

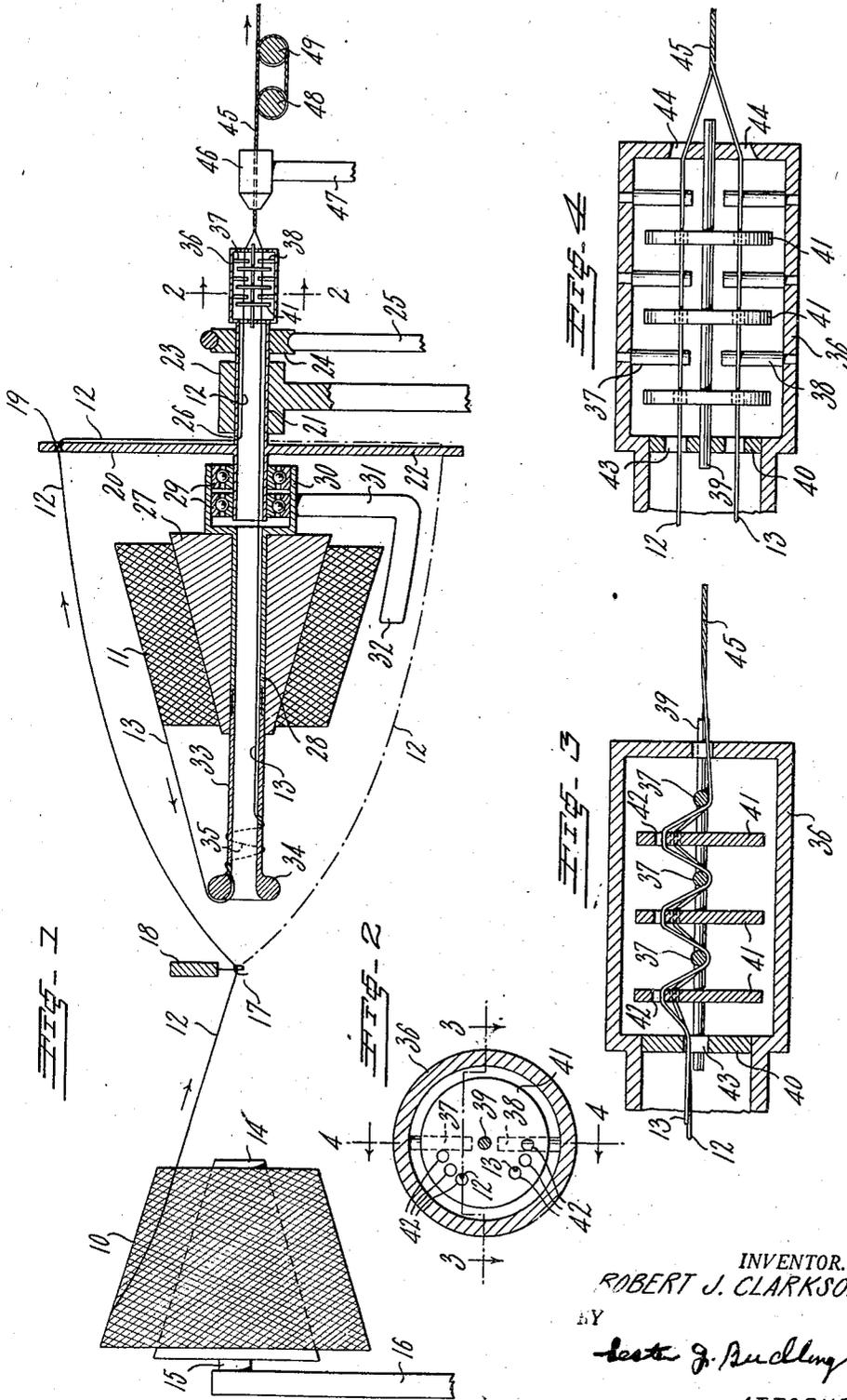
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MECHANISM FOR TWISTING TOGETHER A PLURALITY OF STRANDS

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MECHANISM FOR TWISTING TOGETHER A PLURALITY OF STRANDS

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This invention relates to mechanism for twisting together a plurality of yarns, threads or strands so as to form a plied construction without changing appreciably the twist of the individual strands about their respective axes, and more particularly to tension means for controlling the tension of the individual strands as they are plied together.

