Aug. 19, 1941. G. HÜBNER ET AL 2,252,854

TUBULAR CONTAINER

Filed Oct. 4, 1938

Fig. 1

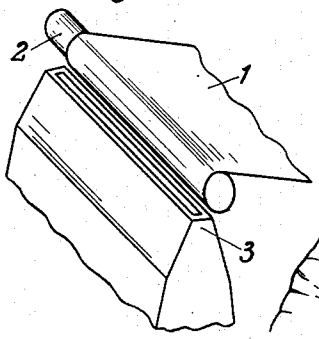


Fig. 2

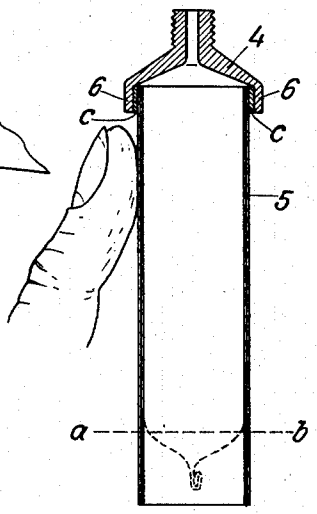


Fig. 3

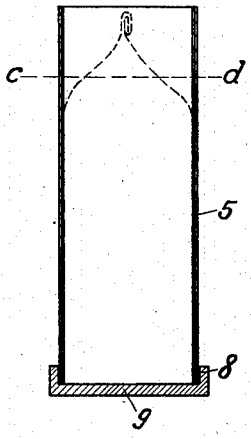


Fig. 4

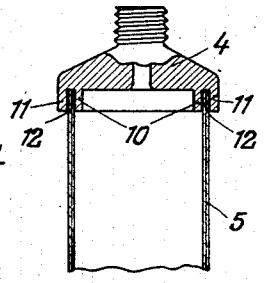


Fig. 5

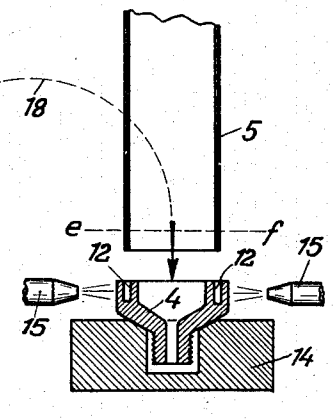
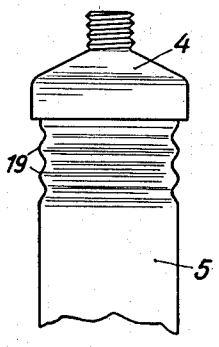


Fig. 6



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TUBULAR CONTAINER

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Application October 4, 1938, Serial No. 233,150
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5 Claims. (Cl. 93—55.1)

The present invention relates to collapsible tubes used for dispensing tooth paste, cold cream and the like and a method of making such tubes, more particularly tubes of the type consisting of a deformable container having one end thereof connected to a rigid closure member.

The closure member in tubes of the above type usually consists of a head piece carrying a screw cap. Moreover, there are tubes having a closure member constructed as a bottom or base for the tube. The latter known as upright tubes are used primarily for shipping and distributing liquid substances such as liquid cream or the like. All these tubes possess the common feature that they are open at the end opposite to the closure member before they are filled, the filling being carried out through this opening which after completion of the filling is closed by flattening and folding the edge portions of the tube.

Tubes of the type described were heretofore usually made of tin. Recently similar tubes have become known consisting of Celluloid, Cellophane or regenerated cellulose, cellulose acetate or other suitable cellulose derivatives or thermoplastic materials.

The present invention relates to tubes of the last mentioned kind, more particularly to tubes made from thin foil, preferably of cellulose acetate wound on a mandrel and cemented onto a rigid closure member.

An object of the invention is to connect a wound tube of the above type to a closure member to ensure an efficient and tight joint capable of withstanding the mechanical stress exerted thereon in practical use to prevent leaking and other defects.

The invention will become more apparent from the following detailed description taken with reference to the accompanying drawing forming part of this specification and wherein:

Figure 1 illustrates the fabrication of a tubular wound body from a thin foil strip,

Figure 2 shows a tube and closure member constructed according to the prior art,

Figure 3 shows an upright tube of conventional construction,

Figure 4 shows an improved construction of a tube according to the improvement of the present invention,

Figure 5 is a schematic diagram illustrating the manufacturing procedure of a tube according to the invention, and

Figure 6 shows a modified tube construction according to the invention.

