

- [54] **DISPENSING CONTAINER
MANUFACTURING APPARATUS AND
METHODS**
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- [62] Division of Ser. No. 308,999, Nov. 24, 1972, Pat. No.
3,832,964.
- [52] U.S. Cl. **222/92, 220/67**
- [51] Int. Cl. **B65d 35/00**
- [58] Field of Search 222/92, 107, 94, 206, 215;
220/66, 67; 229/5.7

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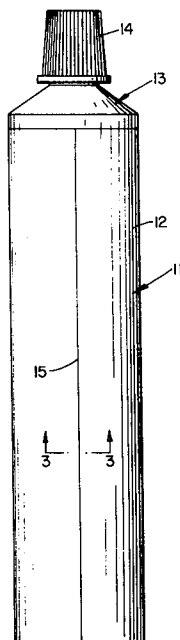
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Attorney, Agent, or Firm—Strauch, Nolan, Neale, Nies
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[57] **ABSTRACT**

Collapsible toothpaste and like dispensing containers having flexible body walls and externally threaded discharge necks are formed by wrapping a sheet of flexible material about a mandrel and fastening overlapping side edges together to provide a tubular body shell having a longitudinal seam, and then inserting and clamping one end of the formed body shell between nested mechanically interengaged inner and outer head structure elements, the inner head element being longitudinally recessed for accepting the longitudinal body seam.

