

[54] **STRAND OR THREAD WINDING APPARATUS**

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[58] Field of Search..... 242/18 DD, 18 R, 43

[56] **References Cited**

UNITED STATES PATENTS

613,384 11/1898 McCausland 242/18 DD
3,092,339 6/1963 Hill, Jr. et al. 242/18 DD

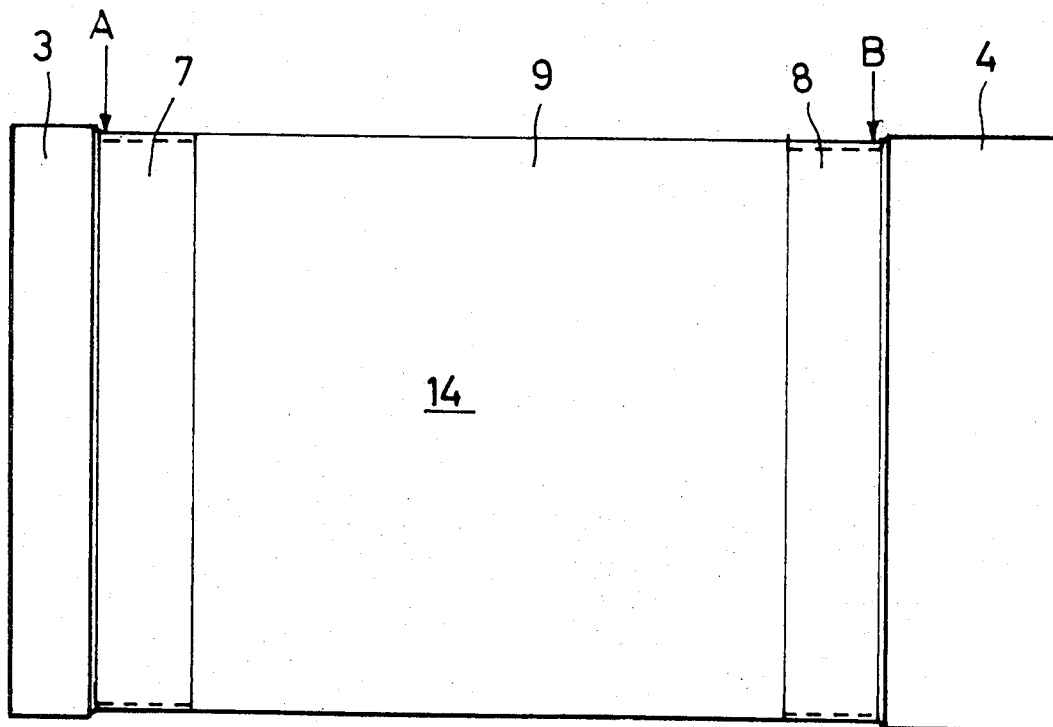
3,690,578 9/1972 Morgan et al..... 242/18 DD

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[57] **ABSTRACT**

A strand or thread winding apparatus includes a reciprocating traversing mechanism and a package wind-up mechanism. A cylindrical roller is disposed between the traversing mechanism and the package wind-up mechanism. The cylindrical roller is provided with grooves, which extend around its circumference, disposed in its end regions. Each groove has two side walls. The walls have differing slopes (steepnesses), the wall closer to the central surface region of the roller having the greater slope. The grooves may be in the form of respective screw threads, one disposed in each end region or in the form of respective pluralities of annular grooves disposed parallel to one another.

