June 14, 1966 D. J. HEALY ETAL 3,255,936

PRESSURIZED DISPENSING CONTAINER

Filed Jan. 3, 1964

Fig. 1.

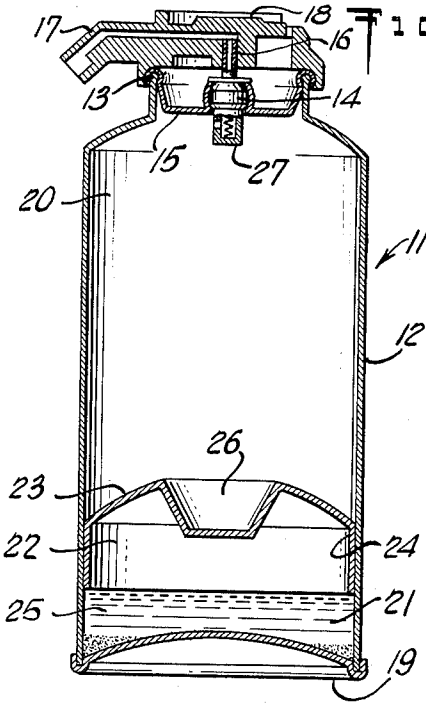


Fig. 2.

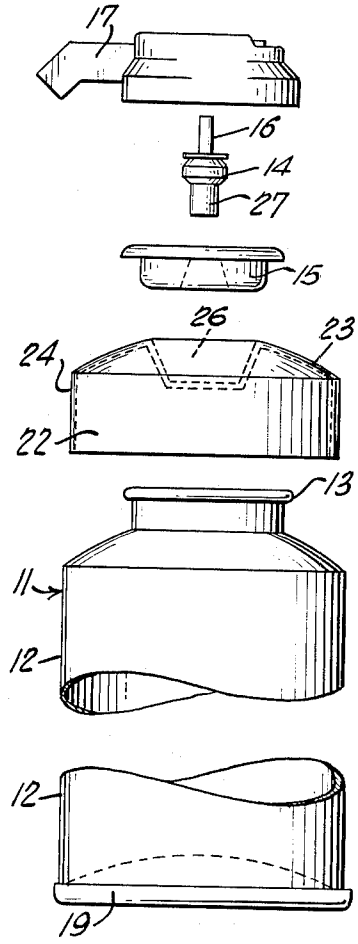


Fig. 3.

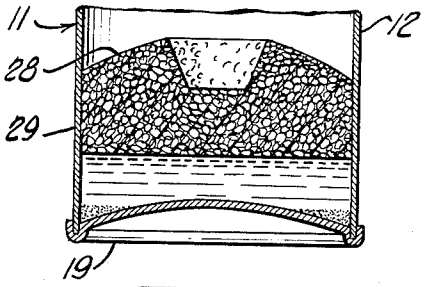


Fig. 4.

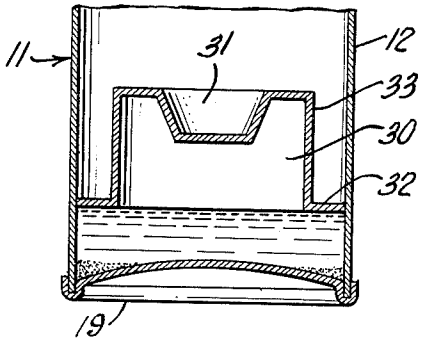
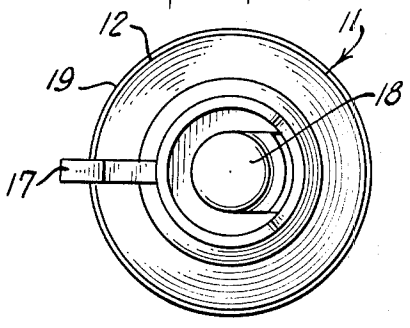


Fig. 5.



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PRESSURIZED DISPENSING CONTAINER

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14 Claims. (Cl. 222—389)

This invention relates to a package and process for dispensing fluent material.