3 Claims, 12 Drawing Figures



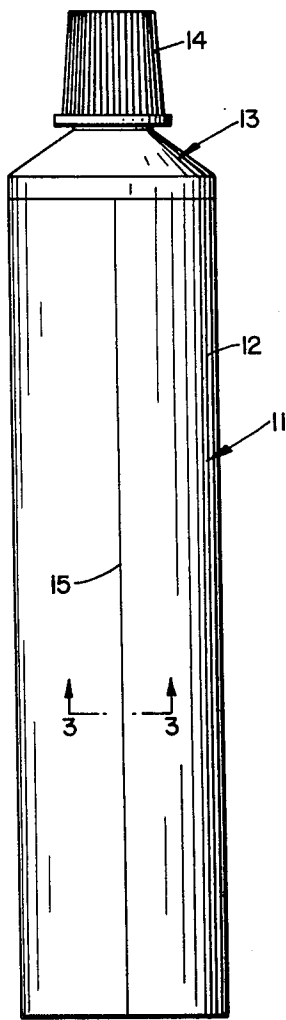


FIG. 1

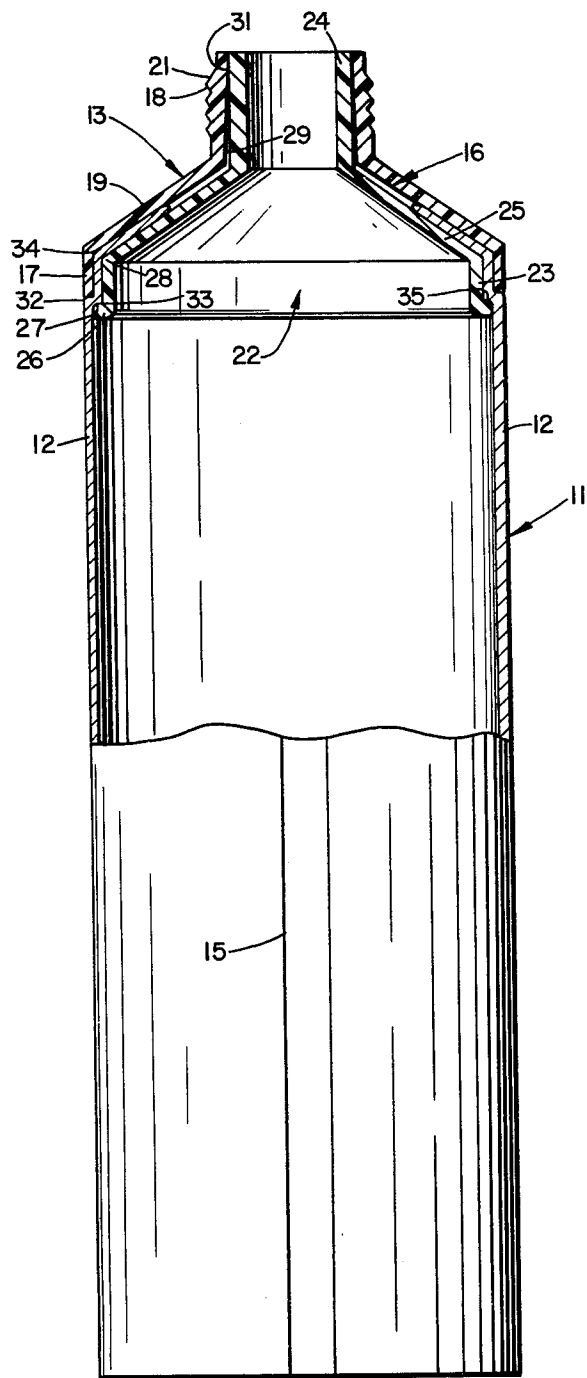


FIG. 2

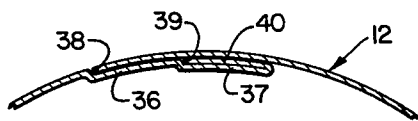


FIG. 3

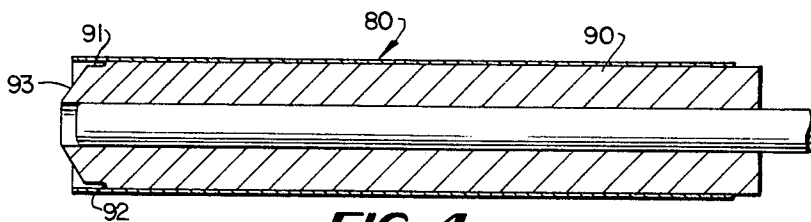


FIG. 4

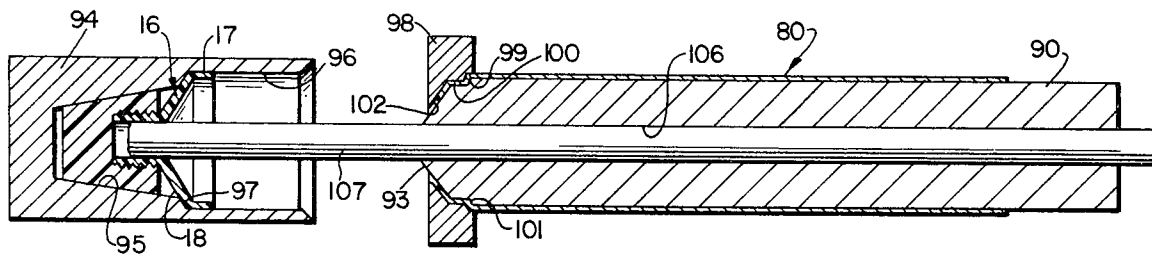


FIG. 5

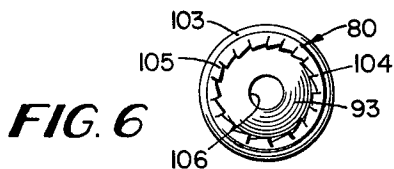


FIG. 6

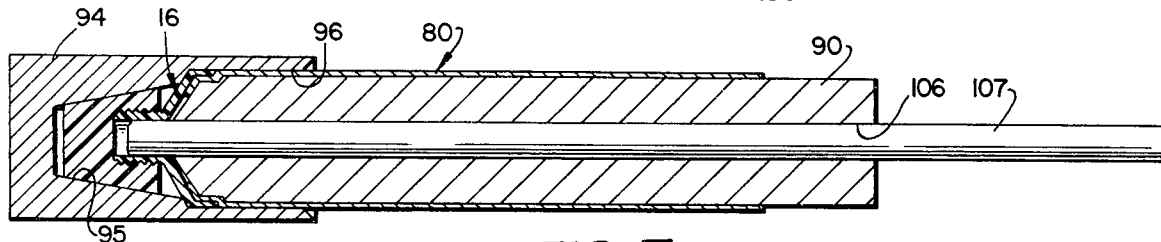


FIG. 7

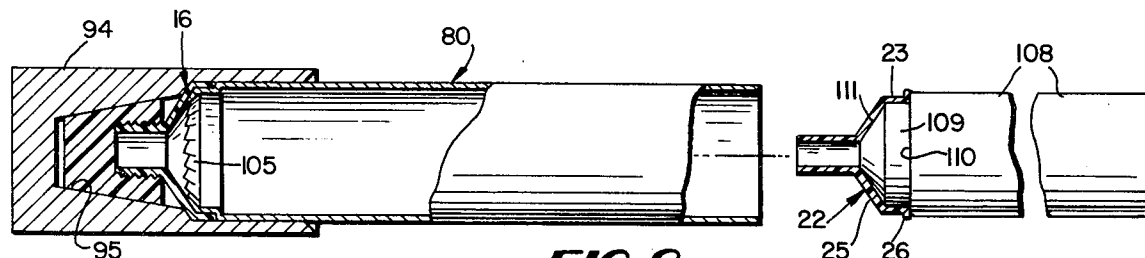


FIG. 8

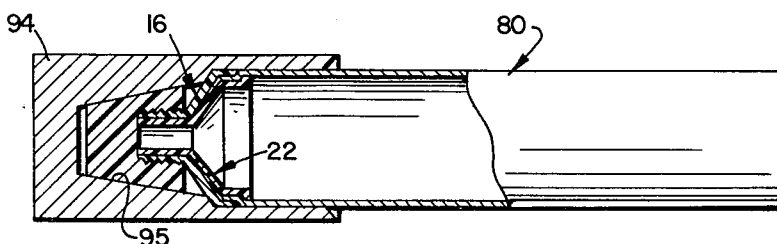


FIG. 9

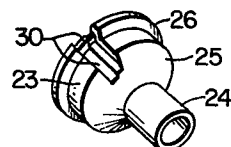


FIG. 8A

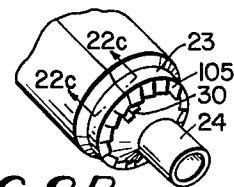


FIG. 8B



FIG. 8C

DISPENSING CONTAINER MANUFACTURING APPARATUS AND METHODS

This is a division, of application Ser. No. 308,999, filed Nov. 24, 1972, now U.S. Pat. No. 3,932,964.

This invention relates to flexible walled dispensing containers such as toothpaste and like tubes, and is particularly concerned with special modes for mechanically combining tubular bodies of such containers with preformed head structure.

The invention provides an advantageously collapsible tube assembly comprising a flexible tubular body having a longitudinal seam containing overlapped layers of sheet material of the body wall and a dispensing head structure secured upon one end of said body, said head structure comprising an inner hollow element having an inclined annular shoulder, a reduced diameter nozzle section projecting longitudinally from the inner periphery of said shoulder, an annular skirt projecting longitudinally from the outer periphery of said shoulder, and a shallow external surface recess extending longitudinally along said skirt and along said shoulder, and an outer hollow element disposed in tight substantially nested relation with said inner element, said outer element having an annular shoulder of corresponding inclination with and surrounding the annular shoulder of said inner element, a longitudinally extending nozzle section surrounding the nozzle section of the inner element, and a longitudinally extending skirt surrounding the skirt of the inner element with the outer diameter of the skirt of said outer element being substantially equal to the outer diameter of said body one end, said body one end extending longitudinally between said skirts and then being bent inwardly to pass between said shoulders, and said body seam being substantially confined in said recess, whereby said tube body and head structures are non-deformably interlocked in so mechanically interlocked as to resist axial separation of the tube body and head structure due to normal axial pull.

Further to the above a narrow annular external flange may be provided around the free end of the skirt of said inner element with said longitudinal recess extending through said flange, and said tube body one end extending over said flange and inwardly at an angle before passing between said skirts.

Further advantages of the invention will appear as the description proceeds in connection with the appended claims and the accompanying drawings.

