June 24, 1969 R. ATWOOD ET AL 3,451,639

TEXTILE TUBE

Filed July 12, 1966 Sheet 1 of 2

FIG.1

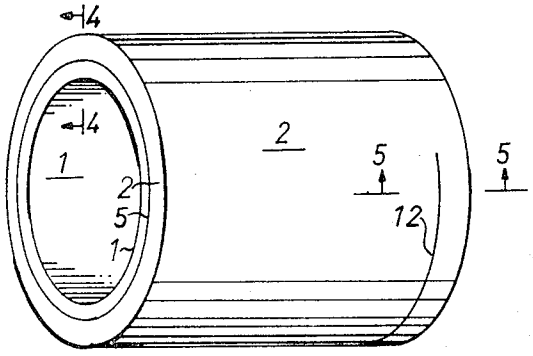


FIG.2

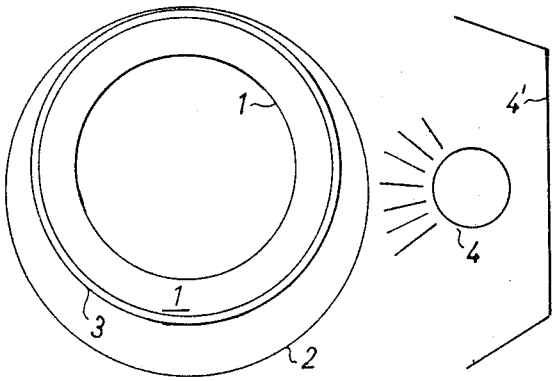


FIG 3

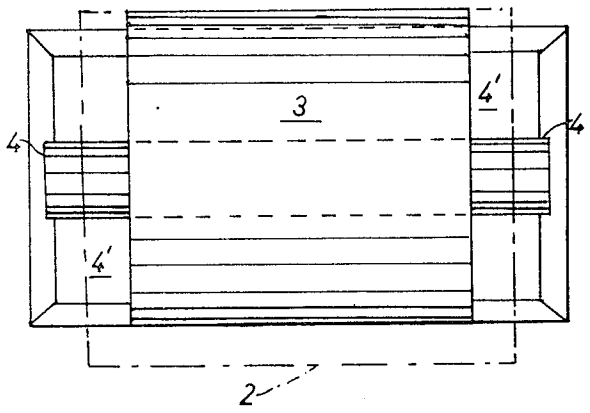


FIG.4

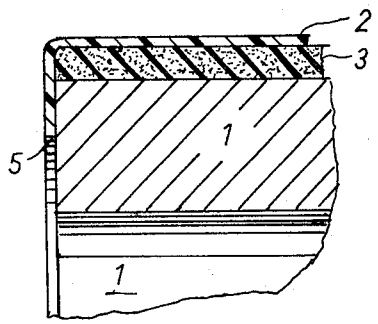
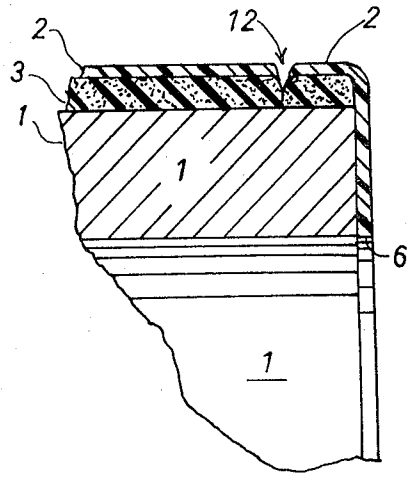