The use of pressurized dispensing containers for a large variety of products has become widely accepted in many fields, including the dispensing of expanded foams and lather 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 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 the product. 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. Consequently, many users do not or cannot exhaust the entire supply in the container, but on the contrary, dispose of the container when it has been only incompletely exhausted of product. Quite naturally, this has been the reason for some customer dissatisfaction.

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 piston, bag or diaphragm which keeps the product separate from a second compartment or section in which the propellant is located. As will be apparent, since no propellant or liquefied gaseous material under pressure is present in the first section, product is not dispensed in an expanded state, such as a foam. For example, it has been proposed to use a flexible bag to serve as the first section. The bag contains product and an inert gas whereupon product is delivered in an expanded state, a Freon serving as a propellant being confined in a second section and exerting pressure upon the flexible bag. While this proposal might overcome some disadvantages of earlier one-compartment containers, it suffers from certain practical shortcomings. The flexible bag must be thin-walled in order that it will collapse as product is expelled therefrom. However, as a collapsing quality is realized, permeability of the bag to gases increases giving rise to dilution of product in the bag by Freon entering the bag and by dilution of composition of the bag contents by inert gas flowing from the bag to the Freon chamber. Additionally, if the bag has a weak area, it will collapse at that area as product is expelled and remaining product will be isolated or "pinched off," thereby making impossible complete exhaustion of product in the bag. Other difficulties with a bag for containing product in a two-compartment dispenser include expense of installation and filling of the bag with product.

Two-compartment pressurized containers with pistons serving to separate the compartments, while generally advantageous, have several shortcomings. For example, plastic, metal and rubber pistons used therein generally are shaped prior to insert in a container body. Since the inside diameter of the body varies within certain tolerances and since the largest diameter of the pistons also varies within similar tolerances, conformation of piston with container body is not uniform. Some pistons fit too tightly in the container body and require considerable propellant pressure to move them toward the discharge valve or outlet means of the container. Other pistons fit so loosely in the container that an ineffective seal is formed between the piston and container walls such that propellant enters the product section and dilutes product therein; additionally, product flows down through the annulus formed by the container and piston wall and is lost in the propellant section.

There exists, then, a need for a package and dispensing process to obviate defects such as mentioned above.

It is an object of this invention, therefore, to provide a package for dispensing fluent product of uniform quality when the package is full, partially full or almost completely exhausted. Another object of the invention is to provide a package which can be completely exhausted of product delivered as fluent product. A particular object is to provide such a package for dispensing shaving preparations. A primary object is to provide a two-compartment container in which a product section and a propellant section are effectively separated one from the other by an efficient seal or sealant. Still another object is to provide a multi-compartment package wherein a product compartment and a propellant compartment are separated by a slidable piston having a gel coating associated therewith. Another object is to dispense fluent product in an expanded state from such a package. Another object is the provision of such a package wherein product and foamant remain emulsified and of substantially constant composition, and wherein losses of product and propellant are minimized. A further object is to provide a piston coated with a gel. Still other objects will appear from the following description.

The foregoing objects are realized with the present invention which provides a device free from the foregoing disadvantages and permits dispensing of a rich, creamy lather of uniform consistency and quality whether the shaving 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 product exhaustion is realized.

Broadly stated, the present invention includes 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 of said body containing propellant under pressure,

A slidable piston in said body for separating said first and second sections one from the other, the wall of said piston depending into said second section contiguous to and spaced apart from the wall of said body, and

A pliable, reversible, hydrogel sealant associated with said piston and serving to separate said product and propellant.

As explained in further detail hereinafter, the first section of the container body preferably contains substantially unexpended dispensable product under pressure,

the product having liquefied gaseous material dispersed therein.

Contemplated also as part of the present invention is a piston, the wall of which is coated with said hydrogel.

