March 30, 1954 W. C. LONG 2,673,442

FALSE TWISTING OF TEXTILE FIBERS

Filed June 2, 1952

Fig. 1.

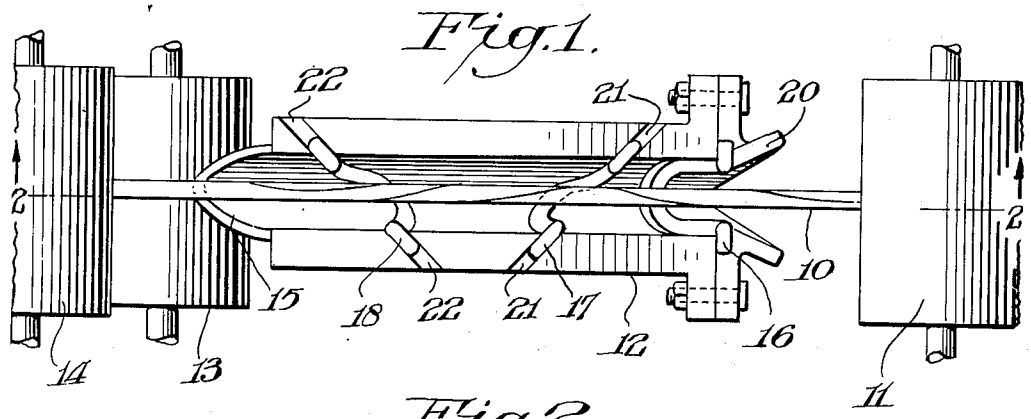


Fig. 2.

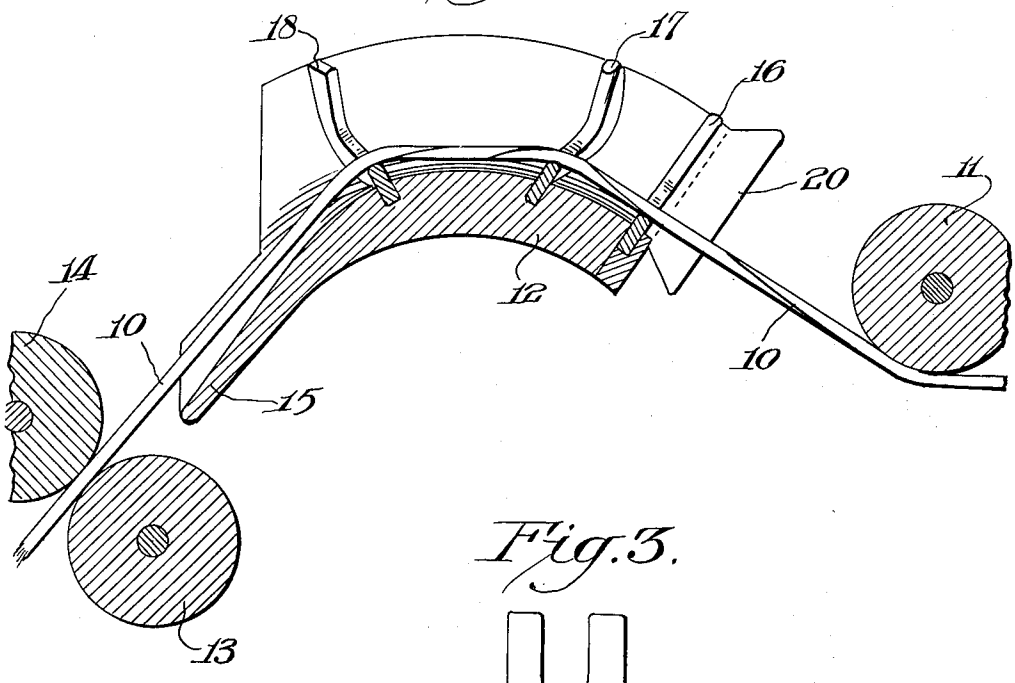
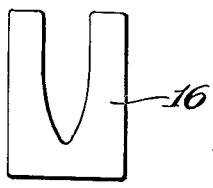


Fig. 3.



INVENTOR
WILLIAM C. LONG

BY Nonie E. Reckman
ATTORNEY

Patented Mar. 30, 1954

2,673,442

UNITED STATES PATENT OFFICE

2,673,442

FALSE TWISTING OF TEXTILE FIBERS

William C. Long, Seaford, Del., assignor to E. I. du Pont de Nemours and Company, Wilmington, Del., a corporation of Delaware

Application June 2, 1952, Serial No. 291,102

7 Claims. (Cl. 57—77.4)

1

This invention relates to apparatus and a process for applying false twist to yarn, sliver and tow, and is more particularly concerned with the compacting of bundles of textile fibers by applying a false twist.

