May 5, 1953 L. P. MILLER 2,637,659

METHOD OF TREATING YARN

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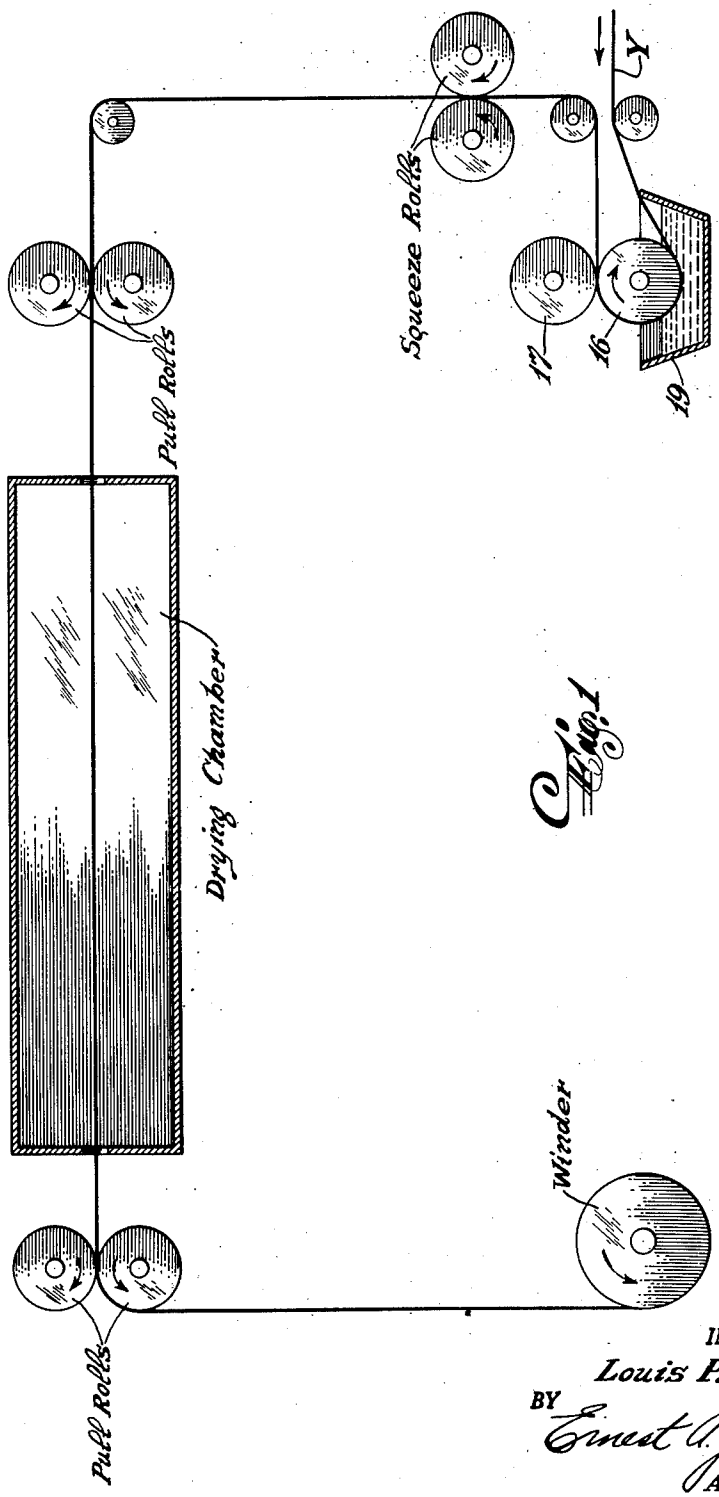