Another embodiment of the invention is a process for assembling a pressurized container, comprising:

(1) Inserting a slidable piston in an upright container body, the upper and lower ends of which are open,

(2) Closing the lower end of said container body,

(3) Applying to the upper portion of said piston an aqueous polyvinyl alcohol solution,

(4) Substantially filling with dispensable product containing at least about 0.01 percent by weight of a salt, a first section comprising the space between the upper surface of said slidable piston and the upper end of said container body, whereby a pliable, reversible hydrogel is formed proximate to said piston on contact of said polyvinyl alcohol solution with said salt,

(5) Securing outlet means to the upper end of said container, whereby substantially all space of said first section is occupied by said product, and

(6) Charging propellant to a second section comprising the space within said container body defined by said piston means and said closed end of said body.

When liquefied gaseous material is present in the first section of the pressurized container, it is preferably charged to that section after propellant has been charged to the second section.

Although the device and process 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 container and piston, and process for assembling the container 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 later hereinafter.

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

FIGURE 1 is a vertical sectional view in elevation of a preferred embodiment of a pressurized container of shaving preparation in accordance with the invention;

FIGURE 2 is a dissembled view of the elements of such container;

FIGURES 3 and 4 are vertical section views in elevation of other embodiments of the invention wherein modified pistons are employed; and

FIGURE 5 is a plan view of a container according to the invention.

Referring more specifically to the drawings, numeral **11** generally designates a dispensing container having a tubular body **12** and a top opening defined by a rim **13** adapted to have a normally closed dispensing valve **14** sealed thereto. Tubular body **12** can be seamed (not shown) or seamless. It is to be understood that while a tubular body is preferred, the body may be of other configuration; e.g., the body may be of conical shape, as a frustum of a cone. The 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 to permit dispensible material to be expelled through the valve stem **16** and out through the spout **17**. A closure member **19** is staked and rolled into pressure-tight engagement with the tubular body **12** at the end opposite valve **14**.

Inside the container **11** and separating the interior thereof into a first section **20**, at one end of which valve **14** is located, and a second section **21**, opposite thereto, is a separation means comprising a slidable piston **22** which is described in more detail hereinafter. The first section

20 is filled with a shaving preparation having dispersed therein a liquefied gaseous material or foamant 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 are 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 said material to shaving preparation be from about 1:100 to about 12:100; preferably 2 to 3:100 for hydrocarbon liquefied gaseous materials and 6 to 9:100 for halogenated materials. Moreover, a sufficient quantity of the dispensible product is utilized to fill the first section **20** 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 **20** from slidable piston **22** through and including the space adjacent the portion of valve **14** within section **20**. Thus, no liquefied gaseous material can return to the gaseous state within product section **20** of the container **11**, and the ratio of liquefied gaseous material or propellant to shaving preparation in the 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 **21** of the container **11** is filled with propellant. The exact composition of propellant employed can vary widely and is described in detail hereinbelow. However, the propellant utilized is preferably one capable of maintaining a substantially constant pressure in the package from manufacture or assembly until product has been exhausted therefrom. Moreover, the vapor pressure in the propellant section (**21**) of container **11** is at least slightly greater than the vapor pressure in the product section (**20**) such that the slidable piston **22** is urged toward valve **14** and prevents formation of any head space in section **20** of the container **11**. For example, in a standard six (6) ounce aerosol container, vapor pressure of section **20** is sufficient to expell all of the dispensible product (of section **20**) in an expanded state. Generally, this will be from about 40 to about 60 p.s.i.g. at 70° F. for shaving preparations. As mentioned hereinabove, the available pressure in the propellant section (**21**) of container **11** is greater than that of product section **20** and is sufficient to move the slidable piston **22** toward valve **14**; a vapor pressure differential of about 0.2 to about 25 p.s.i.g. (the vapor pressure of section **21** being greater than section **20**) is generally employed. It will be recognized that while such a vapor pressure differential is employed with shaving preparations, greater or lesser vapor pressure differentials will be used dependent upon the character, as viscosity, of other dispensible products such as vinegar, catsup, mustard, etc.; the relative fit of slidable piston **22** with the side wall of container **11**, etc.