It is frequently desirable to apply a temporary twist to yarn, tow or sliver during some stage of its processing into finished textile material. Yarn or other material may be given a temporary twist to aid in processing, and this twist may be wholly or partially removed before or during final winding. A temporary twist may even be in the opposite direction from the final twist for some purposes. When the temporary twist need only be in the material for a very short time, the material may be passed continuously from a first feeding device to a second feeding or collecting device and be rotated as it passes an intermediate point, by means of a false twisting device, to produce a twist in the yarn. The resultant twist will be an S-twist on one side of the false twister and a Z-twist on the other, as will be made clear by supporting a yarn at two separated points and twisting it between the fingers at the midpoint. With a travelling yarn successive portions of the yarn are twisted as they approach the false twister and then untwisted to their original condition as they pass beyond the false twister.

Most of the false twisters of the prior art have had a common principle of operation. A tube-like device is rotated continuously while passing yarn through the tube along the axis of rotation. One or more members supported by the tube grip the travelling yarn and cause the yarn to turn with the tube. These gripping members may be a pair of rollers arranged to press against opposite sides of the travelling yarn. A spring may be arranged to apply sliding pressure against the yarn. The yarn passage may be arranged to deflect the yarn away from and then back to the axis of rotation so that the yarn assumes the shape of a crank and is caused to rotate with the tube. A pulley may be supported in the tube and the yarn given a complete turn about the pulley to hold the yarn more positively.

The effect of the above false twisters on yarn is shown in U. S. Patent No. 2,463,620 to Heberlein. In Figure 3 of that patent the yarn, travelling from right to left, is seen to be highly twisted adjacent to the false twister but to lose this twist rapidly as the yarn travels away to the supporting and tension regulating rollers at the left. There are several undesirable characteristics of false twisters of the above type. The

2

twist varies rapidly with distance. The relationship between the speed of yarn travel, the tension and the rotational velocity of the twister must all be controlled carefully to obtain the desired twist, and a different control is usually necessary for different sizes and types of yarn. The false twisters are difficult to thread up when starting; it is usually necessary to stop the rotation to accomplish this. A given twister works properly with only a limited range of yarn sizes and it is inconvenient to adapt the twister for handling a different size range. These twisters are relatively complicated devices which involve considerable initial expense and are difficult to maintain.

U. S. Patent No. 2,091,153 to Martin discloses a different type of false twister which overcomes some of the above difficulties. This is a cylindrically shaped member provided with an exterior helical groove adapted to receive a continuous strand or sliver. The sliver is pulled continuously through the groove and the curving path of travel is said to impart a false twist and also to provide a compacting action when the walls of the groove are arranged to converge slightly along the path of travel. This device has the advantages of being non-rotating and easy to thread up, but each member is expensive to produce and does not permit much variation in the size of strand, especially if a compacting action is desired. Furthermore, the false twist is maintained for only a short distance.

It is an object of the present invention to provide a false twisting apparatus which is relatively simple and inexpensive to construct, is readily maintained, and is easily adapted to handle widely different sizes of yarn sliver or tow. Another object is to provide such an apparatus which has no moving parts and is easy to string up and operate. A further object is to provide a false twisting apparatus with which a twist can be maintained at a uniform value over a considerable distance. A still further object is to provide a new process for false twisting yarn, sliver or tow to compact the textile material and fold outer fibers into the main body of material. Other objects of the invention will become apparent from the disclosure and claims.

In accordance with this invention it has been found that yarn, sliver or tow is given a false twist by merely drawing the material obliquely over a guide, such as a U-shaped bar, and that thereafter drawing the material obliquely at an opposed angle over a second guide will reinforce the twist between the guides and maintain the

twist at a substantially constant value until the material passes beyond the second guide. The two guides may suitably be arranged with the contacting surfaces at approximately 45° to the yarn, sliver or tow, although other angles between 0° and 90° will work satisfactorily. The guides are arranged in an opposed sense to each other, i. e., so that they will twist a yarn in opposite directions. Thus, if they are angled 45° with respect to a yarn, they should be at 90° to each other if they both contact the yarn from the same side, or should be parallel if they contact opposite sides of the yarn. However, the guides need not be at the same angle to the yarn or other material.

