

Dec. 24, 1968

C. L. SANDS

3,417,901

REUSABLE PRESSURIZED DISPENSING DEVICE

Filed July 6, 1967

2 Sheets-Sheet 1

Fig. 1

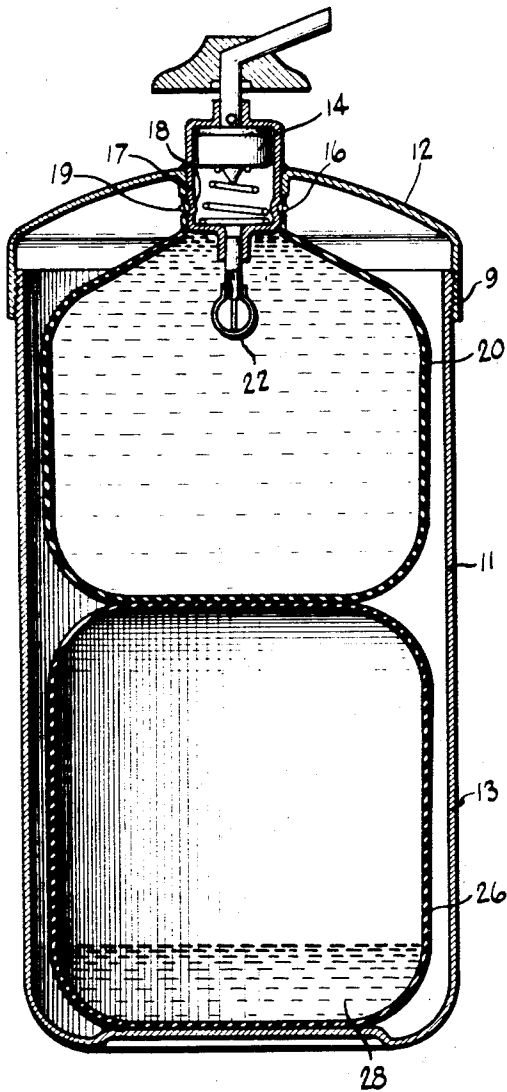
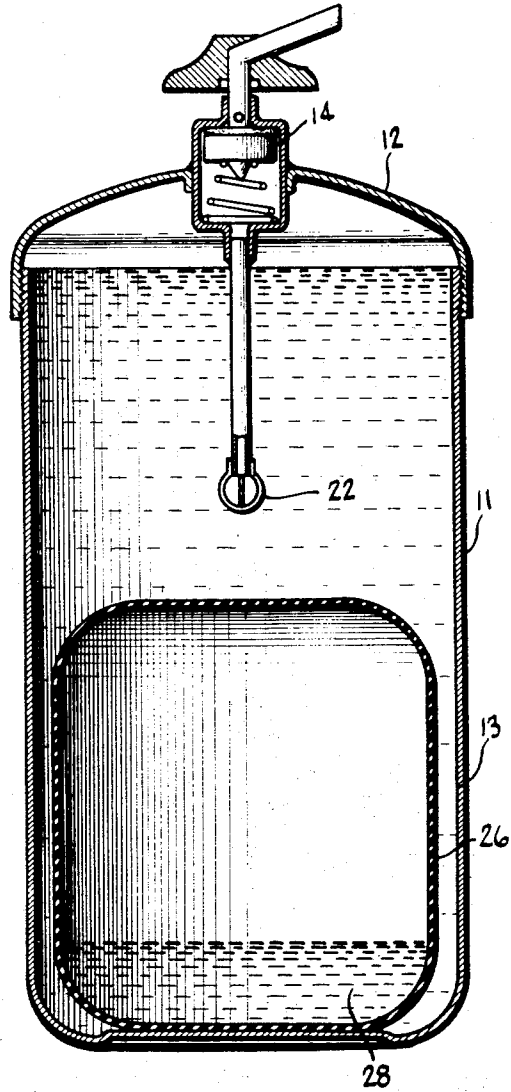


