April 12, 1966 D. J. HEALY 3,245,435

PRESSURIZED DISPENSER WITH PROPELLANT BAG

Filed Dec. 12, 1963 2 Sheets-Sheet 1

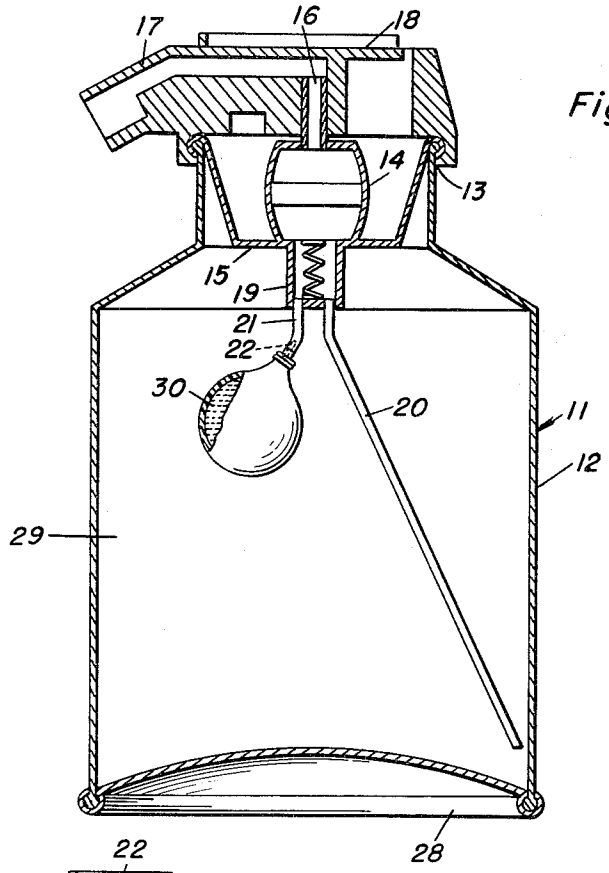


Fig. 1

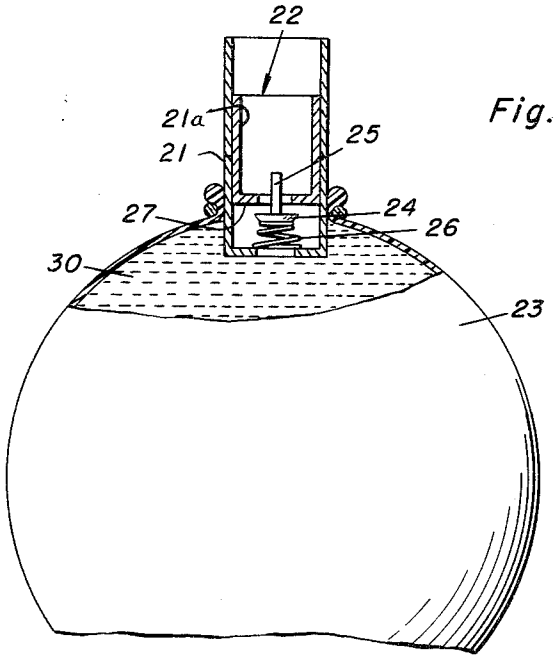


Fig. 2

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Fig. 3

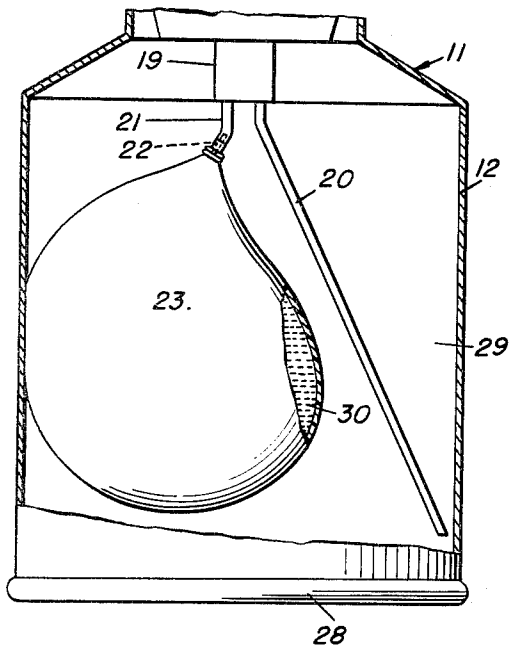


Fig. 4

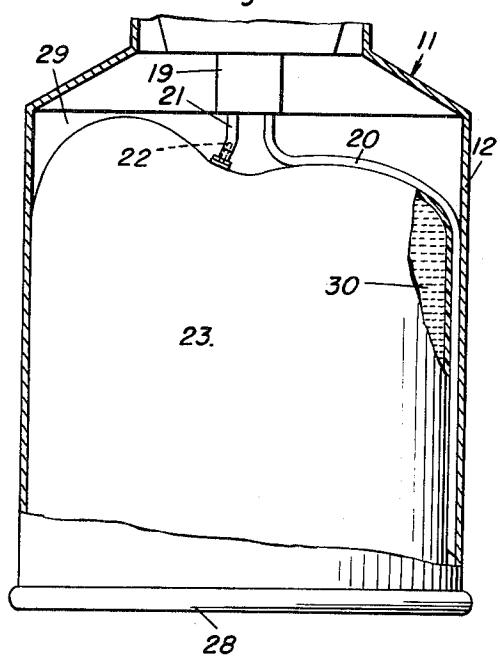


Fig. 5

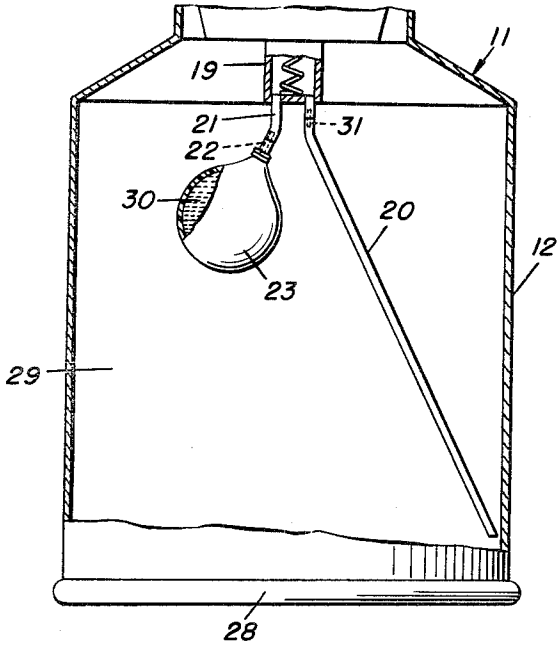
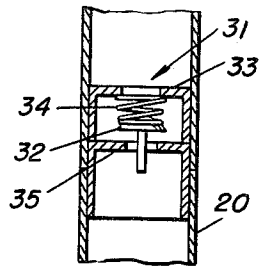


Fig. 6



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PRESSURIZED DISPENSER WITH PROPELLANT BAG

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Filed Dec. 12, 1963, Ser. No. 330,112
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 (foamants) and propellants are well known for use in such containers. However, the dispensing of foamed products, especially shaving lathers and like preparations, presents problems of foam quality and uniformity, and exhaustion of product from the containers. 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. In 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 containers 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 difficulty attendant 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 cumbrous.

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 elevation 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 dispensing valve **14** sealed thereto. Valve **14** can be staked directly to the container or can, as illustrated, be fastened to a valve fitment **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 fitment **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 to 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 **21***a*, 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 therein.

