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 [21] Appl. No. **750,596**
 [22] Filed **Aug. 6, 1968**
 [45] Patented **May 25, 1971**
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 [32] Priority **Aug. 12, 1967**
 [33] **Netherlands**
 [31] **6,711,131**

[56]

References Cited

UNITED STATES PATENTS

3,012,303	12/1961	Whitaker et al.	28/72.16
3,078,542	2/1963	McFarren et al.	28/72.11
3,102,322	9/1963	Whitaker.....	28/72.16
3,220,060	11/1965	Agett.....	19/65(T)
3,375,559	4/1968	Moyer et al.....	19/65(T)(X)

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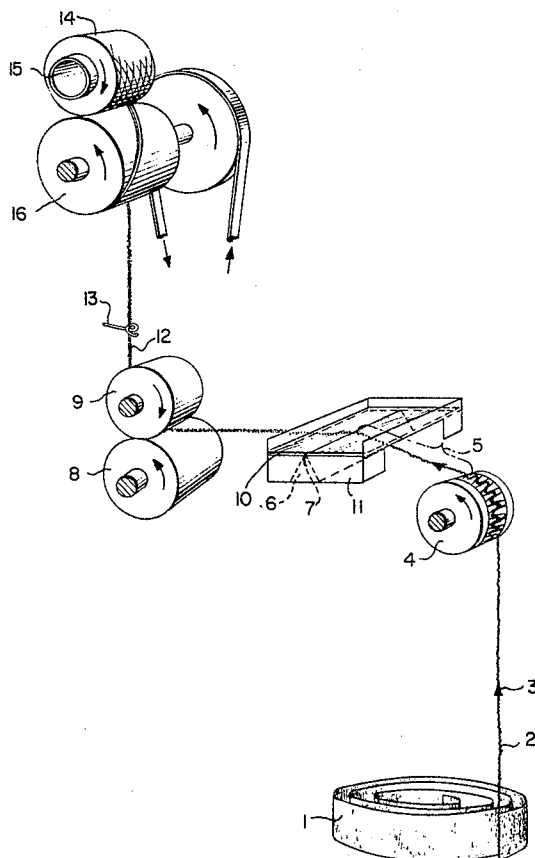
[54] **METHOD OF OPENING CRIMPED YARN**
10 Claims, 5 Drawing Figs.

[52] **U.S. Cl.**..... **28/72.16,**
19/65, 28/17

[51] **Int. Cl.**..... **D04b 19/00**

[50] **Field of Search**..... **19/65 (T);**
28/72.11, 72.13, 72.16, 17

ABSTRACT: A process for opening a crimped synthetic yarn made up of a number of filaments which comprises passing the crimped yarn through a relaxation zone in which the yarn is not under any significant tension and immediately thereafter applying a frictional force to the yarn to displace the filaments relative to one another and thereby open the yarn. An apparatus for carrying out this process is also disclosed.



