

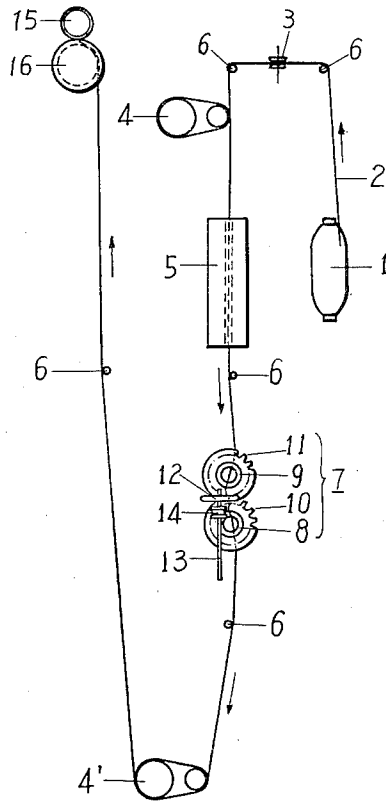
Dec. 4, 1962

YUTAKA MAEDA
APPARATUS AND METHOD FOR IMPARTING TWIST AND
CRIMP TO TEXTILE YARNS

3,066,473

Filed March 15, 1961

4 Sheets-Sheet 1



-FIG. 1.-

INVENTOR
YUTAKO MAEDA
BY *M. Leck*
ATTORNEY

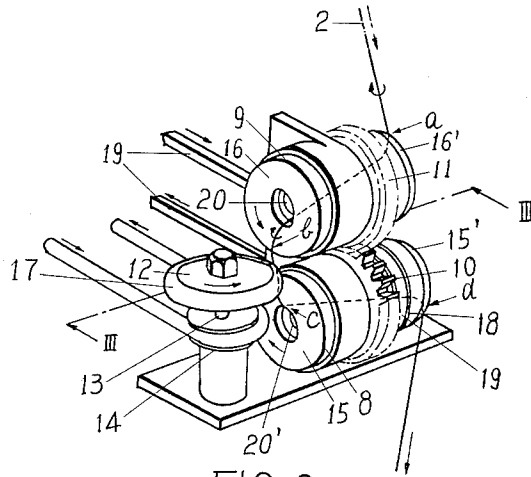
Dec. 4, 1962

YUTAKA MAEDA
APPARATUS AND METHOD FOR IMPARTING TWIST AND
