ABSTRACT OF THE DISCLOSURE

A package for dispensing fluid contained therein as a foam is described. The package comprises an outer deformable housing, rigid container within the deformable housing and a cellular material within the rigid container. The elements are constructed and arranged in order that a fluid being dispensed from the deformable housing and air are required to simultaneously pass into the cellular element where they are admixed prior to being dispensed as a foam.

This application is a continuation of an application Ser. No. 453,256 filed May 5, 1965, now abandoned.

This invention relates to a foam producing device and package. More particularly, the invention embraces a package containing a normally liquid material which is dispensed from the container as a uniform foam of controllable characteristics.

Foams are essentially colloidal systems comprising a gas phase dispersed in a liquid phase. These systems are most commonly prepared by agitating a liquid with a gas or by whipping a gas into a liquid medium. Gas bubbles surrounded by a film of liquid are formed in large numbers, and if the surface forces of the liquid are of the proper magnitude, the foam will persist. The most stable foams are obtained when the enclosing liquid is viscous; whereas when the enclosing liquid is highly fluid, the foams formed will be of only short duration. Although foams are most often not desired in commercial processes, they are eminently suitable for other applications, since minor amounts of the enclosing liquid will cover a relatively large surface area. Moreover, if the foam is stable, the enclosing liquid can be applied to an absorbent surface such as fabric, with only limited wetting of the surface occurring. Therefore, it is often desirable to package cleaners, lotions, polishes, and the like in order that they will be dispensed from the package as foams.

In the prior art, numerous products such as upholstery cleaners, shaving creams, and polishes are packaged and sold in the so-called aerosol containers, for dispensing as foams. In these systems, the material to be dispensed is packaged in a container along with a liquefied propellant, or under pressure with an inert gas such as nitrogen and carbon dioxide. The product is dispensed through a suitable valve mechanism in such a manner that when the mixture leaves the container, the liquid propellant or the inert gas is rapidly expanded, converting the dispensed material into a foam. Although these products have been highly successful on the consumer market, there are disadvantages to such packages. Thus, the charging of the aerosol containers requires special apparatus and special values of close tolerances. Moreover, it is necessary to employ containers which will withstand relatively high pressures, particularly in the event an inert gas is used. Since the containers cannot be re-used, the packaging costs are often prohibitive for normally low-cost items such as household cleaners, lotions, and the like. Additionally, with the aerosol containers, there is at least a minimum amount of danger as a result of explosive or fire hazards brought about by the pressurized container and expandable gas. Furthermore, some liquids such as acids cannot be packaged in the conventional "tin" aerosol container.

In an effort to avoid the problems encountered with aerosol containers, packages have been suggested which comprise a foam producing and dispensing device comprising, in combination, a closed deformable container having an opening means therein, and a compressible spongelike element in the container which does not completely fill the container and which is spaced from the opening means. When a foambable substance is introduced into the deformable container in the nonfoamy state, it is adsorbed and temporarily retained by the spongelike element and will, when the container is deformed in such a manner that the sponge element is compressed, eject the foambable substance from the container in the foamy state. These devices suggested by the prior art, while, in some respects, the problems of the aerosol container, are cumbersome and not completely practical.

Accordingly, it is the primary object of this invention to provide a dispensing device and package which is simple in construction but which permits the dispensing of a normally liquid material as a foam.

It is another object of the invention to provide a foam-dispensing device and package which is capable of continuous reuse.

These and other objects of the invention will be more readily apparent from the following detailed description with particular emphasis being placed upon the drawings.

The objects of the present invention are accomplished by loading the dispensable material in a package comprising, in combination, a first deformable elongated container having an opening at one end of the container; a second container which is substantially coextensive with the opening of the deformable container; a porous cellular or spongelike material which is placed in the rigid container, and a closure having a foam ejecting nozzle which is in engagement with the first deformable container. The rigid container is of shorter height than the deformable container, and maintains broader openings therein. In operation, when the deformable container is inverted for dispensing the material and pressure is applied to the deformable container, air and the material to be dispensed are forced into and through the cellular material entrapping gas bubbles within the enclosing liquid. The material is ejected from the container as a foam. Depending upon the dispensable liquid, particularly its viscosity and other foam-forming characteristics, and the nature of the cellular element, the foam dispensed will vary from a wet, relatively nonstable foam to a dry, stable foam.

As a secondary and preferred embodiment of the invention, a dip tube is attached to the bottom of the rigid container, which tube extends to substantially the bottom of the deformable container. In this embodiment when the container is inverted for dispensing the fluid contained therein, and pressure applied to the deformable container, air is drawn through the dip tube into the cellular structure. When employing a dip tube, the dimensions of the rigid compartment can be substantially lessened, as well as the amount of cellular material contained therein. Other modifications can be made in the presently disclosed structure which will be apparent to one skilled in the art.

