Dec. 7, 1943. M. A. GOLDMAN 2,336,086

COP-TUBE OR YARN-SUPPORT

Filed May 15, 1942 2 Sheets-Sheet 1

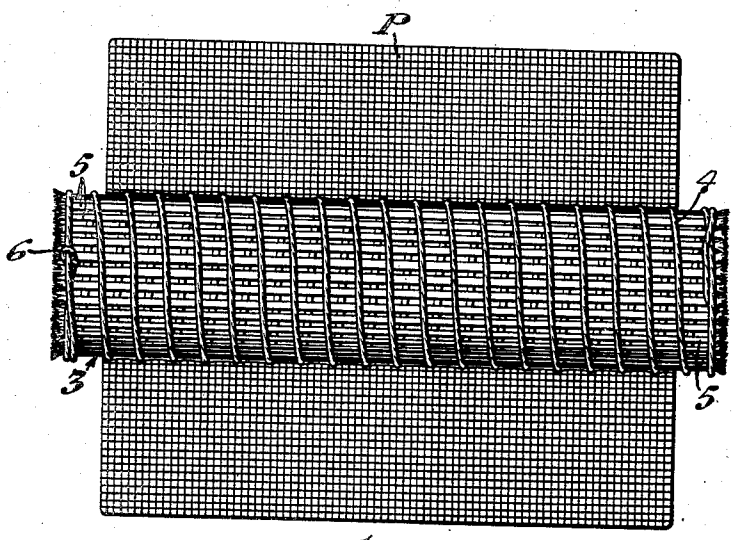


Fig. 1.

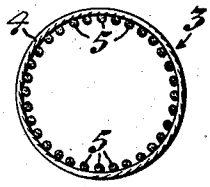


Fig. 2.

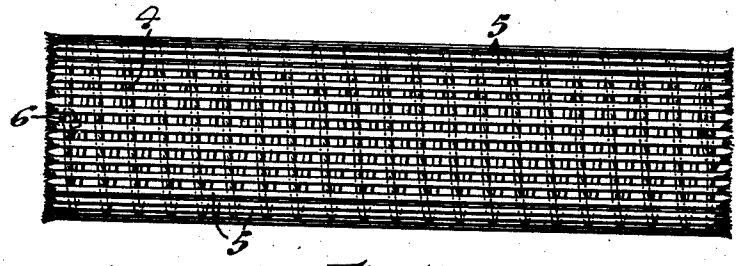


Fig. 3.

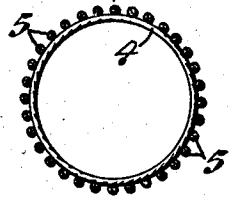


Fig. 4.

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COP-TUBE OR YARN-SUPPORT

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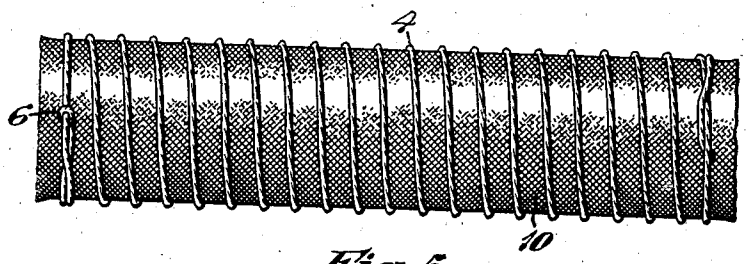


Fig. 5.

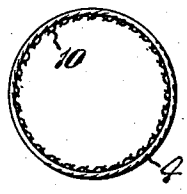


Fig. 6.

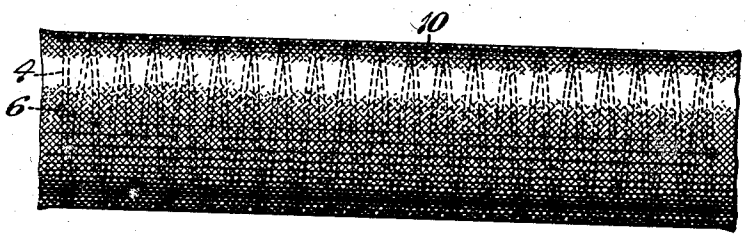


Fig. 7.

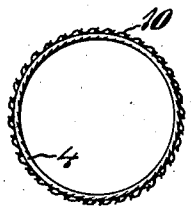


Fig. 8.