CRIMP TO TEXTILE YARNS

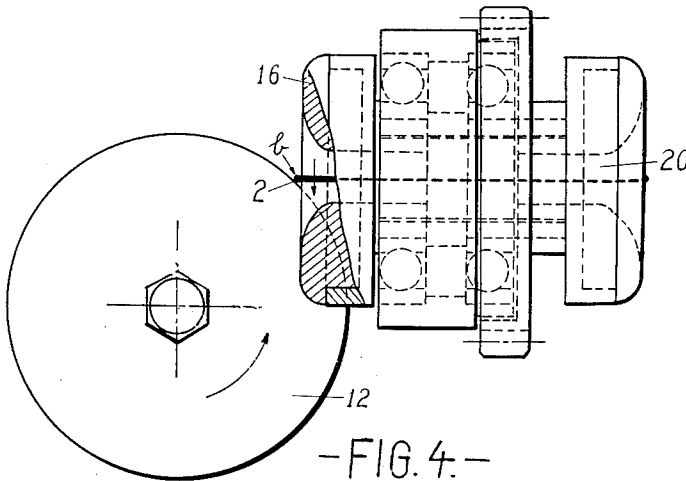
3,066,473

Filed March 15, 1961

4 Sheets-Sheet 2



-FIG. 2.-



-FIG. 4.-

INVENTOR
YUTAKO MAEDA
BY *W. Lock*
ATTORNEY

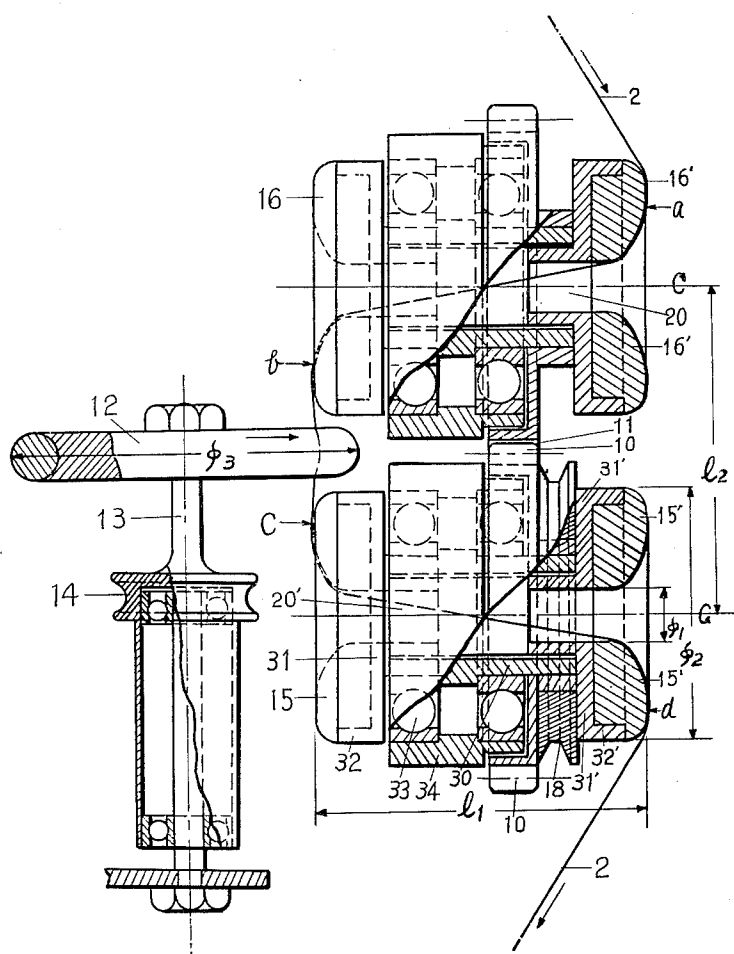
Dec. 4, 1962 YUTAKA MAEDA 3,066,473
APPARATUS AND METHOD FOR IMPARTING TWIST AND
CRIMP TO TEXTILE YARNS
Filed March 15, 1961 4 Sheets-Sheet 3

