

July 10, 1934.

G. N. TAYLOR

1,966,152

COP TUBE HOLDER

Filed June 20, 1932.

Fig. 1.

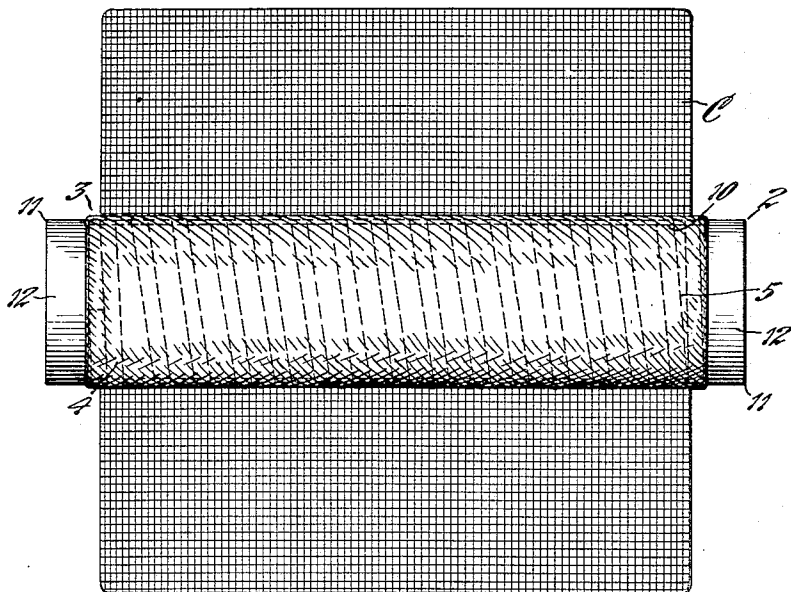


Fig. 2.

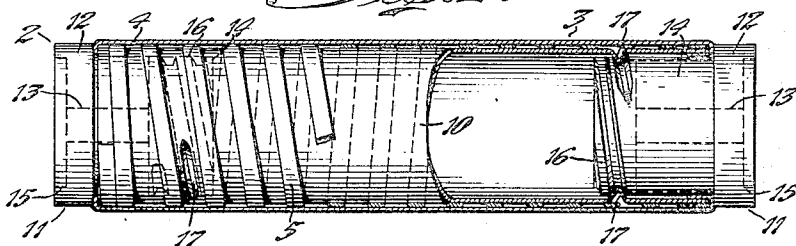
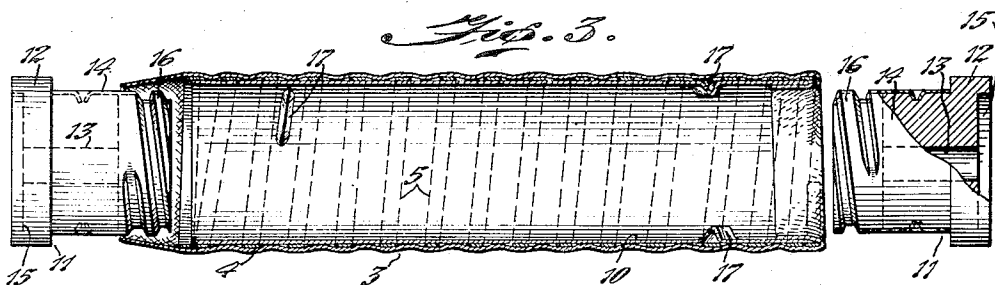


Fig. 3.



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UNITED STATES PATENT OFFICE

1,966,152

COP-TUBE HOLDER

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Application June 20, 1932, Serial No. 618,354

11 Claims. (Cl. 242—118)

This invention relates to an improved mandrel or holder for supporting cop-tubes in winding yarn or thread thereon. The present improvement relates particularly to a mandrel or holder for porous cop-tubes, for example, tubes of the contractible type covered with fabric sheaths and employed as axial supports for yarn packages in dyeing and similar processes.

In the following specification and claims the term "yarn" is used in a general sense to indicate all kinds of textile materials and the term "package" is intended to apply broadly to any form of wound mass of such material.