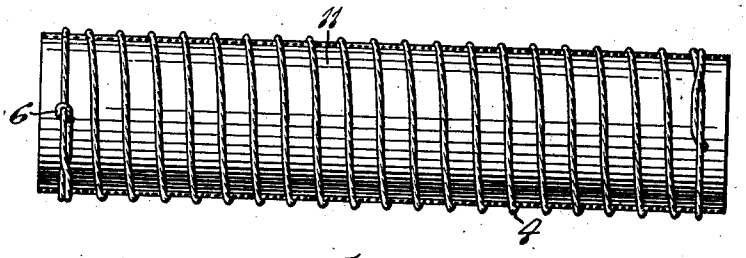


Fig. 9.

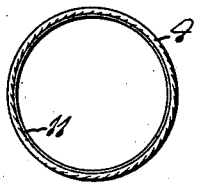


Fig. 10.

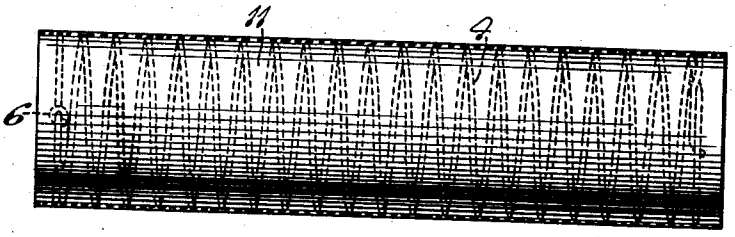


Fig. 11.

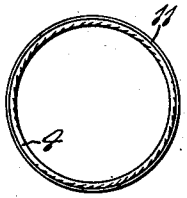


Fig. 12.

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UNITED STATES PATENT OFFICE

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COP TUBE OR YARN SUPPORT

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Application May 15, 1942, Serial No. 443,155

7 Claims. (Cl. 242—122)

This invention relates to improvements in cop-tubes or yarn-carriers for supporting packages of thread, yarn and similar attenuated materials during the processes of dyeing, oxidizing, mordanting, bleaching, steaming, scouring, washing, and other like treatment, and in subsequent transferring operations related to the manufacture and uses of the material.

One object of the invention is to provide a porous, non-collapsible tube on which the yarn or the like may be wound in the form of a cylindrical or conical package in such manner as to be retained in its original shape for submission to dyeing or similar wet treatment and from which the yarn may be unwound subsequently to deliver it to various manufacturing processes.

A particular object of the improvement is to provide a cop-tube of the type specified which is yieldingly contractible or compressible in the direction of its axis so that the cops or packages wound thereon may be placed end-for-end on a perforated standpipe or stringer and compressed in the dyeing chamber to bring the mass of yarn to substantially uniform density and prevent escape of the dye-liquor or other fluid between the ends of the packages when it is forced through the standpipe under pressure.

Another object of the improvement which distinguishes the present cop-tube from articles of similar type is to provide a light-weight supporting structure for the wall of the tube constructed of fibrous material, for example vegetable fiber, impregnated and coated with a plastic or the like to give it the required radial rigidity to prevent its collapse and sufficient resiliency to adapt it for longitudinal contraction.

Another object of the improvement is to provide a cop-tube of the type indicated comprising a helical or otherwise skeleton structure constructed of fiber and impregnated and coated with a plastic or the like which is insoluble and unaffected by acid or alkaline treatment in the bath of dye-liquor or other liquid.

Another object of the improvement is to provide a cop-tube of the type indicated having a ribbed framework of fibrous organic material treated with a phenol or urea formaldehyde resin and resistant to axial distortion yet adapted for longitudinal contraction.

Another object of the improvement is to provide a cop-tube of the type indicated comprising a skeleton ribbed framework of fiber impregnated and coated with a plastic or the like and having longitudinal strips of fiber cemented to the ribbed framework either on the inside or outside of the tube.

Another object of the improvement is to provide a cop-tube of the type indicated comprising a fibrous framework in the form of a helix with the fibrous material impregnated and coated with a resin or other suitable material to provide a tubular structure capable of supporting a porous sleeve or envelope either on its interior or exterior.

Another object of the improvement is to provide an improved cop-tube or the like having a helical ribbed framework which can be handled and transported in multiple without becoming tangled or interlocked, one with another.