Referring more particularly to Figure 1, there is shown a tubular wound body produced by winding a strip of thin foil of cellulose acetate or other suitable thermoplastic material upon a mandrel 2. In order to unite the adjacent turns without requiring a separate binding agent, the foil is preferably heated during the winding operation such as by subjecting it to a hot air stream discharged through a slot or nozzle 3 to sufficiently soften the material and to bond adjacent turns together.

Figure 2 shows a tube with a rigid head piece or closure member 4, which may have been made by compression molding from artificial resin such as "Bakelite" or by injection molding from cellulose acetate or other suitable material, cemented onto the wound body or tube 5. The cement joint C according to this construction is on the inner side of a collar 6 forming part of the head piece or member 4 slipped over or engaging the wound body or tube 5. After the closure member has been applied, the tube is filled from the other end up to a level *a—b* with a paste or the like, such as tooth-paste, and then closed by a flattening and folding operation as indicated in dotted lines in the drawing.

Figure 3 shows an upright tube made in a similar manner. The wound body 5 is first cemented onto the inner face of a collar or cylindrical flange 8 of a base piece or closure member 9. The tube is then filled with liquid cream or the like up to the level *c—d* and closed by a folding operation similar to the preceding illustration.

The present invention relates to an improved construction of tubes of the type described hereinabove. It has been found that a substantial tensile stress may be exerted in use on the cement joint C connecting the wound body 5 with the closure member 4. This tensile stress may cause a tearing or breaking of the joint, resulting in undesirable leakage and other defects and inconveniences. Thus, when collapsing the tube illustrated in Figure 2 by pressing the thumb against the body 5 just below the closure member 4, it is obvious that the cement joint C will be subjected to a strong pulling stress which may result in a break or tearing open of the joint connection. Moreover, the wound body 5 can easily be torn off the collar 6 as the pulling stress must be borne to a substantial degree by the extremely thin outer turn of the wound body, as it is readily understood that a wound body made up of turns united or bonded together by heating behaves substantially differently when subjected to tensile stress to a rigid homogeneous tube.

The above drawbacks are obviated according to the present invention by reenforcing the edge zone of the wound body cemented onto the tube head or closure member at both sides by the provision of rigid supporting rings or reenforcing collars or flanges. In this manner the cemented edge zone of the wound body is enclosed on both sides by two rigid rings capable of withstanding the force exerted thereon and relieving the cement joint.

In the embodiment shown the closure member is formed with two concentric collars providing a narrow annular groove or recess between them and ensuring a snug fitting for the tube. Special precaution, however, is necessary to secure a clean and absolutely tight cement joint. In the first place it is essential to use a cement which does not shrink on hardening. Furthermore, since the two collars are fixed relative to each other, they can not yield in the event of shrinkage of the cement. For this reason it is advisable to provide incisions, depressions or recesses on the inner surface of one or both collars adapted to receive the cement pressed out during the assemblage, or alternatively to use a fusible cement to be introduced into the annular groove in powdered state and transformed into its molten condition in the groove itself.

Non-shrinking cements are of the type which harden by chemical conversion from a plastic to a solid state rather than by evaporation of a solvent. Cements of this kind which are well known are those comprising an artificial resin or the like capable of polymerizing under heat and being converted into a solid substance. Moreover, most fusible cements solidifying without appreciable shrinkage may be used for the purpose of the invention.

A tube constituted according to the invention is illustrated in Figure 4. The tube head or closure member 4 is formed with two concentric depending collars or rings 10 and 11 defining a narrow annular groove or recess 12 between them adapted to receive the wound body 5 to be cemented therein.

In order to facilitate an exact dosing of the quantity of cement required and to avoid the formation of unfilled spaces or voids if a fusible cement is used introduced into the annular groove 12 in powdered state and melted within the groove, the size of grain of the cement powder and the quantity of cement required may be chosen in such a manner that by completely filling the groove it melts and forms a quantity of cement of exactly the prescribed amount. This volume can be so calculated as to completely fill the narrow crevice between the wound body 5 and the collars on rings 10 and 11 without any visible excess being forced outward and soiling the outer surface of the tube.

Shellac has proven particularly suitable as a fusible cement of this kind. Experiments have shown it to be advantageous to add a small quantity of paraffin to the shellac to reduce its brittleness and to increase its adhering properties. It has been found especially advantageous to provide the required amount of paraffin by previously dipping the edge of the tube or wound body to be cemented to the closure member into molten paraffin and then introducing it into the groove 12 filled with the molten shellac. This, on the one hand, enables a very simple and efficient dosing of the paraffin, and on the other hand presents the advantage that any interstices between the projecting edges of the layers of the wound body are filled and additionally bonded by the dipping in the molten paraffin. It is thus no longer possible for the individual winding layers to peel off and unwind when slipped into the annular groove or recess of the closure member.

