APPARATUS FOR TWISTING YARN

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This invention relates to apparatus for applying twist to yarns and, more particularly, relates to a false twist device adapted to simultaneously apply S or clockwise twist to one yarn end and Z or counterclockwise twist to another.

The term "false twist" as used in textile practice refers to twisting a yarn while the ends are constrained and heat setting the applied twist. The conventional device employed to false twist filament yarns is a false twist spindle. Basically, a conventional false twist spindle is a small tube through which the yarn is passed while the tube is rotatably driven. The inner rotating wall of the tube applies a twisting force to the yarn. Conventional false twist spindles have limitations in the speed with which they can be driven due to their structural design. Since the speeds of textile processing machines are constantly being increased, fast twist devices yielding high twist counts are needed. One suggested group of high torque false twist devices employ a plurality of rotating discs arranged in intermeshed relation for twisting a yarn brought into peripheral contact therewith. The known embodiments provide poor contact control of the yarns being processed. The present invention relates to an improved disc type false twist arrangement.

It is an object of this invention to provide a novel high speed yarn false twist device.

Another object is to provide a false twist device adapted to impart a high torque force to yarns and to simultaneously twist a plurality of yarns in opposite directions.

Another object is to provide a false twist device having means for readily stringing up a plurality of yarns.

In brief, the false twist device embodying the invention comprises disc spool means arranged in sets and adapted to rotate in opposite directions. The discs in each set of spool means operatively intermesh and provide a laterally extending peripheral defined trough means having an arcuate base. A plurality of linearly traveling yarn ends are each carried in and out of engagement with the peripheral edges of the discs defining a respective arcuate trough by actuation of pivotal trough means having guide means distally positioned thereon. Positive and tensioned contact of the yarns with the discs is maintained by the guide means and by the arcuately defined trough means. The disc spool means impart opposite rotational forces to the yarns to cause the yarns to twist in opposite directions. High torque forces are imparted to impose high twist counts to the yarns. If desired the toggle arrangement is operable to process one yarn at a time.

A better understanding of the invention will be gained by reference to the accompanying drawings and to the more detailed description that follows. In the drawings:

FIGURE 1 is an elevation view of the false twist device of the invention looking in the direction of 1—1 of FIG. 2;

FIGURE 2 is a plan view of the device shown in FIG. 1;

FIGURE 3 is a cross-section view of the disc stack in a spool;

FIGURE 4 is a plan view schematically showing a driving belt arrangement;

FIGURE 5 is a perspective view showing the trough formed by a set of spools; and

FIGURE 6 is a perspective view of the toggle arrangement in a string-up position.

Referring to the drawings, FIGS. 1—6, the yarn false twist device 1 embodying the invention comprises a base plate 2 adapted to be secured to a textile machine. A pair of adjacently positioned disc assemblies 3 each including a pair or set of spools, 4 and 5, are mounted at one face of plate 2. Each spool 4 and 5 comprises a spool 6 rotatably mounted in a bearing support 7 bolted to plate 2. Each spool 6 has a sleeve member 8 press fit therein. Each member 8 has a whirl 10 at one end and an internally threaded portion 11 at its opposite end thereof.

A sandwich arrangement of annular discs 12 each separated by annular spacer or smaller diameter and enlarged width with a washer 14 at each end of the stack is coaxially positioned on each spool 6. The spacers 13 and washers 14 are securely clamped against a shoulder on the spool 6 by a screw 15 threaded into the threaded portion 11. Preferably, the discs 12 are constructed of a thermoplastic material such as polyethylene. A space larger than the thickness of discs 12 is provided therebetween by spacers 13.

In each spool assembly 3 one of the spools 4 is provided with a lesser number of discs 12 and the discs 12 of one spool 4 are positioned in staggered relation to those on the other spool 5.

Spools 4 and 5 are closely positioned to cause the discs 12 to intermesh or interlace. When intermeshed, the peripheral edges of the discs 12 in each assembly 3 define a pair of opposed V-shaped lateral troughs 16 and 16a or indentations at the point of intersection of the overlapped portions of the discs 12.

