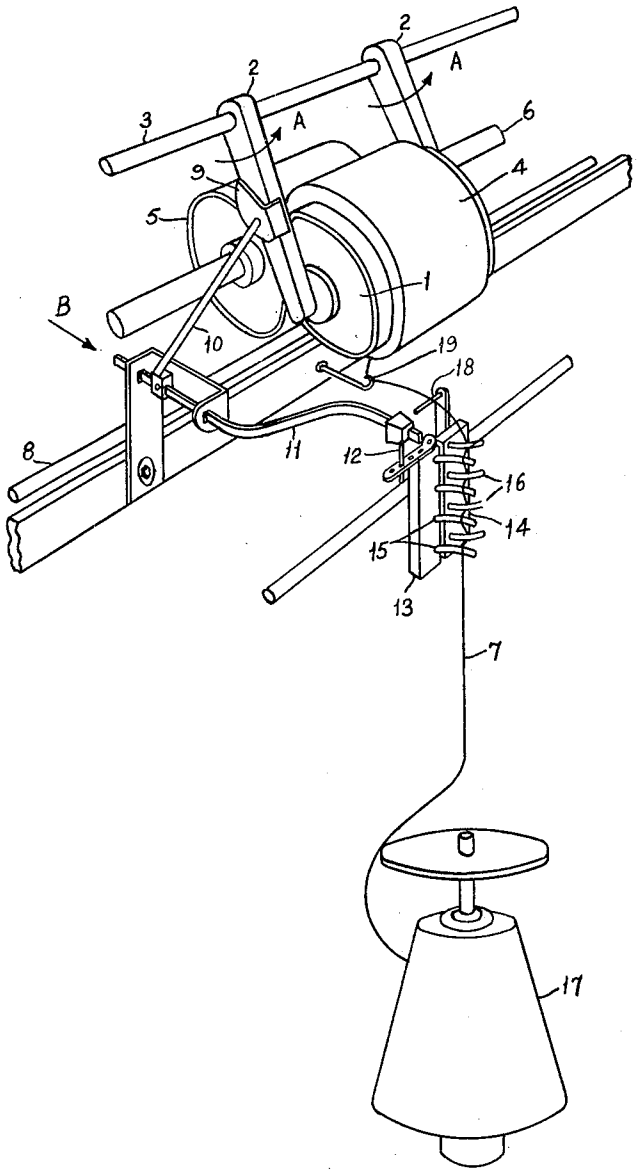
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THREAD SHRINKING

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THREAD SHRINKING

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This invention is concerned with yarn shrinking and in particular with the production of an improved package of a shrinkable yarn, in which we include continuous filament and spun fibre yarns, and with the packages so obtained.

In various circumstances it may be desired to apply a wet treatment to a yarn under conditions which allow the yarn to shrink. For example, the wet treatment may be designed to remove stresses introduced into the fibres by a stretching operation or the yarn may have been produced with a high degree of realisable shrinkage so as to make possible a wet treatment to modify the yarn properties, such as its bulkiness.

Wet treatments of these kinds are often combined with a dyeing operation and is has therefore been attempted to carry out the treatment on conventional dyeing equipment. Unfortunately, the handling of shrinkable yarns in hank form has proved to be more diffiucult than the treatment of conventional yarns in this way.

A desirable method of wet-treating shrinkable yarn would involve treatment in package form but hitherto such treatments have proved unsatisfactory since no package has been devised which allows uniform shrinkage of the yarn throughout its entire length. It is therefore an object of this invention to provide an improved package.

According to this invention, a method of producing an improved package of a shrinkable yarn comprises winding the yarn on a removable former under a yarn tension which decreases during the winding. Preferably the tension in the thread is reduced continuously throughout the whole of the winding, though not necessarily uniformly, and it is advantageous to reduce the tension towards the end of the winding operation to a value closely approaching zero. The initial tension depends very much on the yarn and fibre properties, such as strength, denier and potential shrinkage. However, subject to these considerations, initial tensions of the order of 20, 30, and even 100 gm. are permissible.

The removable former employed may be of the "collapsible" type, i.e. one which can be dismantled to remove it from the centre of the package, or simply a rigid former having a slight taper, for example of the order of one to ten degrees of arc, to simplify its removal. The former shown in the drawing is substantially cylindrical.

The package is preferably wound with a very open structure so as to allow easy and complete penetration of the treatment liquid into its interstices. This structure may be attained by conventional methods such as by employing a winding traverse rate which is high relative to the peripheral speed of the former during winding.