The present invention has for a particular object to provide an improved cop-tube holder for use in supporting contractible cop-tubes of the type illustrated and described in U. S. Letters Patent No. 974,127 to F. H. Daniell and J. C. Hebden, granted November 1, 1910 and Re. No. 13,223 to F. H. Daniell, granted March 28, 1911.

Such cop-tubes are widely used at the present time in what is known as "The Franklin process" of dyeing and similarly treating textiles. In its simplest form the contractible cop-tube comprises a helical coil or wire spring constituting a cylindrical ribbed framework covered by a sheath or stockinet of reticulated fabric. The yarn is wound on this type of tube directly upon the sheath or stockinet to form cylindrical or otherwise shaped cops or packages suitable for dyeing and like treatment by forcing fluids therethrough.

One object of the present invention is to provide a holder of the type specified for supporting porous cop-tubes to adapt them to be rotated at a high rate of speed to wind the yarn thereon.

Another object of the invention is to provide a holder of the type specified adapted to support the skeleton framework of the cop-tube and having means for gripping the fabric sheath or stockinet at the ends thereof to stretch and hold it taut whereby to prevent its ends from being drawn inwardly to interfere with the proper winding of the package thereon.

Another object of the invention is to provide a holder of the type specified having means for securing the cop-tube in place thereon to adapt it to rotate therewith on the spindle or other bearing element of the winding machine.

Another object of the invention is to provide a holder of the type specified whereon the cop-tube may be conveniently and expeditiously placed and the ends of its fabric sheath gripped to hold it stretched on its support.

Another object of the invention is to provide a holder of the type specified which is simple in

construction, economical to manufacture and convenient in use for the purposes described.

Further objects of the invention are set forth in the following specification which describes a preferred form of construction of the device, by way of example, as illustrated by the accompanying drawing. In the drawing:

Fig. 1 is a view showing the present improved holder with a cop-tube supported thereon and illustrating in section the yarn mass wound on the tube;

Fig. 2 is a view of the holder shown partly in section at one end and illustrating the cop-tube held thereon in longitudinal section; and

Fig. 3 is a view of the holder and the cop-tube thereon showing the end members of the holder in detached or disassembled relationship.

With fabric-covered cop-tubes of the character hereinbefore referred to, either of contractible or rigid type, considerable difficulty has heretofore been experienced during the first stages of winding the yarn thereon due to the fact that the fabric sheath or stockinet is not securely held at its ends to prevent its center portion from bellying outwardly under the effect of centrifugal force induced by the rapid rotation of the tube, thus causing the ends of the stockinet to be drawn inwardly from the ends of its support. With the stockinet improperly secured at its ends the bulging of its center portion causes the fabric to become wrinkled and bunched as the yarn is wound thereon, thereby preventing the disposition of the coils of yarn in smooth, uniform layers. If the initial layers of winding are not properly wound the whole package becomes malformed and unsuitable for treatment in the dyeing or similar process and as a further defect the yarn cannot be unwound freely therefrom in the later processes in which it is used.

When no means are provided for securing the fabric sheath of stockinet at its ends the ends will fly out under the action of centrifugal force and when the tube is used on a drum winding machine the loose ends will strike against the driving drum and become frayed and ragged. These frayed ends are drawn inwardly and caught under the coils of yarn as the latter are wound onto the cop-tube, thereby further causing unevenness and irregularity in the first layers of winding to prevent the free delivery of the yarn when it is desired to unwind it from the package.

Such irregularities and defects in the winding, besides preventing free delivery of the material in unwinding it from the package, also results in the matting of portions of the yarn so that the

mass is not of uniform porosity throughout the whole wound mass. Moreover, the stockinet is liable to slip and slide rotatively of the circumference of its support or framework so that the cop-tube will not be properly rotated from the drive-roll or drum during the initial stages of the winding. Such improper functioning of the cop-tube with respect to its holder results in defective winding and malformed packages which in many cases must be rewound to put the material into proper condition for dyeing or like treatment.

