one-half of the product has been so released, the pressure of the product is still at about 45 p.s.i.g., the pressure within propellant section 30 (bag 23) remaining at 45 p.s.i.g. Thus, bag 23 is no longer restrained but flexes to accommodate to space made available by product dispensed and to occupy a different position in container 11 as shown by FIGURE 3. By way of further illustration, when approximately 65 percent of the product originally charged to product section 29 has been dispensed therefrom, the vapor pressure of section 29 is again at about 45 p.s.i.g. Finally, when substantially all of the material has been dispensed from container 11, as illustrated by FIGURE 4, the vapor pressure of product section 29 remains at about 45 p.s.i.g., with bag 23 expanding extensively throughout container 11. As indicated, substantially all of the product is exhausted from the container. It will be clear, therefore, that the vapor pressures of the product and propellant sections 29 and 30, respectively, remain substantially constant throughout use of container 11.

Since the pressure in propellant section 30 (bag 23) of container 11 is substantially equal to the pressure in product section 29 throughout more than about two-thirds of use thereof, bag 23 is urged toward valve 14 and prevents formation of any appreciable head space in section 29 of the container. For example, with a standard six (6) ounce aerosol container, the vapor pressure of product section 29 is sufficient to expel all of the dispensable product (of section 29) in an expanded state. Generally, this will be from about 40 to about 50 p.s.i.g. at 70° F. for shaving preparations. It will be recognized that pressure differentials will vary dependent upon the character, as viscosity, of other dispensable products such as catup, mustad, etc., with respect to the pressures in sections 29 and 30.

Turning now to liquefied gaseous materials or propellants which can be used in product section 29 as expelling or foaming agents, and in propellant section 30 (bag 23), these are volatile organic compounds or materials. At ordinary temperatures and pressures, these compounds normally exist in the form of a gas. However, they can liquefy at lower temperatures or under pressure in the container such, for example, as that disclosed and claimed herein. Among suitable liquefied gaseous materials are aliphatic hydrocarbons, and preferably saturated hydrocarbons, such as propane, n-butane, isobutane and cyclobutane. These are particularly desirable for use as foamants of shaving preparations, since they perform a lather-forming function without undesirable burning of human skin. A mixture of propane and isobutane is particularly preferred. One or a mixture of such compounds having a vapor pressure ranging from about 20 to about 100 p.s.i.g., preferably 40 to 50 p.s.i.g., at about 70° F. can be used.

Homologs having vapor pressures outside of the stated ranges can also be used, so long as the combined vapor pressure is within the stated ranges. By way of illustration, ketones and light mineral oils can be utilized. Also suitable as foaming agents are the partially or wholly fluorurated and partially or wholly chlorofluorurated hydrocarbons such as 1,1-difluoroethane; 1,2-dichloro-1,1,2,2-tetrachloroethane; trichlorotrifluoroethane; dichlorodifluoroethane; monochlorodifluoroethane; monofluoromonochloromethane; 1-monochlorodifluoromethane; monofluoromonochloromethane; trifluoro ethyl chloride; and octafluorocyclobutane.

Soluble, non-compressed gases such as nitrous oxide can also be used. Thus, the term "propellant" used herein denotes liquefied gaseous materials, e.g. propane, and soluble, non-liquefied materials, e.g. nitrous oxide and carbon dioxide, and mixtures thereof.

The quantity of liquefied gaseous material used in product section 29 of container 11, can vary considerably with the character and type of dispensable product. With shaving preparations, generally from about 1 to about 5 parts by weight of liquefied hydrocarbon product to 5—10 parts by weight of liquefied halogen-containing gaseous material are used for 100 parts by weight of product. Such quantities provide excellent dispersions which, when dispensed from container 11, are desirable foamed products. An such quantities are sufficient to remove product in expanded state, e.g., a foam, from container 11. Stable emulsions within product section 29 and foams of desired density from spout 17 are provided by using such quantities.

