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 Pat. No. 3,478,480, which is a division of
 application Ser. No. 587,511, Oct. 18, 1966,
 now Patent No. 3,401,837.

[56]

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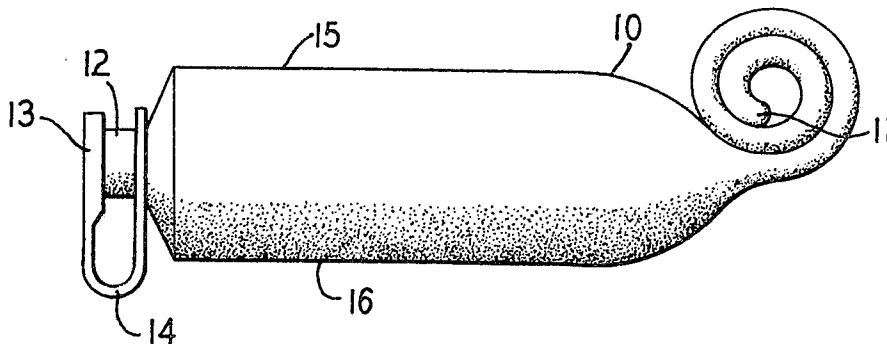
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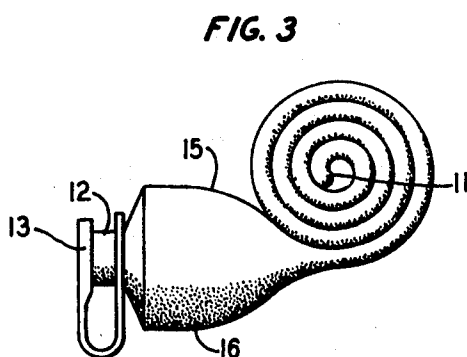
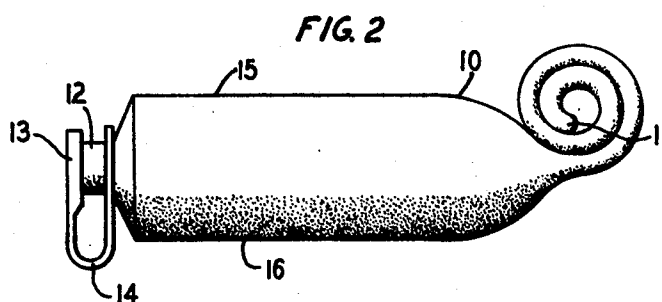
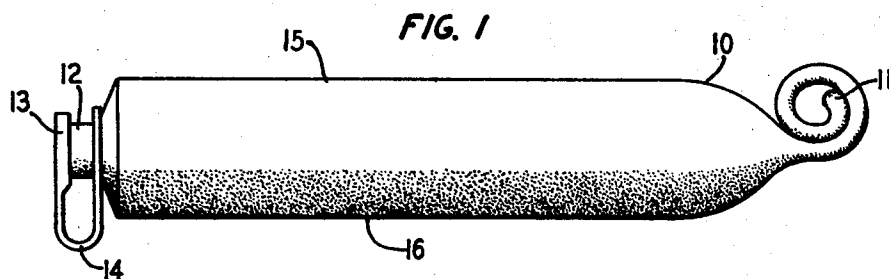
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[54] **SELF-COLLAPSING CONTAINER**
7 Claims, 3 Drawing Figs.

[52] U.S. Cl..... **222/99**
 [51] Int. Cl..... **B65d 35/32**
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ABSTRACT: A self-collapsing thermoplastic container is constructed in such a manner that the walls thereof exert an internal pressure upon the contents in such a manner that upon opening of the discharge outlet the content material may be dispensed.





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SELF-COLLAPSING CONTAINER

This application is a division of copending application, Ser. No. 736,515, filed May 12, 1968, now U.S. Pat. No. 3,478,480, which is a division of copending application, Ser. No. 587,511, filed Oct. 18, 1966, now U.S. Pat. No. 3,401,837.

This invention relates to flexible collapsible containers. More particularly, the present invention relates to a novel collapsible plastic container of the type used to contain and dispense toothpaste, creams, medicaments and similar viscous substances, such containers being constructed in such manner as to automatically dispense the contents thereof.

In recent years, a considerable degree of interest has been generated in the chemical industry for a class of compositions termed "thermoplastic materials," polyethylene and polypropylene being prime examples of such compositions. The inherent advantages of those materials, namely, chemical inertness with respect to contents, ease of ornamentation and nominal cost became evident to workers skilled in the packaging arts and in the years following resulted in an industrial revolution in the packaging industry.

At an early stage in this revolution, the feasibility of utilizing such materials for packaging toothpaste, cosmetics and the like was recognized. Unfortunately, a major prior art difficulty has been the efficient evacuation of the contents of the container. Thus, the normal evacuation or dispensing procedure involves the application by manual means of external pressure and in order to assure maximum evacuation the container must be continually squeezed in an inverted position or rolled end upon end (as in the case of thin walled tubes). Unfortunately, neither of those procedures has proven to be entirely satisfactory due to entrapment of contents or drawing in of air with subsequent lack of control in dispensing. More recently, a major manufacturer of toothpaste containers sought to overcome the noted prior art limitations by furnishing the consumer a slotted key member which facilitates the rollup process. However, entrapment of contents as well as air intake still obtain.