YUTAKA MAEDA
APPARATUS AND METHOD FOR IMPARTING TWIST AND
CRIMP TO TEXTILE YARNS

3,066,473

Filed March 15, 1961

4 Sheets-Sheet 3



-FIG.3--

INVENTOR
YUTAKO MAEDA
BY *A. Heck*
ATTORNEY

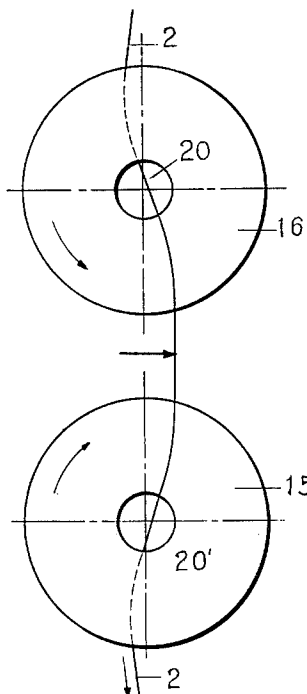
Dec. 4, 1962

YUTAKA MAEDA
APPARATUS AND METHOD FOR IMPARTING TWIST AND
CRIMP TO TEXTILE YARNS

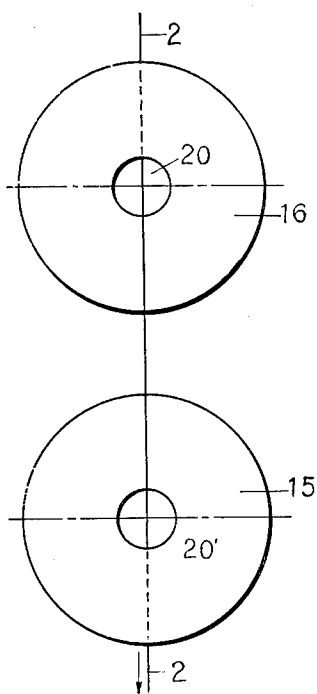
3,066,473

Filed March 15, 1961

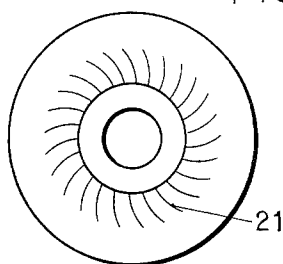
4 Sheets-Sheet 4



-FIG. 5.-



-FIG. 6.-



-FIG. 7.-

INVENTOR
YUTAKO MAEDA
By *C. H. Leek*
ATTORNEY

1

3,066,473

APPARATUS AND METHOD FOR IMPARTING TWIST AND CRIMP TO TEXTILE YARNS

Yutaka Maeda, 426 Kamiyoshida, Fujiyoshida-shi,
Yamanashi-ken, Japan

Filed Mar. 15, 1961, Ser. No. 95,903

Claims priority, application Japan Mar. 23, 1960

10 Claims. (Cl. 57—77.4)

This invention relates to apparatus and method of twisting and crimping textile yarns. More particularly, it relates to apparatus and method of imparting false twist to thermoplastic, organic multifilament yarn in order to impart crimp thereto.

The object of this invention is to provide an apparatus and method for imparting uniform and high twist and crimp to textile yarns, particularly thermoplastic, organic multifilament yarns at a high speed.

Another object of this invention is to provide an apparatus and method for imparting false twist to textile yarns, particularly thermoplastic, organic multifilament yarns with high speed and uniformity.

Still another object of this invention is to provide an apparatus and method for imparting false twist to textile yarns, particularly thermoplastic, organic multifilament yarns with a high speed and uniformity, without damage or breaking of the yarns and filaments or a damage of the member of the twisting device which comes in contact with said yarns.

A further object of the present invention is to provide a twisting cylinder for false twisting device which is easy to handle.

Further objects and advantages of this invention shall become apparent from the following descriptions.

The above objects and advantages of this invention are essentially accomplished by a false twisting device which comprises two hollow cylindrical members having parallel axes and being contra-rotatory, at least the end-most portions of the annular peripheries of at least one side of said two cylindrical members being constituted of a material having a high resistance to abrasion and a high coefficient of friction, and a rotatable disc of which axis is in right-angled relationship with the axes of said cylindrical members, disposed in a position so that a portion of the edge of said disc interrupts the imaginary vertical plane which contiguously covers the two peripheral ends of said cylindrical members.

The present invention shall be more conveniently explained by referring to the attached drawings.

In the drawings:

FIG. 1 is a diagrammatic over-all view showing one embodiment of the apparatus wherein the textile yarns, particularly thermoplastic, organic and continuous multifilament yarns are twisted with the false twisting device of this invention, and crimped;

FIG. 2 is a perspective view of the essential portion of the false twisting device of this invention;

FIG. 3 is a front elevation showing a part of the essential portion of the apparatus of this invention in vertical section, cut along the line III—III of FIG. 2;

FIG. 4 is a plan view showing the essential portion of the apparatus of this invention shown in FIG. 2, a part shown in horizontal section;

FIG. 5 is an illustrative view to explain the displacement of the yarn passage between the two twisting cylinders, which takes place when the disc for correcting the yarn passage is omitted from the present invention;

FIG. 6 is an illustrative view showing the correct passage of the yarn, attained by the provision of rotatable disc to correct the yarn passage at the side of the two twisting cylinders with a part protruding into the space

2

between said two cylinders in accordance with this invention; and

FIG. 7 illustrates the lines of abrasion which appear in the rubber member provided at the peripheral ends of said cylinders which come in contact with the yarn, in case the yarn passage is displaced between the two twisting cylinders as shown in FIG. 5.

In FIG. 1, the thermoplastic, organic and continuous multifilament yarn 2 is fed from a yarn package 1, passed through a guide 6, tension washer 3, adjusted of its tension to a constant value by a tension adjusting device 4, thereafter passed through a heat-setting device 5 twisted by the false twister 7 of this invention, and wound up onto a winding cylinder 15 driven by a drum 16, via guide 6, tension adjusting device 4' and another guide 6. Said multifilament yarn 2 is twisted by the false twister 7 of this invention, meanwhile the twisted state being set in the heat-setting device 5. Immediately after the yarn leaves the false twister of this invention, it is released of the twist and imparted with permanent crimp of excellent uniformity. In FIG. 1 shown is a diagrammatic side view of the essential parts of the false twister 7 of this invention.