12 Claims, 3 Drawing Figures



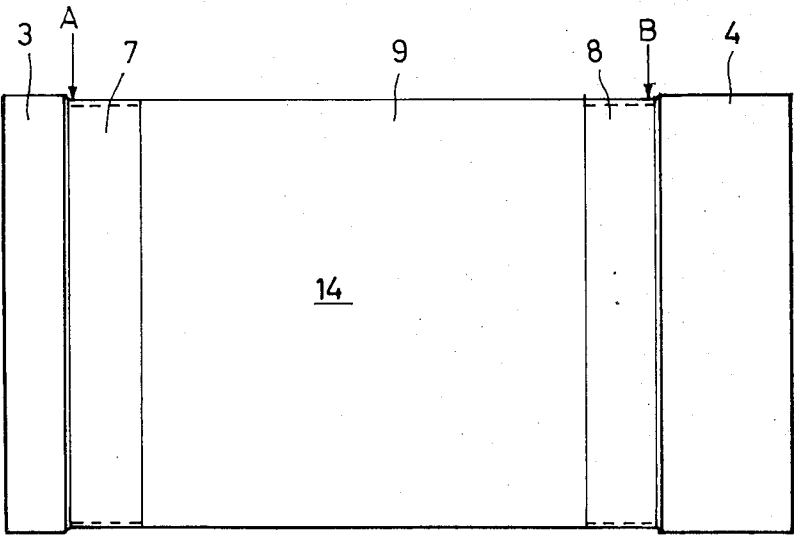


FIG. 1

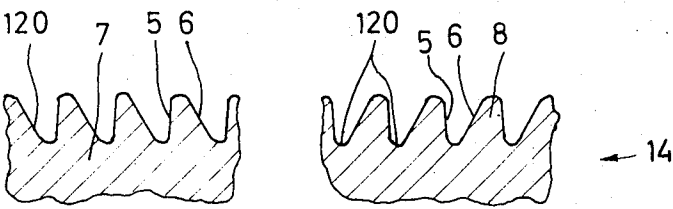


FIG. 2

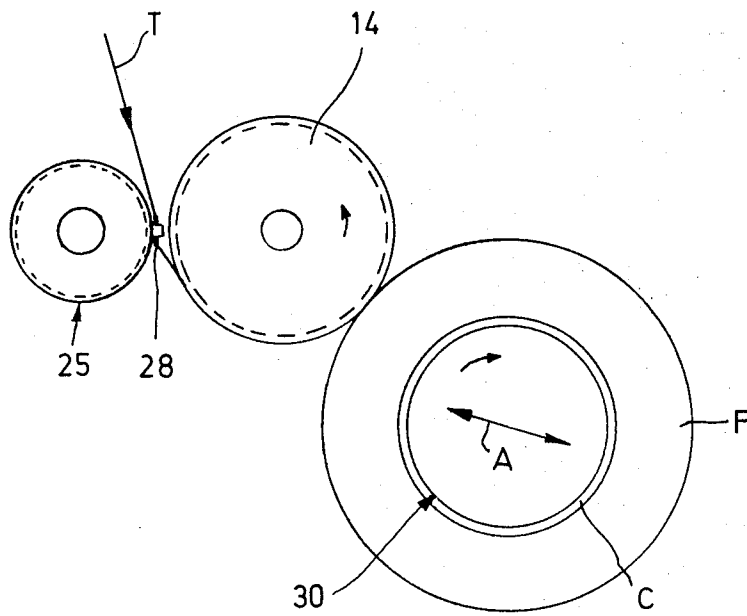


FIG.3

STRAND OR THREAD WINDING APPARATUS**BACKGROUND OF THE INVENTION**

This invention relates to a strand or thread winding apparatus which includes a reciprocating traversing mechanism and a package wind-up mechanism, a grooved roller being disposed between these two mechanisms. The present invention, more particularly, relates to a thread winding apparatus with a reciprocating traversing mechanism which receives the strand or thread to be wound up under tension and guides it to the wind-up mechanism, while moving it to and fro for the purpose of creating a cross-wound yarn package, and includes a cylindrical roller disposed between the reciprocating traversing mechanism and the wind-up mechanism, the roller making contact with the yarn package being wound and having grooves in its surface.

It is known from the U.S. Pat. to Morgan et al., No. 3,690,578, issued Sept. 12, 1972, to provide, in a strand or textile thread winding apparatus having a reciprocating strand or thread traversing mechanism and a package wind-up mechanism, a grooved cylindrical roller. The cylindrical roller, preferably a rotating drive roller, is positioned in the path of travel of the strand or thread between the two mechanisms. The roller cooperates with the traversing mechanism for controlling the traversing action on the strand or thread by receiving the strand or thread in its respective grooves and holding the strand or thread in respective traversed positions in which the strand or thread is played during the traversing action of the traversing mechanism. Thus, the roller aids in guiding and controlling the strand or thread.