The mechanism herein contemplated may be employed to wrap one strand about another so that one forms the core and the other the cover, or it may be employed to twist two strands together so as to form a plied and twisted construction.

It is found in practice that if the mechanism herein contemplated is employed to manufacture a plied construction, it is necessary to control with a high degree of accuracy the tension of the individual strands as they are plied together, because if one strand is subjected to a greater tension than the other the strand under the greater tension will assume the position of a core and the other strand will be wrapped thereupon as a cover, instead of producing the desired plied construction.

A primary feature of the present invention, therefore, resides in twisting mechanism for twisting together a plurality of strands without changing appreciably the twist of the individual strands about their respective axes, and in tension means associated therewith and adapted to be actuated by the tension of one strand to vary the tension of the other strand to thereby equalize the tension upon the strands as they are plied together.

A more specific feature of the present invention resides in twisting mechanism including a revolving spindle adapted to revolve a balloon of one strand about the supply package for another strand so as to twist the strands together into a plied construction without changing appreciably the twist of the individual strands about their respective axes, and in tension means associated therewith and operable to displace each strand from a straight to a serpentine path so that as the displacement of one strand decreases the other increases to equalize the tension upon both strands.

Another feature of the present invention resides in mechanism for twisting together a plurality of strands so as to form a plied construction without changing appreciably the twist of the individual strands about their respective axes, and comprising a hollow twisting spindle adapted to support one let-off package without

rotating the same and so that the strand may be pulled endwise from this package and then advanced axially through the package and the spindle to the twisting point where it is plied with another strand to form the plied construction.

The above and other features of the present invention and novel combination of parts will be further understood from the following description when read in connection with the accompanying drawing, wherein:

Fig. 1 is a schematic side elevation with parts in section of twisting mechanism constructed in accordance with the present invention;

Fig. 2 is an enlarged section taken on the line 2—2 of Fig. 1;

Fig. 3 is a section taken on the line 3—3 of Fig. 2; and,

Fig. 4 is a section taken on the line 4—4 of Fig. 2.

The twisting mechanism of the present invention has been designed to twist together yarns, threads or strands by forming a balloon in one strand and revolving this balloon about the let-off package of another strand to twist the strands together at a point intermediate their ends, without similarly rotating the let-off packages for the strands or the take-up package for the plied construction. The effect of this is to ply the strands together without altering appreciably the manufacturing twist of the individual strands.

Twisting mechanism embodying this general construction may be employed to ply together more than two strands by revolving the balloon around a plurality of let-off packages, and various types of packages or spools may be employed as the let-off packages. The construction shown in the drawing, however, is designed to ply together only two strands.

In Fig. 1 of the drawing there is shown what is termed the first let-off package 10 and the second let-off package 11. Both of these packages preferably have the conical construction shown so that the strand 12 may be withdrawn endwise from the package 10 and the strand 13 may be withdrawn endwise from the package 11 without the necessity of rotating these packages as the strands are unwound therefrom. The package 10 is mounted on a supporting cone 14 that is supported by the shaft 15 extending laterally from the frame or upright 16. The strand 12 upon being unwound from its package 10 passes through a pigtail guide 17 disposed on the central axis through the package 10 but

at some distance from the package, and this guide is supported by a bracket 18.

The strand 12 passes from the pigtail guide 17 through an opening 19 at one end of a flier arm 20 that is rigidly secured to the hollow twisting spindle 21, and extending opposite from the arm 20 is the counter balancing arm 22. The twisting spindle 21 is rotatably supported by the machine frame or bracket 23 and is adapted to be driven by the whorl 24 and belt 25. The strand 12 after passing through the opening 19 travels along the arm 20 to the hollow spindle 21 and then through the hole 26 into this hollow shaft and lengthwise therein in a righthand direction.

The second let-off package 11 is shown as mounted upon a cone 27 which is supported by the hollow shaft 28, and this shaft is non-rotatably supported by the rotating spindle 21 through the ball bearings 29 consisting of the inner rings rigidly secured to a projecting end of the revolving spindle 21 and the outer rings tightly fitted within the casing 30 secured to the shaft 28. This ball bearing construction permits the hollow twisting spindle 21 to be rotated without rotating the spindle 28 which it supports, and in order to prevent the small amount of friction which may be imparted from the rotating spindle 21 to the spindle 28 from turning the latter, a weight such as 31 may be rigidly secured to the casing 30 to hang downwardly therefrom in a vertical direction and has at its outer end the projection 32 positioned to clear the full package 11.

