Dec. 31, 1946. G. S. HILLS 2,413,323

COLLAPSIBLE CONTAINER FOR PASTES

Filed April 2, 1941

Fig.1.

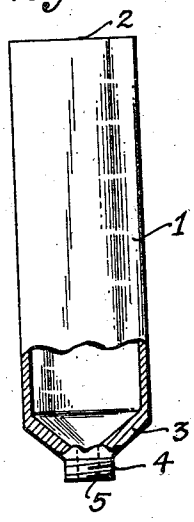


Fig.2.

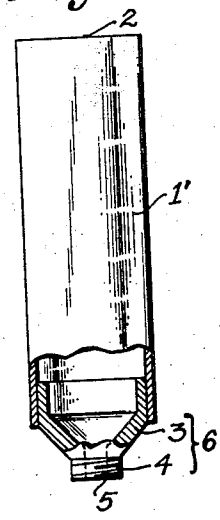


Fig.3.

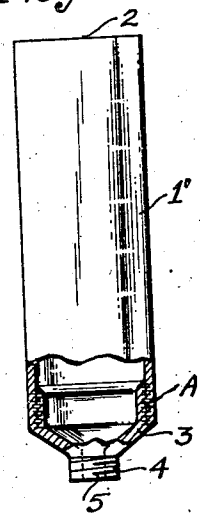


Fig.4.

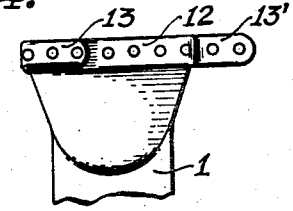


Fig.5.

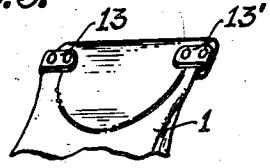


Fig.6.

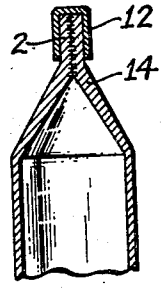


Fig.7.

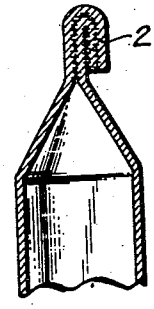
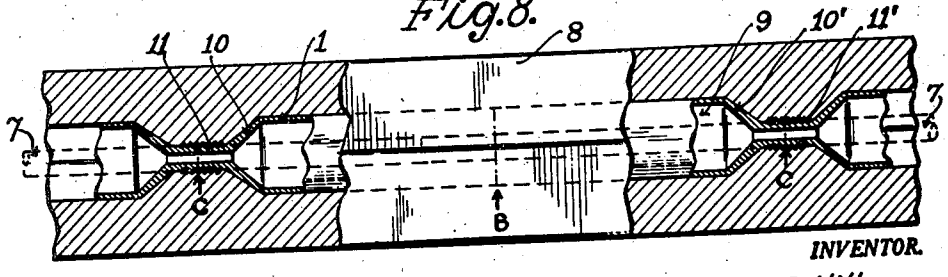


Fig.8.



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COLLAPSIBLE CONTAINER FOR PASTES

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2 Claims. (Cl. 222—107)

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This invention relates in general to collapsible containers and in particular to a container for viscous pasty materials, such as toothpaste and the like and to correlated improvements in the process of producing such containers.

Toothpaste is characterized by being a paste of high viscosity and high water content and it has heretofore been commercially packed satisfactorily only in collapsible tubes made of metal, such as aluminum, tin and the like. Such collapsible metal tubes are characterized by opacity, extreme thinness of the tube wall, flexibility and freedom from seams which would burst under pressure, and when the tubular walls are depressed the walls adhere to the paste.