SUMMARY OF THE INVENTION

It is the principal object of the present invention to provide in a strand or thread winding apparatus having a traversing mechanism and a package wind-up mechanism, a cylindrical roller having improved strand or thread guiding characteristics.

It is another object of the present invention to provide in a strand or thread winding apparatus having a traversing mechanism and a package wind-up mechanism, a grooved cylindrical roller, each groove in the roller having two side walls of differing slopes, the wall lying closer to the central surface region of the roller, in each case, having the greater slope for improved guiding of the strand or thread.

It is a further object of the present invention to provide a strand or thread winding apparatus which effects an improvement in placement of the strand or thread in the vicinity of the two ends of wound-up strand and thread packages.

It is an additional object of the present invention to provide a strand or thread winding apparatus which ensure that even under unfavorable conditions, such as a high velocity of the traversing mechanism, a particularly even and regular strand or thread package results which has substantially no hills or valleys near its ends.

The foregoing objects, as well as others which are to become clear from the text which follows, are achieved in accordance with the present invention in a strand or thread winding apparatus by providing a special grooved roller between a traversing mechanism and a

package wind-up mechanism. At least the end regions of the strand or thread depositing surface area of the cylindrical roller, contacted by the strand or thread in its traversing motion, are provided with grooves extending around the circumference of the roller, two side walls of each groove having differing slopes (steepnesses). The wall of the groove lying closer to the central surface region of the roller is the steeper wall. The grooves disposed in the end regions are very close to each other. By developing the grooves in this manner in the end regions of the strand or thread placing surface area of the roller, the reciprocal motion of the strand or thread is particularly advantageously controlled in the vicinity of and at the reversal points of this to-and-fro motion so that the strand or thread package which is formed has a particularly regular form which, even in the vicinity of its ends, shows practically no hills or valleys:

Preferably it is provided that such grooves, whose two side walls exhibit differing slopes, are located only in the end regions of the strand or thread depositing surface area. Of course, such grooves can also be located on both sides of the strand or thread placement surface area contiguous to the provided reversal points of the strand or thread which, for example, opens the possibility to change the length of the strand or thread placement region.

In many cases, it is suitable that the entire strand or thread placement surface area of the roller be provided with grooves of the kind described above. It has been found to be particularly advantageous to make smooth, preferably to polish, the intermediate region of the roller lying between the two end regions provided with grooves. In many cases, this intermediate region of the roller, however, can also be provided with grooves, preferably with grooves having symmetrical cross-sectional profiles. Depending on the development of the package wind-up mechanism, the roller can serve for the deposition of a single strand or thread or it can be sufficiently long so that several strand or thread placement surface areas are contained on it, one adjacent to the next.

The grooved end regions of the roller, whose grooves have walls of differing steepness, can, according to a preferred embodiment, be developed in the form of a sawtooth profile, i.e., in such a way that each groove side wall is essentially straight in cross section. Preferably, the particular grooved regions can exhibit a sawtooth-shaped screw thread in profile.

In some cases, it may be suitable that one or both of the side walls of the groove have a cross-sectional form different from a straight line, preferably slightly concave or slightly convex in cross section.

The grooves of the particular grooved regions can be annular grooves disposed parallel to one another, or they can run in the form of a screw thread.

If only the end regions of the strand or thread placement region of the roller are provided with such grooves, whose two side walls show differing slopes, then it can be preferably provided that the length of each of these end regions is from approximately 5 percent to approximately 20 percent and preferably from approximately 8 percent to approximately 12 percent, of the entire length of the strand or thread placement region. If the grooves in the grooved end regions are developed in the form of screw threads, then it can be preferably provided that one end region has a left-

handed thread and the other end region has a right-handed thread.

According to a preferred embodiment, it is provided that the angle of inclination of the steeper side wall, with respect to a plane normal to the axis of the roller, is from 0° to 6° and is preferably from 2° to 4°.