Fig. 2



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FIG. 3

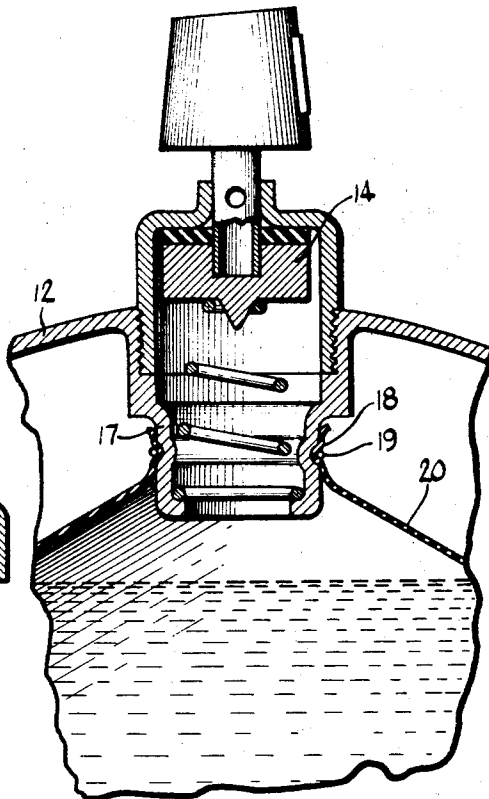
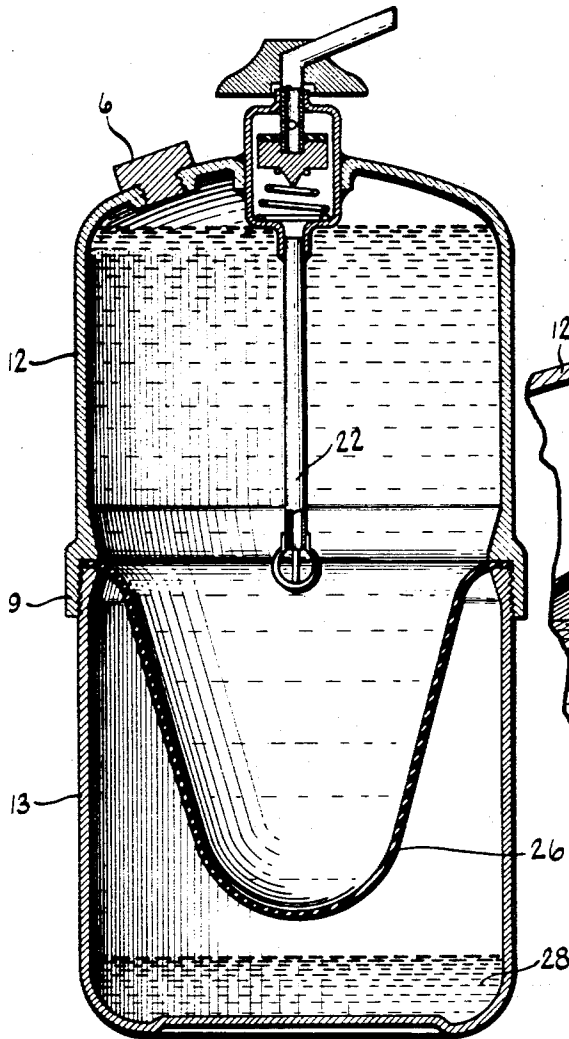


FIG. 4

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ABSTRACT OF THE DISCLOSURE

Disclosed is a reusable pressurized dispensing device which has a sealed chamber to hold a propellant which can be liquified in a home refrigerator, and which will boil below operating temperatures in order to force the liquid to be dispensed from the dispensing device. The device may be refilled by cooling to liquefy the propellant and opening the device to add more material to be dispensed.

This invention relates to a pressurized can suitable for dispensing fluid products, whereby the can can be reused without the necessity of it being repressurized.

The dispensing of many substances such as shaving cream, deodorants, paint, insecticides and the like directly from packages in which they are stored and transported under pressure, and from which they are eventually used, has grown to be an important segment of industry. The effectiveness of the "aerosol bomb" as a means for dispensing certain liquids, such as insecticides, is well known. The mechanism by which these liquids are generally dispensed, according to the prior art, has been determined to a large extent by the compatibility of the liquid to be dispensed and the propellant. The principal mechanism by which these aerosol bombs operate is to mix insecticide or the like with a liquid propellant having a sufficiently low boiling point to provide the mixture with a vapor pressure sufficiently high to cause the liquid to be ejected forcefully from the container when the dispensing valve is open. Low boiling liquids such as the chlorofluoro methanes, methyl chloride, methylene chloride, methyl bromide and others have been used in these applications. In such applications the low boiling liquid propellant is generally a component of the product which is dispensed and the propellant is irrecoverably dispersed in the air.