FIG.5



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FIG. 7

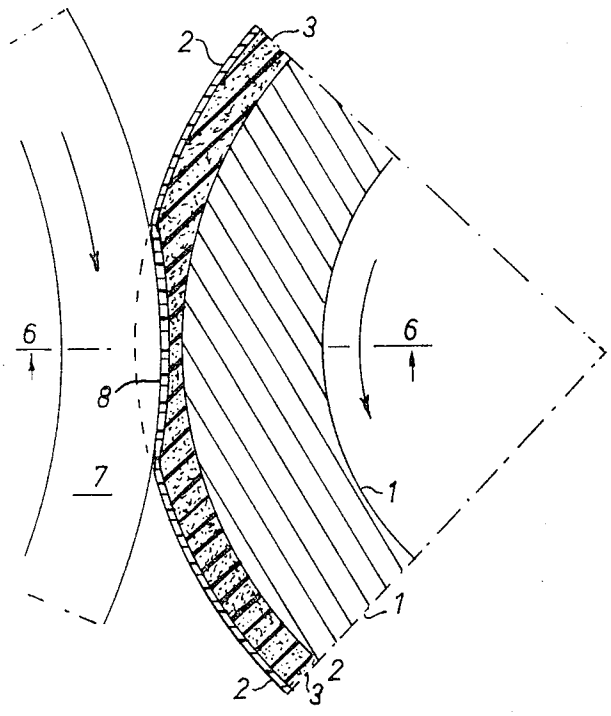


FIG. 6

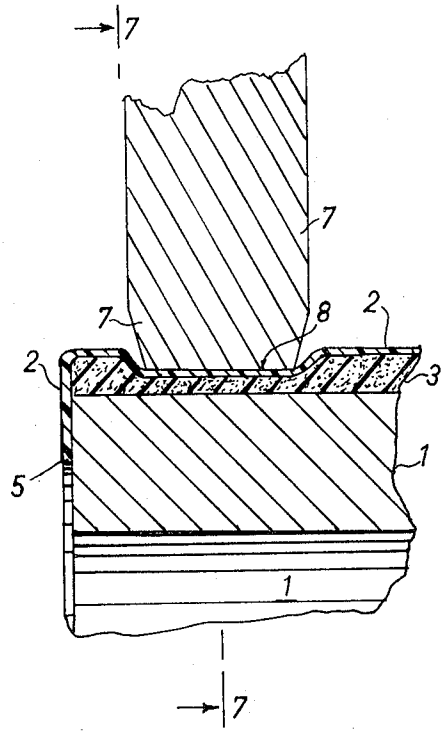
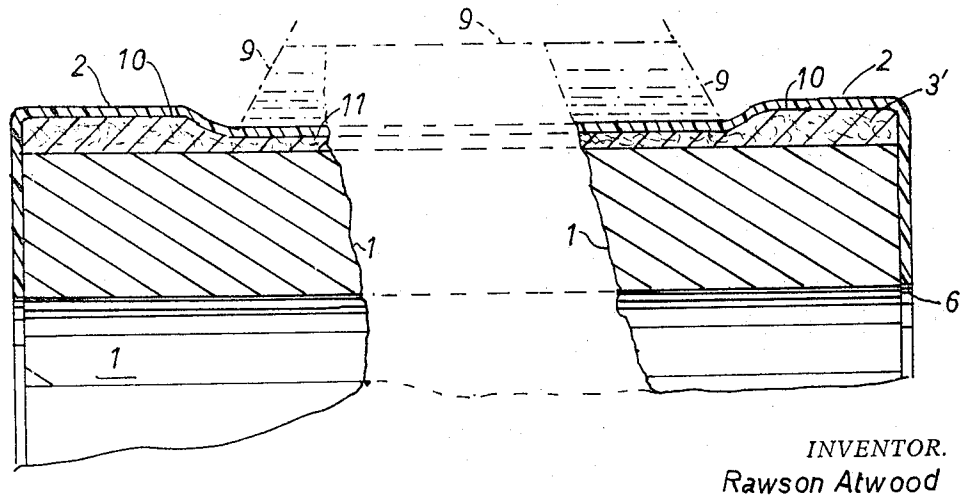


FIG. 8



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3,451,639

TEXTILE TUBE

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Int. Cl. B65h 75/10, 75/12, 75/28
U.S. Cl. 242—118.32 7 Claims

ABSTRACT OF THE DISCLOSURE

A low cost, disposable textile tube or bobbin comprises an inner cylindrical barrel formed from a relatively strong and rigid material such as metal, plastic, laminated paper or the like, an intermediate cover layer disposed on said barrel and formed from a compressible and advantageously resilient material such as polyurethane foam or the like, and an outer cover of a heat-shrinkable plastic material that has been heat shrunk onto the outer surface of the intermediate cover layer of compressible material.