Certain attempts have been made to substitute for such collapsible metal tubes containers made of regenerated cellulose, Celluloid and the like. Regenerated cellulose has the disadvantage that it is water-swelling and permits the evaporation of moisture and must be coated with a water proofing composition to prevent the drying out of the paste. These difficulties have heretofore prevented the commercial use of regenerated cellulose tubes. On the other hand, collapsible containers made from cellulose derivatives such as nitrocellulose and cellulose acetate have inter alia, the disadvantages of not being sufficiently flexible or heat sealable per se so that they have to be plasticized with camphor, tricresyl phosphate and the like to render them flexible and properly heat sealable. Such plasticizers frequently have an objectionable odor, solubility or toxicity so that the containers made therewith cannot be used for food or toilet preparations. Moreover the cellulose derivatives as a class are not as tough or as water-resistant as the resins used in the present invention and have a lower wet bursting strength than resins. Finally, the cellulose derivatives as a class soften at temperatures such as are found in the tropics and the cellulose derivatives are also swollen or dissolved by alcohol, esters and oils which are normally present in toilet preparations.

Accordingly, it is the general object of the present invention to provide a collapsible container for pastes in particular, for toothpastes and the like, which will have thin, highly flexible walls and will be tough, strong, odorless, oil and water-resistant, and capable of use with highly viscous paste containing water or organic solvents such as alcohol, esters, oils, etc.

It is another object of the invention to provide a method for forming a collapsible container

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of a non-fibrous organic plastic material in a simple and economic manner.

It is a specific object of the invention to provide a collapsible container for toothpaste which will be waterproof, readily collapsible, transparent or opaque and capable of being used in the manner of the metal tubes heretofore available.

It is a further specific object of the invention to provide a tubular container for pastes the walls of which will adhere to the paste when collapsed and which can be rolled upon itself when collapsed and will stay rolled up.

Other objects of the invention will in part be obvious and will in part appear hereinafter.

According to the present invention, there is provided a collapsible container for pastes, in particular for toothpaste, comprising a container formed of a thermoplastic synthetic resin and having a hollow tubular body the walls of which are thin enough to be collapsed and when collapsed to remain collapsed and in contact with the paste contained therein, said tubular body terminating at one end in a shoulder portion having less flexible walls than the tubular body and having an opening therein, the tubular body being closed at the other end by an autogenous fusion of the walls thereof.

The collapsible container of the present invention is formed from non-fibrous, thermoplastic synthetic resins (i. e., not thermosetting resins) such, for example, as the thermoplastic resins formed by the polymerization or condensation of various organic compounds such as coumarone, indene hydrocarbons, styrene, aldehydes; resins formed from acrylic acid, alkacrylic acid, its homologues and derivatives, sulphur-olefine resins, resins formed from dicarboxylic acids and diamines (nylon type); synthetic rubber or rubber substitutes such, for example, as polymerized butadiene, olefine-polysulfides, e. g., "Thiokol," isobutylene polymers, e. g., "Vistanex," chloroprene polymers, e. g., "Duprene" and the like, also thermoplastic resins comprising the product of copolymerizing two or more organic resin-forming compounds such, for example, as the copolymers of vinyl halide and vinyl acetate, co-polymers of vinyl halide and methacrylic acid, co-polymers of a vinyl compound and a styrol compound; and also a mixture of thermoplastic resins such, for example, as a mixture of vinyl resins and acrylic acid resins, a mixture of polyolefine resins and vinyl resins, or a mixture of two or more resins from the different classes just named.

The thermoplastic resins differ from the ther-

mosetting resins such as the alkyd resins, urea-aldehyde resins, and phenol aldehyde resins in that they are capable of being formed into thin, tough, films of high inherent flexibility while the thermosetting resins form brittle films of little strength. In the now preferred embodiment of the invention, the container is molded from a thermoplastic resin of high resistance to swelling in water such, for example, as the Vinylite resins which are co-polymers of vinyl chloride and vinyl acetate, "Pliolite" which is a cyclicized rubber derivative, and the like, and "Duprene" which is a polymer of chloroprene.