BRIEF DESCRIPTION OF DRAWINGS

FIG. 1 is a side elevation showing a collapsible tube made according to the invention;

FIG. 2 is an enlarged side elevation of part of the tube of FIG. 1 partly broken away and in section to illustrate a preferred head structure;

FIG. 3 is a fragment section substantially on line 3—3 of FIG. 1 illustrating a longitudinal body seam structure;

FIG. 4 is a side view showing a formed tube body mounted on a mandrel in the initial stages of assembly of the tube body with the head structure according to a preferred embodiment;

FIG. 5 is a side elevation partly in section showing a further phase in assembly of the tube body and the head structure;

FIG. 6 is an end view showing the tube body end crimped over to the shape of the mandrel end during the FIG. 5 phase;

FIG. 7 is a side elevation partly in section showing a further phase of assembly of the tube body to the head structure;

FIG. 8 is a side elevation partly in section showing a further phase wherein the inner head element of the head structure is mounted for introduction;

FIG. 8A is a generally perspective view showing the inner head element formed with an external surface recess for accommodating the body seam during assembly of the head elements;

FIG. 8B is an end view of the mandrel mounted inner head element of FIG. 22;

FIG. 8C is an enlarged section on line 8C—8C of FIG. 8B comprising a fragmentary showing of the seam as disposed in the surface recess of the inner head element;

FIG. 9 is a side elevation partly in section showing completion of the inner head element introduction phase.

PREFERRED EMBODIMENTS

FIGS. 1—3 show an unfilled dispensing tube 11 according to the invention. The tube comprises a flexible tubular body 12 open at one end and secured at the other end to a head structure 13 closed by cap 14.

Tube body 12 is formed from a single sheet of flexible material such as aluminum foil or a synthetic plastic. In the case of tubes for fluid paste products, the tube body is usually aluminum foil laminated with a plastic external layer bearing printed matter and, in the case of many tooth-pastes and the like, may be lined with a synthetic plastics layer impervious to the product. The tube body has a longitudinal seam 15 extending its entire length.

The tube head structure comprises an integral one-piece annular molded synthetic plastics outer head element 16 formed with a cylindrical skirt 17 and a reduced diameter discharge nozzle 18 connected by an annular tapered shoulder 19 that slopes at about 60° to the tube axis. Nozzle 18 is externally threaded at 21 to mount cap 14.

An inner head element 22 is tightly fitted or nested within head element 16. Element 22 is preferably an annular integral one-piece molded synthetic plastics part having a cylindrical skirt 23 and a tubular nozzle lining portion 24 joined by a tapered shoulder 25. The free end of skirt 23 has an external annular flange 26.

One end of the flexible tube body 12 extends longitudinally closely over flange 26, then at about right angles over the corner 27 at the end of the flange, then substantially radially inwardly between flange 26 and the lower edge of head element skirt 17, then longitudinally in the annular space between skirts 17 and 23, and then over the obtuse angle corner 28 between skirt 23 and shoulder 25 into the space between shoulders 18 and 25.

The parts are so dimensioned that the outer periphery of flange 26 is of a diameter that is slightly less than the diameter of the outer periphery of skirt 17 whereby, since body 12 is only a few thousandths of an inch in thickness, in the assembly the outer surface of skirt 17 will appear as a substantial continuation of the outer surface of body 12. The relationship of parts is

illustrated rather exaggeratedly in FIG. 2 for clarity of explanation.

The skirts 17 and 23 are of the same contour and they are radially spaced by only the small amount necessary to frictionally receive the wall thickness of body 22 between them. Similarly shoulders 18 and 25 are of the same contour and slope and the annular space between them is only the small amount necessary to frictionally receive the wall thickness of body 12 between them. The smooth internal surface 29 of nozzle 18 is preferably cylindrical, and the smooth external surface 31 of nozzle lining portion 24 of the inner head element is preferably slightly tapered with the smaller end of the taper being at the outer end and substantially equal in diameter to the cylindrical interior of nozzle 18. Thus when head element 22 is forced into head element 16 there is a strong force fit between the nozzle parts at 18, 24 as permitted by the resiliency of the plastics material of head element 16. The head element 16 is preferably of polypropylene, while the insert is made of a harder more brittle material such as urea formaldehyde which provides a protective barrier for the polypropylene.

With the inner head element forced within head element 16 to the position shown in FIG. 2 it will be noted that the wall of the tube is forced into three relatively sharp sequentially reversed annular bends indicated at 32, 33 and 34 respectively that effectively resist longitudinal forces tending to pull tube body 12 away from the head structure. Preferably the lower edge 35 of skirt 17 axially abuts the radially inwardly extending portion of the tube body between the bends 32 and 33 to further improve resistance to longitudinal separation.

