Feb. 3, 1948. C. A. TOME 2,435,251

COLLAPSIBLE WALL TYPE CONTAINER

Filed Sept. 28, 1943

Fig. 1.

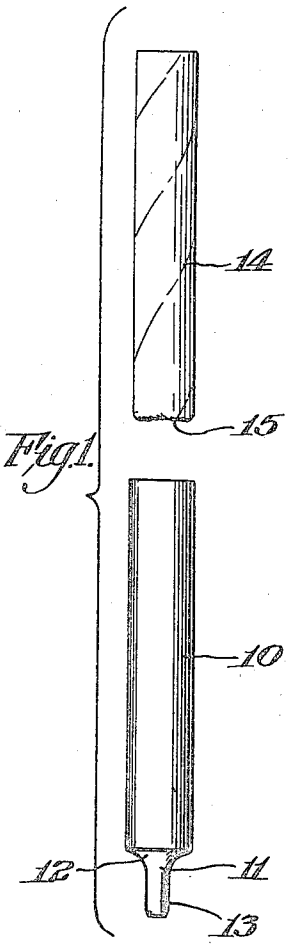


Fig. 2

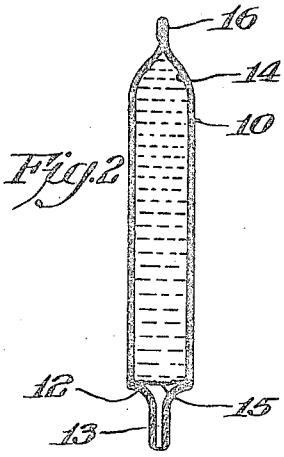


Fig. 3.

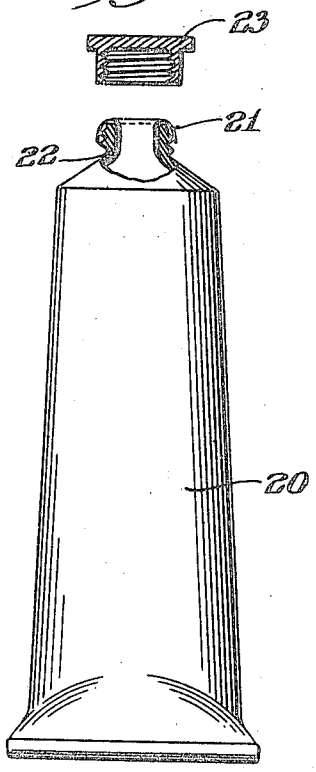


Fig. 4.

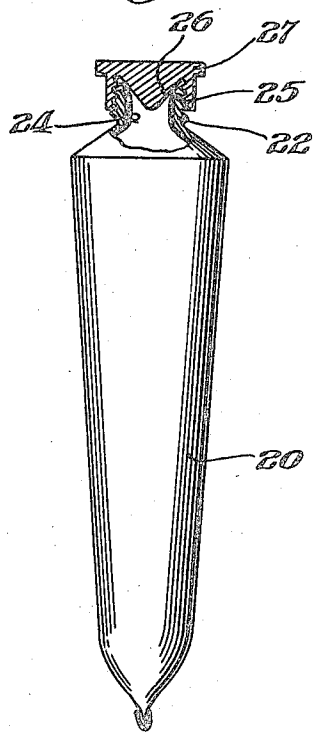


Fig. 5.

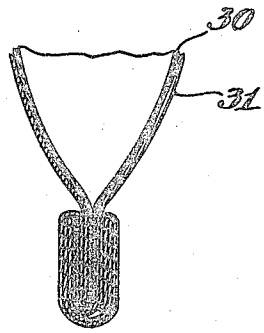
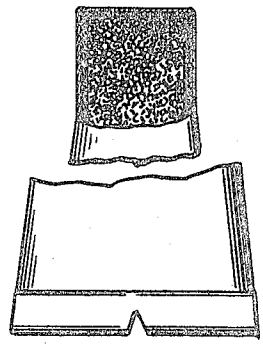


Fig. 6.