Fig. 1

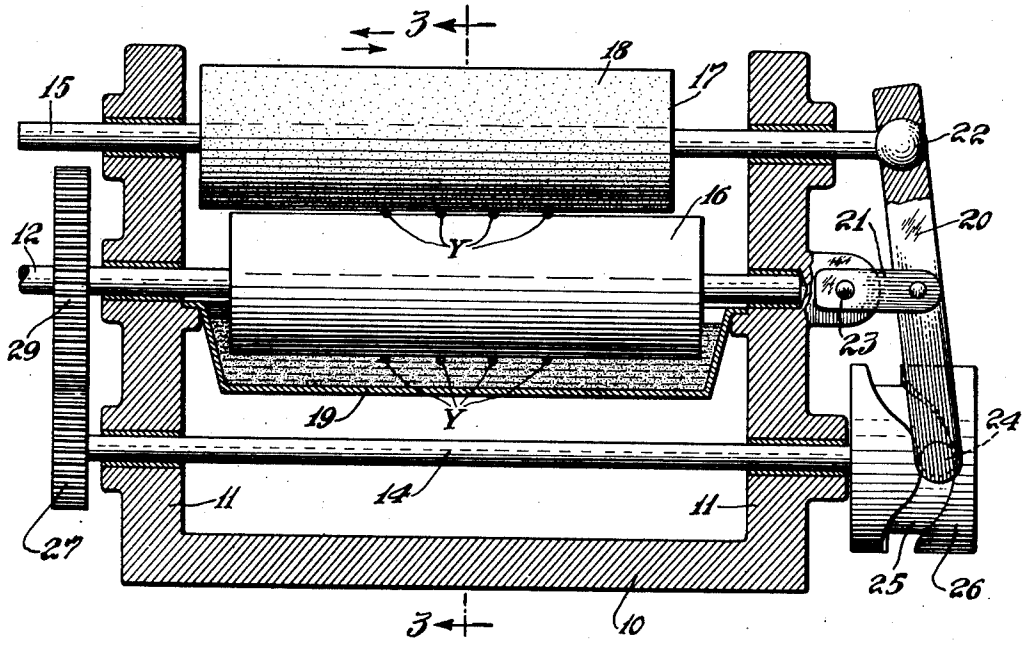
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Fig. 2



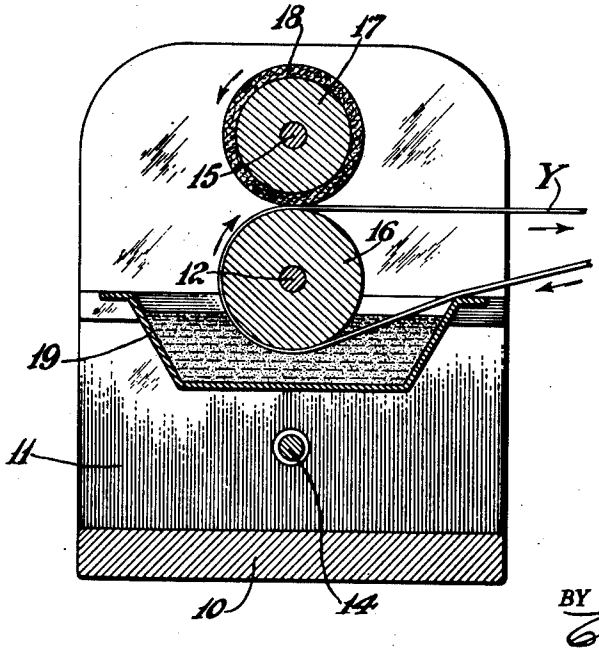


Fig. 3

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METHOD OF TREATING YARN

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2 Claims. (Cl. 117—7)

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The present invention relates to treating yarn and the like, and, more particularly, to a method of treating yarn wherein the yarn is impregnated with a treating solution, is stretched and is then dried.

The present invention is primarily concerned with improving the method of treating yarn, thread, cord and the like to increase the tensile strength and decrease the stretch thereof disclosed in United States Patent Number 2,220,953, dated November 12, 1940, which method generally comprises applying an impregnating solution containing a bonding agent to the yarn, stretching the yarn under a tension closely adjacent the breaking point, and allowing the bonding agent to harden while the yarn is stretched to permanently set the individual fibers making up the yarn.

Whenever there is a need for impregnating yarn, cord or other form of bundled or twisted fibers with such a solution, the basic problem is to drive the impregnant into the interior of the fibrous bundle. This problem becomes particularly complex when the impregnant is in the form of an emulsion. In such case, the impregnating agents are carried as small globules in another liquid medium such as water, and when the yarn is immersed in such an impregnant, the outer fibers thereof tend to screen out the globules and allow only the water or other liquid carrying medium to reach the inner fibers of the yarn.