To overcome the above stated defects and deficiencies of devices previously used in the winding art, the present invention contemplates an improved holder or mandrel for porous and contractible cop-tubes having means embodied therein for gripping the fabric sheath or stockinet at its ends whereby to maintain it stretched substantially taut on its support or framework and to secure it for rotation therewith with a smooth, practically unbroken surface on its periphery. In brief, the present improved holder provides for supporting the contractible tube in a substantially rigid state throughout its entire length to prevent lateral distortion thereof; for gripping both the tube and its stockinet sheath to the holder to adapt them to rotate as a unit therewith; and for holding the covering sheath or stockinet in stretched condition to provide a uniformly smooth, level and substantially inflexible surface for receiving the yarn windings.

Referring now to the embodiment of the invention as illustrated in the accompanying drawing, in Fig. 1 the reference numeral 2 indicates the holder in general and 3 designates the cop-tube supported thereon with the yarn mass surrounding its periphery in the form of a cylindrical package, shown in section and indicated by the reference character C. In the type of contractible cop-tube 3 herein illustrated the outer fabric sheath or stockinet 4 is supported by a skeleton framework constituted by a helically coiled flat band or spiral wire 5. The yarn may be wound on the cop-tube 3 in overlying layers comprising crossing turns with each layer extending substantially the entire length of the tube. The package C may be produced with what is termed an "open wind", that is, with the yarn turns spaced slightly apart to render the mass sufficiently porous for the permeation of the dye liquor or other fluid thereinto during the dyeing or similar process to which it is subjected. With the present improved cop-tube holder the yarn may be wound more uniformly in the first or starting layers of the package with the turns or convolutions evenly distributed to obtain a greater uniformity of density in the mass and hence improve the conditions for hydraulic or fluid treatment.

In drum-driven winding machines the cop-tube is supported on a holder which is rotatably mounted with respect to a drive-roll or drum to adapt the tube for peripheral contact therewith to effect the driving operation. The yarn is deposited on the cop-tube by suitable traversing means such as a helically grooved roll or a reciprocating thread-guide which constantly traverses the strand from one end of the package to the other.

In accordance with the present invention the improved cop-tube holder 2 is constituted by a cylindrical sleeve or mandrel 10 adapted to be received within the helical or otherwise ribbed framework of the cop-tube 3 and having end

members 11 by means of which it may be rotatably mounted on the spindle of a winding machine. The end members 11 are detachable from the sleeve 10 and provided with means for gripping and binding the fabric sheath 4 of the cop-tube at the ends thereof to hold it stretched longitudinally of its framework to provide an unbroken surface on the periphery of the tube.

According to one preferred embodiment of the invention the cylindrical shell or sleeve 10 is constructed of seamless tubing and the end members 11 may be made of wood, fiber or any other suitable material. Each end member or head 11 has a cylindrical portion adapted to fit within the end of the sleeve 10 and at its outer end is an enlarged annular flange 12. The end members 11 are bored axially at 13 with the diameter of the bore such as to adapt it to freely fit the spindle on which the holder rotates. Preferably, the members 11 have counterbores in their outer ends as shown at 15 in Fig. 3 of the drawing.

To provide means for detachably securing the end members 11 within the ends of the sleeve 10 the reduced cylindrical portions of said members are formed with screw threads 16 engageable with suitable means on the interior of the sleeve. In the present construction the reduced portions of the end members 11 are provided with metal sheaths 14, for example, lengths of seamless tubing which may be rolled or otherwise shaped to form the threads 16 surrounding their ends. The sheaths or sleeves 14 on the end members 11 fit snugly around the reduced portions thereof and may be secured in place by indenting the metal to provide prongs for penetration into the material of the end members. The indenting of the metal may be done with a prick-punch or like tool thus providing for economical manufacture and at the same time insuring a firm joint between the parts.