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COLLAPSIBLE WALL TYPE CONTAINER

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Application September 28, 1943, Serial No. 504,090

4 Claims. (Cl. 222—192)

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This invention relates to flexible containers and particularly to collapsible tubes adapted to hold medicines, pastes, such as shaving cream, oils and oily liquids, powders, and aqueous solutions.

The collapsible tubes which have heretofore been accepted as standard have been made from tin. Tubes are also made from lead or aluminum and other metals, but those substitutes are inferior to that which has been adopted as standard. Lead tubes in particular, even when coated with tin, discolor the contents of the tube, are relatively weak, and may prove to be toxic, particularly after a product has remained therein for an extended period of time.

The needs of war having reduced the amount of tin which can be used in tubes to a point where only a small number of satisfactory tubes can be produced, attempts have been made to find satisfactory substitutes. Demand has also arisen for stronger tubes than were provided by the prior art, tubes strong enough to withstand the hard usage to which they are subjected under the conditions of war. Certain medicines and materials which are packaged in tubes for the use of the armed forces have been found to react with the tube even when the tube has been coated with a presumably impervious material, so that the contents deteriorate and after relatively short periods of standing are reduced in effectiveness. For instance, collapsible tubes made of lead, aluminum, and even tin must be waxed or lacquered on the inside to prevent some products from reacting with the metal. Such coatings have proved to be ineffective partly because it seems impossible to secure a complete covering of the inner surface of the tube and partly because the coating itself may dissolve in or react with the contents.

It is an object of this invention to prepare a collapsible tube having exceptional strength in order that it may withstand abuse.

Another object of the invention is to prepare a collapsible tube whose contents are effectively, hermetically sealed against contact with the metal of the tube, and to protect the metal tube against the destructive effects of the contents thereof.

Another object of the invention is to seal the contents of a collapsible tube against the entrance or escape of gases.

Another object of the invention is to make a container of the type described by an efficient process which provides effective sealing by the same operations which construct the tube.

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The objects of the invention are accomplished, generally speaking, by constructing a tube of flexible metal having a liner composed of an inert, impervious, non-metallic pellicle. This liner differs from waxes, lacquers and the like in being in effect a self-sustaining sack of size and shape substantially conforming to the size and shape of the tube, and which may or may not be integrated with the tube. The liner may be made from pellicles of materials such as the esters and ethers of cellulose, regenerated cellulose, rubber film, vinyl polymers, and the like. The special objects as to process of manufacture are accomplished by a process of sealing to be hereinafter described.

In the drawing Figure 1 is a plan view of the separated constituents of a container conforming to my invention. Figure 2 is a cross-section through the sealed and assembled container of Figure 1. Figure 3 is a view, partly in section, of a modified form of my invention. Figure 4 is a view, partly in section, of a further modification of my invention. Figure 5 is a sectional view showing one method of sealing the ends of a container constructed in accordance with my invention. Figure 6 shows a method of opening a sealed container.

In Figure 1, 10 is a flexible metallic tube which is described in this instance as made of lead or aluminum thin enough to be flexible; 11 is a head composed of shoulder 12 and nozzle 13; the head is relatively rigid; 14 is a sack of non-metallic material such as a vinyl polymer, the rubber pellicle called "pliofilm," or the regenerated cellulose pellicle called "cellophane." 15 is a sealed end of the sack, which conforms in size and shape to the interior of tube 10, as shown in the assembled view of Figure 2. The nozzle of this tube is shown without a cap, which is satisfactory under some conditions.

The tube is made by methods known to the prior art. The sack shown in the drawing is made by the spiral winding of a strip of non-metallic material, the edges being sealed at the overlap. The sack may also be made by overlapping the edges of a flat strip and sealing them with a straight seam. The sack may also be made seamless by the extrusion of a tube. In any of these cases one end of the sack may be sealed before assembling the container if desired. The sack is then slid into the tube 10 and filled by machines known to the prior art. The end of the tube is then sealed by crimping the end 16 as shown and subjecting it to heating. By using electricity in the crimping process a perfect seal

is made by the film. A better seal is made in this manner than by sealing the sack directly before crimping the end of the tube. The efficiency of this process is indicated by the fact that a pliofilm sack seals through a tin tube with walls .004 in. thick in 20 seconds at 240° and a lead tube with walls .006 in. thick seals in 30 seconds at the same temperature. There is thus formed a container in which the contents thereof are effectively sealed from contact with the metal.

