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Stark

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[54] **TUBE CONSTRUCTION**

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[52] **U.S. Cl.** **138/172,** 138/147, 160/238, 160/404

[51] **Int. Cl.** **F16l 9/16**

[58] **Field of Search** ..... 138/172, 174, DIG. 5, 147, 138/150, 153; 160/245, 238, 404; 93/94 R, 94 M

[56] **References Cited**

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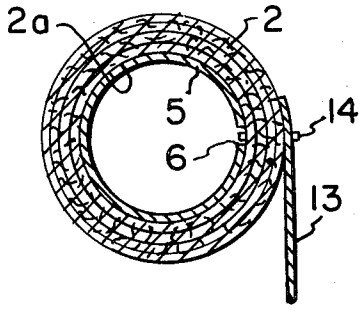
[57] **ABSTRACT**

A tube adapted for use with a window shade, for example, comprises a convolutely wound paper tube within which is an elongate, longitudinally slotted reinforcing sleeve, the sleeve constantly exerting a radially expansive force on the tube.

13 Claims, 5 Drawing Figures



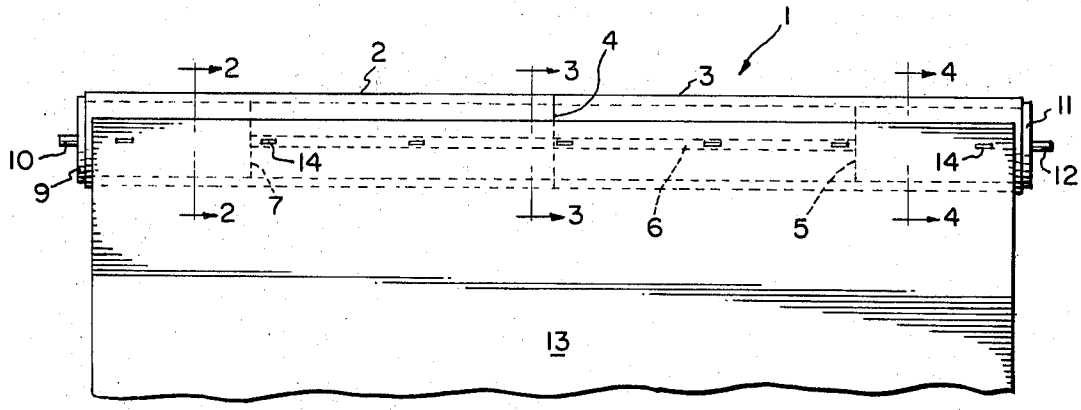


FIG.1

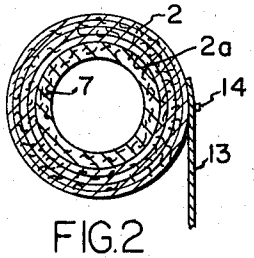


FIG.2

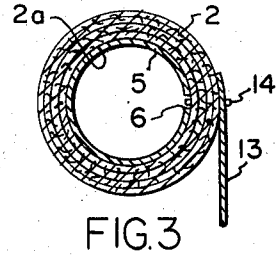


FIG.3

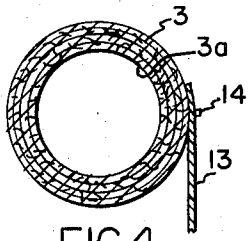


FIG.4

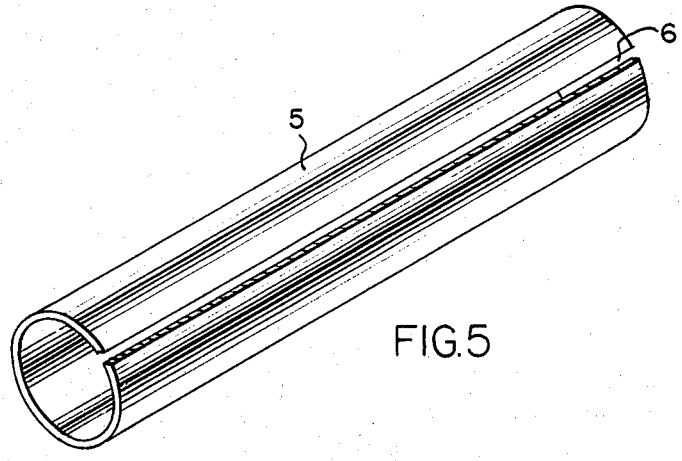


FIG.5

TUBE CONSTRUCTION

The invention disclosed herein relates to a tube or roller construction of the kind especially adapted for use in connection with window shades, photographic projection screens, and the like wherein sheet material is secured at one end to the roller so as to be capable of being wound about and unwound from the roller. The invention is applicable to uses other than as a shade or the like roller, however. For example, a tube constructed according to the invention may be used as a handle for brooms, mops, and the like.

Conventional shade rollers and handles of the kind referred to are formed of wood or a combination of wood and some other substance. Rollers and handles formed of wood are quite satisfactory, but wood is becoming increasingly scarce and the cost of that wood which is available is becoming excessive. Shade rollers formed of materials other than wood are satisfactory for some purposes, but many rollers, particularly extra length rollers of 50 inches, for example, have a tendency to warp, deflect or sag between their ends. In many cases a roller subjected to such deflection assumes a permanent set. When a roller assumes a permanent set, the shade or other sheet material carried by the roller hangs unevenly and presents an unattractive appearance. Moreover, when the sheet material is wound about such a roller, the winding also is uneven and may cause permanent creasing of the sheet material. In addition, a bowed roller rotates with an eccentric motion resulting in the creation of objectionable noise between the roller's supporting brackets and the mounting means at the ends of the roller.