The slidable piston **22** referred to hereinabove, dividing container **11** into sections **20** and **21**, is composed of a relatively flexible material which is substantially inert to the dispensible product, liquefied gaseous material, propellant and other materials making up the package. Any metal or plastic which can be formed into pistons such as those illustrated herein can be used. For example, polyurethanes, polypropylene, polyethylene, nylon, steel, and aluminum can be employed as piston material. Since containers often are damaged in storage or while in transit, as by denting of the body, it is generally preferred that slidable piston **22** be flexible in order to accommodate to any such changes in configuration.

As illustrated in the drawings, piston **22** is preferably cup-shaped and has a closed end **23**. Piston **22** is mounted within body **12** in an inverted position, that is

with closed end 23 facing toward outlet valve 14 which is positioned in the first section 20 of container 11. Extending from the closed end 23 of piston 22 and connected thereto is a wall or skirt 24, which is substantially parallel to the side wall of the tubular body 12 of container 11, and which is normally slightly smaller, e.g., as much as 0.001 to 0.05 inch smaller, than the inside diameter of the side wall of body 12. The cup shape of piston 22 traps a portion of propellant gas 25 within its confines, thereby transmitting the force exerted by the gas to the inside surface of the piston. This transmitted force tends to lift the piston.

In order to provide an effective seal between sections, 20 and 21, a sealant is used herein. The sealant is maintained between between the skirt 24 of piston 22 and the wall of tubular body 12. As contemplated herein, the sealant can be applied to the skirt 24 and/or to the wall of tubular body 12. A particularly advantageous procedure for applying and maintaining the skirt is to form it in situ in container 11. The sealant used herein is a pliable, reversible hydrogel and particularly a hydrogel formed of a polyvinvyl alcohol and a salt. A variety of polyvinyl alcohols can be used herein; however, particularly advantageous is one having a residual polyvinyl acetate content of about 3 percent by weight, and a 4 percent aqueous solution which has a viscosity of about 23–28 centipoises at 20° C. Used in forming the gel sealant is a salt, and particularly an inorganic salt of which borax is especially preferred.

An advantageous hydrogel sealant is formed by bringing together a polyvinyl alcohol aqueous solution containing about 10 percent by weight of the alcohol, and borax. This sealant is preferably formed in situ by applying the alcohol solution to closed end 23 of piston 22 when the piston is placed in container 11, such that the alcohol solution flows down the piston shoulder to skirt 24 and the wall of tubular body 12. Product, as a shaving composition, containing borax, is then added. Promptly (normally less than about 60 seconds), on contact of borax and the polyvinyl alcohol, they form a pliable, reversible hydrogel. The latter effectively serves as a sealant between product compartment 20 and propellant compartment 21. Yet, while an effective seal is provided, piston 22 remains slidable and moves upwardly in container 11 as product is dispensed therefrom. This procedure is particularly advantageous since hydrogel is formed at that area necessary to correct leakage which could develop in container 11.

As shown, the central portion of the closed end 23 of piston 22 has a depression 26 which surrounds the base 27 of valve 14, thereby reducing the volume of section 20 to a minimum. It is to be noted that the top or closed end 23 of piston 22 conforms closely to the inside surface of the end of container 11 in which valve 14 is located. The purpose of this type of construction is to force substantially all of the product in section 20 out of the container 11.

Although the hollow or cup-shaped, slidable piston (22) illustrated in FIGURE 1 is a preferred form, a modified piston 28 having wall 29 is shown in FIGURE 3. The particular embodiment shown is a slidable piston of communicating cellular structure. The cellular piston 28 can be made of a foam of a synthetic resinous material, such as polystyrene, polyethylene, polypropylene, polyurethane or other foamable and preferably resilient plastic. The sealant described above is placed, coated or formed on the upper surface of a piston such as that illustrated by 28. It is to be noted that foamed cellular piston 28 is not cup-shaped as is piston 22, since there is a multiplicity of small voids which permit entrance of the propellant therein.