It is further provided in a preferred embodiment that the angle of inclination of the less steeply inclined wall of the groove, with respect to a plane normal to the axis of the roller, is from approximately 25° to approximately 35° and preferably to approximately 30°.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a diagrammatic side view of a grooved cylindrical roller for a strand or thread winding apparatus constructed according to the invention.

FIG. 2 is a partial cross-sectional view through the grooved portion of the cylindrical roller of FIG. 1 in enlarged representation.

FIG. 3 is a schematic side view of a strand or thread winding apparatus according to the present invention using the roller shown in FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIGS. 1 and 2, a roller 14, which is part of a strand or thread winding apparatus for forming cross-wound packages, includes a strand or thread placement surface area which extends approximately from a location A to a location B.

At two end regions 7 and 8 of the strand or thread placement surface area, the roller 14 is provided with grooves 120 which are, as illustrated, developed as respective screw threads having a sawtooth profile. As illustrated, the end region 7 is provided with a left-hand thread and the end region 8 is provided with a right-hand thread. Neighboring grooves of each of these screw threads, according to FIG. 2, are immediately adjacent to one another.

The end regions 7 and 8 are relatively short in this exemplary embodiment, with respect to the total length of the strand or thread placement surface area and, in this exemplary embodiment, they extend over approximately 10 percent of the entire length of the strand or thread placement surface area which extends from the location A to the location B.

It is to be understood that the grooved end regions 7 and 8 can, if desired, extend considerably beyond the end of the strand or thread placement surface area which extends between the locations A and B, for example, in order to make the length of the strand or thread placement surface area variable. In this case, the excursion amplitude of the reciprocating traversing mechanism (not shown in FIG. 1), which moves the strand or thread back and forth on the strand or thread placement surface area of the roller 14, must be adjustable in order to produce strand or thread packages of desired differing lengths.

Between the two grooved end regions 7 and 8 having the sawtooth screw threads thereon, there is located, in the preferred exemplary embodiment shown in FIG. 1, a smooth, polished cylindrical region 9. On the sides of the two grooved end regions 7 and 8 remote from the cylindrical region 9 there are respectively smooth regions 3 and 4 of the roller 14 whose diameters are chosen to be somewhat larger than the diameter of that portion of the roller 14 between the locations A and B

which define the strand or thread placement surface area.

In this preferred exemplary embodiment, the angles of inclination of steeper walls 5 of the grooves 120 (FIG. 2) with respect to a plane normal to the rotational axis of the roller 14, are approximately 3°. The corresponding inclination of the less steeply inclined wall 6 of the grooves 120 is approximately 30° in this preferred exemplary embodiment. The depth of the grooves 120 in this exemplary embodiment is approximately 0.9 mm and the mean distance between the neighboring grooves in each of the end regions 7 and 8 is approximately 1 mm. It is to be understood that, of course, other dimensions than the above-indicated dimensions could be provided.

Instead of the illustrated sawtooth profile shown in FIG. 2, other profile cross sections for the grooves 120 can be provided. For example, in many cases it may be suitable to make the bottom of the grooves 120 wider than has been shown, preferably to connect the two walls of the groove by a bottom which, in cross section, is approximately straight and parallel to the rotational axis of the roller 14.

Instead of making the intermediate region 9 of the strand or thread placement surface area defined between the locations A and B smooth, in many cases it can also be provided with grooves, and preferably with grooves having symmetrical cross sections as they are described and shown in the above-mentioned U.S. Pat. No. 3,690,578.

FIG. 3 shows a strand or thread winding apparatus which includes the roller 14 shown in FIG. 1 and in which a strand or thread T is moved back and forth by means of a reciprocating traversing mechanism 25 in a direction transverse to its longitudinal direction of transport and parallel to the longitudinal axis of the roller 14. The roller 14 is driven and makes contact with a strand or thread package P which is being produced. The strand or thread package P is wound on a spool C, in turn located on a rotatably mounted carrier 30, which is moved in a straight line in the direction of the double arrow A and is loaded with a constant force so that the strand or thread package P presses with a constant force against the roller 14.