Discs 12 on each spool 4 and 5 have their diameters and peripheral edges dimensioned so that the multiple disc stack is spherical or barrel in shape as shown in FIG. 3. When a barrel disc combination of one spool 4 is intermeshed with that of the other spool 5 as described, a line 17 drawn from disc to disc in the plane of intersection of the combined intermeshed discs defines an arcuately curved path and the bottom or valley of a respective V-shape lateral trough 16 and 16a. In the illustrated embodiment troughs 16 are the working troughs or those used in twisting the yarns. The spool assemblies 3 are, preferably, arranged with troughs 16 of each assembly slightly facing each other.

Spools 4 and 5 are driven by a belt 18 in turn driven by a motor driven roll 18a. Belt 18 engages the whirl 10 of each spool and 15 and is laced around a plurality of idle rolls 19 mounted on plate 2 to drive spools 4 and 5 of one assembly 3 in one direction and those of the other assembly 3 in an opposite direction.

A manually operable guide assembly 20 is provided to bring a pair of yarns into operating position with the disc spools 4 and 5. Guide assembly 20 comprises a pair of U-shaped members 21 pivotally mounted in back to back relation on upper and lower base members 22 and 23, respectively, and about pins 24. The lower base member 23 is suitably secured to plate 2 by bolt means. The U-shaped members 21 each provide a pair of spaced outwardly extending arms, upper and lower arm 25 and 26, respectively, and the arms of one member 21 project in the opposite direction from those of the other, symmetrically. The distal end of each arm 25 and 26 has a guide 27. Each guide 27 has an inwardly extending L-shaped slot 28. A pin 29, preferably ceramic, extends across the inner end of each slot 28. The space between the arms of the U-shaped members 21 is larger than the height of
the intermeshed discs in each assembly 3 to permit the arms 25 and 26 to straddle the discs.

A manually operable toggle arrangement is provided to pivot the U-shaped members 21 to an operating position toward or to a string-up position away from the spool assemblies 3. The toggle arrangement comprises a rod 20 having a handle 31 secured to one end thereof and being slidable operable at its other end within a bore 22 formed in the upper base member 22. To articulate the U-shaped members 21 toward and away from the spool assemblies 3 in unison a U-shaped spring wire 33 is loosely pivoted about pins mounted at each end of a respective upper arm 25 and extends intermediate its ends through a transverse perforation 34 formed in handle 31.

Stop member 35 extending from the lower base member 23 are positioned in the pivotal plane of the lower arms 26 to limit the movement of the U-shaped members 21 toward spools 4 and 5. Each lower arm 26 carries a screw 36 which serves as a close distance control of the U-shaped members 21 to pivot from spools 4 and 5.

Perforation 34 is enlarged to permit the U-shaped spring wire 33 to move therein to an extent to permit one of the U-shaped members 21 to be separately operated to or away from spools 4 and 5 without actuating the other U-shaped member 21. The guide assembly 20 is positioned on plate 2 so that guides 27 are actuated toward troughs 16.

In a typical operation, the false twist device 1 is arranged in the path of two linearly traveling yarn ends 9 intended to be false twisted. Spools 4 and 5 are then driven by belts 18. Assuming that the guides 27 are in an operating position as shown in FIG. 1, an operator pulls handle 31 outwardly away from spools 4 and 5 to a string-up position for pivoting each guide 27 away from a corresponding trough 16 as shown in FIG. 6. When handle 31 is pulled outward, spring wire 33 is carried therewith and the latter pulls on the U-shaped members 21 to cause them to pivot about pins 24. The string-up position of guides 27 is shown in FIG. 6.

An operator then positions one of the yarns 9 in corresponding slots 28 in guides 27 on the upper and lower arms 26 of one U-shaped member 21, and the other yarn 9 is positioned similarly in the guides 27 in the corresponding upper and lower arm 25 and 26 of the other U-shaped member 21.

The handle 31 is then moved inward toward the disc assemblies 3 to move guides 27 into an operating position. Because the perforation 34 is enlarged, handle 31 may move a short distance before contact is made with spring wire 33. Spring wire 33 causes the U-shaped members 21 to pivot to the operating position for carrying the yarn into troughs 16. The yarns are forced into contact with the ceramic pins 29 in the inner ends of slots 28 when the guides 27 are pivoted into the operating position and a tension is applied to the yarns. Ceramic pins 29 provide durability and a smooth surface for engagement with the yarns. Each yarn is carried by guides 27 into a trough 16 and into contact with the peripheral edges of the discs defining the projected lines 17. Guides 27 impart a tension to the yarns as the latter assume an arcuate path across the discs. Good contact and positive control over the yarns is provided.

