Nov. 27, 1956 A. BURLESON ET AL 2,771,756

KNITTING

Filed May 13, 1955

FIG. 4.

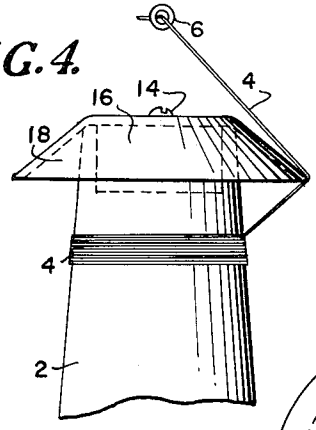


FIG. 6.

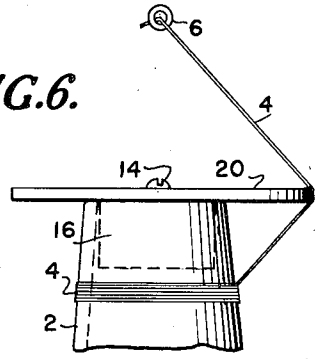


FIG. 5.

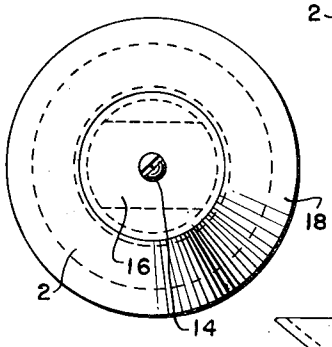


FIG. 7.

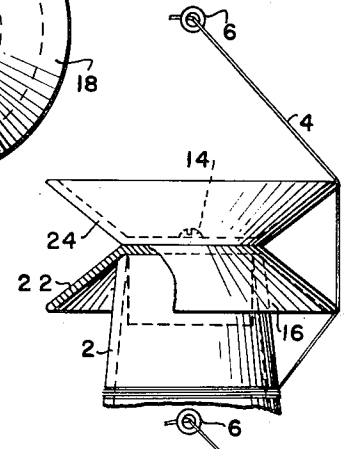


FIG. 1.

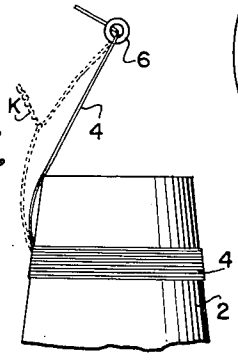


FIG. 2.

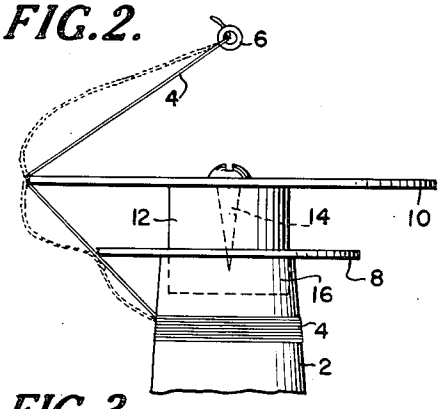


FIG. 8.

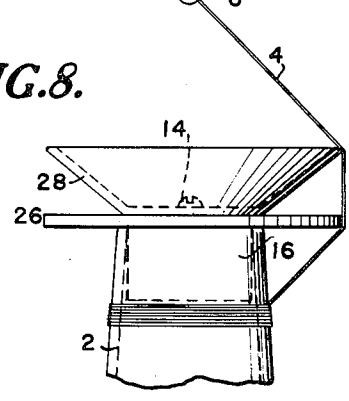
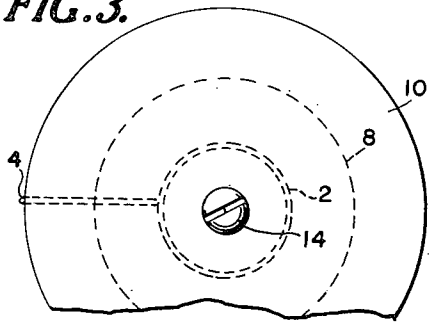


FIG. 3.



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Application May 13, 1955, Serial No. 508,096

17 Claims. (Cl. 66—146)

The present invention relates to novel improvements in knitting with nylon yarns which are lively and tend to kink when relaxed. Yarns of this type are disclosed in copending U. S. applications Serial No. 248,283, filed September 25, 1951; Serial No. 342,709, filed March 16, 1953; Serial No. 367,776, filed July 13, 1953, and Serial No. 454,204, filed September 3, 1954. The invention is applicable to either monofilament or multifilament nylon yarn, as disclosed in said applications, although it is of particular importance when used with monofilament yarns since these are the most difficult to handle.