This invention relates to improvements in textile tubes.

It is an object of the invention to provide a textile tube with an improved synthetic resin cover.

Another object is to provide such a tube at a low cost, permitting throwing it away after a single use.

Another object is to provide a tube of the type indicated and having a start-up slot.

Another object is to provide a tube having a cushioned or resilient layer below its surface layer, to lessen the shock of contact by a start-up wheel.

A still further object is to provide such a cushioned or resilient construction for relaxing yarn wound on the tube.

With the foregoing objects, as well as others which will appear, in mind, a textile tube embodying the invention in a preferred form will now first be described with reference to the accompanying drawing and the features forming the invention will then be pointed out in the appended claims.

In the drawing:

FIG. 1 is an isometric view of a textile tube embodying the invention in a preferred form;

FIGS. 2 and 3 are respectively, end and side elevational views illustrating the application of the barrel cover;

FIG. 4 is a very much enlarged fragmentary section, taken on the line 4—4 of FIG. 1;

FIG. 5 is a fragmentary enlarged section on the line 5—5 of FIG. 1;

FIG. 6 is an enlarged fragmentary section taken on the line 6—6 of FIG. 7, showing the action of a start up wheel;

FIG. 7 is a section on the line 7—7 of FIG. 6; and

FIG. 8 is an enlarged fragmentary section showing the compression of the bobbin cover in relaxing yarn.

The textile tube comprises a barrel 1 and cover 2 which extends over the entire peripheral surface of the barrel and also over its ends as at 5 (FIG. 4) or 6 (FIG. 5).

Cover 2 is composed of heat shrinkable synthetic resin, such, for example, as a heat shrinkable ABS (acrylonitrile-butadiene-styrene copolymers) resin or polyvinyl chloride resin, and is applied to the barrel 1 in the manner shown in FIGS. 2 and 3.

Interposed between the barrel 1 and cover 2 is a layer of material 3, which may be resilient, collapsible, or of electrically or thermally conductive material. The present invention permits utilizing a barrel 1 of desirable structural properties in conjunction with a cover 2 having desirable surface properties while obtaining other characteristics, heretofore not available, by means of the intermediate layer 3.

In manufacturing the tube, the intermediate material 3 is applied to the barrel 1 in any convenient manner and the cover 2 is shrunk thereon. As indicated in FIGS. 2 and 3 the cover 2 may be a tube of about 10% greater diameter than the barrel 1 with intermediate layer 3 in place, being shrunk on to the barrel by application of heat as from the heating element 4 and reflector 4' or in any suitable oven. Preferably the tubular element 2 shrinks but little in the axial direction but has considerable shrinkage circumferentially so that it not only fits down snugly around the periphery but also forms a radial flange which covers the barrel end either part way (FIG. 4) or completely so as to be flush with the inner surface of the barrel 1 (FIG. 5). The inner edge 5 (FIG. 4) will ordinarily not be trimmed while the inner edge 6 (FIG. 5) will normally be cut so as to terminate flush with the inner surface of the barrel.

The tube 2 (FIG. 2) is formed in a known manner by expanding a tube either pneumatically or by pulling it over a mandrel at a suitable temperature, so that upon cooling the tube will have an increased diameter, decreased wall thickness and the ability to shrink rapidly and uniformly upon heating.

While the cover 2 may vary in wall thickness to suit the particular requirements of the use to which it is put, it will normally be very thin, as for example, in a range between .001 inch to .010 inch, a thickness of about .004 inch being preferred in some applications.