Further objects of the improvement are set forth in the following specification which describes several preferred forms of construction of the invention as illustrated by the accompanying drawings. In the drawings:

Fig. 1 is a view of one form of the present improved cop-tube illustrating in section a cop or package of yarn wound thereon;

Fig. 2 is an end view of the tube;

Fig. 3 is a view of a tube similar to that illustrated in Fig. 1 showing the longitudinal strands or strips applied to the outside instead of the inside of the helical ribbed framework;

Fig. 4 is an end view of the same;

Fig. 5 shows another form of cop-tube having a reticulated fabric sleeve cemented to the inside of the helical framework;

Fig. 6 is an end view of the same;

Fig. 7 is a view of another form of the cop-tube showing the fabric sleeve enclosing the helical framework;

Fig. 8 is an end view of the same;

Fig. 9 is a view of another modified form of the tube showing a porous paper sleeve fastened to the interior of the helical framework;

Fig. 10 is an end view of the same;

Fig. 11 is a view of a still further modified form of the cop-tube showing the pervious paper sleeve or envelope enclosing the helical framework; and

Fig. 12 is an end view of the same.

In accordance with the present practice of dyeing and otherwise treating textile materials in cop form the yarn or other strand material is wound on porous longitudinally-contractible tubes and a plurality of the packages assembled in stacks on standpipes in a kier or other vessel. The packages are compressed longitudinally in the stacks to adapt the liquid to be forced through their tubes to penetrate and permeate

the mass of material supported thereon and, in some cases, to provide for the reverse process of forcing the liquid through from the outside of the packages to exhaust through the interior of the tubes.

The above-described method of dyeing and similarly treating textile materials in packages of relatively large bulk is described in United States Letters Patent No. 1,052,817 to J. C. Hebden and F. H Daniell dated February 11, 1913; and the preferred form of contractible cop-tube generally employed in this process is illustrated and described in Reissue Patent No. 13,223 to F. H. Daniell dated March 28, 1911. This latter type of cop-tube comprises a helical coil or spring of either round or flat wire supporting an enclosing sleeve of reticulated fabric, such as a woven or knitted "stocking," so-called, to serve as the core or support for the yarn wound thereon, preferably in the form of a cylindrical package. The wire coil or spring must be made of stainless steel or other non-corrosive metal and at the present time such materials are difficult, if not impossible, to obtain since they are considered critical in the present emergency. Moreover, steel or other metal of this type is of relatively high cost and it is one object of the present invention to provide a cop-tube having a supporting structure made from less expensive material and at the same time one which is relatively light in weight so as not to add to the weight of the packages when the dyed thread or yarn is shipped on the tubes from the dyeing plant to weaving, knitting and other mills to be manufactured into fabrics. Where the metal spring is used and the yarn shipped from a dyeing plant for use in mills at a distance therefrom, the cop-tubes are usually returned to the plant in which the material is dyed or processed for further repeated use and this involves additional cost of transportation. It is therefore an object of the present invention to provide a cop-tube of the present type which is of relatively light weight to reduce the cost of shipping the yarn wound thereon and the return of the tubes, but which is nevertheless not subject to disintegration or destruction from repeated use over long periods. In accordance with my invention the present improved cop-tube may comprise a framework constructed of fibrous organic material, for example, textile fiber in the nature of cotton roving or sliver, impregnated and coated with a suitable hard-setting plastic, for example, phenol formaldehyde resin known by the trade-name "Bakelite."

In order that the yarn wound on the cop-tube may have a substantially continuous support lengthwise thereof I prefer to apply a series of longitudinal strips or strands of the fibrous material to either the inside or outside of the coil of treated fiber with the longitudinal strands cemented to the coils of the framework in spaced relationship therearound to provide openings for rendering the structure porous or pervious to the flow of liquid or gas through the interstices.

Fig. 1 illustrates a cop-tube 3 of this last-mentioned form with a package P of yarn wound thereon as shown in section taken in a plane common to the axis of the tube. The tube 3 is made long enough to extend beyond the ends of the package P to prevent the coils of yarn from overrunning or falling down across its terminal portions, but it will be understood that when a series of packages are placed end-to-end and assembled on a standpipe in the dyeing kier the tubes will be compressed and contracted within the confines of the yarn mass. As illustrated in Fig. 1, the supporting structure or framework of the cop-tube 3 may comprise a helical coil 4 of substantially twenty turns but this number is arbitrary and may be varied at will. Longitudinal strands or strips of fibrous material 5 are supported by the helical framework to extend in spaced-apart relationship therearound, see Fig. 2. In the form of the invention illustrated in Fig. 1 the longitudinal strands 5 form a porous wall within the confines of the helical coil 4, being cemented thereto at the crossing points.