The above applications describe, inter alia, the production of knitted fabric, e. g., women's hosiery, by alternately knitting with oppositely twisted nylon yarn which is lively due to the twist therein and kinks when relaxed. Accordingly, in order to avoid kinking when the yarn is relaxed, specific means must be utilized to control the twist until the fabric is knit. Several satisfactory ways of controlling this lively yarn during knitting are disclosed in the above-mentioned applications. For instance, Serial No. 342,709 and Serial No. 367,776 propose that the twisted yarn be sized so as to hold the torque therein temporarily dormant until the desired fabric has been knit. This effectively eliminates kinking in the case of multifilament nylon yarn. However, with monofilament nylon yarn, it is difficult to put enough size on the yarn to entirely deaden the twist and permit completely satisfactory knitting. Accordingly, it is proposed in Serial No. 454,204 to avoid kinking of lively monofilament nylon yarn by winding the yarn onto the supply bobbin in a direction opposite to its twist, i. e., yarn with Z twist is wound onto the bobbin in a clockwise manner, while yarn with S twist therein is wound on the bobbin in a counterclockwise fashion.

Additionally, it is proposed in Serial No. 454,204 to leave the takeoff end of the bobbin substantially free of yarn. In this way, when tension on the monofilament yarn taken off the bobbin is relaxed so that kinking would normally occur, the yarn torque causes the yarn to turn in towards the bobbin and cleave to the yarn-free end thereof. In other words, the torque which, under conventional circumstances, would cause kinking of the relaxed yarn is actually utilized to effectively avoid kinking.

It has now been found that even more outstanding results can be obtained if the unique wind and cleavage zone of Serial No. 454,204 and/or the sizing operation of Serial No. 342,709 and Serial No. 367,776 are supplemented, and preferably replaced, by providing means at the takeoff end of the bobbin which sets up a static charge that attracts the relaxed yarn thereto without exerting any substantial amount of drag on the yarn when the latter is drawn under tension and supplied to the knitting machine. Accordingly, the principal object of the present invention is to provide novel improvements in knitting with nylon yarn which is lively and tends to kink when relaxed.

Another object of the invention is the provision of

unique means for avoiding the kinking of lively nylon yarn, particularly monofilament nylon, in knitting with the same.

Other objects will be apparent from the following detailed description and the accompanying drawings wherein:

Figure 1 is a fragmental elevational view of a conventional bobbin showing the kinking that occurs therewith when using lively yarn;

Figure 2 is a fragmental elevational view of a supply bobbin including a preferred form of anti-kinking means according to the invention;

Figure 3 is a plan view of the anti-kinking means of Figure 2;

Figure 4 is a fragmental elevational view of another embodiment of the present invention;

Figure 5 represents a plan view of the embodiment of Figure 4; and

Figures 6–8 represent fragmental elevational views of other alternative embodiments of the present invention.

Referring more particularly to the drawings, Figure 1 discloses a bobbin 2 having lively nylon yarn 4 wound thereon in conventional manner. Positioned above the takeoff end of the bobbin, and in alignment with the longitudinal axis thereof, is the customary loop or guide member 6 through which yarn is periodically taken off the bobbin under tension (as indicated by the full line) and fed to the knitting needles (not shown) of any suitable knitting machine, e. g., a full-fashioned hosiery knitting machine. As the knitting needles function to knit a course of the desired fabric, the yarn is momentarily relaxed and, even though this period of relaxation is extremely short, it is sufficient to permit the yarn to turn upon itself, by virtue of the twist torque therein, and assume the kinked condition shown at *k* in Figure 1.

Figures 2 and 3 show preferred means according to the invention for avoiding the kinking shown in Figure 1. These means comprise a pair of flat, circular discs 8 and 10 fixed to the takeoff end of bobbin 4. These discs preferably comprise Plexiglas (polymethyl methacrylate) although any other material which sets up a static field, such as cellulose acetate, wood coated with shellac or Lucite, may be used. As shown, the disc centers are aligned with the longitudinal axis of the bobbin and the discs project outwardly beyond the lateral confines of the bobbin so as to provide a pair of yarn-contacting surfaces about the takeoff end.

In the embodiment shown in Figure 2, discs 8 and 10 are held together in parallel, spaced relationship by means of a spacer member 12, which may be of wood or other suitable material, and screw means 14. The discs may be fixed to the takeoff end of the bobbin, or otherwise positioned adjacent thereto, in any suitable way. Where the takeoff end of the bobbin is hollow, as shown, the anti-kinking means may include an attaching member 16 of wood or the like rigidly fixed to the discs by screw means 14 and suitably shaped to fit snugly into the hollow end. In this way, the anti-kinking means may be readily attached to or detached from the bobbin.