The interior of the sleeve 10 may be formed with rolled or embossed threads corresponding to those on the end members if desired, but preferably, in accordance with the present embodiment of the invention, the threads in the sleeve are only partial. Referring to Fig. 3 of the drawing, the sleeve 10 is herein shown as being indented to provide relatively short angularly-disposed projections 17 on its interior for engaging with the threads 16 on the end members 11. The end members or heads 11 are inserted into the ends of the sleeve 10 and by imparting a slight relative rotative movement thereto the threads 16 will engage with the projections 17 to draw the end members into place with the shoulders of their flanges 12 engaging snugly against the ends of the sleeve. The reduced body portions of the end members 11 fit rather loosely within the ends of the sleeve 10 whereof the ends of the fabric sleeve or stockinet 4 may be folded into the open ends of the holder and bound into place by the end members. In use the improved cop-tube holder operates as follows:

The cop-tube 3 consisting of the helical coil or spring 5 covered by the fabric sheath or stockinet 4 is slipped into place on the holder sleeve 10, and usually the latter is made somewhat shorter than the cop-tube so that the spring will be contracted longitudinally to a slight extent when held in place on the holder. After the cop-tube 3 has been placed on the sleeve 10 the ends of the stockinet 4 are folded or tucked

into the ends thereof as indicated at the right in Fig. 3. The end member or plug 11 is then inserted into the end of the sleeve 10 to engage its threads 16 with the projections 17 on the interior of the holder and by giving the end member a slight rotative movement it is drawn into the sleeve or shell 10 to cause its shouldered flange 12 to bind against the inturned end of the stockinet 4.

The fabric sheath or stockinet 4 is next drawn taut towards the opposite end of the sleeve 10 and this end of the stockinet tucked into place while the fabric is held in stretched condition by the operator's fingers. The other end member 11 is then screwed into place in the manner as previously explained to bind this end of the stockinet 4 between the flange 12 on the end member and the end of the sleeve 10. With the two end members 11 thus screwed snugly into place the outer fabric sheath or stockinet 4 will be held in stretched condition between the ends of the sleeve 10 to provide a smooth unbroken surface on the periphery of the cop-tube for receiving the yarn windings. As the end members 11 are applied to the holder 2 their flanges 12 engage the ends of the cop-tube 3 to effect a slight contraction in the length of the helical coil or spring 5 whereby its ends will be frictionally engaged with the flanges on the end members to connect the parts for unitary rotation.

The holder 2 and its assembled cop-tube 3 may be placed on the winding-spindle by inserting the latter through the bores 13 in the end members 11 to provide for rotation of the cop-tube with its holder. If desired, the end members 11 may be constructed of lubricant-impregnated material so as to provide oilless bearings for the cop-tube holder on the winding or other machine. During the winding operation the yarn is deposited on the periphery of the cop-tube 3 overlying the fabric sheath or stockinet 4 with the turns or convolutions crossing and recrossing to build up in layers culminating in a cylindrical or other form of yarn package as indicated at C in Fig. 1. At the completion of the winding operation the end members or heads 11 are unscrewed and withdrawn from the sleeve 10 of the holder 2 and the cop-tube 3 may then be removed and the package applied to the dyeing or other process for which the yarn has been prepared.

In some processes of dyeing, rigid perforated cop-tubes are employed in place of the contractible skeleton tube illustrated in the present drawing. It is usually desirable to cover such tubes with fabric sheaths or stockinets, however, and the present improved holder is adapted for supporting such a type of cop-tube as well as that herein described and illustrated.

It will be observed from the foregoing that the present invention provides a particularly simple yet convenient form of holder for supporting cop-tubes or carriers of yarn masses in the form of dye cops. The device is light in weight, economical in its cost of manufacture, while at the same time being strong and rigid to support the cop-tubes under the constrictive action of masses of yarn wound thereon.

The present improved holder further provides means incorporated therein for gripping and holding the ends of the fabric sheath or stockinet at the ends of the cop-tube to prevent these ends from drawing inwardly under the tendency of the stockinet to balloon or fly outwardly at its cen-

ter portion. The gripping or holding of the ends of the stockinet in the manner explained also prevents the ends of the fabric from flying radially outward to cause them to strike against the driving drum and become frayed and ragged from such contact. Thus, besides preventing the frayed ends from interfering with the winding of the yarn on the cop-tube the invention further protects the sheath or stockinet of the tube from wear and disintegration whereby to render it more durable in use.

As a further feature of the invention the means for holding the fabric sleeve or stockinet stretched longitudinally of its support tends to prevent it from being drawn in between the ribs of the framework by the constriction of the coils of winding wound on its surface and thus permits the package to be more readily withdrawn from its holder upon completion of the winding operation.