This effect of the obliquely-turned guides on a travelling yarn, sliver or tow is surprising and difficult to explain. The yarn surface contacting the guide is forced to one side in a direction which tends to cause a point on the yarn to move parallel to the contacting surface of the guide. Since this force is not balanced by the effect of a contacting surface on the other side of the yarn, an unbalanced torque is produced which twists the yarn. The twisting will continue until the torsion of the yarn becomes sufficient to resist the torque. It is apparent that the twist can be varied by changing the yarn tension.

In the drawings, which illustrate a preferred embodiment of the invention,

Figure 1 is a plan view of an apparatus in accordance with the invention,

Figure 2 is a cross-sectional elevation of the apparatus, taken on the line 2—2 in Figure 1, and

Figure 3 is an elevation of one of the guides.

In Figure 1 a tow of textile fibers 10 is shown passing from feed roll 11 at the right of the figure to false twisting device 12, which delivers the tow to the nip of rolls 13 and 14 at the left of the figure. This device has a rounded throat 15 extending from the entrance of the device to the exit. It will be seen in Figure 2 that this throat bends in a quadrant from the entrance to the exit and the direction of the tow is changed approximately 90°. The tow is guided primarily by U-shaped guides 16, 17 and 18. These all have the general shape shown in Figure 3 and are arranged to be inserted in slots cut into the device 12. A flared guiding head 20 is also provided to help direct the tow smoothly into the false twister.

Guide 16 is arranged at right angles to the tow; hence does not impart any twist to the tow. This guide is located at the entrance end of the false twister and is held in place by the head 20. Guide 17 is supported in a slot 21 cut obliquely in the main body and the throat 15 of the apparatus, at a 45° S-angle with respect to the tow. The tow, passing under tension obliquely over the skew guide, is caused to twist in a clockwise direction, when viewed in the direction of travel, and the resultant twist is indicated by the slanting lines on tow 10 in Figures 1 and 2. The last false twisting guide 18 is similarly supported in slot 22 at a 45° angle to the tow, but at a Z-angle, 90° to guide 17. Since skew guide 18 is thus arranged in the opposite sense to the previous guide, the tow is caused to twist in the opposite or counter-clockwise direction. The effect is to reinforce the twist imparted by the first guide and to hold the twist at a constant value between the false twisting guides. As indicated in the figures, the tow is given a Z-twist as it approaches guide 17, has a higher S-twist between the guides, and has a Z-twist which becomes negligible during passage of the tow from guide 18 to rolls 13 and 14.

It is to be understood that the twist imparted by the false twisting elements both upstream and downstream exists as standing waves which may be in a state of dynamic flux, particularly downstream of the last false twisting element. In some cases it has been observed that a large diameter tow may first roll one way and then the other downstream of the last false twisting element, possibly because resonance in the compacted section upstream of this element causes some of the false twist in this section to spill over, and possibly because some of the false twist in the section downstream of the last false twisting element slips through the nip of the forwarding rolls. Whatever transient effects may occur, the condition that the algebraic sum of the twist equals zero over the whole length of the yarn, tow, or sliver will be met.

The reinforced twisting produced by the opposed false twisting guides condenses the tow and produces a compact bundle. The amount of twist is limited by the tension on the tow, and this action of the tow in resisting a greater twist serves to fold any loose outer fibers about the main bundle. Flicking of ends is thereby eliminated. Additional false twisting guides can be used to further compact the tow, although two guides are generally ample. Thus a series of four skew guides can be used, arranged with alternate guides in the opposed sense, e. g., with the first and third parallel and at right angles to the second and fourth, which are parallel to each other. The amount of false twist introduced and, hence, the reinforcing and compacting action can be varied by changing the angle of skew; the optimum effect usually ocurs at the guide angle of 45° disclosed above.

Other variations in the false twister may be made for various purposes. The guides need only have skewed edges and may be simple straight bars. A guide of the type shown in Figure 3 should be of a size appropriate for the tow, sliver or yarn to be handled. The guides are shown relatively close together but they can be located at a considerable distance apart if, for example, it is desired to treat the fiber bundle while in a twisted condition. The direction of twist can be reversed by reversing the angles of the guides or reversing the direction the tow passes through the false twister. Other modifications which can be made in the apparatus disclosed will be obvious to one skilled in the art.