In addition, the air trapped between the fibers at the center of the yarn is compressed when the yarn is fed over or between rollers and tends to further prevent liquids from reaching the center. This phenomenon reacts equally unfavorably to emulsions and impregnating agents which are truly dissolved in a liquid carrying agent or are liquids themselves.

Accordingly, an object of the present invention is to provide an improved method of treating yarn to increase the tensile strength and decrease the stretch thereof which overcomes the foregoing disadvantages and objections.

Another object is to provide a method of treating yarn wherein the penetration of the impregnant and the bonding agent into and between the fibers at the center of the yarn is facilitated.

Another object is to provide a method wherein the fibers of the yarn so treated are permanently set by the bonding agent.

A further object is to provide a simple practical method of treating yarn in the foregoing manner which results in the production of yarn having greater tensile strength and less stretch than yarns heretofore treated by similar methods.

Other and further objects of the invention will be obvious upon an understanding of the illustrative embodiment about to be described, or will be indicated in the appended claims, and various advantages not referred to herein will occur to

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one skilled in the art upon employment of the invention in practice.

In accordance with the invention, these objects are accomplished by supplying to the yarn an impregnant, preferably containing a bonding agent, working the yarn while the impregnant is being supplied, for example, by kneading or rolling the same to slightly loosen or untwist the individual fibers to thereby relieve entrapped air and to momentarily open the yarn sufficiently to enable the impregnant to penetrate substantially to the center of the yarn, stretching the yarn, preferably, almost to its breaking point, and permitting the bonding agent to harden and set the individual fibers of the yarn while in a stretched condition.

More specifically, the yarn is treated to facilitate impregnation by utilizing a method which includes moving the yarn in a lengthwise axial direction, applying pressure to the yarn at diametrically opposite points of engagement, applying back and forth movement tangentially with respect to the yarn to effect rolling thereof, and supplying liquid impregnant to the yarn at the points of engagement.

A preferred embodiment of the invention has been chosen for purposes of illustration and description, and is shown in the accompanying drawings, forming a part of the specification, wherein:

Figure 1 is a schematic view of apparatus diagrammatically illustrating the treatment of the yarn in accordance with the present invention.

Figure 2 is an end view, partly in elevation and partly in section, illustrating apparatus for performing the impregnating step.

Figure 3 is a sectional view taken along the line 3—3 on Figure 2.

Referring to the drawings in detail, apparatus is shown in Figure 1 thereof for performing the method of the present invention, the operation of which will serve to illustrate the method in which the yarn is treated. One or more strands of yarn Y are pulled or delivered from a source of supply (not shown) and are passed through a bath of impregnant in a receptacle 19, around a power driven roll 16, the lower portion of which is immersed in the bath, and between the roll 16 and a roll 17 which is operated to work the yarn to facilitate more effective impregnation thereof as described in detail hereinafter. If desired, the yarn may be advanced directly from the source of supply to between the rolls 16 and 17 whereby the roll 16 serves as the sole means for applying the impregnant to the yarn.

The impregnated yarn is passed through power driven squeeze rolls, which are operated at a slightly lower surface speed than the rolls 16 and 17, to enable the impregnated yarn to relax while passing from the rolls 16 and 17 to the squeeze rolls, and is next passed through a set of power driven pull rolls. The pull rolls are operated at a sufficiently higher surface speed than the

squeeze rolls to tension the yarn to almost its breaking point and to stretch the same in passing from the nip of the squeeze rolls to the nip of the pull rolls.

The tensioned yarn is then passed through a drying chamber, such as an oven or the like, wherein the liquid in the impregnant is removed by evaporation, while the bonding agent contained in the impregnant remains between the fibers of the yarn and is permitted or caused to be hardened to permanently set the individual fibers of which the yarn is composed.

The yarn is then removed from the oven by a second set of pull rolls which, preferably, are operated at a surface speed sufficiently higher than that of the first mentioned pull rolls to maintain the yarn in stretched condition while passing through the oven and to take up any stretch in the yarn occasioned during the drying thereof to thereby retain the yarn in its elongated condition.