The single figure of the drawing is a perspective view of an apparatus suitable for producing improved yarn packages. Referring to the drawing, a collapsible former 1 is supported for free rotation at the end of two arms 2 which are secured in parallel on a rotatable shaft 3. The former 1, on which a yarn package 4 is being wound in the drawings, is rotated at constant yarn speed by frictional contact between a coated roller 5 and the package. The roller 5 is secured upon a driven shaft 6.

Yarn 7 is wound on the former 1 by means of a traversing guide (not visible in the drawing) located close to the line of contact of the roller 5 and the yarn package 4 and

mounted on a traverse rod 8. A rider 9 abuts one of the arms 2 and is linked via a lever 10 to a gate control rod 11. Swinging of the arms 2 about the axis of shaft 3 in the direction of arrow A, as the size of the package 4 increases, gives rise to linear longitudinal movement of the rod 11 in the direction of arrow B.

The end of the rod 11 further from the lever 10 is pivotally linked by a pin 12 to one half 13 of a yarn-tensioning gate 13, 14. The gate halves 13, 14 are provided with vertical rows of spaced hooks, 15, 16, respectively, the hooks 15 being staggered with respect to the hooks 16. The yarn passes from a supply cone 17, in a zig-zag path round the hooks 15, 16 of the gate, over a guide pin 18 and thence via a further guide 19 to the traversing mechanism.

The linking of the rider 9 to the gate-half 13 is such that, as the yarn package 4 builds up, the gate-half 13 moves to bring the row of hooks 15 closer to the row of hooks 16 so that the path of the yarn through the gate gradually becomes straighter and the restraint on the yarn, i.e. the winding tension, is progressively reduced. By suitable adjustment of the points of linkage of the lever 10, the rod 11 and the gate-half 13 and by suitable loading of the gate, the initial and final yarn tension and its rate of reduction may be changed.

In an example of the use of the apparatus described, the yarn was a two-fold yarn consisting of two 29's worsted count yarns doubled together, each yarn spun from a blend of stabilised and high-shrinkage Courtelle (registered trademark) polyacrylonitrile staple fibres. The high-shrinkage component consisted of fibres possessing a potential shrinkage of 20 percent. The two-fold was wound on to a collapsible former of 5¼ inches diameter using a traverse of 4 inches and 20 cycles/minute and a yarn speed of 40 yards/minute. The yarn tension was progressively reduced from 20 grams to zero during the winding of a package weighing about 12½ ounces.

The former was removed from the package and the package was then immersed in a boiling aqueous bath until the increase in yarn bulk resulting from shrinking of the high-shrinkage fibre was completed. The package was then given a light hydro-extraction and subsequently dressed on to a stainless steel former for dyeing. The bulking and dyeing were both satisfactorily uniform.

In a second example, a 2/28's worsted count thread of the same type as above was wound at 100 yards/minute using a 4-inch traverse at 44 cycles/minute, to give a 16-ounce package. The yarn tension was progressively reduced from 30 grams to zero. The package produced was immersed in steam in an autoclave until bulking of the yarn was completed. Again the bulking and subsequent dyeing were admirably uniform.

What we claim is:

1. A method of producing a package of a shrinkable textile yarn which will permit uniform shrinkage in package form of said yarn throughout its length comprising winding a shrinkable yarn on a substantially cylindrical removable former with an initial tension on the yarn of a value in the range of 20 to 100 gm., continuously decreasing the tension of the yarn during the winding of the package to a value closely approaching zero at the completion of the winding, thereby producing a package in which the tension in the yarn varies continuously throughout the package from a maximum value at the core of the package to a minimum value at the outside of the package, removing the former from the package and subsequently shrinking the yarn in the package.

2. A method according to claim 1, in which the former has a taper of the order of one to ten degrees of arc.

3. A method according to claim 1 in which a winding

traverse rate is employed which is high relative to the peripheral speed of the former during winding.

4. A method of producing a yarn shrunk substantially uniformly throughout its length, comprising winding a shrinkable yarn onto a substantially cylindrical former under a yarn tension, and decreasing the tension on the yarn continuously during the winding, thereby producing a package in which the tension in the yarn varies continuously throughout the package from a maximum value at the core of the package to a minimum value at the outside of the package, removing the former from the package and subsequently shrinking the yarn in the package.

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