APPARATUS FOR TEXTURING YARN

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INVENTOR.

D. E. FISHER

BY

Stanley M. Tarter

ATTORNEY
UNITED STATES PATENT OFFICE

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APPARATUS FOR TEXTURING YARN

Don E. Fisher, Pescua, Fla., assignor, by mesne assignments, to Monsanto Chemical Company, a corporation of Delaware

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3 Claims. (C1. 57—34)

This invention relates to an apparatus for texturing yarn. More particularly, this invention relates to a novel apparatus for processing continuous lastingly set coiled yarn of the relaxed type in a single unified operation.

Presently, textured yarns of the type comprising helically convoluted coils are processed with or without a core yarn passing centrally through the coiled yarn. This invention relates to the processing of the latter or “coreless” type coiled yarn used to produce “stretch” type textile material from which hose, sox, sweaters and other sundry items are manufactured.

Heretofore, a number of different methods have been used to coil yarn. In accordance with one such method, yarn is physically displaced to form coils therein and subsequently heated for permanently setting the coils. This common method, however, does not encompass coiling, heating, relaxing, and setting of yarn in one continuous operation.

Various devices have also been suggested to physically displace yarn for forming coils therein but the devices do not provide for the setting thereof. In general, these devices include a rotatably driven shaft adapted for mounting a package of yarn and guide means rotatable with the shaft and revolvable about a tapered element. Yarn from the supply package is led to the rotatable guide means which operatively serves to wind the yarn around the tapered element. However, the resulting yarn produced by such devices is not modified in a way that its bulk is enhanced substantially since no provision is made for heat-setting the yarn.

In application, the above described known method and devices employed to process coiled yarn present difficulties. The suggested devices require frequent interruption of operation as they must be shut down each time the yarn on a supply package is depleted; the devices are not adapted to produce continuous relaxed coiled yarn in which the coils have been set; and, the operation of the devices is costly and time consuming. Moreover, the suggested method does not yield lastingly set coiled and relaxed yarn.

It is an object of this invention to provide novel textile apparatus, simple and compact in design and inexpensive to construct, of the kind for coiling, heat-setting, and relaxing yarn in one unified process. Another object is to provide yarn texturing apparatus for producing continuous relaxed coiled yarn. Another object is to provide novel texturing apparatus of the type which does not require frequent shut down of operation and of the type wherein a planetary gear arrangement is provided to maintain a tapered elongated member stationary while yarn is coiled therearound and passed through a heating unit for relaxing the yarn and setting the coils therein. A further object is to provide a novel apparatus for texturing yarn comprising coiling, heating, controlled relaxing, and cooling yarn in one continuous and unified operation.

According to the invention, a novel apparatus, for texturing continuous filament yarn and designed to produce lastingly set coiled yarn, is provided. In general, the preferred construction comprises an elongated tapered member mounted to be non-rotatable and adapted to accommodate movement of yarn coiled thereover moving from the end of said member, having the larger diameter, to the end of said member having the smaller diameter. A yarn heater is positioned adjacent the elongated tapered member to heat the yarn during part of its movement along said member and rotary means is provided for feeding and wrapping yarn on the tapered member at the larger end thereof to form a succession of coils. The newly formed coils push the previously formed coils forwardly toward the smaller end of said member, the smaller end thereof projecting beyond the heater for a predetermined distance so that the yarn is cooled sufficiently to lastingly set the coils therein. The predetermined degree of taper of the elongated tapered member controls the degree of contraction of the coils while the latter is being heated. Take-up means for orderly taking up the yarn pushed off the elongated tapered member is further provided.

One rotary means comprises a cylindrical hollow casing rotatably mounted on a pair of axially aligned shafts. One of the shafts is fixedly mounted while the other shaft is maintained in an idle or stationary position, in relation to said cylindrical casing, by planetary gear means interconnecting the shafts and mounted in a gear-carrier member mounted on and rotatable with the cylindrical casing. The elongated tapered member comprises a cone-shaped member secured at its base to the end of the stationary shaft and an elongated tapered pin extending axially from the apex thereof.

In operation, a yarn from a supply package, preferably located at one end of the casing, is threaded into and through an axial passage in the fixed shaft and thence through the bore of a tubular member mounted within the cylindrical casing. Thereafter, the yarn is led to and is wound in helical manner about the cone-shaped member at the opposite end of said casing. The cylindrical casing is then operatively driven by power and belt means so as to rotate about the pair of shafts for bringing the yarn helically around the cone-shaped member.

The novel method for texturing yarn comprises wrapping or coiling yarn, such as nylon yarn or similar synthetic yarn, around the larger diameter end of a tapered elongated member in a manner whereby each newly formed coil slidingly moves the adjacent coils progressively and longitudinally toward the reduced end thereof, heating and simultaneously relaxing the coils during a part of the movement of the coils toward the reduced end of the elongated member, and cooling the yarn during the latter part of its movement along said elongated member so that the coils are lastingly set. The predetermined taper of said elongated member controls the degree of contracting of the yarn to increase its bulk and to decrease the residual shrinkage thereof.