The barrel tube 1 may be of metal, laminated synthetic resin, spirally or convolute wound paper, or in general any material having suitable mechanical or other properties for the intended use. The intermediate layer 3 may be of any of a variety of materials, depending upon the service requirements. In the construction shown in FIGS. 1–7, which is a draw winder tube such as used with polyester and other synthetic fibers, a resilient layer 3, composed of such material as urethane foam is advantageous. Any irregularity in the outer surface of the tube 1 (as for example, gaps and overlaps in a spiral strip) are completely masked by the layer 3 and the cover 2 fits layer 3 snugly without compressing it materially and being itself substantially untensioned. A starting slot 12 for catching the fiber in commencing to wind on the tube may be cut, as indicated. The cover 2 will not spring apart and the elasticity of the foam 3 will be cause it to grip any fiber entering the slot.

Tubes of the type indicated are commonly brought up to speed by a rapidly rotating wheel (7 in FIGS. 6 and 7) which is brought into contact with the surface of the tube, the tube being carried on a suitable mandrel (not shown). It is found that the friction and heating of engagement of the start up wheel abrades and softens thermoplastic cover materials where the cover is rigidly backed up by the barrel. By interposing the resilient layer 3 damage to the cover is effectively prevented. As indicated in an exaggerated way in FIGS. 6 and 7 a substantial flat 8 is formed providing the required driving torque without undue concentration of friction force at any one point. Silicone or other lubricants may be applied to the tube surface where engaged by the wheel 7 or may be incorporated in the formulation of cover 2 to advantage, showing clearly that the construction provides a controlled slipping friction and correspondingly controlled torque, while protecting against surface damage. Heat conductive or electrically conductive material may be incorporated in or used in addition to the layer 3 for dissipating heat or static electricity where necessary.

The intermediate layer may be composed of material such as "styrofoam" or other expanded but non-resilient materials, such as any of the various paper or other felted materials and woven materials. In this case the tube may be used to provide relaxation for yarn wound thereon, (as indicated in an exaggerated way in FIG. 8.) The intermediate layer **3'** in FIG. 8 will initially have a cylindrical surface aligned with end surfaces **10** but will collapse to a leser diameter **11** as the yarn **9** is wound. By selecting dimensions and characteristics of material of the layer **3'** it is possible to wind the yarn initially with little or no compression of the layer **3'** so that the compression of this layer occurs as the outermost layers of yarn are wound or even after the winding has been completed. Since the characteristics and thickness of layer **3'** are subject to a wide range of selection, control of the winding and relaxing of the yarn may be provided to an extent not possible in prior constructions.

In the draw winder tube shown in FIGS. 1 to 7, the layer **3** may be about 1/16 inch thick and applied to a spiral wound paper barrel **1** with about 1/4 inch wall thickness, while cover **2** is about .004 inch thick. Other thicknesses and proportions may be used to suit particular requirements. In the embodiment of FIG. 8, the barrel **1** may be a paper tube or steel or other high strength material and the layer **3'** may provide accurately controlled diameter reduction by regulating the percentage of voids in its structure so as to obtain a desired diameter reduction.

What is claimed is:

1. A textile tube comprising an inner cylindrical barrel formed from a strong, rigid material, an intermediate cover layer formed from a resilient compressible material covering the periphery of the inner barrel, and a heat-shrinkable synthetic resin outer cover shrunk onto the outer surface of the intermediate cover layer, the outer cover fitting snugly over the periphery of the intermediate cover layer and the ends of the intermediate cover layer and the barrel, but being untensioned.

2. A textile tube according to claim **1**, in which the said intermediate cover layer is of resilient compressible material, whereby a start up wheel forms a substantial flat when pressed against the tube.

3. A textile tube according to claim **2**, in which the said resilient compressible material is urethane sponge.

4. A textile tube according to claim **1**, in which the intermediate cover layer is of non-resilient compressible material, whereby contraction of the outer diameter of the tube under yarn pressure occurs for relaxing yarn wound thereon.

5. A textile tube according to claim **4**, in which the compressible material is an expanded polystyrene resin.

6. A textile tube according to claim **1**, in which the intermediate cover layer of compressible material is electrically conductive, whereby static charge on said tube is dissipated.

7. A textile tube according to claim **1**, in which the said intermediate cover layer of compressible material is heat conducting, whereby overheating of the tube surface is prevented.

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HERBERT F. ROSS, *Primary Examiner.*

U.S. Cl. X.R.

138—140; 242—125.1