An object of this invention is to provide a construction applicable to shade rollers, handles, and the like and which avoids the necessity of using wood, but which overcomes the difficulties heretofore associated with rollers or tubes formed of materials other than wood.

Another object of the invention is to provide a construction of the kind referred to and which can be manufactured from paper, but which nevertheless is highly resistant to warpage, deflection and permanent set.

A further object of the invention is to provide a paper tube construction of the kind referred to and which lends itself to the manufacture of both relatively long and relatively short tubes.

Other objects and advantages of the invention will be pointed out specifically or become apparent from the following description when it is considered in conjunction with the appended claims and the accompanying drawings, in which:

FIG. **1** is an elevational view of a tube constructed in accordance with the invention for use as a shade roller and illustrating a shade or other sheet material secured to the roller;

FIGS. **2, 3** and **4** are cross-sectional views taken on the lines **2—2, 3—3** and **4—4,** respectively, the left hand end plug and the right hand spring winding mechanism being omitted; and

FIG. **5** is an isometric view of a reinforcing sleeve according to the invention.

A tube constructed in accordance with the invention is designated generally by the reference character **1** and comprises a pair of tubular members **2** and **3** each having a bore **2***a* and **3***a*, respectively, the confronting ends of the members abutting and being joined to one another as at **4.** Each of the members comprises convolutely wound paper such as recycled or virgin high grade jute tube winding stock having a thickness of about 0.012–0.025 inch. To one side of the paper stock is applied a continuous layer of a suitable glue, such as polyvinyl alchohol, so that each convolution is adhered to the adjacent inner convolution.

The outside diameter of each member **2** and **3** should correspond and will be dictated by the length of the finished roller and the weight which it is to support. Acceptable rollers have been formed from six to twelve convolutions of paper.

The inside diameter of the tubular members will depend upon the diameter of the mandrel around which the paper stock is wound. Winding mandrels having diameters of 0.5–1.0 inch or more are not uncommon.

Following the forming of the tubular members **2** and **3** they may have their confronting ends joined together by a suitable adhesive so as to form a tube having the combined length of the individual members.