There may be added to the thermoplastic resins from which the container is made compatible organic cellulose derivatives such, for example, as ethyl cellulose, benzyl cellulose and cellulose aceto-butyrate, natural resins, rubber and the like. To the resin employed there may be added also a suitable plasticizer selected with regard to the particular plastic employed. Preferably, the plasticizer should be insoluble in water, odorless, non-toxic, tasteless and inert with respect to the ingredients to be packed in the container. Suitable plasticizers are known to those skilled in the art and may be selected without transcending the scope of this invention.

Since the public is accustomed to collapsible containers which are opaque, it is preferable to add to the thermoplastic resin a suitable opaquing agent such, for example, as a filler or pigment such as titanium dioxide, zinc oxide, iron oxide, carbon black, ultramarine blue, and the like. Further, the plastic may be colored by the use of suitable dyestuffs selected with regard to the nature of the plastic. The dyestuffs employed should be insoluble in water, tasteless and odorless.

For a more complete understanding of the nature and objects of the present invention, reference should be had to the accompanying drawing, in which:

Fig. 1 represents one embodiment of the container of the invention;

Figs. 2 and 3 represent two views of a second embodiment of the container of the invention.

Figs. 4 and 5, 6 and 7 represent several views of various end closures of the container.

Fig. 8 represents one embodiment of means for forming the container of the invention.

Referring to Fig. 1 in its preferred form, the container of the invention comprises a hollow tubular body 1 open initially at the top end 2 and terminating at the opposite end by a shoulder portion 3, which may be provided with a threaded neck having a discharge orifice therein. A screw cap of known type (not shown) may be used to close the orifice. In one embodiment of the process a container of the type shown in Fig. 1 is made by injection molding of the thermoplastic resin. For example, a composition comprising a polyvinyl resin and a water-insoluble inert filler is melted and injected into a metal mold capable of being cooled and the plastic molded in a single operation to produce the shape shown in Fig. 1. The neck 4 may be provided with screw threads 5 during the molding operation or by threading the neck in a subsequent operation after molding.

In a second embodiment of the process, the tubular member 1 is formed by a molding operation separate from the formation by molding of the shoulder 3 and neck portion 4 designated generally as 6. The cylinder 1' and the closure 6 are then brought together in such a manner

that one end of the cylinder overlaps and encloses the side walls of the closure 6 as shown in Fig. 2 and the contiguous walls are fused together by the application of heat and pressure. A solvent or plasticizer may be used to augment the fusing of the walls. As a result of the fusion process the walls of the tube 1 and the closure 6 form one homogeneous continuous piece without a seam. This fused area of the contiguous walls has been indicated by the cross-hatching at the points A in Fig. 3.

In the now preferred process of forming the container there is employed a single step pneumatic molding method. Referring to Fig. 8, a preformed hollow tube 7 made of the thermoplastic resin composition is inserted between the halves of a block mold 8 which can be heated by suitable means (not shown). The mold has a plurality of connected longitudinal cavities 9 which conform to the shape of the desired container but each cavity has twice the length of a single container.

Heated air under high pressure is introduced in the interior of the tube to inflate the tube until it conforms to the shape of the cavity 9, the tapering ends 10 and 10' defining the shoulder portions 3 of the container and the threaded cylindrical constrictions 11 and 11' defining the threaded neck 4 of the container. The mold block is then opened and the hot expanded tube chilled quickly in cold water or air to set the shape. The expanded tube is then severed along the lines B and C to form the individual container. It is to be noted that the walls of the shoulder portion 3 thus formed taper in thickness toward the thinner walls of the tubular body 1 of the container.

It is characteristic of the container of the invention that the walls of the shoulder portion 3 and the neck 4 are less flexible than the walls of the tubular body 1.