During the wind-up process, the strand or thread T running to the thread package P being produced is moved back and forth transversely to its longitudinal transport direction by the reciprocating traversing mechanism 25. The reciprocating traversing mechanism 25 also deposits the strand or thread T in the grooves 120 of the two end regions 7 and 8 of the roller 14 whenever a thread guide 28, which forms part of the reciprocating traversing mechanism 25, is moving over either of the end regions 7 and 8 of the roller 14. Each portion of the strand or thread T which is deposited in a groove 120 remains in it and shares the motion of the rotating roller 14 and does not move with respect to axis of rotation of the roller 14 until the roller 14 has transported it to the strand or thread package P in contact with and normally driven by the roller 14. The strand or thread T then reaches and is wound onto the package P which constitutes a cross-wound package on a spool sought to be produced. By means of the grooves 120 of the roller 14, the strand or thread T is deposited regularly in the vicinity of the two ends of the strand or thread package P in such a way that no hills or valleys are formed in the periphery of the strand or thread

package P where, even during very high reciprocating speeds of the strand or thread, this regular deposition is possible because of the differing steepnesses of the side walls of each of the grooves 120, constructed according to the present invention.

It is to be appreciated that while the foregoing detailed discussion, as it relates to FIG. 2, indicates that the grooves 120 are formed by respective screw threads, it is to be appreciated that the grooves could be developed as respective pluralities of distinct annular grooves disposed parallel to one another. The cross section of the grooves 120, as shown in FIG. 2, would be in this case as illustrated, eight distinct grooves being visible.

It is to be appreciated that the foregoing detailed description and accompanying drawing illustrations have been presented by way of examples. Numerous variations and other embodiments are also contemplated and possible without departing from the spirit and scope of the invention, which is defined by the appended claims.

What which is claimed is:

1. A strand or thread winding apparatus comprising, in combination:

- a. package wind-up means;
- b. a reciprocating traversing means which receive a strand or thread under tension and guide it to said package wind-up means while moving it to and fro for forming a cross-wound package;
- c. a cylindrical roller disposed between said traversing means and said package wind-up means, said cylindrical roller being adapted to contact a package being formed and having a strand or thread placement surface area including two end regions and a central region between said two end regions; and
- d. grooves provided in said cylindrical roller around its circumference at least in said two end regions, each groove of said grooves having two side walls with differing slopes, that one of said walls lying closer in each case to said central region having the greater slope.

2. A strand or thread winding apparatus according to claim 1, wherein said central region of said cylindrical roller is smooth surface.

3. A strand or thread winding apparatus according to

claim 1, wherein said central region is a polished smooth surface.

4. A strand or thread winding apparatus according to claim 1, wherein said side walls are substantially straight in cross section.

5. A strand or thread winding apparatus according to claim 1, wherein that side wall which has said greater slope, in each case, is inclined with respect to a plane normal to the axis of rotation of said roller in a range from approximately 0° to approximately 6°.

6. A strand or thread winding apparatus according to claim 1, wherein that side wall which has said greater slope, in each case, is inclined with respect to a plane normal to the axis of rotation of said roller in a range from approximately 2° to approximately 4°.

7. A strand or thread winding apparatus according to claim 1, wherein that side wall which has the lesser slope, in each case, is inclined with respect to a plane normal to the axis of rotation of said roller in a range from approximately 25° to approximately 35°.

8. A strand or thread winding apparatus according to claim 1, wherein that side wall which has the lesser slope, in each case, is inclined with respect to a plane normal to the axis of rotation of said roller in a range from approximately 25° to approximately 30°.

9. A strand or thread winding apparatus according to claim 1, wherein said grooves are respectively formed by two respective screw threads, one of said screw threads being formed in one of said end regions and the other of said screw threads being formed in the other of said end regions.

10. A strand or thread winding apparatus according to claim 1, wherein said end regions exhibit respective sawtooth-shaped screw threads in profile.

11. A strand or thread winding apparatus according to claim 1, wherein one of said end regions is provided with a screw thread which is left handed and the other of said end regions is provided with a screw thread which is right handed.

12. A strand or thread winding apparatus according to claim 1, wherein said grooves are constituted by a first plurality of annular grooves and a second plurality of annular grooves, these pluralities of annular grooves being respectively in one and the other of said end regions.

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