The false twisting guides may be made from any of the usual guide materials having adequate wear resistance and capable of receiving a finish which will not injure the fibers treated. Generally metals or ceramics are best for the guides, since these are capable of being given a suitable wear resistant surface, either a smooth polished surface or a matte finish, as desired, which will not injure fibers.

The outstanding advantages of the false twister of this invention are the ease with which it is strung up, operated and maintained. These result primarily from the simplicity of the device, the absence of moving parts other than the usual feeding rolls or equivalent, and the readily accessible parts. In stringing up, the yarn, sliver or tow need only be passed over the guides, and need not be threaded through any part. The construction and operation are such that jamming difficulties are avoided. The false twisting guides

are simple and inexpensive to construct, and are readily replaced when worn.

The process of producing a reinforced false twist, by false twisting a travelling tow, sliver or yarn first in one direction and then in the opposite direction at a subsequent location, is best carried out with a false twisting device of the type disclosed. However, this process can also be practiced by using two or more of the false twisting devices of the prior art. It is only necessary to use two false twisting devices in series which operate to twist the fiber bundle in opposite directions and which do not twist the yarn, sliver or tow in excess of the desired amount. For this reason a rotating false twister must be able to slip on the yarn after the desired twist is reached, otherwise the yarn twist would continue to increase until the yarn either broke or kinked to jam the mechanism. This can be visualized by fastening a yarn between two supports and then twisting it in opposite directions at two intermediate points. Within that limitation the process can be practised with any pair of oppositely acting false twisters, such as rotating twisters, helical groove guide members or fluid jets, in addition to skew guides of the general type disclosed herein.

As many different embodiments of the present invention may be made without departing from the spirit and scope thereof, it is to be understood that the invention is not limited to the specific embodiments disclosed except to the extent defined in the appended claims.

What is claimed is:

1. An apparatus for applying false twist to yarn, sliver and tow as the material travels along a fixed path under tension which comprises a pair of spaced apart guiding members each having a contacting surface at an oblique angle to the direction of the travel of the material adapted to make an oblique twist-producing contact with one side of the traveling material without making oblique contact with the opposite side of the material, one of said contacting surfaces being arranged at an S-angle with the direction of travel of the material and the other of said contacting surfaces being arranged at a Z-angle to twist the material in opposite directions.

2. An apparatus for applying false twist to yarn, sliver and tow as the material travels along a fixed path under tension which comprises a guiding member having a skewed edge adapted to contact the traveling material at an oblique angle to impart a twist and a second guiding member having a skewed edge adapted to contact the material at a subsequent point of the travel at an oblique angle which is opposed to that of said first member to twist the material in the opposite direction.

3. An apparatus for applying a reinforced false twist to yarn, sliver and tow as the material travels along a fixed path under tension which comprises a pair of twist producing members adapted to contact the traveling material at separated points, the contacting surface of each being bar shaped and arranged to contact the material at an oblique angle to impart a twist, and the contacting surfaces being arranged in an opposed sense to twist the material in opposite directions.

4. An apparatus for applying a reinforced false twist to yarn, sliver and tow as the material travels along a fixed path under tension which comprises a U-shaped guide adapted to support the traveling material inside the U with material contacting the base of the U at an oblique angle to impart a twist, and a second U-shaped guide adapted to support the material in a similar manner at a subsequent point in the travel but with the material contacting the base of the U at an opposed oblique angle to twist the material in the opposite direction from said first guide.

5. A process for compacting yarn, sliver, and tow which comprises continuously drawing the yarn material under tension over a skewed edge to apply a false twist and then drawing the material, still under tension, over a second skewed edge arranged to apply twist in the opposite direction to reinforce the twist in the material.

6. A process for imparting a reinforced false twist to yarn, sliver and tow which comprises continuously drawing the yarn material under tension obliquely over two spaced apart guiding surfaces having skewed edges arranged at opposed angles relative to each other.

7. A process for maintaining a false twist at a uniform value for any predetermined distance in yarn, sliver and tow which comprises continuously feeding the yarn material under tension along a fixed path while continuously twisting the material first in one direction by drawing the material over a bar-like surface arranged at an oblique angle to the path of travel and then, at a subsequent predetermined distance continuously twisting the material in the opposite direction by drawing the material over a second bar-like surface arranged at an oblique angle to the path of travel and in an opposed sense to the first surface.

WILLIAM C. LONG.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
884,621	Singleton et al.	Apr. 14, 1908
2,089,198	Finlayson et al.	Aug. 10, 1937