Thereafter the yarn is delivered to a winder for packaging the same.

Referring more particularly to Figures 2 and 3 of the drawings, there is shown apparatus for working the yarn to effect impregnation thereof which comprises a base 10 and a pair of upright side frames 11 mounted on the base for rotatably mounting a drive shaft 12 and a cam operating shaft 14 and for rotatably and slidably mounting an idler shaft 15. Motor means (not shown) are adapted to effect rotation of the drive shaft.

The drive shaft 12 has the roll 16 keyed thereon, and the idler shaft has the roll 17 keyed thereon which is positioned to be frictionally engaged and rotated by the roll 16. These rolls are constructed and arranged to feed a plurality of strands of yarn Y therebetween and may be of any desired width depending on the number of strands to be fed by the machine. Preferably, one of the rolls has a soft covering 18 so that when the rolls are pressed together the area of contact is of appreciable proportion.

The receptacle 19, adapted to contain the yarn impregnant, is supported by the side frames 11 in a position whereby the underside of the roll 16 passes through the impregnant and applies the same to the yarn passing between the rolls 16 and 17.

One of the rolls, for example the roll 17, is moved back and forth endwise with respect to the other roll 16 to prepare the yarn for impregnation. To accomplish this, the shaft 15 is moved back and forth by an arm 20 pivotally mounted to one of the side frames 11 by a link 21 pivoted at 23 to the frame, and having one end connected to the shaft 15 by a spherical bearing 22 and having its other end provided with a follower 24 riding in a cam groove 25 of a cam drum 26 mounted on one end of the cam shaft 14. The other end of the cam shaft is operatively connected to the drive shaft for rotation therewith by a gear 27 on the cam shaft meshing with a gear 29 on the drive shaft.

While the shaft 15 has been illustrated and described herein as an idler shaft, it will be understood that this shaft may be positively driven by the drive shaft, for example, by a relatively wide gear meshing with the gear 29 on the drive shaft.

In operation, yarn is fed between the rotating rolls 16 and 17 and the back and forth movement of the roll 17 kneads or rolls the yarn to slightly untwist and open the yarn for a short but sufficient duration to allow the impregnant to reach

the center thereof to thus insure more complete impregnation of the yarn and subsequent bonding of the individual fibers throughout the cross-section of the yarn. Thereafter, the yarn is caused to be relaxed by removing tension therefrom between the rolls 16 and 17 and the squeeze rolls whereby the bonding agent in the impregnant is further directed into or absorbed by the relaxed fibers of the yarn throughout its cross-section.

From the foregoing description, it will be seen that the present invention provides an improved method of treating yarn and the like which is simple, practical and economical and readily lends itself to the production of yarn having greater tensile strength and less stretch than yarns heretofore treated to accomplish similar results.

As various changes may be made in the form, construction and arrangement of the parts herein, without departing from the spirit and scope of the invention and without sacrificing any of its advantages, it is to be understood that all matter herein is to be interpreted as illustrative and not in any limiting sense.

It is also to be understood that the following claims are intended to cover all the generic and specific features of the invention herein described and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

This application is a continuation-in-part of my prior application for Letters Patent of the United States, Serial No. 755,078, filed June 17, 1947, now Patent 2,577,793.

I claim:

1. The method of treating a strand of yarn in twisted condition which comprises moving the yarn in a lengthwise axial direction, applying pressure to the yarn at diametrically opposite points of engagement, applying back and forth movement tangentially with respect to the yarn at said points of engagement to subject the yarn to a rolling action back and forth transversely to the axis of movement of the yarn to thereby slightly untwist the yarn and open the same at said points of engagement, and supplying liquid impregnant to the yarn at said points of engagement.

2. The method of treating a strand of yarn in twisted condition which comprises first moving the yarn in a lengthwise axial direction through a bath of liquid impregnant, applying pressure to the yarn at diametrically opposite points of engagement, applying back and forth movement tangentially with respect to the yarn at said points of engagement to subject the yarn to a rolling action back and forth transversely to the axis of movement of the yarn to thereby slightly untwist the yarn and open the same at said points of engagement, and supplying liquid impregnant to the yarn at said points of engagement.

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