With reference to FIG. 3 the sheet material of body 12 is formed along one longitudinal edge with parallel shallow successively inwardly stepped sections 36 and 37 having circumferentially facing shoulders 38 and 39 respectively. The terminal section is doubled back tightly on itself to form an external lip 40 that has its terminal edge in abutment with shoulder 39. The other longitudinal edge of the sheet material extends tightly over the lip 40 and wall section 36 to terminate in a longitudinal edge in abutment with shoulder 38. Thus externally except for the fine usually invisible line at shoulder 38 the external body surface appears continuous. The double and triple thicknesses of material at the seam project internally of the tube body and do not affect the external contour. This seam may be formed by suitable automatic apparatus, the sheet material of the body being such that it will maintain a given shape.

Referring now to FIGS. 4 to 9 the open ended tube body shell 80 is mounted on a cylindrical mandrel 90 that at one end is formed with a reduced diameter cylindrical portion 91 extending from a radial shoulder 92 and terminating in an inclined converging generally conical portion 93. The diameter and axial length of mandrel portion 91 are substantially the same as the internal diameter and axial length of outer head element skirt 17, and the slope of surface 93 is the same as that of outer head element shoulder 18. As shown in FIG. 4 the shell is initially positioned to extend at one end over the reduced diameter end of the mandrel 90.

Mandrel 90 with the shell 80 on it is positioned in axial alignment with a relatively stationary die member 94 that is recessed at 95 to receive a preformed outer head element 16. Recess 95 has an outer large diameter

entrance portion 96 of such diameter as to snugly slidably receive skirt 17 of the head member and is formed with a tapered internal surface 97 against which shoulder 18 abuts. Recess 95 is otherwise large and deep enough to freely accept the capped nozzle.

An annular die member 98 having cylindrical surfaces 99 and 100 corresponding to the cylindrical mandrel surfaces, a shoulder 101 corresponding to mandrel shoulder 94 and a tapered annular surface 102 corresponding to the conical end of the mandrel is applied to conform the extended end of shell 80 to the shape of the mandrel end. This is done preferably by axially engaging the die member 98 with the mandrel end under pressure, and as a result the shell end is formed to the shape shown in FIG. 5 wherein it conforms to shoulder 92 and surfaces 91 and 93. FIG. 6 shows the formed shell on the mandrel as having an annular radial shoulder section 103, a cylindrical section 104 and a crimped tapered end section 105.

Mandrel 90 is preferably hollow with a central bore 106 for slidably mounting a guide and pilot rod 107 that has a diameter adapted to slidably enter nozzle 18 of the outer head element 16. The rod is inserted into the nozzle and mandrel 90 with the formed shell 80 on it is displaced axially along rod 107 until the formed end of the shell enters outer head element 16, this condition being shown in FIG. 7. As a result of this operation the formed end of shell 80 is forcibly fitted to line the shoulder and skirt of outer head element 16, and the cylindrical surface of the shell is frictionally disposed with recess surface 96. This friction force fit of the end of the shell within the outer head element and the recess is sufficient to retain the shell attached to the head element when mandrel 90 and rod 107 are axially withdrawn, this being the condition shown at the left side of FIG. 8.

Now the preformed inner head element 22 is mounted on the shaped end of a cylindrical mandrel 108 as shown at the right side of FIG. 8. Mandrel 108 has a reduced diameter surface 109 adapted to smoothly slidably receive the skirt 23, an axial shoulder 110 adapted to about flange 26 and an end surface 111 tapered in conformance with insert shoulder 25 which it engages. Mandrel 108 is displaced axially to the left in FIG. 9 until nozzle section 24 of the inner head element forcibly enters and lines outer nozzle 18. The crimped end 105 of the shell 80 is compressed and clamped between tapered shoulders 18 and 25, the flange 26 is forcibly engaged against shoulder section 103 of the shell and the cylindrical section 104 of the shell is frictionally compressed between the skirts 17 and 23. Preferably the edge 32 of skirt 23 forcibly axially abuts shoulder section 103 of the shell to clamp it against insert flange 26, all as shown in FIG. 9.