Figure 5 is explanatory of a tube made in accordance with the foregoing. The closure member 4 is placed with its threaded neck projecting downwardly into a ring or equivalent member having a recess 14. The annular groove 12 in this position is filled with shellac of suitable grain size distributed within the groove by sufficiently shaking it, and any excess material brushed off. Exactly the prescribed quantity of this powder is now in the annular groove. The head piece 4 is then heated by means of burners 5 or any other heating arrangement until the shellac powder in the annular groove 12 starts to melt and in so doing rises by adhesion to the walls of the groove. Instead of heating the head piece 5 directly by the burner 15, it may be indirectly heated by introducing a pre-heated body into the space within the member 5 or in any other suitable manner. In the latter case the heating flame is prevented from coming into direct contact with the member 4 and from affecting or scorching its surface. As soon as the cement is melted, the end of the wound body 5 is first dipped into the paraffin bath 16 heated by the heater 17 (up to the line *e—f*), and thereupon introduced into the annular groove 12 as indicated by the arrow 18. The paraffin adhering to the wound body 5 then mixes with the liquid shellac in the groove 12, resulting in an extremely solid and tight connection between the tube 5 and the member 4. Experiments have shown that this connection becomes so rigid that the wound body 5 is torn or the head piece 4 broken before the cement joint gives way.

To prevent the inner protecting ring from breaking when pressing out the contents of the tube in the case of tubes filled with very viscous pastes, it is advisable to provide a zone directly in front of the cement joint within which zone the wound body is formed with annular corrugations. These corrugations provide a certain spring action resulting in a distribution of the forces over a wider area of the cement joint.

An example of a construction of the latter type is shown in Figure 6. The wound body 5 is connected to the head piece 4 in the manner above described. Adjacent to the cement zone or head piece the tube 5 is formed with corrugations 19 providing the required spring action and resiliency as pointed out above.

It will be evident from the above that the invention is not limited to the specific constructions and steps described herein for illustration but that the underlying novel concept and inventive principle are subject to numerous embodiments and modifications coming within the broader scope of the invention as defined in the appended claims. The specification and drawing are to be regarded therefore in an illustrative rather than in a limiting sense.

We claim:

1. In the art of manufacturing collapsible tubular containers of cellulosic material having at least one end thereof cemented in an annular recess of a rigid closure member, wherein said recess has a width substantially of the order of the thickness of the containers the steps of introducing a measured quantity of fusible cement in powdered state into the recess of a closure member, melting the cement in said recess, and

inserting a tube into said recess and allowing the molten cement to solidify to effect a tight joint between said tube and closure member.

2. In the art of manufacturing collapsible tubes having at least one end thereof cemented in an annular recess of a rigid terminal member, wherein said recess has a width substantially of the order of the thickness of the tubes the steps of introducing a measured quantity of fusible cement in powdered state into the recess of a terminal member, melting said cement in a recess, inserting said tube into said recess, and allowing the molten cement to solidify to effect a tight joint between said tube and terminal member.

3. In the art of manufacturing collapsible tubes of cellulosic material having at least one end thereof cemented in an annular recess of a rigid dispensing terminal wherein said recess has a width substantially of the order of the thickness of the tubes, the steps of introducing a measured quantity of shellac powder into the recess of a dispensing terminal, melting the shellac powder within said recess, inserting a tube into said recess, and allowing the molten shellac to solidify to effect a tight joint between said tube and said dispensing terminal.

4. In the art of manufacturing collapsible tubes of cellulosic material having at least one end thereof cemented in an annular recess of a rigid dispensing terminal, the steps of introducing a measured quantity of shellac powder into the recess of a dispensing terminal, melting said cement within said recess, coating an edge portion of a tube with paraffine, inserting the coated edge of said tube into said recess, and allowing the molten shellac to solidify to effect a tight joint between said tube and said dispensing terminal.

5. In the art of manufacturing collapsible tubes having at least one end thereof secured in an annular recess of a rigid closure member, wherein said recess has a width substantially of the order of the thickness of the tubes, the steps of introducing a measured quantity of fusible cement in powdered state into the recess of a closure member, thoroughly shaking the closure member and removing excess cement from said recess, melting the cement in said recess, inserting a tube into said recess, and allowing the molten cement to solidify to effect a tight joint between the tube and closure member.

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