In the construction shown the package 11 is supported so that its smaller end faces the smaller end of the first package 10, and the construction is preferably such that the strand which is unwound from the package 11 may be pulled endwise therefrom and then advanced axially through this package within the hollow supporting shaft 28. To accomplish this and at the same time prevent the unwinding strand from dragging unduly upon the smaller end of the conical package a fairly long tubular guide 33 is provided the inner end of which fits telescopically within the hollow tube 28. The outer end of this tubular guide has the enlarged beaded portion 34 over which the strand 13 may slide freely as it passes into the tube 33.

The purpose in mounting this guide 33 telescopically within the outer end of the shaft 28 is to permit the guide 33 to be removed when a package is to be changed.

When the twisting spindle 21 is rotated rapidly a portion of the strand 12 extending from the pigtail 17 to the arm 20 will balloon as shown in full lines above the package 11 and in dot and dash lines below the package. This will subject the strand 12 to a greater tension than that placed upon the non-rotating strand 13 as it passes to the guiding tube 33. Therefore, in order to increase the tension upon the strand 13 to subject it to somewhere near the tension that is placed upon the strand 12, the strand 13 after it enters the tubular guide 33 is preferably passed outwardly through a hole in the tube and wound about the tube one or more times as at 35 and then passed into the tube through a second hole, whereupon the strand 13 passes lengthwise within the hollow non-rotating support 28 and the hollow rotating spindle 21.

As above stated the mechanism herein contemplated will not twist the strands together symmetrically to produce the desired plied construction unless the tension upon the different strands is equal or nearly equal. The mechanism so far

described will serve to place upon the strand 13 a tension which somewhat approximates that of the strand 12 but will not control the tension upon the strands with the desired degree of accuracy. Therefore, an extremely important feature of the present invention resides in the tension mechanism which will now be described whereby the tension to which one strand is subjected serves to control the tension to which the other strand is subject to equalize the tension upon the strands as they are plied together.

This is accomplished in the construction shown by providing at the righthand end of the rotating spindle 21 the casing 36 which is rigidly secured to the spindle 21 to rotate therewith, and inside this casing is provided a row of pins 37 which project inwardly in a radial direction from the inner wall of the casing 36 and a second row of pins 38 that are disposed diametrically opposite to the pins 37 and extend inwardly from the inner wall of the casing. Within the casing 36 there is also mounted the longitudinally extending and centrally disposed shaft 39, one end of which is journaled in the outer wall of the casing 36 and the other end is journaled in the bridge member 40 rigidly secured at the inner end of the casing 36. Upon this pivotally mounted shaft 39 are mounted the discs 41, three being shown, as disposed between the longitudinally spaced pins 37 and 38.

Within each of the discs 41 are provided two or more holes 42 through which the strands 12 and 13 may extend as shown. The arrangement is such that each strand is led through selected holes 42 and about the pins 37 or 38 so that they will take the serpentine path shown in Fig. 3. The tension to which a strand is subject may be varied by threading the same through the holes 42 that lie different distances from the pins, and since the discs are rotatably supported by the shaft 39 they will rotate as the tension upon a particular yarn increases to decrease the serpentine path for that yarn and increase the serpentine path for the other yarn. The effect of this is to decrease the retarding action to which one strand is subjected and increase the retarding action to which the other strand is subjected and thereby equalize the tension upon the strands as they are plied together.

The strands 12 and 13 pass through holes 43 in the bridge member 40 as they enter the casing 36 and pass through holes 44 as they leave this casing, and as they pass out of the holes 44 the rotation of the spindle 21 and the casing 36 plies the yarns together as at 45 adjacent the guide chuck 46 which is supported by the bracket 47. The plied construction thus formed is pulled forward through the chuck 46 by any suitable means such as the spaced pull rolls 48 and 49. One of these rolls is positively driven and both rolls are provided with spaced annular grooves about which the plied yarn 45 is wound in a plurality of runs to keep the yarn from slipping upon the rolls. The roll not positively driven will be rotated by the belt-like action of the yarn runs passing from one roll to the other. The pulling action of the rolls 48 and 49 serves to draw the yarns 12 and 13 forward from their supply packages 10 and 11. The yarn 45 may pass from these pull rolls to a take-up package, not shown.