It will be noted that whether the tube is formed in a single molding operation, as shown in Fig. 1 or 8 or by a separate molding of the tube, as illustrated in Figs. 2 and 3, the walls of the tubular member 1 are thinner and more flexible than the closure 6 of the container. The tubular member 1 is sufficiently self-sustaining to stand upright during the filling operation but the walls are thin enough to be collapsed against the paste and when collapsed to adhere to the paste. The shoulder 3 can be made less flexible either by making the cap thicker in cross-section than the walls of the tubular member 1, or by molding the cap of a thermoplastic composition of harder nature from that used in forming the tubular member 1. In this latter case, for example, the tubular member 1 may be formed of a thermoplastic resin which is highly plasticized, while the cap portion 3 and 3' would be formed of the same resin with less plasticizer. It is to be understood that the expressions "less flexible" and "non-flexible" when used with respect to the shoulder portion of the container or the closure 6, are relative terms and designate closures which are both solid, rigid and absolutely inflexible, as well as closures which have a slight degree of flexibility or resiliency.

If desired, a reinforcing clip 12 of harder plastic material, metal or pressed fibre board or the like may be applied over the closed end of the tube before or after the fusion of the contiguous surfaces, as shown in Fig. 6. In Figs. 4 and 5 the fused end is shown enclosed in a U-shaped metal clip 12 which is clamped over the end as shown in

Fig. 6, by pressure. Preferably this clip 12 is one having projecting tabs 13 and 13' which initially may be folded against the sealed portion as shown on the left side of Fig. 4. When the paste is extruded and the end of the flattened tube 1 rolled upon itself the tabs 13 and 13' are bent around the unrolled section of the tube 1 as shown in Fig. 5. When the tabs are in the position shown in Fig. 5 the end of the tube is prevented from unrolling. Referring to Fig. 6 the walls 14 adjacent the end of the tubular member 1 may be thicker to reinforce the end and prevent the wrinkling and buckling of the flattened and closed end when the weight of the container is borne by the end 2 as in shipping. The metal clip 12 may be omitted and the end walls flattened and fused together as shown in Fig. 6, or folded over and fused together as shown in Fig. 7. The fusion of the end 2 may be augmented by the use of solvents or plasticizers.

Various modifications may be made in the process and in the article without transcending the scope of the present invention. For example, the tube may be embossed or otherwise decorated.

While the present invention has particular reference to containers designed for toothpaste, it is adapted for use for pastes of all kinds such, for example, as cold cream, printer's and artist's color pastes and paints, sausage and anchovy paste, lubricating grease, waxes, salves and medicinal pastes, and the like.

Owing, however, to the high moisture content of toothpastes, cold cream and shaving soap, the tubes of the present invention are particularly adapted for such products, as they are inherently impermeable to water and therefore do not swell or distort and do not impart objectionable odors or color to the pastes contained therein. Moreover, since the containers of the present invention are seamless as compared to Celluloid tubes heretofore known, the present containers do not burst when subjected to pressure incident to normal use. The containers of the present invention are lighter in weight than metal containers, are resilient and are not subject to be permanently dented and crimped as metal containers and may be made in a single and simple molding operation.

I claim:

1. A collapsible container for pastes formed from a water-resistant thermoplastic flexible resin containing a plasticizer and having a seamless hollow tubular body, the walls of which are thin and flexible so that they can be readily collapsed and when collapsed will remain in contact with the paste contained therein, said tubular body terminating at one end in a tapered integral shoulder, and an integral neck thereon having an opening therein, the walls of the shoulder increasing in thickness toward the neck, the other end of the tubular body being closed by an autogenous fusion of the walls thereof, the tubular body containing more plasticizer than the shoulder and neck portions of said container.

2. A collapsible container for pastes formed from a water-resistant thermoplastic flexible resin containing a plasticizer and having a seamless hollow tubular body, the walls of which are thin and flexible so that they can be readily collapsed and when collapsed will remain in contact with the paste contained therein, said tubular body terminating at one end in a tapered integral shoulder and an integral neck thereon having an opening therein, the walls of the shoulder increasing in thickness toward the neck, the tubular body containing more plasticizer than the shoulder and neck portions of said container.

GEORGE S. HILLS.