The false twister 7 of this invention essentially consists of, as shown in FIGS. 1 and 2, two hollow twisting cylinders 8 and 9 rotating each to the opposite direction, the respective axis thereof being disposed parallel to each other, and a rotatable disc 12 disposed in the space between said cylinders 8 and 9 at such a position that a portion of the edge of said disc interrupts the imaginary vertical plane contiguously covering the two respective annular peripheral ends of the two cylinders, said disc having its axis 13 in right angled relationship with the axes of the cylinders. As illustrated in FIG. 1, the twisting cylinders 8 and 9 are made contra-rotatory by the engagement of gears 10 and 11, each of which is fixed on each of said cylinders, respectively, while the rotatable disc 12 is rotated by a pulley 14.

As shown in FIG. 2, at least the end portions 15, 16 of the twisting cylinders 8 and 9 at one and the same side, respectively, and the peripheral edge 17 of the rotatable disc 12 have facings made of abrasion resistant material having a high frictional coefficient, such as synthetic rubber and synthetic resin. In a preferred embodiment, such facing is also provided on the end portions 15' and 16' of the cylinders 8 and 9 at the other side.

Again as illustrated in FIG. 2, when a belt 19 in fitting contact with a pulley 18, which in turn is fittingly attached to the hollow member of the twisting cylinder 8, is driven toward the direction of the arrow by a driving source which is not shown, the twisting cylinder 8 and another cylinder 9 which is in engagement with the former by means of gears 10 and 11 are rotated each to the opposite direction as indicated by the respective arrow.

Still referring to FIG. 2, the yarn 2 to be crimped is passed diagonally from the right side, upper portion of the twisting cylinder 9 in the drawing, through the inner bore 20 of the twisting cylinder 9, and is withdrawn from the left side, lower portion of the same cylinder. The same yarn is again led into the inner bore 20' of the twisting cylinder 8 along over the lower portion of peripheral edge 16 of the twisting cylinder 9 and the upper portion of peripheral edge 15 of the twisting cylinder 8, and is withdrawn from the inner bore 20' from the right side of the twisting cylinder 8, thereafter guided downwards as indicated by the arrow. In the above embodiment, the yarn 2 comes in frictional contact with the rotating body of abrasion resistant material having high frictional coefficient at the contacting portions a and b of the two peripheral ends 16' and 16 of the twisting cylinder 9 and also at the portions c and d of the two peripheral ends 15 and 15' of the twisting cylinder 8,

3

at said portions the yarn 2 being imparted with the twist of the direction as indicated by the arrow. The twisting cylinder 8 rotating to the opposite direction from that of the cylinder 9, the yarn 2 is imparted with the twist of the same direction at the contacting portions c and d, as at the portions a and b of the twisting cylinder 9.

However at the portions b and c where the yarn 2 comes in contact with the twisting cylinders 9 and 8, respectively, due to the rotation of the twisting cylinders the yarn is forcibly carried away to the direction of rotation of said twisting cylinders, said direction being in right angled relationship with the axis of the yarn positioned between the contacting portions b and c. Thus, the passage of the yarn is displaced as shown in FIG. 5 forming an arcuate path which curves to the direction of rotation of the twisting cylinders 8 and 9. When the displacement exceeds a certain point, however, the tensional force of the advancing yarn overcomes the force for displacement, resulting in the return of the yarn 2 again to the correct position shown in FIG. 6.