In each assembly 3, the peripheral edges of the discs 12 contact the yarn surface and impart a rotational or a torque thereto for twisting the yarns. One yarn 9 is rotated in one direction and the other in the opposite direction, simultaneously.

If desired, either one of the yarns can be moved away from contact with the discs by manually taking hold of a U-shaped member 21 and pivoting it away from a spool assembly 3. In pivoting the U-shaped member 21 away from a trough 16 the spring wire 33 moves freely within perforation 34 without disturbing the other U-shaped member 21 or the position of handle 31.

When it is desired to discontinue twisting the yarns, handle 31 is pulled away from the spools 4 and 5 causing the U-shaped arms 21 to return thereto carrying yarns 9 out of engagement of the spools.

By turning adjusting screws 36 mounted on lower arms 26 inward or outward it is possible to adjust the position of the U-shaped members in close tolerance to or away from the spools to provide close tension control over the amount of twist applied to the yarns.

The barrel shape of the multi-disc formation on each of the spools in cooperation with the geometric position of the guides 27 relative thereto provides positive contact of the yarns with the discs 12 at all times.

Line 17 arcs convexly in relation to an imaginary straight line drawn from an upper guide to a lower guide on the same U-shaped member 21. The false twist device 1 can be operated at high speeds, is simple in construction and is adapted for processing of composite torque yarns having S and Z twisted yarns combined into one strand to form a balanced-torque stretch yarn.

It will be understood that the invention is not expected to be limited to the illustrated embodiment but that variations and modifications are contemplated within the spirit of the invention and within the scope of the following claims.

Claims:

1. Yarn twisting device comprising,
   (a) driven disc means defining a yarn trough having an arcuate yarn engaging bottom,
   (b) means for driving said driven disc means, and
   (c) guide means normally having engagement with a linearly traveling yarn and being selectively movable toward said yarn trough for carrying said yarn into contact with said arcuate bottom effecting twisting of said yarn and movable away from said trough to carry said yarn out of engagement with said arcuate bottom.

2. Yarn twisting device as in claim 1, wherein said guide means comprises a pair of spaced guide members that straddle said disc means and control the passage of yarn in one continuous arcuate path from guide member to guide member while passing engagingly over said arcuate bottom of said trough.

3. Yarn twisting device as in claim 1, wherein said driven disc means comprises a plurality of intermeshing discs.

4. Yarn twisting device comprising in combination,
   (a) sets of cooperating rotatable intermeshing discs, each set defining a lateral peripheral trough,
   (b) means for synchronously driving said sets of discs in opposite directions, and
   (c) guide means normally having engagement with a plurality of moving yarn ends and being selectively movable toward said peripheral troughs for carrying each of said yarns into contact with a peripheral trough for twisting said yarns in opposite directions and movable away from said peripheral troughs for carrying said yarns out of engagement with said troughs.

5. Yarn twisting device as in claim 4, wherein said lateral peripheral troughs defined by said discs have arcutately defined bottoms, and wherein said guide means comprises a pair of spaced guide members associated with each of said sets of discs and each pair of guide members straddles a set of discs to control the passage of yarn in one continuous arcuate path from guide member to guide member while controlling the passage of yarn over said arcutately defined trough bottoms and applying tension thereto.

6. Yarn twisting device comprising,
   (a) two pairs of disc spools adapted to be synchronously driven with one pair of spools rotating in one direction and the adjacent position pair rotating in the opposite direction,
(b) means for synchronously driving said pairs of disc spools each in opposite directions,
(c) each of said spools having a sandwich arrangement of spaced discs, one spool in each pair having said discs therein staggered in relation to the discs on the other spool and spatially intermeshing therewith to provide a laterally extending trough having an arcuate bottom, and
(d) pivotally operable guide means operable in one position to carry a plurality of yarns each into positive tensioned contact with a respective arcuate trough defined by a pair of spools and operable to a second position for pivoting said guide means away from said pairs of spools into a string-up position.

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