Other objects and advantages of the present invention will be apparent from the following description and drawing which is intended merely to be illustrative and not limitative. In the accompanying drawing:

FIGURE 1 is a side elevation view of the novel apparatus for texturing yarn embodying the invention;

FIGURE 2 is a longitudinal cross-section view taken through the apparatus shown in FIG. 1 with the yarn package 21 doubled and the take-up means 36 removed;

FIGURE 3 is a perspective view showing the gear-carrier member 25 separately for purposes of clarity;

FIGURE 4 is a transverse section view taken through FIG. 4—4 of FIG. 1.

Like components in the various figures in the drawing are designated by the same reference numerals for reasons of convenience and simplicity.

Referring to the drawing, one form of the novel apparatus for texturing yarn embodying the invention, as shown in FIGURES 1—4, comprises a rotatable cylindrical casing or sleeve 1 having a transverse C-shaped section of the cylindrical casing side wall removed therefrom, intermediate its ends, providing a recess or opening...
2 extending inwardly at one side of casing 1. Opening 2 separates casing 1 into a pair of spaced cylindrical members 3 and 4 and linked or connected therebetween by a longitudinal strip or member 5 (FIG. 4) of the side wall of casing 1. Cylindrical members 3 and 4 have respective retainer 6 and 7 thereon that open at their inner ends into opening 2. Each cylindrical member 3 and 4 is concentrically and rotatably mounted intermediate the ends of corresponding shafts 8 and 9, respectively, by means of bearings 10 carried on the shafts and interposed between the shafts and the cylindrical members. To suitably position bearings 10, shafts 8 and 9 to prevent axial shifting of the shafts, small snap rings 11 that fit into corresponding circumferential grooves cut in the shafts and larger snap rings 12 that fit into corresponding grooves formed in the walls of bores 6 and 7 are provided.

Shafts 8 and 9 are axially aligned within corresponding cylindrical members 3 and 4 in spaced end-to-end relation and are provided with integrally formed toothed-gear inner ends 13 and 14, respectively, which extend into opening 2. Separate spur-type gear members may be fixedly secured to the inner ends of shafts 8 and 9, if desired. Shaft 9 has an axial passage 15 therethrough and is threaded adjacent its outer end thereof having a nut 16 secured thereon. Shaft 9 is clampingly mounted in a transverse bore 17 formed in one arm of a U-shaped bracket 18 by a nut 19. The other arm of bracket 18 has a mounting lug 20 extending laterally therefrom into the space between the ends of the bracket 18 to provide means for mounting a supply package of yarn 21 thereon. Bracket 18 is fixedly mounted intermediate its ends on a mounting base. If desired bracket 18 may be constructed to provide a plurality of mounting lugs 20 for mounting a plurality of yarn packages 21 whereby the ends of the yarn from different packages may be tied together for producing continuous coiled yarn.

Each gear 13 and 14 at the end of corresponding shafts 8 and 9 has meshing engagement with a corresponding parallel arranged gear 22 and 23, respectively. Gears 22 and 23 are carried on a common spindle 24 which is rotatably journaled at its ends within a generally C-shaped gear-carrier member 25. The spindle 24 is journaled at each end thereof within the inner ends of respective slots formed in member 25 and are retained therein by a pair of retainer 25a, each providing a bearing surface at each inner end thereof having engagement with spindle 24. The member 25 is secured, such as by screws 26, to a flat mounting surface 27 provided at the inner side of member 5 of casing 1. Gear-carrier member 25 is designed to fit into opening 2 and to combine with the longitudinal section 5 of casing 1 to form a generally symmetrical transverse section in casing 1 so that the latter is properly balanced when rotated.

A bent tubular member 28 extends at an angle to the longitudinal axis of casing 1 from a point within opening 2 of casing 1, adjacent the inner end of passage 15 in the shaft 9, to and through a slot 29 in one end of gear-carrier member 25 and thence through a longitudinal bore 30 formed in the wall of cylindrical member 3. Tubular element 28, preferably, projects slightly beyond the outer end wall of cylindrical member 3.

A cone-shaped element 31 having an elongated tapered pin 32, extending axially from the apex thereof, is preferably integrally attached at its base to the outer end of shaft 9. Pin 32 is circular in cross section and is of larger diameter near the apex of the cone element 31. Also, pin 32 extends through a heating chamber 33 formed in a heating unit 34, which may be of any common construction, and projects a predetermined distance outwardly therefrom for reasons to be explained hereinafter. A cylindrical protective cover 35 comprising a pair of semi-cylindrical shells is clampingly secured by a suitable means about gear-carrier member 25 and longitudinal member 5.