Another piston modification is shown by FIGURE 4. Piston 30 has a hat-shaped configuration, depression 31 of which accommodates to the base 27 of valve 14. The extremity of piston 30 is a horizontal member 32 extending from piston wall 33 to close to wall 12 of container 11. A hydrogel of the type described herein can be applied to or can rest on extension member 32 and extend into the annulus formed with the inner wall of body 12. Broadly, then, since the hydrogel can be so related to extension member 32, coated on the inner wall of container body 12, coated on the skirt (24) of piston 22, or formed in situ as explained above, the hydrogel can be said to be associated with the piston.

As a guide, and not by way of limitation, the ratio of the length of skirt 24 of piston 22, of wall 29 of piston 28, and of wall 33 of piston 30, to the diameter of each is from about 1:1 to about 1:2.

As indicated, the sealant is a pliable, reversible hydrogel. Its pliability is advantageous in that it stretches as piston 22 moves in the container and thereby maintains a tight seal. It also is sufficiently mobile that it moves with the piston (22) in the latter's movement in container 11; in a sense, the hydrogel also serves as a lubricant. Further, neither product or propellant is readily soluble in the hydrogel. And the hydrogel is stable at relatively high temperatures to which the container may be exposed. Thus, the hydrogel has a melt point in excess of about 130° F. The quantity of hydrogel used is a minor amount in relation to the quantity of product and the capacity of container 11. For example, in illustrations provided hereinafter, small amounts of hydrogel were effective in sealing product and propellant one from the other. In general, the quantity or volume of hydrogel need only be sufficient to substantially fill the annular space between skirt 24 and the wall of container body 12. Yet, a relatively large quantity of hydrogel can be used with a piston having a diameter substantially smaller than the inside diameter of container 11. In the latter circumstance, the hydrogel is sufficiently pliable and mobile to seal the relatively large annulus between a piston and the container wall, nonetheless of sufficient strength that a portion thereof does not break away and drop into the propellant section.

Liquefied gaseous materials which can be used in product section 20 as foaming agents, 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. They 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.

Partially or wholly fluorinated and partially or wholly chlorofluorinated hydrocarbons are also useful herein as foamants. Illustrations of such materials are given below in discussion of the propellants.

The quantity of liquefied gaseous material used in product section 20 of container 11, can vary considerably with the character and type of dispensible product. With shaving preparations, generally from about 1 to about 5 parts by weight of liquefied gaseous hydrocarbon material and from about 5 to about 10 parts by weight of a halogenated 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. And such quantities are sufficient to remove product in expanded state, e.g. a foam, from container 11. Stable emulsions within product section 20

and foams of desired density from spout **17**, are provided by using such quantities.

It is to be understood, however, that no liquefied gaseous material is used in product section **20** when product is to be dispensed in an unexpanded state.

Propellants useful herein are volatile organic compounds or materials, of which many exist in the form of a gas at ordinary temperatures and pressures. They can liquefy at lower temperatures or when under pressure in a container such as those described and claimed herein. Included among suitable propellants are aliphatic hydrocarbons, partially or wholly fluorinated and partially or wholly chloroflorinated hydrocarbons which have vapor pressures ranging from about 20 to about 100 p.s.i.g., preferably 40 to 70 p.s.i.g., at about 70° F. Either a single compound or a mixture of two or more such compounds can be used. And other homologs individually having vapor pressures outside of the desired ranges set forth, can be used with other homologs, if the combined vapor pressure falls within such desired ranges. By way of illustration, kerosenes and light mineral oils can be utilized. Gases such as carbon dioxide, nitrogen and air can be used. Thus, the term "propellant" used herein denotes liquefied gaseous materials, e.g. propane, and non-liquefied gaseous materials, e.g. carbon dioxide.