While the improved device is herein described and illustrated as embodied in a preferred form of construction, it is to be understood that modifications may be made in the structure and arrangement of its parts without departing from the spirit or scope of the invention. Therefore, without limiting myself in this respect, I claim:

1. A device of the character specified comprising a mandrel for holding a cop-tube embodying an outer flexible sheath, and end members having screw-engagement with the mandrel and provided with means for gripping the ends of the flexible sheath against the ends of the mandrel to hold said sheath stretched under tension.

2. In a holder for a cop-tube constituted by an inner support covered by an outer flexible sheath, the combination of a hollow mandrel for receiving the inner support of the cop-tube with the ends of its sheath disposed within the ends of the mandrel, and end members attachable to the ends of the mandrel and provided with shoulders for gripping the ends of the sheath thereagainst.

3. A holder for a cop-tube embodying an outer flexible sleeve, said holder comprising a hollow cylindrical sleeve having a relatively thin wall, and end members adapted to be received within the ends of said sleeve, said sleeve and end members having interengaging means for detachably securing the end members in place, and said end members having shoulders adapted to abut the ends of the sleeve to bind against the inturned ends of a flexible sheath enclosing the cop-tube.

4. In a holder for cop-tube, the combination of a cylindrical sleeve, end members having portions adapted to be received within the ends of the sleeve and provided with tubular metal sheaths surrounding said portions, and cooperating screw threads on the metal sheaths of the end members and the interior of the sleeve.

5. In a holder for a cop-tube covered by a flexible stockinet, the combination of a hollow mandrel formed with interior projections at its ends, and end members adapted to be received within the ends of the mandrel and provided with screw threads for engaging the projections therein to detachably secure said end members in position at the ends of the mandrel, said end members formed with shouldered abutments adapted to bind the inturned ends of the flexible stockinet against the ends of the mandrel.

6. In a holder for cop-tubes, the combination of a cylindrical shell indented at its ends to provide projections on its interior, cylindrical end members having portions adapted to be received within the ends of said shell and provided with

- annular flanges at their ends, and tubular metal sheaths enclosing the end members and formed with screw threads adapted to engage the projections on the interior of the shell to detachably secure the end members thereto with their flanges abutting the ends of the shell.
7. In combination, a contractible hollow cop-tube enclosed by a flexible fabric sheath, and a holder therefor comprising a rigid sleeve fitting within said tube, end members carried by said sleeve and provided with annular portions adapted to abut the ends thereof to bind the ends of the flexible sheath thereagainst, and means for detachably securing said end members to the sleeve.
8. In combination, a contractible hollow cop-tube enclosed by a porous stockinet, and a holder therefor comprising a rigid cylindrical sleeve adapted to be received within said cop-tube, and end members detachably secured to the ends of the sleeve and having means for engaging the ends of the contractible tube to hold it in place on the sleeve and to bind the intumed ends of the stockinet against the ends of the sleeve to maintain it in stretched condition.
9. In combination, a contractible hollow cop-tube having a stockinet sheath enclosing its periphery, and a holder for said cop-tube comprising a central rigid supporting element, and end members detachably connected with said supporting element and having means for binding the ends of the stockinet against the ends of the supporting element to hold the same in stretched condition on the cop-tube.
10. In combination, a hollow cop-tube having a flexible fabric cover, and a holder therefor comprising a cylindrical sleeve of less length than the hollow cop-tube, said sleeve slidable within said cop-tube, end members removably attachable to the ends of said sleeve, and means on said end members for engaging the ends of the cop-tube and the ends of the flexible cover to secure the cop-tube rotatively with the holder and to bind the ends of the fabric cover against the ends of the sleeve.
11. In combination, a contractible cop-tube consisting in a helical spring enclosed by a flexible porous sleeve stretched thereover, and a holder therefor comprising a mandrel adapted to fit within the helical spring of the cop-tube with the ends of the sheath folded into its ends, and end members attachable to the ends of the mandrel and having portions engaging the folded ends of the sheath to hold it in stretched condition on the helical spring.
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