A second type of aerosol bomb contains a propellant and a liquid to be dispensed which are not miscible. In such aerosol bombs, by using appropriate valving systems, the propellant merely maintains a pressure within the bomb and the liquid to be dispensed is forced out of the bomb by the pressure created by the propellant. In such cases, it is required that the liquid to be dispensed and the propellant be compatible at least to the extent that they cause no chemical reaction, excess heat, corrosion or the like, even though it is necessary that they be immiscible with one another. Such bombs are handicapped by the requirement that they be operated in a particular attitude in order to avoid discharging the propellant before all of the liquid to be dispensed is exhausted. Even when operated in the chosen attitude, usually at the conclusion of the discharge of the liquid, the propellant is discharged into the air.

In both these types of prior art dispensers, care must be taken in selecting the propellant in order that it has the correct miscibility, or immiscibility as the case requires, as well as the lack of corrosion or chemical reaction and general compatibility with the liquid to be dispensed. Additionally, certain propellants, such as some of the hydrocarbons, are highly inflammable and not suitable for use in some applications.

The present invention overcomes the foregoing problems by providing a reusable pressurized package or con-

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tainer which contains a propellant in a completely closed chamber and a separate area or chamber for the liquid to be dispensed from the package. The liquid to be dispensed is subjected to pressure from the propellant and the liquid may be pushed from the package or container by this pressure through a suitable valve means. Further, the present invention is based on the discovery that a practical reusable aerosol package can be made by selecting a propellant which is gaseous at the operating temperature (the temperature at which it is desired to dispense the liquid from the device) but which may be liquified by cooling to a readily achievable temperature, e.g. the temperatures achieved by a household refrigerator freezer section.

Since the propellant is encapsulated by a completely closed chamber, problems such as reactivity between the propellant and the liquid to be dispensed, and loss of propellant during or after the dispensing of the liquid to be dispensed are obviated. Thus, this invention permits the reuse of the propellant supply. This is accomplished by placing the complete device or the propellant chamber alone in a refrigerated area, having temperature sufficiently low to liquify the propellant, and thus collapse the propellant chamber. Following this, the balance of the device is filled with liquid to be dispensed and the device is closed. The device is then permitted to warm up sufficiently to vaporize at least part of the propellant which in turn causes a pressure to be applied to the liquid to be dispensed. Thereafter when the valve system is actuated, the liquid to be dispensed, is dispensed under the pressure exerted by the vaporizing propellant.

The invention may be better understood by reference to the accompanying drawings wherein, in the interest of clarity, certain figures have been shown on a somewhat exaggerated scale and wherein:

FIGURE 1 is a side elevational view, taken in section, of the first embodiment showing a propellant chamber which is separate from the container, a liquid chamber which is also separate from the container, and a container having a valve opening.

FIGURE 2 is a similar elevational view, of a section of the second embodiment wherein the propellant chamber is separate from the container, but the liquid to be dispensed is merely held in the container.

FIGURE 3 is an elevational view taken in section of an embodiment of the invention where the propellant chamber, while separated from the liquid chamber, is an integral part of the container. This figure also shows a filling opening.

FIGURE 4 is a side elevational view of a modification of the embodiment shown in FIGURE 1 wherein the bag holding the liquid to be dispensed is permanently mounted to the collar of the container and whereby the valve mechanism may be withdrawn to fill or refill the liquid bag.

FIGURE 1 shows a container 11 which may be made of metal or glass or any other convenient material. The container comprises a top member 12 and a bottom member 13 which are secured together in such a way that pressure in the container will not disengage the top from the bottom. The fastening means may be a threading arrangement as shown at 9, or a simple bayonet lock wherein the top portion 12 extends around the upper periphery of the bottom portion 13, and can be locked merely by rotating the upper portion with respect to the bottom portion for several degrees. It will be obvious to those skilled in the art that many variations may be made to the means for keeping the container closed.