As shown in FIG. 22a the inner head element 22 is preferably formed with a shallow longitudinal external recess 30 of constant depth that extends across flange 26, along skirt 23 and partially along shoulder 25. The purpose of recess 30 is to accommodate the increased thicknesses of the tube body shell at the longitudinal seam so that when the inner and outer head elements are assembled to the FIG. 9 condition the internally projecting multiple layers of the tube body material will become disposed in recess 30, and this is particularly advantageous in the turned over crimped area of the seam that overlies the shoulder of the inner head element. As shown in FIG. 8C the recess 30 may be later-

ally stepped for accommodating the side by side double and triple thickness wall regions.

It has been found that, by providing the recess 30 of sufficient length along the element to extend beyond the crimped section 105 as shown in FIG. 8B, the double and triple thicknesses of material at the seam are disposed in that recess (FIG. 8C) whereby the snug interfit of the head elements is greatly improved and the external surface of the seam at its juncture with the skirt of the outer head element presents a smooth continuous appearance. There will be little or no outward bulge of the external head element where it overlies the seam.

During assembly the body seam may be suitably registered in alignment with the recess 30. Where the body is formed on a split mandrel as disclosed in parent application Serial No. 308,999, now U.S. Patent No. 3,832,964, this registration can readily be effected by providing suitable internal keying projections on the inner head element related to the location of the seam on the body being formed on the mandrel.

This completes assembly of the empty tube body and attached head structure, so that when the assembly is complete it may be withdrawn axially from die member 94, and this provides the required empty tube assembly shown in and described for FIGS. 1-3.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiments are therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of the claims are therefore intended to be embraced therein.

What is claimed and desired to be secured by Letters Patent is:

1. A collapsible tube assembly comprising a flexible tubular body having a longitudinal seam containing overlapped layers of sheet material of the body wall and a dispensing head structure secured upon one end of said body, said head structure comprising an inner hollow element having an inclined annular shoulder, a reduced diameter nozzle section projecting longitudinally from the inner periphery of said shoulder, an annular skirt projecting longitudinally from the outer periphery of said shoulder, a narrow annular external flange at the free end of said skirt and a shallow external surface recess extending longitudinally from said flange along said skirt and along said shoulder, and an outer hollow element disposed in tight substantially nested relation with said inner element, said outer ele-

ment having an annular shoulder of corresponding inclination with and surrounding the annular shoulder of said inner element, a longitudinally extending nozzle section surrounding the nozzle section of the inner element, and a longitudinally extending skirt surrounding the skirt of the inner element with the outer diameter of the skirt of said outer element being substantially equal to the outer diameter of said body one end, said body one end extending over said external flange and then being bent inwardly at an angle in a first annular portion, then extending longitudinally between said skirts and then being bent inwardly at a second annular portion to pass between said shoulders, and said body seam being substantially confined in said recess, whereby said tube body and head structures are non-deformably interlocked and so mechanically interlocked as to resist axial separation of the tube body and head structure due to normal axial pull.

2. A collapsible tube assembly comprising a flexible tubular body having a longitudinal seam containing overlapped layers of sheet material of the body wall and a dispensing head structure secured upon one end of said body, said head structure comprising an inner hollow element having an inclined annular shoulder, a reduced diameter nozzle section projecting longitudinally from the inner periphery of said shoulder, an annular skirt projecting longitudinally from the outer periphery of said shoulder and a shallow external surface recess extending longitudinally along said skirt and along said shoulder, and an outer hollow element disposed in tight substantially nested relation with said inner element, said outer element having an annular shoulder of corresponding inclination with and surrounding the annular shoulder of said inner element, a longitudinally extending nozzle section surrounding the nozzle section of the inner element, and a longitudinally extending skirt surrounding the skirt of the inner element with the outer diameter of the skirt of said outer element being substantially equal to the outer diameter of said body one end, said body one end extending longitudinally between said skirts and then being bent inwardly to pass between said shoulders, and said body seam being substantially confined in said recess, whereby said tube body and head structures are non-deformably interlocked and so mechanically interlocked as to resist axial separation of the tube body and head structure due to normal axial pull.

3. A collapsible tube assembly as defined in claim 2, wherein said longitudinal recess is laterally stepped to accept seam portions of different lateral thickness.

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