The size and positioning of discs 8 and 10 can be widely varied but should be such that sharp angles in the yarn are avoided. In other words, the discs should exert a minimum resistance on the yarn as it is drawn off the bobbin and fed to the knitting machine through guide member 6.

Inner disc 8 is not essential, as shown in the embodiment of Figure 6, but it is preferred in order to insure against sharp angles in the yarn being taken off the bobbin. To this end, disc 8 has a somewhat smaller diameter than disc 10. In this way, it is possible to provide for a gradual variation in the angle of the yarn taken off the bobbin. Similar consideration should be

given to the positioning of disc 10 with respect to guide member 6 so as to minimize sharp changes in the direction of yarn travel.

In practicing the present invention, the yarn 4 must be wound on the bobbin in a direction opposite to the twist therein as described in Serial No. 454,204. However, it is not necessary to provide a yarn cleavage zone on the bobbin although such zone may be utilized if desired.

Assuming that 15 denier monofilament nylon yarn which has been heat set and subsequently twisted between 10 and 20 turns per inch is wound on bobbin 2 in a direction opposite to its twist, the yarn 4 will take the position shown by the full line in Figure 2 as it is drawn off the bobbin through guide member 6. However, when the yarn is relaxed for the knitting operation, as discussed above in connection with Figure 1, the static charge set up by the discs causes the relaxed yarn to adhere thereto in the manner shown by the broken lines in Figure 2. This attraction of the yarn for discs 8 and 10 effectively avoids kinking despite the relaxed nature of the yarn. However, the attraction is such that no substantial amount of drag is caused thereby when the yarn is again put under tension and drawn to the knitting machine.

The embodiments of Figures 4–8 are basically similar to the anti-kinking means shown in Figures 2 and 3 in that they also include the provision of a smooth, unobstructed circular yarn-contacting surface which attracts the yarn when it is relaxed, by virtue of the static charge thereon, and at the same time exerts substantially no drag on the yarn as it is drawn thereover. In Figures 4 and 5, the anti-kinking means comprise a substantially frusto-conically shaped cap 18 positioned to enclose the takeoff end of bobbin 2. Cap 18 is detachably secured to the end of the bobbin by an attaching member 16 fixed to the cap by suitable screw means 14 as in the embodiment shown in Figures 2 and 3. The cap 18 of Figure 4 functions in the same manner as the discs 8 and 10 of Figure 2 when the tension of the yarn drawn through guide member 6 is relaxed.

The anti-kinking means of Figure 6 comprise a single flat, circular disc 20 detachably secured to the takeoff end of the bobbin and projecting circumferentially about the same to provide the desired yarn-contacting and attracting surface. Figure 7 shows a double funnel-type arrangement including a frusto-conically shaped cap 22, as in Figure 4, enclosing the takeoff end of the bobbin and a second, similarly shaped cap 24 inverted thereon. This particular arrangement is desirable where the yarn has a relatively great amount of torque and a larger yarn attracting surface is necessary. The anti-kinking assembly of Figure 8 represents a combination of the features shown in Figures 4 and 6. In particular, the embodiment of Figure 8 includes flat, circular disc 26 having the frusto-conically shaped cap 28 of Figure 4 positioned thereon in an inverted position. As in Figures 2 and 4, the anti-kinking assemblies of Figures 6–8 include a suitably shaped member 16 for ready attachment to the hollow end of the bobbin. Screw means 14 which fix member 16 to the yarn attracting member also serve to join together the caps 22 and 24 of Figure 7 and the disc 26 and cap 28 of Figure 8.

The bobbin 2 on which the yarn is wound and fed to the knitting machine may be made of any material conventionally utilized. Preferably, however, it also comprises a material which sets up a static charge so as to attract the yarn thereto, thus supplementing the effect of the anti-kinking means of the invention. Wooden bobbins coated with shellac have been found satisfactory for this purpose.

As indicated above, the invention is operable with either monofilament or multifilament lively nylon yarn, although it is most advantageously used with monofilament yarn processed in accordance with the disclosure

of copending application Serial No. 454,204, the subject matter of said application and Serial No. 342,709 and Serial No. 367,776 being incorporated herein by reference. Typically suitable monofilament nylon yarn is 10, 12 or 15 denier yarn which contains from 5 to 40, and preferably 10 to 20, turns per inch.