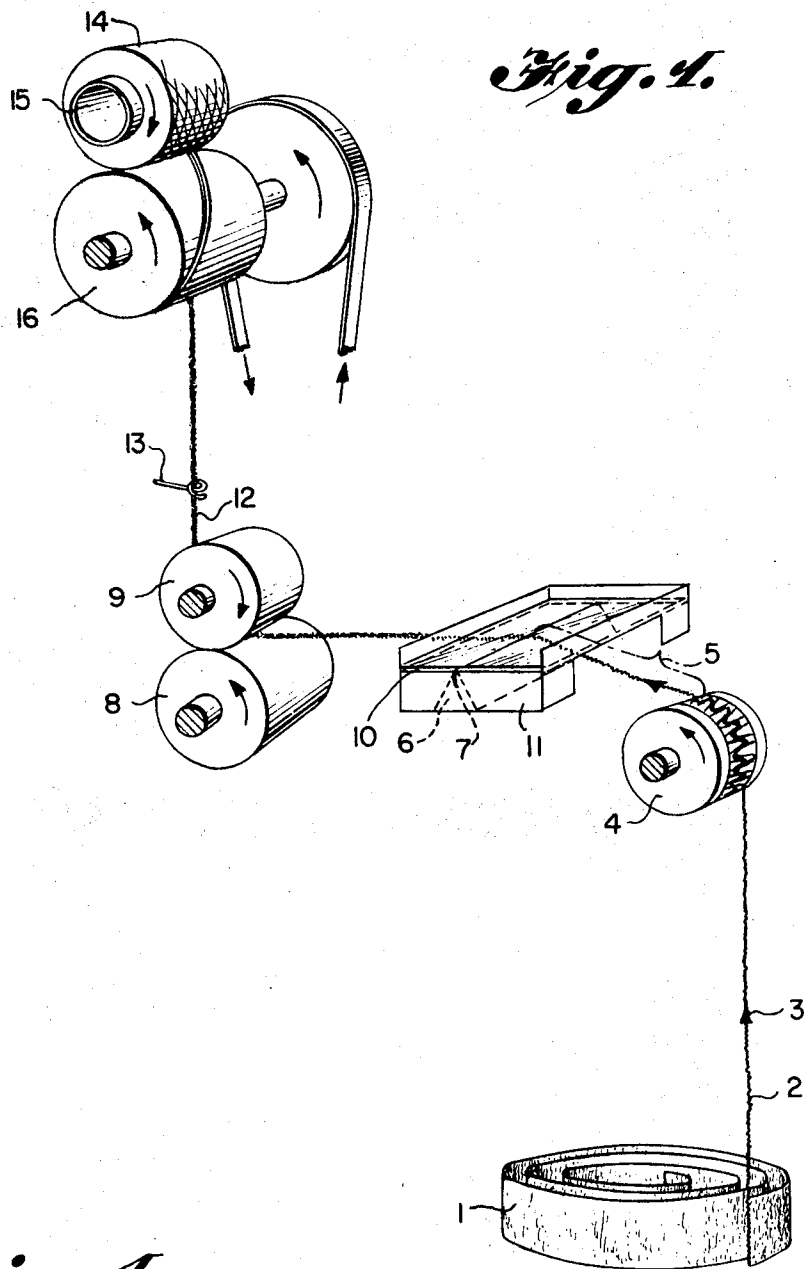
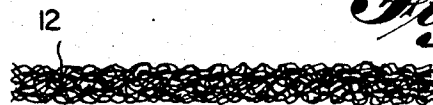


Fig. 4.

Fig. 4.



Fig. 5.



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Fig. 2.

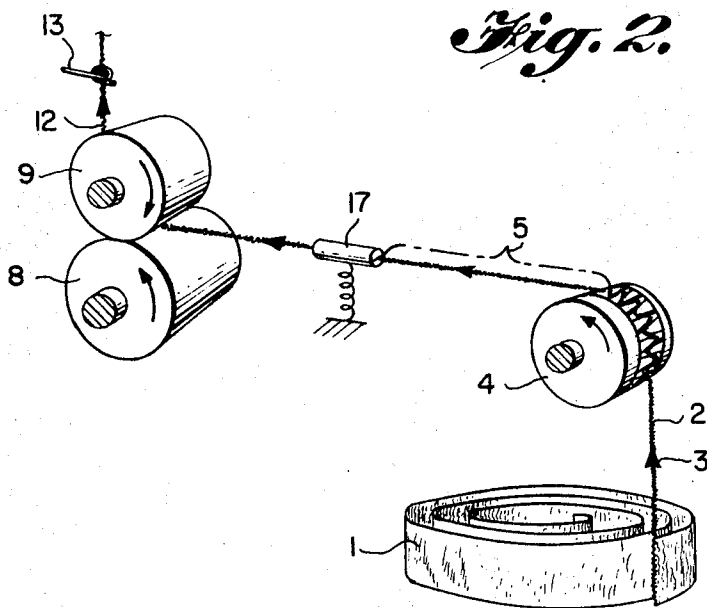
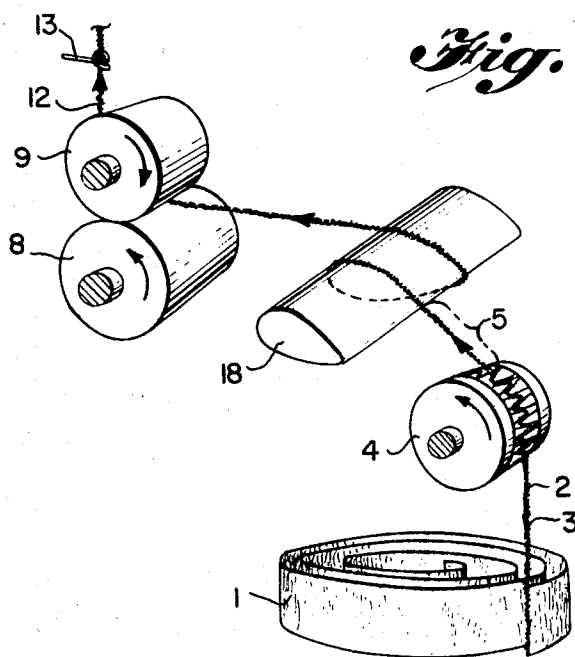


Fig. 3.