FIGURE 5 illustrates container 11 equipped with two check valves. FIGURE 5 differs from FIGURE 1 only in the inclusion of check valve 31 in dip tube 20. Such a
container is useful when no propellant is to be associated with product in product section 29. For example, foods such as catup, non-foaming hair creams, and the like, can be used in such a container. When propellant is charged through spout 17, check valve 22 is actuated and propellant enters bag 23. Check valve 31, as shown in greater detail in FIGURE 6, is positioned in dip tube 28 such that it is opposed to check valve 22 in tube 21. As so positioned, valve cup 32, secured to valve member 33 by spring 34, is forced against valve members 35, when propellant is charged to the contained 11. Thus, no propellant enters product section 29. When bag 23 is fully charged with the desired quantity of propellant, charging of container 11 is stopped. For example, bag 22 can be so charged as to exert a pressure of about 80 p.s.i.g.

Spring 34 of check valve 31 can be regulated so as to be actuated by any pressure differential existing between bag 23 and the atmosphere, spring 34 of check valve 31 having no greater tension than about 80 p.s.i.g. Accordingly, when product is to be dispensed from container 11 by manually depressing button 18 to open valve 14, check valve 31 opens by virtue of the greater pressure imposed by bag 23 and product flows from product section 29 through dip tube 20 and check valve 31 and thence out of container 11 through spout 17.

It is to be understood that container body 12 can be composed of a wide variety of materials, including steel, aluminum, plastic such as polyolefins. Valves—as 14—used herein are such as illustrated in FIGURE 1; however, they need not have in combination therewith a dip tube such as 20 shown in FIGURES 1 and 3 through 6. It is to be understood, however, that dip tube 20 can be made of any one of a variety of materials such as natural and synthetic rubbers, plastics such as polyethylene, etc.

Check valve 22 can be one in which a ball, pin or the like acts as a positive seal to obviate propellant leaving bag 23 once the bag has been charged. Check valve 22 can be of similar type. A particularly advantageous check valve is valve VI-100AA of the Dill Manufacturing Company, Cleveland, Ohio.

By way of illustration, an excellent dispenser for shaving father is one such as represented by FIGURE 1, containing about 5.5 ounces (avoirdupois) of product and having a capacity when empty of 7 fluid ounces:

<table>
<thead>
<tr>
<th>Product:</th>
<th>Grams</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soap solution</td>
<td>177</td>
</tr>
<tr>
<td>C3-C4 mixture</td>
<td>4.7</td>
</tr>
</tbody>
</table>

The C3-C4 mixture comprises 87 percent (87%) of isobutane and 13 percent (13%) of propane. The vapor pressure of the product section of the illustrative dispenser is approximately 55 p.s.i.g. and the vapor pressure of the propellant or bag section is approximately 45 p.s.i.g.

Container 11 of FIGURE 1 was charged with propellant. Valve 14, equipped with dip tube 20 and tube 21 provided with check valve 22 and bag 23, and valve stem 16, 17 and 18 was then secured to valve fixture 15. Propellant (C3-C4 mixture) was then charged through spout 17 at a pressure of about 100 p.s.i.g. A portion of the propellant was dispensed through dip tube 20 to mix with product in section 29, and the remaining portion of propellant flowed through valve 14 into tube 21 and check valve 22 into bag 23. The check valve 22 is regulated to open with a pressure imposed upon spring 26 thereof of 40-60 p.s.i.g.

It will be understood that the size of the oriifice of the check valve 22 with relation to the oriifice connecting with dip tube 20, can serve to meter the ratio of propellant which flows to the product into bag 23. It will be recognized that dip tube 20 can have a smaller oriifice than the oriifice of valve base 19 with which tube 20 is connected, in which case the oriifice of dip tube 20 is the limiting oriifice with regard to charging propellant to section 29. Tension on spring 26 of check valve 22 can also serve to meter the ratio of propellant to 29 and 23. Such controls of the check valve serve to determine its capacity.