It will be appreciated that various modifications may be made in the invention as above described without in any way deviating therefrom. For example, while the bobbin is shown as generally cone shaped with a hollow end, it may be a solid cylinder to which the yarn-contacting and attracting means are fixed in any convenient manner. Accordingly, the scope of the invention is not limited to the foregoing description except as it may be defined in the following claims wherein we claim:

1. For use in a knitting operation, a package of twisted nylon yarn wound on a core, which yarn possesses a tendency to kink when unwound in a relaxed condition, a member located adjacent the takeoff end of the core and having a smooth circular outer yarn-contacting surface, said member being formed from a material which sets up a static field as a result of the rubbing of the yarn over said yarn-contacting surface, thereby causing the yarn to adhere thereto while being unwound and preventing the yarn from kinking without exerting any substantial drag upon said yarn as it is drawn off said package, said member comprising the sole means for so controlling the yarn as it leaves the package.

2. A device as defined in claim 1, wherein a substantially frusto-conically shaped cap is mounted on said core adjacent the takeoff end thereof.

3. A device as defined in claim 1, wherein a single flat circular disc is mounted on said core adjacent the takeoff end thereof.

4. A device as defined in claim 1, and in which two spaced juxtaposed flat circular discs are mounted on said core adjacent the takeoff end thereof, and the innermost of said discs is of a smaller diameter than the other disc.

5. A device as defined in claim 1, wherein two frusto-conically shaped caps are mounted on said core adjacent the takeoff end thereof.

6. A device as defined in claim 1, wherein one flat circular disc and one frusto-conically shaped cap are mounted on said core adjacent the takeoff end thereof.

7. A device as defined in claim 1, wherein said member is detachably mounted on said core.

8. For use in a hosiery knitting machine, a bobbin having twisted nylon yarn wound thereon which possesses a tendency to kink when unwound in a relaxed condition, a member mounted on said bobbin adjacent the takeoff end thereof and having a smooth circular outer yarn-contacting surface, said member being formed from a material which sets up a static field as a result of the rubbing of the yarn over said yarn-contacting surface, thereby causing the yarn to adhere thereto while being unwound and preventing the yarn from kinking without exerting any substantial drag upon said yarn as it is drawn off said bobbin, said member comprising the sole means for so controlling the yarn as it leaves the bobbin.

9. A method of preparing twisted nylon yarn for a knitting operation, said yarn having a tendency to kink when unwound in a relaxed condition, comprising winding said yarn on a bobbin in a direction opposite to the twist therein and unwinding said yarn over a member having a circular yarn-contacting surface at an end of said bobbin comprising a material which sets up a static field as a result of the rubbing of the yarn over said yarn-contacting surface, thereby causing the yarn to adhere thereto while being unwound and preventing the yarn from kinking.

10. A method of preparing twisted nylon yarn as defined in claim 9, and in which the yarn is wound on said bobbin leaving a portion of said bobbin adjacent the takeoff end thereof free of yarn.

11. A method of preparing twisted nylon yarn as defined in claim 1 and in which the yarn is monofilament nylon yarn.

12. A bobbin having twisted nylon yarn wound thereon in a direction opposite to the twist therein which possesses a tendency to kink when unwound in relaxed condition and at least one member mounted on said bobbin adjacent the takeoff end thereof and having a smooth circular outer yarn-contacting surface, said member being formed from a material which sets up a static field thereby causing the yarn to adhere thereto while being unwound even in a relaxed condition and preventing the yarn from kinking without exerting any substantial drag upon said yarn as it is drawn off said bobbin.

13. A device as defined in claim 11 wherein said member having a circular yarn contacting surface is formed from a plastic material.

14. A device as defined in claim 11 wherein said bobbin is formed from a material that sets up a static field and thereby causes the yarn to adhere thereto.

15. A device as defined in claim 11 wherein two spaced juxtaposed flat circular discs are mounted on said bobbin adjacent the takeoff end thereof and the innermost of said discs is of a smaller diameter than the other disc.

16. A device as defined in claim 11 wherein said yarn is monofilament nylon yarn.

17. A device as defined in claim 11 and in which a portion of the bobbin adjacent the takeoff end of the bobbin is substantially free of yarn and provides a cleavage zone for the yarn.

References Cited in the file of this patent

UNITED STATES PATENTS

1,783,339	Mitchell	Dec. 2, 1930
2,377,799	Markwood	June 5, 1945
2,514,582	Johnson	July 11, 1950
2,532,467	St. Pierre	Dec. 5, 1950
2,537,000	Stibbe et al.	Jan. 2, 1951
2,584,944	Tilles	Feb. 5, 1952
2,714,812	Leath et al.	Aug. 9, 1955

OTHER REFERENCES

Nylon Technical Service, E. I. du Pont de Nemours and Co., pages 2–18.02, March 27, 1953.

The Science of Knitting, by E. Tompkins, published by J. Wiley and Sons, pages 103–104, 1914.