The upper portion of the container is fitted with a suitable valving means 14 (not shown in detail) and a locking system 16 for securing the bag containing the liquid product to be dispensed to the upper portion of the container. Again, this may be done in any convenient way.

It has been found satisfactory that an annular projection from the lower end of the valve body 17 may be fitted with an annular detent 18 and a ring 19 which may be used to clamp the bag containing the liquid to be dispensed 20 to the valve means. This structure is more clearly seen by reference to FIGURE 4.

It is preferred, though it is not absolutely necessary, a guard cage 22 extending below the valving means, and attached thereto, to prevent either the liquid containing bag 20 or the propellant containing bag 26 from collapsing across the throat of the valving means. This guard cage may be made in any convenient form and may be raised to extend a considerable distance into the container 11, as illustrated by FIGURE 2.

Many alternative sealing means for sealing the liquid bag 20 to the valve means 14 will occur to those skilled in the art, and this invention contemplates such other methods of sealing. Another method which might be commercially adaptable is to permanently heat seal a male or female threaded member to the bag 20 which threads would match up with threads placed on the valving means on the annular projection 17, whereby the bag could be screwed onto the valving means 14. Such an adaptation would be usually on a bag that was a throwaway or a refillable bag. This invention contemplates the bag 20 being permanently sealed to the lower portion of the valve means 17, where the valve means, as shown in FIGURE 4, is removable to permit refilling the bag 20 with liquid to be dispensed.

The container 11 also houses a propellant bag 26 which may be made of any convenient material. It is essential that the propellant bag be made of some material that is fairly impermeable to the propellant used, and a material which is compatible, i.e. will not react or corrode when in contact with the propellant 28. It is necessary that the propellant bag be able to expand to approximately fill the container 11. This invention contemplates two principal modes by which this may be accomplished. First, the bag may be made of a nonresilient, but flexible material, such as polyethylene or the like, of a size such to approximately fill the container 11. When the propellant in the propellant bag 26 is collapsed, the bag will collapse to a crumpled, wrinkled form, leaving most of the container 11 unfilled. The second mode contemplates a propellant bag made of a rubbery, resilient, or stretchable material such as natural or synthetic rubber whereby the physical dimensions may be altered, i.e. shrink or expand, according to the pressure exerted by the propellant which in turn is proportional to the temperature of the propellant.

It is preferred that when the propellant bag is made of stretchable material, that a means be employed to limit its uppermost size, in order to permit easy handling while it is in its warm or completely expanded state. It has been found that this can be accomplished by housing the propellant bag within a fish net or a mesh stocking whereby the expansion of the propellant bag is limited to something close to approximately the volume of the container 11.

FIGURE 2 illustrates a second embodiment wherein the material to be dispensed occupies that portion of the container not occupied by the propellant chamber. Although this is not the preferred embodiment, it may be useful for some applications. The container used in this embodiment must be essentially watertight in order to prevent leakage of the material to be dispensed. In this connection, a threaded connection between the top 12 and bottom 13 of the container is preferred. Suitable gaskets and the like (not illustrated) may be used if desired.

FIGURE 3 illustrates a further embodiment, wherein the propellant chamber is formed in part by the lower portion of the container. As in FIGURE 2, the liquid to be dispensed occupies that portion of the container not occupied by the propellant chamber, and thus, the container must be fluid tight. Also, shown is a filling open-

ing 6, which may be used to refill the device. Such a filling opening also may be used in connection with the embodiment shown in FIG. 2.

The material from which the propellant chamber is manufactured may vary over wide limits, but may be divided into two general categories, as mentioned above. Although the drawings attached hereto have shown the propellant chamber 26 to be unwrinkled in nature, indicating an extensible flexible material, the invention is not so limited. Suitable materials from which the propellant chamber may be made include the various synthetic rubbers such as butyl rubber, polybutadiene, ABS polymers, styrene-butadiene rubbers, the various acrylonitrile rubbers and natural rubbers. Among the relatively non-extensible but flexible materials which may be used are vinyl chloride, polyethylene, polypropylene nylons, and similar materials.

In the first embodiment, as illustrated by FIGURE 1, the chamber which contains a liquid to be dispensed, may likewise be made out of either a flexible extensible material or an inextensible flexible material. Generally, the same materials which are used for the propellant bag are suitable for use as the chamber for the liquid to be dispensed, provided the materials are non-reactive with the liquid to be dispensed.