When it is desired to use the contents of a tube, one may thrust a pin through the nozzle 13 and puncture the sack, thereafter expelling the contents in the usual way.

In Figure 3, 20 is a metal tube, 21 is a liner which projects through the nozzle 22 and is folded over outside of it; 23 is a cap of non-metallic material, such as hard rubber or phenol-formaldehyde resin, which seals the container by compressing the end of the pellicle 21 between the screw threads of nozzle 22 and cap 23.

Figure 4 shows a similar tube in which a sack 24 extends through the nozzle but terminates near a shoulder thereon. 25 is the shoulder; 26 is a conical boss on the inside of cap 27 which acts when the cap is screwed on to seal the container by pressing the pellicle against the shoulder.

Figure 5 shows a sack 30 within a metal tube 31, the sack being shorter than the tube instead of the same length as shown in Figure 1. This also shows a method of crimping which is satisfactory with the heat-sealing method which has been described. In this figure the tube is sealed and the end is crimped at a point which forms a single bend in the end of the sack; the metal extending beyond the end of the sack is folded as shown to make a comparatively strong and rigid end support.

The sack can be integrated with the tube at the seal only, as shown, or it can be integrated throughout by the use of suitable adhesives or heat sealing methods. The tube may be separately sealed at both ends by the type of seal shown in Figure 5, in a modification of the invention, but the strength of the tube is such, when so constructed, that it is difficult to make a satisfactory opening in it. The tube may also be made with one solid closed end, if desired. In this case the device of Figure 6 is useful. In the container of that figure a notch is provided in the crimp, entering both metal and sack. To open the tube one simply tears the notch deeper until the contents of the tube are exposed.

An advantage of the container of my invention is its great strength, compared with the tubes of the prior art. Another advantage is the complete protection which it affords the contents against the metal tube. Another advantage is the greatly increased protection which it affords the contents from the action of air and gases. A still further advantage is that the cost of the new container compares with the cost of lacquered tubes.

As many apparently widely different embodiments of this invention may be made without departing from the spirit and scope thereof, it is to be understood that I do not limit myself to the specific embodiments thereof except as defined in the appended claims.

I claim:

1. A container comprising a flexible metal tube having an integral comparatively rigid head with a screw threaded nozzle, a cap for said nozzle composed of inert non-metallic material, a pellicle constituing a liner for said tube and nozzle, said cap having conical means to press the liner against the inside of the nozzle and having a screw threaded wall adapted to encircle and strengthen the nozzle.

2. A flexible container comprising a metal tube having a screw threaded nozzle, a liner therefor comprising an inert, flexible, self-sustaining, tubular pellicle of organic material having an open end within the nozzle, a screw threaded cap mounted on and encircling the nozzle, means on the cap to press the open end of the pellicle against the nozzle to seal the tube, said container being collapsed and folded at the other end, the collapsed portions of the pellicle being self integrated within the fold.

3. A container comprising a flexible, base-metal tube having a screw threaded nozzle, a cap for said nozzle composed of inert material and having a screw threaded wall adapted to encircle and brace said nozzle, a pellicle constituting an impermeable liner for said tube and nozzle, said cap having means to press the liner against the nozzle whereby leakage and contact between the metal of the tube and its contents are prevented.

4. A flexible container comprising a metallic tube and an inert, flexible, self-sustaining liner of organic material, said tube and liner being collapsed at one end to bring opposed parts thereof into contact across the width of the tube and folded to form a closure, the engaging parts of the liner within the fold being self-integrated to form a seal, and the tube having a notch extending partially through the metal and the liner of the fold.

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