In constructing a tube of this type the longitudinal strands 5 may be supported initially on a cylindrical arbor or mandrel and the helical framework applied thereto by coiling the fibrous strand 4 therearound. The leading end of the strand 4 may be fastened by looping it around the first turn in a bight or knot as shown at 6 in Fig. 1; and the finishing end of the coil may be secured in like manner or by merely tucking it in under the last turn of the coil. In either case the plastic or other cementitious coating material will cause the terminal portion of the coil to be bonded to the end turn of the strand 4 to prevent the coil from unwinding. As one satisfactory method of forming the structure, the strand 4 may consist of textile roving having a slight twist and impregnated and coated with a hard-setting plastic such as previously referred to. The coating compound applied in a liquid state remains sticky or tacky while the strand 4 is coiled about the longitudinal strands 5 and the coating penetrates these longitudinal strands to some extent at the crossing points to cement and securely bond them to the helical turns of the strip 4. When the coating material is dried and hardened it bonds together the fibers in the strip 4 and reinforces the helical coil to render its substantially rigid or non-collapsible radially of the tube. The reinforcement of the fibrous strand 4 with the plastic or other compound also renders the framework resistant to axial distortion, but at the same time imparts sufficient resilience thereto to permit the tube to be contracted longitudinally of its axis when used in dyeing or other wet processes. The yarn is supported on the tube 3 by the longitudinal strands 5 without being drawn into the spaces between the coils of the framework 4 so that after the dyeing or other process the yarn may be unwound down to the last coils without undue restriction. When the packages are placed end-to-end on a perforated standpipe or stringer and the whole mass of yarn compressed longitudinally the ends of the tubes 3 will telescope within the confines of the several packages so that the yarn thereon is combined into one continuous mass of substantially uniform density throughout the length of the stack.

When the packages are removed from the standpipe or stringer after the dyeing or other process the tubes will expand beyond the ends of the package to prevent the yarn therein from being disarranged or the coils thereof from being displaced to fall over the ends of the tube. Consequently, the packages will remain substantially in their original form to adapt them for delivering the yarn to various processes of manufacture in the textile and other arts.

Figs. 3 and 4 of the present drawings illustrate a modified form of construction of the cop-tube in which the longitudinal strands 5 are superimposed on the outside of the helical framework 4. That is to say, the strands 5 are spaced around the circumference of the coil 4 and cemented

thereto, thus providing a straight smooth surface for supporting the yarn in the package wound on the tube. In other respects the construction of the tube is substantially the same as that illustrated in Figs. 1 and 2 and described in connection therewith.

Figs. 5 and 6 illustrate still another modification in the form of construction of the cop-tube consisting in the use of a reticulated fabric sleeve 10 extending through the coil 4 and cemented thereto to form a substantially integral structure therewith.

Figs. 7 and 8 show a still further modification in the structure of the tube in which the fabric sleeve or stocking 10 is drawn over the exterior of the supporting framework or coil 4 which is constructed of fiber and impregnated and coated with a plastic or the like as in the case of the previously-described tubes. In this last-described embodiment of the invention the enclosing sleeve or sheath 10 may be cemented to the exterior of the framework or coil 4 although this is not necessary. When the stocking or sheath 10 is cemented to the framework 4 it forms an integral structure therewith, thereby avoiding the necessity for applying the stocking to or adjusting it on the tube during repeated use thereof. Furthermore, with this last-mentioned form of construction the enclosing sleeve 10 does not extend beyond the ends of the framework, as is necessary with an unattached covering, so that loose overhanging terminal portions of the sleeve will not catch the yarn or interfere with its unwinding.

Figs. 9 and 10 illustrate a cop-tube of the present type including a paper sleeve 11 extending through the coil framework 4. The coil 4, as in the previously-described embodiments of the invention, may be composed of any suitable organic fiber treated with a resin, plastic or the like, and preferably the paper tube 11 is cemented to the interior of the coil. In order to render the wall of the cop-tube pervious to the flow of liquids or gases I may use what is known in the trade as "Dexter" paper, a wet-strength vegetable fiber tissue which has recently come into use for tea-bags. This type of paper has considerable wet-strength and is resistant to immersion in acid and alkaline liquids so that it meets requirements for use in a cop-tube for application to dye baths and other fluid treatment.