In the practice of this invention it is necessary to select a propellant which has a boiling point below the temperature at which the reusable pressurized package is to be used. It is necessary, for practical operation, that the boiling point of the propellant not be too low, in order that the propellant may be liquified conveniently when it is necessary to recharge the reusable package. Generally, the boiling point of the propellant should be higher than -20° and preferably between 0° F. and 60° F.

It has been found that dichlorotetrafluoro ethane, sold under the trademark "Freon 114" is particularly suitable for use as a propellant in the dispensing devices of this invention. The dichlorotetrafluoro ethane has a boiling point of 38.4° F. with a latent heat of vaporization at one atmosphere of 58.3 B.t.u.'s per pound (which is relatively low). Other materials which may be used as propellants in my invention include ethyl chloride, methyl chloride, sulfur dioxide, Freon 21 (dichlorofluoromethane) and others.

It is essential that the propellant chamber be completely closed, at least during the operation of the pressurized package. Optionally, the propellant chamber may be fitted with a valve system whereby the propellant may be replenished to make up any loss because of diffusion.

Although the drawings show a particular valve means 14, the present invention is not limited thereto, but contemplates the use of a wide variety of valve systems which will be apparent to those skilled in the art. The valve means must have an external control means by which the valve may be operated, and it must be able to remain closed under the application of the relatively low pressures generated by the propellant. Any valve means meeting these standards may be used in conjunction with the present invention. The valve means may be mounted in any convenient manner. As shown in FIGURE 4, it may be removable in part in order to permit the filling of the device with the material to be dispensed.

A dispensing package when constructed in a manner corresponding to the first embodiment of this invention has many advantages, and provides for flexible operation. The container can be used to dispense different liquids simply by changing the liquid containing bag 20. Since the propellant is completely separated from liquid to be dispensed, there is no dilution or adulteration of the product in the liquid containing bag and 100 percent pure product is dispensed. Should the propellant chamber for some reason become punctured or otherwise unusable, it may be removed and a new chilled propellant bag be inserted at any time. Further, the throw-away bags may be used as a package for marketing the liquid to be dispensed.

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Additionally, the liquid dispensing devices of this invention may be used to dispense semi-liquid or plastic materials such as catsup, molasses, putty and cement or glue in addition to liquid products. It is also possible to dispense highly volatile products such as perfumes and solvents from such a dispensing device.

The container 12 need not be in the shape of a can as shown in the drawings, but may be in any form desired, including various decorative forms. Since the device of this invention is reusable, it is designed to compete with less expensive throw-away cans. Hence, the construction and design may be more expensive in nature than the throw-away dispensers and still achieve economic competition. While several embodiments of this invention have been shown and described, various adaptations and modifications thereof may be made without departing from the scope of the appended claims:

I claim:

1. A reusable pressurized dispensing device which comprises a container; a permanently closed collapsible propellant chamber within said container, said propellant chamber being adapted to approximately fill the inner volume of said container, said propellant chamber containing a propellant having a boiling point at atmospheric pressure above -20° F. and below the operating temperature of said device; said container being sufficiently strong to contain said propellant when at operating pressure, including a space adapted to hold material to be dispensed; readily removable and replaceable closure means for said container to permit insertion, at atmospheric pressure, of said material to be dispensed, into said container when said propellant is at a temperature below its boiling point at atmospheric pressure; said container having a valve

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means in fluid communication with said material to be dispensed and the outside of said container; whereby the expansion of said propellant tends to exert pressure on said material to be dispensed in a manner tending to force it out of said container through said valve means.

2. A device as described in claim 1, which includes a separate chamber for the material to be dispensed said chamber being in fluid contact with said valve means.

3. A device as described in claim 2, wherein the chamber for the material to be dispensed is removable from said container and detachable from said valve means.

4. A device as described in claim 2, wherein said closure includes said valve means.

5. A device as described in claim 1, wherein the propellant has a boiling point of between 0° F. and 60° F.

6. A device as described in claim 2, wherein the propellant has a boiling point of between 0° F. and 60° F.

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141—3; 222—386.5