In accordance with the present invention, the prior art limitations noted above are effectively obviated by a novel container capable of collapsing automatically during expulsion of content material. The inventive structure is fabricated in such manner that the walls thereof exert an internal pressure upon the content material so that upon exposing the discharge outlet to the external ambient the content material is automatically dispensed with the concurrent collapse of the container. Application of the desired internal pressure is effected in accordance with the invention by prestressing and cross linking, the container walls prior to filling, so assuring that the content material may be easily advanced through the container and out of the discharge outlet of the tube upon removal of the cap while simultaneously permitting the automatic collapse of the container. This end is effectively obtained by selecting a pliant material capable of having a retractile memory generated therein, forming the container configuration of interest and heating the resultant container to a temperature slightly below the melting point thereof for a time period ranging up to 5 minutes, thereby generating the desired retractile memory in the material. The container so prepared is then in readiness for filling with content material, such end being attained by any of the well-known prior art procedures.

It will be understood by those skilled in the art that the present invention is described for convenience largely in terms of tube contents wherein the container is a cylinder of oval cross section closed at one end by a heat seal crimp and at the other end by a cap of the stopper type. However, it will be readily appreciated that such is for purposes of exposition only and that any thermoplastic container may be constructed as described herein.

The invention will be more readily understood from the following detailed description taken in conjunction with the accompanying drawing wherein:

FIG. 1 is a side elevational view of a typical container constructed in accordance with the invention;

FIG. 2 is a side elevational view of the container of FIG. 1 after a portion of the contents thereof have been dispensed, and

FIG. 3 is a side elevational view of the container of FIG. 2 after the container has been completely evacuated or before being filled.

With reference now more particularly to the drawing wherein like numerals denote corresponding parts, a collapsible container of the type normally utilized to contain toothpaste and the like is shown. Shown in the figures is container 10, said container being essentially a chamber of cylindrical or oval cross section constructed of a thermoplastic material comprising opposite sidewalls and having one end sealed as at wall 11 and the other or discharge end wall provided with a neck portion 12 through which a discharge passage or container opening extends. A stopper or cap means is secured in neck 12 in order to prevent the inadvertent escape of contents therethrough until removed by pulling upon tab 13 secured thereto, tab 13 being fastened to neck 12 by means of an elongated ribbon 14.

As indicated, the subject container which is capable of automatically collapsing upon opening of the discharge outlet requires the generation therein of a retractile memory by prestressing and cross-linking walls 15 and 16 thereof, so causing crimped end 11 to coil upon itself as the content material is evacuated. This end is most conveniently attained by winding the thermoplastic container, prior to filling, in helical coil form either about itself or around a mandrel and cross linking it by a controlled thermal or irradiative technique thereby imparting a permanent coiled configuration to the sidewalls thereof.

The thermoplastic material selected for use in the practice of the present invention is preferably chosen from among those materials manifesting high tensile moduli, that is, a high ratio of stress to strain in the elastic range of the material. The tensile modulus is a determining factor in the degree of retractile potential a helically wound member of given cross-sectional area will possess. Thermoplastic materials found useful in the practice of the present invention include polyethylene, polypropylene, polystyrene, polybutylene, polyvinylchloride, polyamides, etc.

The cross linking and prestressing required herein may typically be effected by heating the coiled container, as shown in FIG. 3, in a suitable bath, such as water of oil to a temperature just below the melting point thereof, typically 200° C., for a time period ranging up to 5 minutes. It will be understood, however, that the specific temperature employed is dependent upon the particular thermoplastic material utilized. Alternatively, this end may be attained by conventional irradiation techniques such as by means of Van De Graf, cobalt, 60 radiation, etc. Following the generation of a retractile memory in tube 10, the fluid content material is added by any suitable means, thereby resulting in the unwinding of the container by extension of the sidewalls as caused by the development of internal forces.

The container then has a stopper or cap affixed thereto and is ready for use. Upon opening of the container, the content material is dispensed and the walls automatically collapse, by progressively returning to the helical coil configuration as shown in FIGS. 2 and 3.

Studies of the structures prepared in the foregoing manner have indicated that oftentimes adverse chemical reactions occur between container walls and content material. Accordingly, it has been found advantageous to coat the interior container walls with a protective coating of a material which is inert not only to the container walls but also to the tube contents, such coating serving as a barrier to the migration of penetrants and/or diffusants and retarding corrosive affects attributed to reaction between wall and content material.

The end may effectively be attained by depositing a metal coating meeting the above criteria upon the interior container

walls by suitable condensation on plating techniques, vacuum evaporation being eminently suited for this purpose. The thickness of the deposited coating is not critical and may range from about 100-500 Angstroms, such limits being dictated by practical considerations. The metal most suitable for such purposes is aluminum.

Alternatively, it may be desirable to employ a thin coating of a thermoplastic material such as polyethylene which does not evidence the objectionable characteristics of other olefinic.

I claim:

1. A collapsible thermoplastic container for fluid material comprising a pair of opposite sidewalls, an end wall and a discharge wall having a container opening, the walls defining a chamber; the sidewalls of the container being permanently deformed into a helical coil configuration and being extendible when fluid contents are introduced into the chamber, the sidewalls tending to return progressively to the helical coil configuration to constrain continuously the fluid contents in a direction toward the container opening.

2. A collapsible thermoplastic container according to claim 1 wherein the interior of the chamber further includes a protective coating of a material which is inert to the thermoplastic material of the container and to the fluid material to be contained within the chamber.

3. A collapsible thermoplastic container according to claim 2 wherein the protective coating comprises aluminum.

4. A collapsible thermoplastic container according to claim 2, wherein the protective coating ranges in thickness from 100-500 Angstroms.

5. A collapsible thermoplastic container according to claim 1 wherein the discharge wall further includes a neck portion having a conduit communicating with the chamber.

6. A collapsible thermoplastic container according to claim 5 wherein a stopper means is removably mounted on the neck portion.

7. A collapsible thermoplastic container according to claim 5 wherein a cap means is mounted on the neck portion.

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