Thus the yarn 2, while undergoing a twisting operation contacting with peripheral edges of the twisting cylinders 9 and 8 at portions a, b, c and d, at the position between b and c makes a reciprocating motion between the point of maximum displacement shown in FIG. 5 and the normal position shown in FIG. 6. Such reciprocating motion results in the lines of abrasion 21 cut onto the facings 15 and 16 of abrasion-resistant material having a high frictional coefficient provided on the peripheral ends of the twisting cylinders 8 and 9, said lines extending radially from the circumference of the inner bore of the twisting cylinder slightly curving to the direction of the rotation of respective cylinder. And, once such lines of abrasion are cut onto the peripheral facing materials 15 and 16, the reciprocating motion of the yarn 2 becomes the jumping motions from one line of the abrasion to the next line, consequently making the lines of abrasion deeper and deeper. Thus the displacement which takes place during this reciprocating motion of the yarn 2 gives an undue tension to the yarn 2, thereby the yarn 2 receives damages such as breakage of monofilaments constituting the yarn, or even of the whole yarn, and moreover the tension of the yarn while being twisted constantly changing, the twist imparted to the yarn becomes non-uniform, resulting in the non-uniform crimp in the yarn.

In the present invention, in order to eliminate the above defect inherent to the twisting of yarns only by means of rotating cylinders, a rotatable disc 12, having its axis in right angled relationship with the axes of the twisting cylinders, is provided in the space between the yarn contacting portions b and c of the twisting cylinders 9 and 8, respectively, at such a position that a portion of the edge of said disc 12 interrupts the imaginary vertical plane contiguously covering the peripheral ends of the twisting cylinders 8 and 9, as shown in FIGS. 3 and 4.

Next the structure and function of the rotatable disc 12 shall be explained in detail referring to FIGS. 2, 3 and 4.

In FIG. 2, while the twisting cylinders 8 and 9 are rotating to each opposite direction, the rotatable disc 12 is disposed at the side of the two twisting cylinders with the yarn 2 intervening therebetween, a portion of the edge of the disc protruding into the space between the two cylinders 8 and 9 and contacting with the yarn 2. And said disc is caused to rotate to the direction as will increase the twisting of the yarn from the opposite direction from that of the twisting cylinders relative to the yarn 2, thereby said yarn 2 being imparted with the firm twist by its contact with the facing 17 of said disc 12 and aforesaid peripheral end portions 15 and 16 of said twisting cylinders. In other words, the rotatable disc 12 is rotated to the direction opposite from that of advance of the peripheral portions of the twisting cylinders at the points b and c, relative to the yarn. By doing, the disc 12 exerts a force on yarn 2 as will off-set the

4

displacing force working on yarn 2 to the direction shown by the arrow in FIGS. 4 and 5, so as to constantly put the position of the yarn 2 to the right. As the result, the yarn 2 is maintained always at the correct position shown in FIG. 6 throughout the twisting operation, thereby the variation in tension while twisting is prevented, and the uniform twisting and crimping are accomplished. Thus the rotatable disc 12 functions as a yarn passage correcting disc. Again the rotatable disc 12 imparting a positive twisting to the yarn 2 at between the portions b and c at which points the yarn 2 contacts with the twisting cylinders 9 and 8, the total twisting torque given to the yarn 2 is so much the more increased, which is also advantageous for decreasing the untwisting which takes place during the subsequent operations in the present invention.

Again, by adjusting the depth of interruption of the edge portion of said rotatable disc 12 with the imaginary vertical plane contiguously covering the peripheral end portions of the twisting cylinders 8 and 9; the distance between the axis of the rotatable disc 12 and the plane contiguously covering the axes of the twisting cylinders 8 and 9; and the rotation speed of the rotatable disc 12, not only the yarn 2 can be properly returned to the right position, but also the degree of twisting exerted to yarn 2 may be varied and adjusted. Again according to the present invention, by the provision of the rotatable disc 12 the damage in the yarn and untwisting of the yarn during the twisting are prevented, and therefore the number of rotations of the twisting cylinders 8 and 9 is increased, making it possible to impart high degree of twist and crimp to the yarn 2 at a remarkably great speed.

Further, the twisting cylinders of the present invention have a high twisting efficiency and are of easy handling, being constructed as shown in FIGS. 3 and 4.