Representative propellants are: aliphatic hydrocarbons, preferably saturated hydrocarbons, such as propane, butane, isobutane and cyclobutane; saturated fluorinated, and fluorinated and chlorinated, aliphatic hydrocarbons illustrated by:

1,1-difluoroethane;
1,2-dichloro-1,1,2,2-tetrafluoroethane;
trichlorotrifluoroethane;
dichlorodifluoromethane;
monochlorodifluoromethane;
monofluoromonochloromethane;
1-monofluoro-1, 1-difluoroethane;
octafluorocyclobutane; and
trifluoro ethyl chloride.

Regardless of which of the particular compounds or mixtures thereof are employed herein as propellants, it is not necessary to be concerned about the effect of the propellant on the physical or chemical properties of the dispensible product or their effect upon a surface or area to which the product is applied. This follows from the facts that the propellant or propellants are substantially completely isolated in the propellant section (**21**) of container **11** and that they do not come into contact with the product to be dispensed. Accordingly, in a pressurized package or container of a shaving preparation manufactured in keeping with this invention, those compounds set forth above as propellants which cause a tingling sensation to the skin or instability of lather can be employed since they are completely isolated from the dispensible product in section **20**.

As indicated above, the vapor pressure of propellant in section **21** will depend upon the force necessary to urge slidable pistons such as **22** and **28** toward the valve end of container **11**.

It is to be understood that container body **12** can be composed of a wide variety of materials including steel, aluminum, plastics such as polyolefins. Valves—as **14**—used herein are those conventionally used; however, they need not have in combination therewith a dip tube.

The base or closure member **19** can have a filling plug or a spot weld therein (neither shown), such plug or weld serving as a safety member to avoid explosion under unusual circumstances. The plug, for example, can be composed of natural or synthetic rubber, and can be one having a self-sealing filling channel (not shown).

It will be recognized that containers can be assembled from the several parts described above and charged with products, liquefied gaseous materials and propellants so described, in a variety of manner. A particularly advantageous assembling operation is as follows. Container **11** is equipped with slidable piston **22** as shown in FIGURE 1. Closure member **19** is secured to body **12**. A polyvinyl alcohol solution is poured onto piston **22**, particularly at the surface adjacent the container wall such that it forms a coating about the upper portion of skirt **24** of **22** forming an annulus with the inner wall of body **12**. Shaving preparation containing borax is then added to section **20** of container **11** so that little space remains at the top of this section. As the borax from the shaving preparation contacts polyvinyl alcohol on and about piston **22** and skirt **24** thereof, it forms a gel therewith. Valve **14** is then inserted at the top of body **12** and is crimped thereto. Liquefied gaseous material—a mixture of propane (13%) and isobutane (87%)—is charged as a gas to section **21** through a hole (not shown) in closure member **19** and the hole is then plugged with a rubber plug (not shown). When product is to be dispensed in expanded state, liquefied gaseous material, such as the propane-isobutane mixture, is thereafter charged to section **20** of container **11** through valve **14**. When so charged, product **20** is substantially filled, there being substantially no head space therein. Generally, the vapor pressure of propellant section **21** will be 5–10 p.s.i.g. greater than the vapor pressure of product section **20**, when foamant is used in the latter section.

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:
- Soap solution ---------- grams -- 131
- C_3–iC_4 mixture ---------- do ---- 3.2

Propellant:
- C_3–iC_4 mixture ---------- do ---- 1.5

Slidable pistol: Polyethylene.
Sealant: Hydrogel comprising polyvinyl alcohol and borax.

The hydrogel is formed with a twenty percent aqueous polyvinyl alcohol solution containing 4 grams of the alcohol, and 0.6 gram of borax in the soap solution.

Another excellent container was formed by using the components mentioned in the illustration given directly above, except that a ten percent aqueous polyvinyl alcohol solution containing 2 gram of polyvinyl alcohol was used.

In addition to shaving compositions, a wide variety of fluent products can be dispensed in an expanded state, in accordance with this invention. Shampoos, hand lotions, face creams, dentifrices and other toilet compositions are contemplated. So, too, are edible products typified by whipped creams, icings, etc. Antiseptics and medicinal ointments can be used. Still other products are paints, lacquers, chemicals, etc. Nonexpanded products can also be dispensed from the containers of this invention. Typical of such products are tooth pastes, after-shave lotion, catsup, mustard, etc.