Figs. 11 and 12 illustrate the use of a similar paper sleeve or covering 11 on the outside of the helical framework 4 and in this form of construction cementing of the sleeve to the skeleton support or framework is not essential, although preferred. It is to be noted that the paper or fiber tissue of the type described becomes extremely flexible when wet and consequently the contraction or compression of the helical coil or inner framework 4 will cause the paper sleeve 11 to contract in accordion-fashion when the dye-cops or packages are compressed in the dyeing chamber.

It has been stated herein that textile material such as cotton roving may be used for constructing the helical coil or ribbed framework of the tube and also for the longitudinal strands underlying or overlying the framework. It is to be understood, however, that other types of organic fibrous material may be employed for the purpose, for example, strips of resilient wood, such as bamboo or rattan, impregnated and coated with a resin or plastic of suitable type. Likewise, in place of cotton roving, strands of synthetic fibers may be employed and I have also found that cotton sliver in a relatively flat attenuated strip may be drawn through a bath of liquid plastic and condensed into a constricted cross-sectional area with the filaments compacted to greater density to give the required strength and resiliency to the strand used for the coil. Other materials of organic or similar fiber may also be used for the helical and longitudinal strands of the tube within the scope and purview of the present invention; and any impregnating and coating material having the characteristics specified herein may be employed for the stiffening, bonding and strengthening agent.

While being relatively strong and stable in its construction, the improved cop-tube is adapted for longitudinal contraction for supporting packages stacked in multiple and compressed axially on a stndpipe or skewer in the dyeing kier or other vessel. Such a form of tube also possesses a high degree of porosity to provide for forcing the dye-liquor or other fluid through its wall and into the yarn mass supported thereon.

It will be observed from the foregoing specification that my invention provides an improved cop-tube or carrier for supporting packages of thread, yarn and the like for submission to dyeing and other wet processes in substitution for similar tubes having relatively heavy metal frameworks. The present improved cop-tube is of light weight whereof to reduce the cost of transportation either in the dye-house or during trans-shipment of the packages wound thereon, yet it has the necessary characteristics such as strength and resistance to collapse and axial distortion to render it durable for repeated use over long periods of time. Moreover, the impregnation and coating of the fibrous material in its structure renders it unaffected by acid or alkaline treatment in its use in dyeing and other wet processes.

While the invention is herein shown and described as a cop-tube embodied in several different forms, it is to be understood that further modifications may be made in its structure and in the materials employed both for its framework and its tubular wall. Moreover, my improved tubular article may be applied to other uses besides that herein specified within the scope and purview of the invention. Therefore, without limiting myself to the exact form and construction of the article and its particular application to use as herein disclosed, I claim:

1. A cop-tube for dyeing and similar purposes comprising a skeleton framework constructed from a strip of fiber impregnated and coated with a plastic and having longitudinal strands of fiber cemented to the framework.

2. A longitudinally-contractible cop-tube comprising a helically-coiled strand of organic fiber treated with a plastic and a series of longitudinal strands of organic fiber supported thereon in spaced-apart relation circumferentially thereof.

3. In a cop-tube or yarn-support, a helical framework constructed of a strand of textile fiber impregnated and coated with a plastic and compressed to amalgamate and bond the filaments together, and a plurality of strands of organic fiber extending longitudinally of the framework and cemented thereto at the crossing points.

4. An article of the type indicated comprising a tubular skeleton framework of crossing strips of fibrous material bonded together at their intersections and impregnated with a plastic to reenforce the structure.

5. A cop-tube for dyeing and similar purposes

comprising a skeleton framework constructed from a strip of fibrous material extending helically and impregnated with a plastic with a series of strands of flexible material crossing the helical strip and bonded thereto at the intersections.

6. A cop-tube for dyeing and similar purposes comprising a skeleton framework constructed from a strip of organic material impregnated with a plastic and having crossing strands of fibrous material bonded to the framework at the intersections.

7. A cop-tube for dyeing and similar purposes comprising a skeleton framework constructed from a strip of fibrous material impregnated with a plastic and having a series of crossing strands of roving bonded to the framework at the intersections.

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