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 hereinafter. 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 spaced 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 dispensed 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 one 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 of E. I. du Pont de Nemours and Company; TELSAL, a du-Pont 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; AZDEZ, 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 product section **29** is at least equal to, and is preferably greater than, the pressure of propellant section **30** when container **11** is fully charged and ready for initial 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 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 catsup, mustard, 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 a 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, kerosines and light mineral oils can be utilized. Also suitable as foaming agents are the partially or wholly fluorinated and partially or wholly chlorofluorinated hydrocarbons such as: 1,1-difluoroethane; 1,2-dichloro-1,1,2,2 - tetrachloroethane; trichlorotrifluoroethane; dichlorodifluoromethane; monochlorodifluoromethane; monofluoromonochloromethane; 1 - monochlorodifluoromethane; monofluoromonochloromethane; 1-monofluoro-1,1-difluoroethane; 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 gaseous material or 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 catsup, 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 **20** 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 container **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 **23** 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 **31** 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 lather 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:

Product:	Grams
Soap solution	177
C_3–iC_4 mixture	4.7
Propellant:	
C_3–iC_4 mixture	1

The C_3–iC_4 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 product. Valve **14**, equipped with dip tube **20** and tube **21** provided with check valve **22** and bag **23**, and valve stem **16**, spout **17** and button **18** was then secured to valve fitment **15**. Propellant (C_3–iC_4 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 orifice of the check valve **22** with relation to the orifice connecting with dip tube **20**, can serve to meter the ratio of propellant which flows to the product section **29** and to the bag **23**. It will be recognized that dip tube **20** can have a smaller orifice than the orifice of valve base **19** with which tube **20** is connected, in which case the orifice of dip tube **20** is the limiting orifice 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, trichloromonofluoromethane 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**.

In addition to shaving compositions, a wide variety of fluent products can be dispensed in an expanded state, in accordance with this invention. Broadly, three-phase, water-base systems can be dispensed from product sections or compartments such as **29** of FIGURE 1. Shampoos, hair dressings, hand lotions, face creams, dentifrices and other toilet compositions are contemplated. So, too, are edible products typified by whipped creams, icings, catsups, mustard, mayonnaise, etc. Antiseptics, pharmaceutical and medicinal ointments can be used. Still other products are paints, lacquers, chemicals, room sprays, insecticides, etc.

It will be understood that proper choice of propellant is made consistent with the product to be dispensed from a container. For example, with a shaving cream, a number of choices can be made, whereas with food products octafluorocyclobutane is a proper choice at present.

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 under pressure substantially unexpanded product having liquefied gaseous material dispersed 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

said flexible bag, said check valve admitting liquefied gaseous material to said bag and preventing liquefied gaseous material from flowing from said bag.

2. A package defined by claim 1 wherein said product is shaving cream.

3. A package for dispensing a fluent product in an expanded state comprising

a first section containing under pressure substantially unexpanded product containing a soluble, non-liquefied gas and having outlet means for dispensing said product to the atmosphere in an expanded state,

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.

4. A pressurized dispensing container for dispensing shaving lather comprising

a tubular body having closures at each end,

a first section containing under pressure substantially unexpanded shaving cream having liquefied gaseous hydrocarbon dispersed therein and having a discharge valve for dispensing said shaving cream to the atmosphere in an expanded state in response to repeated openings,

a flexible bag containing liquefied gaseous hydrocarbon therein,

a discharge tube secured at one end thereof to said discharge valve 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 discharge valve and secured at the other end to said flexible bag, said check valve admitting liquefied gaseous hydrocarbon to said bag and preventing liquefied gaseous hydrocarbon from flowing from said bag.

5. 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 liquefied gaseous material therein,

a discharge tube secured at one and 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 liquefied gaseous material to said bag and preventing liquefied gaseous material from flowing from said bag.

6. A package defined by claim 5 wherein a second check valve is associated with said outlet means to prevent said liquefied gaseous material from flowing through said outlet means into said first section during charging of said flexible bag and to permit product to flow from said first section during use of said package.

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,

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 compartment, said latter inlet means containing a check valve which admits propellant to said bag during said charging operation and which prevents propellant from flowing therefrom, until said product compartment is substantially charged with propellant 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 product is shaving cream.

11. The process defined by claim 9 wherein the propellant is liquefied gaseous hydrocarbon.

12. The process defined by claim 9 wherein the propellant is a halogenated low molecular weight aliphatic hydrocarbon.

13. The process defined by claim 9 wherein the propellant is nitrous oxide.

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