In the accompanying drawing, forming a material part of the application, and wherein like numerals are employed to designate like parts throughout the specification:

FIGURE 1 is a partially broken away cross-sectional view of one embodiment of the present invention;

FIGURE 2 is an exploded cross-sectional view of the package shown in FIGURE 1;

FIGURE 3 is a cross-sectional front view of a sec-
3

ond embodiment of the invention utilizing a dip tube; FIGURE 4 is a cross-sectional front view of the rigid container employed in the modification shown in FIGURE 3; and FIGURE 5 shows the completed assembly of FIGURE 3 containing a dispensable material in the inverted, foam ejecting position.

More specifically, referring to FIGURE 1 of the drawing, rigid container 2 is positioned in opening 1.1 of deformable housing 1. A porous cellular material 3 substantially fills container 2. Closure 4 having a foam ejecting nozzle 4.2 and an elongated inner sleeve 4.1, which is threadedly engaged with container 1, functions to direct the flow of the packaged dispensable liquid and to retain container 2 and cellular material 3 in their proper position. Thus, lip 2.3 of container 2 extends over the edge of shoulder 1.2 of opening 1.1 of deformable container 1. When the container is inverted and container 1 depressed, the dispensable fluid within the container is drawn into rigid container 2 through breather openings 2.1. Air which is drawn in through nozzle 4.2 and the dispensable fluid are admixed in the cellular material and ejected from the container through nozzle 4.2 as a foam.

Although the modification shown in FIGURE 1 is highly efficient, superior foaming with smaller amounts of cellular material can be obtained by using a dip tube 2.3 positioned in opening 2.2 of container 2 as seen in FIGURE 3. When the container is inverted for dispensing the material, as seen in FIGURE 5, dip tube 2.3 will be out of contact with the fluid to be dispensed and will draw air into the cellular material as the container is depressed. When employing the embodiment shown in FIGURE 3, openings 2.1 are preferably located on the bottom of the container 2 rather than on the upper side as shown in FIGURE 1.

According to the invention, container 1 is preferably a flexible plastic such as linear polyethylene, polytetrafluoroethylene, polyvinylchloride, and the like, or it can be a lightweight metal capable of being deformed. Container 2 and closure 4 which are non-deformable, or substantially so, can be glass, a lightweight metal, or a relatively rigid plastic body. Because of economic considerations and its non-breakability, rigid plastic materials such as linear polyethylene are preferred. The dip tube, again because of economic considerations, is preferably plastic; however, glass dip tubes can be employed.

The cellular material which is to be employed herein and retained in container 2 can be any porous material which is liquid absorbing or absorbing. Exemplary materials are the natural sponges and the synthetic sponglike materials such as polyurethane, foam rubber, vinylite sponges, polyester sponges, and the like. The synthetic materials are preferred in that the irregular and tortuous paths extending from surface to surface of the materials are highly conducive to the production of a foam. In addition to the above sponglike material, expanded metals, porous ceramics, and the like, can be selected. Again, it is only essential that the material be porous and have an irregular tortuous path extending from surface to surface thereof.

The materials which are to be packaged and dispensed according to the present invention include the common household products for cleaning sinks, fabrics, oven, and the like, as well as personal products such as lotions, anti-septics, and bactericides. Inasmuch as the containers can be refilled and reused, it is possible to extend the use of foamed materials into areas where heretofore, because of the increased expense of packaging a foam product, it was impossible to do so. Moreover, the foam-encapsulated packages of the present invention do not employ liquefied gases, or gases under pressure, and are safe for use in any environment.

As will be apparent to one skilled in the art, the detailed description and the drawing are only set forth as illustrative embodiments of the invention. However, the invention is not to be construed as limited thereby. It is possible to produce still other embodiments without departing from the inventive concept herein described and such embodiments are within the ability of one skilled in the art.

We claim:

1. A foam dispensing device and package comprising in combination:
   (1) a deformable elongated housing having an opening at one extremity thereof for retaining a fluid to be dispensed as a foam;
   (2) a rigid container or shorter longitudinal height than said elongated housing positioned within said elongated housing; said rigid container having a top and bottom end, said top end having an opening which is in operable association with, and in axial alignment with said opening in said elongated housing, an opening in said bottom end for receiving a dip tube, and an air passage for receiving air into the interior of said rigid container;
   (3) a cellular material within and substantially filling said rigid container, said cellular material obstructing said opening for receiving said dip tube;
   (4) a dip tube in fluid communication with said opening for receiving a dip tube in said bottom of said rigid container and extending from below and being obstructed by said cellular material within said rigid container; and
   (5) a closure for said elongated housing having a foam ejecting nozzle;

   said dip tube, rigid container, cellular material, and housing being constructed and arranged such that fluid being dispensed from said elongated housing and air entering said rigid container through said air passage within said rigid container pass into said rigid container and into and through said cellular material prior to being dispensed from said foam ejecting nozzle.

2. The foam dispensing device and package of claim 1 wherein the deformable elongated housing is polyethylene and the cellular material is a polyvinylchloride foam.

3. The foam dispensing device and package of claim 2 wherein the elongated container contains a neck portion and said rigid container is of substantially the same height but of lesser diameter than said neck portion.

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U.S. Cl. X.R.

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