As a modification of this illustration, mixed propellants can be used by following a two-stage charging sequence. Thus, trichloromethane can be charged through spout 17 at a pressure of about 100 p.s.i.g. All of this propellant enters product section 29 since spring 26 of check valve 22 can be one which is not actuated until a pressure of about 110 p.s.i.g. is imposed upon it. When a sufficient quantity of this propellant has been charged to product section 29, a second propellant such as dichlorodifluoromethane can be charged through spout 17 at a pressure of about 120 p.s.i.g. Now, a portion of the second propellant flows to the product section 29 and a portion flows through check valve 22 to bag 23. This modification provides a means for rapid charging of a mixture of propellants to the product section. In addition, this provides a means for confining a relatively expensive propellant of a propellant mixture to the product section, and confining a relatively less expensive propellant to bag 23.

As another modification of the illustration given above, one propellant can be charged to the product section 29 and to the propellant section 30. That is, substantially all of the propellant can be charged through spout 17 at a pressure of 100 p.s.i.g. which is less than that necessary to actuate check valve 22 of FIGURE 22. Check valve 22 is regulated to operate at about 110 p.s.i.g. When product section 29 is so provided with propellant, charging can be continued at higher pressure, as about 120 p.s.i.g., sufficient to actuate check valve 22. This technique is advantageous for it permits rapid charging of a single propellant to product compartment 29 and to propellant compartment 30.

Numerous modifications and variations of the invention can be made without departing from the spirit and scope thereof. Accordingly, it is to be understood that the invention is not to be limited, but is to be construed in the light of the language of the appended claims.

I claim:

1. A package for dispensing a fluent product in an expanded state comprising a first section containing a fluent product having liquefied gaseous material disposed therein and having outlet means for dispensing said product to the atmosphere in an expanded state, a second section comprising a flexible bag containing liquefied gaseous material therein, a discharge tube secured at one end thereof to said outlet means located at one end of said container and extending into and terminating close to the bottom of said container, and a tube containing a check valve secured at one end to said outlet means and secured at the other end to
7. A package defined by claim 5 wherein said product is shaving cream.

8. A package for dispensing a fluid product comprising
   a container body having closures at each end,
   a first section of said body containing product and
   having outlet means for dispensing said product to
   the atmosphere,
   a second section comprising a flexible bag containing
   propellant therein,
   a discharge tube secured at one end thereof to said
   outlet means located at one end of said container
   and extending into and terminating close to the
   bottom of said container, and
   a tube containing a check valve secured at one end to
   said outlet means and secured at the other end to said
   flexible bag, said check valve admitting propellant
   to said bag and preventing propellant from flowing
   from said bag.

9. The process for simultaneously charging propellant
to a product compartment and to a propellant
compartment of a package for dispensing fluent product
in an expanded state, comprising
   charging propellant at greater than atmospheric
   pressure to said product compartment of said package
through a valve thereof equipped with inlet means to
said product compartment and with inlet means to a
flexible bag comprising said propellant compart-
ment, said latter inlet means containing a check
valve which admits propellant to said bag during
charging operation and which prevents propell-
ant from flowing therefrom, until said product
 compartment is substantially charged with propell-
ant and charging propellant to said flexible bag at a
pressure greater than the pressure at which said
product compartment was charged and sufficient to
actuate said check valve to admit propellant to said
bag until said bag is substantially charged with
propellant.

10. The process defined by claim 9 wherein the prop-
product is shaving cream.

11. The process defined by claim 9 wherein the propel-
lant is liquefied gaseous hydrocarbon.

12. The process defined by claim 9 wherein the propel-
        low molecular weight aliphatic hydrocarbon.

13. The process defined by claim 9 wherein the propel-

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RAFAEL M. LUPO, Primary Examiner.