Means is provided for reinforcing the tube **1** against deflection and comprises a preferably spring steel sleeve **5** having a slot **6** extending the full length of the sleeve. The outside diameter of the sleeve preferably is greater than the inside diameter of the tube **1** so as to require radial compression of the sleeve to insert the latter in the tube. Prior to insertion of the sleeve in the tube, the outside diameter of the sleeve preferably is about 0.03 inch greater than the inside diameter of the tube **1.** The width of the slot **6** is greater than the diameter differences referred to, however, so that when the sleeve is fitted into the tube the edges of the sleeve on opposite sides of the slot are spaced from one another for a purpose presently to be explained.

Following the forming of the tube **1,** the sleeve **5** is compressed radially and fitted into the tube. Once inside the tube the sleeve tends to expand radially, thereby exerting a constant radially outer force on the tube. The sleeve thus provides reinforcement against bowing of the tube and the sleeve maintains its position in the tube by friction.

The length of the sleeve is less than that of the tube and the sleeve preferably is centered longitudinally of the tube so that the sleeve extends substantially an equal distance on opposite sides of the joint **4.**

One end of the tube **1** is occupied by a fiber cylinder **7** which preferably is adhered to the surface of the bore. The inside diameter of the cylinder **7** should be such as to accommodate a plug-like fitting **9** provided with a gudgeon pin **10** by means of which one end of the roller may be mounted for rotation. The plug **9** may be like that disclosed in U.S. Pat. No. 3,362,461. The cylinder **7** is utilized so as to enable the use of a standard size member **9.** The inside diameter of the opposite end of the tube should be such as to accommodate a plug-like member **11** of conventional construction and having a spade **12** connected to a spring winding mechanism (not shown) of conventional construction, the spade enabling the right hand end of the roller to be mounted for rotation.

If the tube **1** is to be used to mount a shade cloth **13** or the like, one end of the cloth may be positioned on the outer surface of the roller parallel to the longitudinal axis of the latter. Staples **14** or the like then may be used to fasten the cloth to the roller. Preferably, those staples which lie between the ends of the sleeve **5** register with the slot **6** so as to avoid interference with the

passage of the staples through the wall of the tube. See FIG. 3.

The tube 1 need not necessarily be composed of a plurality of joined members. The tube could constitute a single member.

It will be recognized that the reinforced tube is not limited to use as a roller for window shades, photographic screens, maps, and the like, but has many other uses. For example, such a tube may be used as a handle for a broom, a dust mop, or many other devices.

The disclosed embodiments of the invention are representative of presently preferred forms of the invention, but are intended to be illustrative rather than definitive thereof. The invention is defined in the claims.

I claim:

1. A tube construction comprising an elongate, hollow tube; and an elongate reinforcing member fitted within said tube, said reinforcing member comprising a sleeve formed of resilient, springy material having a slot extending the full length thereof, said sleeve prior to being fitted into said tube having an outer diameter greater than the inner diameter of said tube.

2. A construction according to claim 1 wherein the resilience of said material constantly acts on said sleeve tending to expand its diameter.

3. A construction according to claim 1 wherein said tube comprises convolutely wound paper.

4. A construction according to claim 3 wherein each convolution is secured to the next adjacent convolution by an adhesive.

5. A construction according to claim 1 wherein said reinforcing member is formed of metal.

6. A construction according to claim 1 wherein said tube comprises convolutely wound paper and said reinforcing member is formed of metal.

7. A construction according to claim 1 wherein said sleeve terminates short of both ends off said tube.

8. A construction according to claim 7 including means fitted into opposite ends of said tube for mounting the latter for rotation about its longitudinal axis.

9. A construction according to claim 1 wherein the width of said slot is greater than the difference between the outer diameter of said sleeve and the inner diameter of said tube.

10. A construction according to claim 1 including a sheet of material having one end thereof secured to said tube longitudinally thereof so as to be wound about and unwound from said tube, said one end of said sheet being secured to said tube by fastening means which extend into said tube in register with said slot.

11. A construction according to claim 10 including means fitted into opposite ends of said tube for mounting the latter for rotation about its longitudinal axis.

12. A construction according to claim 1 wherein said tube is composed of two tubular members in end to end abutting relation, and wherein said sleeve spans the abutting ends of said tubular members.

13. A construction according to claim 12 wherein said tubular members are fixed to one another to their abutting ends.

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