Referring to FIG. 3, a hollow cylindrical member 30 is provided with a pulley 18 fitted around the outer periphery thereof, thereby caused to make a rotation together with said pulley 18, while at the both ends of said cylinder 30 fitted are each cap 31 having a flange 32 and cap 31' having a flange 32', said flanges being of a greater outer diameter than that of the cylinder 30 and moreover their outer surfaces being adhered with annular members 15 and 15', which are concave in plan (that is, partially concave relative to their rotary axes), of an abrasion resistant material having a high frictional coefficient. Said cylinder 30 is supported by a bracket 34 through a suitable bearing such as a ball bearing 33, while said bracket 34 is in turn secured on a portion of a casing.

In another embodiment, this cylinder 30 may be fitted with additional suitable rotation transmitting mechanism such as a gear 10. Further in FIG. 2, the twisting cylinder 9 has the identical construction with that of the twisting cylinder 8 except that the former is not provided with the pulley 18. The gear 10 of the twisting cylinder 8 and the gear 11 of the twisting cylinder 9 are in mutual engagement. Consequently, rotating a belt fitted around the pulley 18 by a suitable driving source causes, referring to FIG. 3, the rotation of the cylinder 30, the caps 31 and 31' fitted thereon, the annular members 15 and 15' which are adhered on said caps 31 and 31' respectively, and the gear 10, all in one body. This rotating motion is transmitted, referring to FIG. 2, to the twisting cylinder 9 through the gear 11, resulting in the rotation of the twisting cylinder 9 at the same speed as of the twisting cylinder 8, however to the opposite direction. It is also possible in the present invention to cause the separate rotation of the twisting cylinders 8 and 9 by means of a suitable transmitting mechanism such as a belt or gears driven by any suitable power source, without the use of said engaging gears.

By constructing the twisting cylinders 8 and 9 as above described, such various advantages are gained as, depending on the types and deniers of the yarns and the desired number of twist to be imparted thereto, the flanges of suit-

able size may be replaceably used, or only the facing members 15 and 15' of abrasion resistant material having a high frictional coefficient may be replaced without causing a need to change any other parts.

Although so far an instance of subjecting a single strand of yarn to the false twisting device of the present invention has been explained, it is also possible in this invention to pass another strand of yarn simultaneously through a passage symmetrical to that of the yarn 2 as shown in FIGS. 2 and 3. That is, the yarn may be passed diagonally from the left side of the twisting cylinder 9 into its inner bore 20, guided to the opposite end 16' of the twisting cylinder 9 and thereafter again led diagonally into the inner bore 20' of the twisting cylinder 8 from the end covered with the facing 15' and withdrawn to the guide provided below the twisting cylinder 8 after contacted with the periphery of the opposite end 15. By so doing, the yarn may be imparted with a twist of opposite direction from that imparted in the instance illustrated in FIGS. 2 and 3. In case of thus simultaneously imparting twists of opposite direction respectively to two strands of yarn and crimping, a rotatable disc of identical construction with the rotatable disc 12 shown in FIGS. 2 and 3 should be provided at the opposite position corresponding to said disc 12, relative to the twisting cylinders 8 and 9.

This invention shall be further described as to the examples, it being understood that the following are given only for illustration purposes, and the scope of this invention is by no means thereby limited.

Example

The false twisting device as shown in FIGS. 3 and 4 of the attached drawings was disposed as in FIG. 1. The dimensions of the twisting cylinder and the rotatable disc employed were as follows:

(The letters in the following correspond with those shown in FIG. 3.)

Diameter of the inner bore of the twisting cylinder.....	(ϕ 1) 12 mm.
Diameter of the outer periphery of the flange of the twisting cylinder.....	(ϕ 2) 50 mm.
Diameter of the rotatable disc.....	(ϕ 3) 60 mm.
Total length of the twisting cylinder.....	(l1) 85 mm.
Distance between the axes of the two twisting cylinders.....	(l2) 62 mm.

Using the above false twisting device, the nylon multifilament yarns of various deniers as shown in Table 1 below were crimped according to the conditions given in the same table.

Further, the draft in the twisting device was 11%, and the tension was 0.3 g./denier. As the abrasion-resistant material to cover the peripheral edges of the cylinders, synthetic rubber mixed with white carbon was used.