Numerous modifications and variations of the invention may 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.

We claim:

1. 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 of said body containing propellant under pressure,
a slidable piston in said body for separating said first and second sections one from the other, the wall of said piston depending into said second section con-

tiguous to and spaced apart from the wall of said body,

and being coated with a pliable, reversible hydrogel.

2. The package defined by claim 1 wherein the hydrogel comprises a polyvinyl alcohol and a salt.

3. The package defined by claim 1 wherein the hydrogel comprises a polyvinyl alcohol and an inorganic salt.

4. The package defined by claim 1 wherein the hydrogel comprises a polyvinyl alcohol and an alkali metal borate.

5. The package defined by claim 1 wherein the hydrogel comprises a polyvinyl alcohol and borax.

6. The package defined by claim 1 wherein the hydrogel comprises a polyvinyl alcohol and a salt, the polyvinyl alcohol having a viscosity of about 23–28 centipoises when used in a 4 percent aqueous solution at 20° C. and having a residual polyvinyl acetate content of about 3 percent by weight.

7. The package defined by claim 1 wherein the hydrogel comprises borax and an aqueous polyvinyl alcohol solution containing about 10 percent of the polyvinyl alcohol which has a viscosity of about 23–28 centipoises when used in a 4 percent aqueous solution at 20° C. and which has a residual polyvinyl acetate content of about 3 percent by weight.

8. The package defined by claim 1 wherein the upper surface of said piston means is a sloping shoulder.

9. The package defined by claim 1 wherein said hydrogel is positioned between the wall of said body and the wall of said piston, and in contact with said walls.

10. The package defined by claim 1 wherein said piston means is an impermeable synthetic resinous, slidable piston the exterior surface of which is coated with said hydrogel.

11. The package defined by claim 1 wherein said piston means is an impermeable synthetic resinous, slidable piston of cellular foam material, the exterior surface of said piston being coated with said hydrogel.

12. A package for dispensing a fluid product in an expanded state comprising

a container body having closures at each end,

a first section of said body containing under pressure substantially unexpanded dispensible 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 of said body containing propellant under pressure, and

a slidable piston in said body for separating said first and second sections one from the other, the wall of said piston depending into said second section contiguous to and spaced apart from the wall of said body, and being coated with a pliable, reversible hydrogel.

13. 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 dispensible 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 second section containing propellant under pressure,

an impermeable cup-shaped slidable piston of a polyolefin positioned in an inverted position in said tubular body and presenting a closed end toward said first section and having a substantially straight skirt on said closed end, the skirt extending toward the open end of the piston and disposed contiguous to and spaced apart from the wall of said tubular body,

and being coated with a pliable, reversible hydrogel.

14. 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 dispensable 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 second section containing propellant under pressure, an impermeable cup-shaped slidable piston of a polyolefin positioned in an inverted position in said tubular body and presenting a closed end toward said first section and having a substantially straight skirt on said closed end, the skirt extending toward the open end of the piston and disposed contiguous to and spaced apart from the wall of said tubular body, and a pliable, reversible hydrogel sealant in the space between said skirt portion and the wall of said piston, said gel being coated on the surface of said skirt portion of said piston.

References Cited by the Examiner

UNITED STATES PATENTS

2,376,371	5/1945	Lowe et al.	
2,439,108	4/1948	Staehle.	
2,838,210	6/1958	Detrie et al.	222—389 X
2,860,801	11/1958	Nielsen	220—64 X
3,020,688	2/1962	Modderno	53—36
3,022,923	2/1962	Hoffman	222—389 X
3,112,846	12/1963	Hein	222—394
3,117,404	1/1964	Miles	53—36
3,117,699	1/1964	Epstein	222—389
3,128,922	4/1964	Kuster	222—389

FOREIGN PATENTS

1,162,440	4/1958	France.

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