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METHOD OF OPENING CRIMPED YARN

This invention relates to the manufacture of opened and crimped yarn and, more particularly, to a process and apparatus for opening a crimped synthetic yarn consisting of a number of filaments in which the crimped yarn is relaxed and then subjected to a frictional force to thereby produce a unique opened and crimped yarn.

A process is known for opening of crimped yarn in which a frictional force is applied to the crimped yarn. However, in the application of the known process, for textile yarn as well as for carpet yarn, the yarn obtained is found to be insufficiently opened to satisfy high demands on quality, especially as to bulkiness, crimp contraction and also as to the uniformity.

Advantageously, this invention provides a process for the manufacture of opened and crimped yarns which do satisfy the high quality demands.

Thus, this invention contemplates a process for the opening of a crimped yarn consisting of a number of filaments which comprises passing the crimped yarn through a relaxation zone in which the yarn is not under any significant tension, and then applying a frictional force to the yarn to displace its filaments relative to one another and thereby open the yarn.

Thus, in accordance with this invention, it has surprisingly been found that immediately before the application of the frictional force, the yarn must be passed through a relaxation zone under substantially no tension in order to obtain high bulkiness and other desirable properties in the opened and crimped yarn.

Furthermore, it has been found that it is preferred that the yarn tension should be lower than 0.05 grams per denier in the relaxation zone and that the degree of relaxation of the yarn should be adjustable to ensure that the yarn is under practically no tension.

The relaxation zone of the invention extends advantageously between a rotatable relaxation roller and a friction device, and the peripheral speed of the relaxation roller is higher than the speed of the yarn in the relaxation zone.

It is believed that the improved opening of the yarn according to the invention is obtained because the filaments in the relaxed yarn are virtually free to displace themselves relative to one another. This thus ensures a maximum opening of the yarn.

According to the invention, the opened yarn, after passing the friction device, is forwarded while under a tension, which may be of the order of at least 0.10 grams per denier.

A preferred process according to the invention is characterized in that the yarn is withdrawn by the rotatable relaxation roller from a knitted fabric, particularly a tubular fabric, which has been subjected to a heat treatment for setting the crimp in the yarn.

According to the invention, it has been found that the frictional force required for opening the crimped yarn may be applied to the yarn by passing the yarn over an edge which is relatively sharp and has a radius of curvature of approximately 0.005 mm., for instance, an agate knife. The opening effect of the frictional force may be intensified if, viewed in its longitudinal direction, the edge is positioned at an angle to the longitudinal direction of the yarn.

Advantageously, favorable results are obtained in the opening of carpet yarns crimped by the knit-set-deknit process when, in combination with the above-described relaxation zone, the frictional force required for opening is applied to the yarn by passing the yarn between two parts of a tensioner device or means that are pressed together.

Moreover, the frictional force required for opening the yarn may, according to the invention, be applied to the yarn by guiding it at a greater or lesser angle of contact over a non-round pin of ceramic material (e.g., one having a tear droplike configuration).

This invention also is concerned with an apparatus for carrying out the heretofore described process. This apparatus includes a feed means for supplying the crimped yarn, a friction device or means for applying a frictional force to the yarn, and a discharge member for removing the crimped and opened

yarn from the friction means. Advantageously, the apparatus further is characterized in that the feed means consists of a relaxation roller so that a relaxation zone is formed between the roller and the friction means.

This invention is also directed to the yarn manufactured by the aforementioned process. This yarn, because of its favorable properties, particularly its high bulkiness, has been successfully processed into various textile products and carpets.

The invention will be further described with reference to the accompanying schematic drawings in which:

FIG. 1 shows an apparatus of this invention for the opening of a yarn crimped by the knit-set-deknit process;

FIGS. 2 and 3 show different embodiments of the apparatus of the invention;

FIG. 4 shows the unopened yarn prior to being treated by the process of this invention; and

FIG. 5 shows the opened yarn produced by the invention.