A take-up means 36 of the usual type, is provided near the base or free end of pin 32. A sheave 37 is concentrically mounted about the cylindrical member 4 and is held securely thereon by means of a screw or the like. A belt 38 driven by power means, not shown, is laid around the groove in the sheave 37 and drives casing 1 about shafts 8 and 9.

The end of a yarn 39, from supply package 21 mounted on lug 20, is threaded through axial passage 15 in shaft 9 at one end of casing 1 and thence through tubular element 28, the yarn emerging from tubular member 28 at the opposite end of casing 1. The yarn is then wrapped around cone-shaped element 31, several turns near the apex thereof and thereafter is led to take-up means 36 where the yarn is laid on a bobbin. Any suitable type flexible threading tool may be used to thread yarn 39 through the apparatus in the manner explained.

In operation, casing 1 is rotatably driven about shafts 8 and 9 by any known type of power means operatively connected to casing 1 by belt 38. Since gear-carrier member 25 is fixedly secured to member 5 of casing 1, gear-carrier member 25 is rotatably journaled within casing 1 and as a part thereof. Due to the fact that shaft 9 is fixedly mounted and that gears 22 and 23 are rotatably journaled within gear-carrier member 25, gears 22 and 23 will consequently be carried in a circular orbit around shafts 8 and 9 while in meshed engagement with gears 13 and 14. Although shaft 8 is rotatably mounted, it is held in a stationary or idle position in relation to casing 1 by gear 22 which is operatively connected to fixed gear 14 by gear 23. Also, while cone-shaped element 31 and elongated pin 32 attached to shaft 8 are held in a stationary position, tubular element 28 and yarn 39 within the element 28 revolve around cone-shaped element 31 and pin 32 thereby causing yarn 39 to be wound continuously around the apex of cone-shaped element 31 in coiled manner.

As each new coil is formed it pushes or crowds the adjacent coil so as to move the yarn progressively and longitudinally forward toward the smaller diameter end or base of pin 32. The coils move away from the apex of cone-shaped member 31 and pass through heating chamber 33 where the coils are subjected to heat causing the coils to relax and shrink. Pin 32 is increasingly reduced in diameter toward its free end in accordance with a predetermined degree of taper and is constructed of such a length as to project a predetermined distance beyond the outer end of heating chamber 33 after passing therethrough so that the coils can be cooled to permit them to lastingly set before being taken up on a bobbin mounted on take-up means 36. The degree of taper of and the diameter of pin 32 will control the amount of contraction or relaxation of yarn 39 and will also determine the size of the coils processed.

As a consequence of the yarn frictionally engaging the inner walls of tubular element 26 a false twist will be imparted to yarn 39, but the yarn will untwist when it leaves pin 32 and before being taken up on take-up means 36.

It is to be understood that changes and variations may be made without departing from the spirit and scope of the invention as defined in the appended claims.

What is claimed is:

1. Apparatus for texturing yarn, said apparatus comprising in combination, a first and a second shaft arranged in spaced end-to-end relation, a cylindrical hollow casing having a recess therein intermediate the ends thereof and being rotatably mounted on both said shafts, the inner ends of said shafts extending into said recess of said hollow casing, said first shaft being fixedly mounted adjacent its outer end thereof outwardly therefrom said hollow casing and having an axial bore therein for moving yarn therethrough, a cone-shaped member for wind-
ing the yarn therearound, said cone-shaped member hav-
ing an axial elongated tapered pin extending outwardly from the apex thereof and being positively secured at its base to the outer end of said second shaft, said tapered pin diminishing in diameter outwardly from the juncture of said tapered pin with the apex of said cone-shaped mem-
ber and having a predetermined degree of taper to con-
trol the amount of contracting of the coils thereon, a pas-
sage extending through a portion of the wall of said hol-
low casing, a tubular member extending through said pas-
sage in said casing wall, the yarn moving from said bore in said first shaft, power means for operatively driving said hollow casing rotatably about said shafts, and take-up means for taking up the coiled yarn from said circular pin.

3. Apparatus for texturing yarn of the coiled type, said apparatus comprising in combination, a pair of spaced axially aligned fore and aft shafts, respectively, arranged in end-to-end relation, a sun gear fixedly mounted at the inner end of each of said shafts, said aft shaft having an axial bore therethrough through which the yarn extends and being fixedly mounted at its outer end thereof, means for mounting said aft shaft at the outer end thereof, a conical shaped element having a recess therein intermediate the ends thereof and being rotatably mounted on both of said shafts, the inner ends of said shafts extending into said recess of said hollow casing, said first shaft being fixedly mounted adjacent said casing, a heater providing a thermal chamber for heating the yarn, said circular pin extending through said thermal chamber of said heater and projecting outwardly of said thermal chamber a predetermined distance to permit yarn which has been heat-set and relaxed in said thermal chamber to cool thereon for lastingly setting the coils therein, a yarn source for supplying yarn to said bore in said first shaft, power means for operatively driving said hollow casing rotatably about said shafts, and take-up means for taking up the coiled yarn from said circular pin.

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