The tension device shown in Figs. 2, 3 and 4 is adapted to accommodate only two strands, but a somewhat similar tension device adapted to accommodate three strands could be provided by pro-

viding three rows similar to the pins 37 but disposed at 120 degrees apart around the interior of the casing 36 instead of 180 degrees apart as shown. In such a construction a high tension exerted upon any one of the three strands would tend to reduce the serpentine path of this strand and shift the position of the discs 41 to increase the tension upon the other two strands, and this would tend to equalize the tension upon all three strands.

It will be seen from the foregoing that by employing twisting mechanism such as herein contemplated a plurality of strands may be twisted together to form a plied construction without altering the manufacturing twist of the individual strands forming such plied construction, except possibly for the slight change produced in the twists of the individual strands due to the stretching of these strands during the plying operation.

Having thus described my invention, what I claim and desire to protect by Letters Patent is:

1. Mechanism for twisting together a plurality of strands so as to form a plied construction without changing appreciably the twist of the individual strands about their respective axes, comprising a first let-off package and a second let-off package, a revolving spindle operable to rotate a balloon of the strand from the first package about the second package and twist the strands together into said plied construction, means for pulling the strands forward, and tension means actuated by the tension of one strand to vary the tension of the other strand so as to equalize the tension upon the two strands.

2. Mechanism for twisting together a plurality of strands so as to form a plied construction without changing appreciably the twist of the individual strands about their respective axes, comprising a first let-off package, a twisting spindle, a second let-off package supported by said spindle without being rotated thereby, means for rotating said spindle to thereby revolve a balloon of a strand from the first package about the second package and twist the strands together into said plied construction, means for pulling the strands forward, and tension means actuated by the tension of one strand to vary the tension of the other strand.

3. Mechanism for twisting together a plurality of strands so as to form a plied construction, comprising a first let-off package, a twisting spindle, a second let-off package supported in axial alignment with said spindle, means for revolving the spindle so as to rotate a balloon of a strand from the first package about the second package and twist the strands together into said plied construction without changing appreciably the twist of the individual strands about their re-

spective axes, means for pulling the strands through said spindle, and tension means actuated by the tension of one strand to vary the tension of the other strand.

4. Mechanism for twisting together a plurality of strands so as to form a plied construction, comprising a first let-off package, a twisting spindle, a second let-off package supported upon the axis of said spindle so that the strand from this package may be pulled axially through the package and spindle, means for rotating said spindle to revolve a balloon of a strand from the first package about the second package and twist the strands together into said plied construction, means for pulling the strands forward, and tension means actuated by the tension of one strand to vary the tension of the other strand.

5. Mechanism for twisting together a plurality of strands so as to form a plied construction, comprising a first let-off package and a second let-off package, a revolving spindle that rotates independently of both of said packages to revolve a balloon of a strand of one package about the other package and twist the strands together about a common axis without changing appreciably the twist of the individual strands about their respective axes, means for advancing the strands, and tension means actuated by the tension of either strand to vary the tension of the other strand.

6. Mechanism for twisting together a plurality of strands so as to form a plied construction without changing appreciably the twist of the individual strands about their respective axes, comprising a first let-off package and a second let-off package, a revolving hollow spindle operable to rotate a balloon of a strand from one package about the other package and twist the strands together into said plied construction, means for advancing the strands through the spindle, and tension means mounted in said hollow spindle and actuated by the tension of one strand to vary the tension of the other strand.

7. Mechanism for twisting together a plurality of strands so as to form a plied construction without changing appreciably the twist of the individual strands about their respective axes, comprising a first let-off package and a second let-off package, a revolving spindle operable to rotate a balloon of the strand from the first package about the second package and twist the strands together into said plied construction, means for pulling the strands forward, and pivoted tension means adapted to displace each strand from a straight to a serpentine path and operable so that as the displacement of one strand decreases the other increases to thereby equalize the tension upon both strands.

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