In the embodiment of the invention shown in FIG. 1, a roll of knitted tube 1 manufactured on a circular knitting machine rests on a support (not shown). After knitting, the resulting tube 1 had (in a known manner) been subjected to a heat treatment, so that the unraveled and still insufficiently opened yarn 2 shows a permanent crimp and approximately has the appearance shown in FIG. 4. The crimped and unopened yarn 2 is pulled upwards in the direction indicated by the arrow 3, with the knitted tube 1 being unraveled. The unraveling of the knitted tube is effected by the pulling force supplied by the high-speed relaxation roller 4 and over which the yarn is guided through an angle of wrap of about 360°. The relaxation roller 4 has a peripheral speed that is considerably higher than the speed of the yarn in the adjacent relaxation zone 5. In the relaxation zone 5, which extends between the relaxation roller 4 and an agate knife edge 6, the yarn is practically without tension. With the embodiment shown in FIG. 1, a friction device is formed by the knife edge 6 having a radius of curvature 7 of approximately 0.005 mm. The yarn is passed over the knife edge 6 by means of driven transport rollers 8 and 9. Since in the relaxation zone 5 just before the knife edge 6 the yarn is not under any significant tension, the force to be applied by the transport rollers 8 and 9, which corresponds to the maximum permissible tension for the treated yarn, can be utilized almost entirely for producing the frictional force required for opening the yarn on the knife edge 6.

The yarn is fed to the friction device 6 while in the relaxed state, so that the shifting and displacing of the filaments relative to one another by friction can take place without the presence of other forces acting on the yarn to prevent the movement of the filaments. The angular contact of the yarn with the relaxation roller 4 and the amount of slippage thereon, are adjustable by displacing in a known manner the two halves of the relaxation roller 4 relative to each other in axial direction, or by changing the speed of the relaxation roller. Correct adjustment will ensure that the yarn in the relaxation zone 5 is practically without any tension.

Resting on the yarn passing over the knife edge 6 is a glass plate 10 which is, in a known manner, supported by a framework 11. The weight of the glass plate 10 is so chosen that the yarn tension after the knife edge 6 will not exceed the permissible value.

After leaving the transport rollers 8 and 9, the opened and crimped yarn 12 is passed through a thread guide 13 and subsequently wound on to a bobbin 15 to form a package 14, using a grooved traverse drum 16. The appearance of the opened and crimped yarn is shown on an enlarged scale in FIG. 5.

FIG. 2 shows a slightly modified embodiment, like elements being referred to by like reference numerals. Compared with the embodiment shown in FIG. 1, the primary difference consists in that the friction device is formed by a tensioner 17 (a known device), in which the yarn is passed between two parts that are pressed together by spring action.

FIG. 3 shows another modified embodiment in which the yarn is passed over a friction device formed by a ceramic rod 18 having a nonround, tear droplike cross section.

While the novel features of the invention have been shown and described and are pointed out in the appended claims, it is to be understood that various omissions, substitutions and changes in construction and arrangement of the features shown and described may be made by those skilled in the art without departing from the spirit and scope of the invention.

We claim:

1. A process for opening of a knit-set-deknit crimped synthetic yarn made up of a number of filaments which comprises withdrawing said crimped yarn from a knitted fabric, passing said crimped yarn once through a relaxation zone in which the yarn is in a relaxed state under a tension lower than about 0.05 grams per denier and immediately thereafter applying a frictional force to the yarn, in its relaxed state, to displace the filaments relative to one another and thereby open said yarn, said relaxation zone extending between relaxation roller means for withdrawing the yarn from said fabric and another means for applying the frictional force to said crimped yarn, the peripheral speed of the relaxation roller means being higher than the speed of the yarn in the relaxation zone to cause the roller means to slip with respect to said yarn and thereby insure that the yarn in said zone is in said relaxed state.

2. The process of claim 1 in which the degree of relaxation of the yarn is adjustable in said relaxation zone.

3. The process of claim 1 in which the frictional force is applied to the yarn by passing the yarn over a relatively sharp edge of a knife.

4. The process of claim 3 in which the sharp edge has a radius of curvature of approximately 0.0005 mm.

5. The process of claim 3 in which the edge is made of agate material.

6. The process of claim 3 in which the edge is positioned at an angle to the longitudinal direction of the yarn.

7. The process of claim 1 in which the frictional force is applied to the yarn by passing the yarn between two parts of a tensioner means that are pressed together by spring action.

8. The process of claim 1 in which the frictional force is applied to the yarn by guiding the yarn over a nonround pin of ceramic material at an angle of contact different from that of the relaxation roller means.

9. The process of claim 1 in which the opened yarn is advanced under a predetermined transport tension of the order of at least about 0.10 grams per denier after application of said frictional force.

10. The process of claim 1 in which the yarn is unraveled from the knitted fabric by said relaxation roller means, said fabric having been subjected to a heat treatment for setting the crimp in the yarn.

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