TABLE 1

	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7
Yarn Size:							
Denier.....	40	50	70	100	110	130	150
Number.....	13	17	34	24	30	34	34
Winding Speed, m./min.....	335	280	210	145	135	125	115
Setting Conditions:							
Temp., ° C.....	165	175	185	195	195	195	195
Time, sec.....	0.108	0.129	0.195	0.248	0.267	0.288	0.313
Number of Rotation of the Twisting Cylinder, r.p.m.....	6,470	5,860	4,840	3,520	3,300	2,930	2,700
Number of Rotation of the Rotatable Disc, r.p.m.....	6,470	5,860	4,840	3,520	3,300	2,930	2,700

NOTE.—The length of the heat-setting device was 600 mm.

As shown in the above Table 1, according to the present invention the crimping of thermoplastic, organic multifilament yarn at a very high speed was possible, and during the working thereof no yarn breakage took place.

Having thus set forth the present invention, what I claim is:

1. An apparatus for imparting false twist to thermoplastic, continuous multifilament yarn which comprises two hollow cylindrical members having parallel axes and being contra-rotatory, at least the end-most portions of at least one and the same side of the annular peripheral edges of said cylindrical members being constructed of a material having a high abrasion resistance and a high frictional coefficient, and a rotatable disc the axis of which is in right angled relationship with the axes of said cylindrical members, said disc being disposed in the space between the two cylindrical members at such a position that a portion of the edge of the disc interrupts the imaginary vertical plane contiguously covering the respective annular, peripheral ends of the two cylindrical members.

2. An apparatus as in claim 1, wherein a driving mechanism is provided for positively driving said rotatable disc in the opposite direction relative to the yarn from the direction of the rotation of the outer peripheral portions of the two hollow cylindrical members positioned against said rotatable disc.

3. An apparatus as in claim 2, wherein the peripheral edge portions of the rotatable disc is constructed of an abrasion resistant material having a high frictional coefficient.

4. An apparatus as in claim 3, wherein at least the end-most portions of each of the hollow cylindrical members at both ends are constructed of an abrasion resistant material having a high frictional coefficient.

5. An apparatus as in claim 1, wherein one of the hollow cylindrical members carries a pulley fixed on the outer periphery thereof, said pulley being provided at both its ends with a flange, each flange having a greater outer diameter than that of said cylindrical member, at least the peripheral ends of said flanges being covered with an abrasion resistant material having a high frictional coefficient.

6. An apparatus as in claim 5, wherein the outer periphery of said hollow cylindrical member carrying the pulley is provided with a rotation transmitting wheel, thereby causing the rotation of the other cylindrical member at the same speed but in the opposite direction from that of the first mentioned cylindrical member, the other cylindrical member being provided with a receiving member which comes in engagement with said rotation transmitting wheel.

7. A twisting cylinder to be employed in a false twisting device, characterized by the construction wherein a hollow cylindrical member which rotates in a body with a pulley fitted around the outer periphery thereof is provided at both ends with caps carrying an annular flange, said flange having an outer diameter greater than that of the hollow cylindrical member, and the flange carried by the cap being provided with an annular facing, which is concave in plan, of an abrasion resistant material having a high frictional coefficient.

8. A method for imparting false twist to thermoplastic, organic multifilament yarn which comprises feeding a yarn from one end of the first of two hollow cylindrical members having parallel axes and rotating in the opposite direction, drawing said yarn diagonally through the inner bore of the first hollow cylindrical member, withdrawing the yarn from the other end of the first hollow cylindrical member, again drawing the yarn diagonally through the inner bore of the second hollow cylindrical member along a path symmetrical to that in the first hollow cylindrical member, the yarn coming into frictional contact with the peripheral portions of the two hollow cylindrical members at four points at the yarn entrance and withdrawal and thereby being imparted with a twist in one direction, and meanwhile rotating a disc in frictional contact with the yarn passing between the peripheral portions at the same side of said two hollow

7

cylindrical members in a direction that will decrease the twist in the yarn imparted by the rotation of said hollow cylindrical members.

9. A method as in claim 8, wherein the hollow cylindrical members are rotated in opposite directions to each other at the same speed.

10. A method as in claim 9, wherein said disc is

8

rotated at least at the same speed as that of the cylindrical members.

References Cited in the file of this patent

FOREIGN PATENTS

818,950 Great Britain ----- Aug. 26, 1959