June 14, 1966 J. U. PRICE 3,255,579

PRODUCTION OF COMPOSITE STRETCH YARNS

Filed Sept. 3, 1963

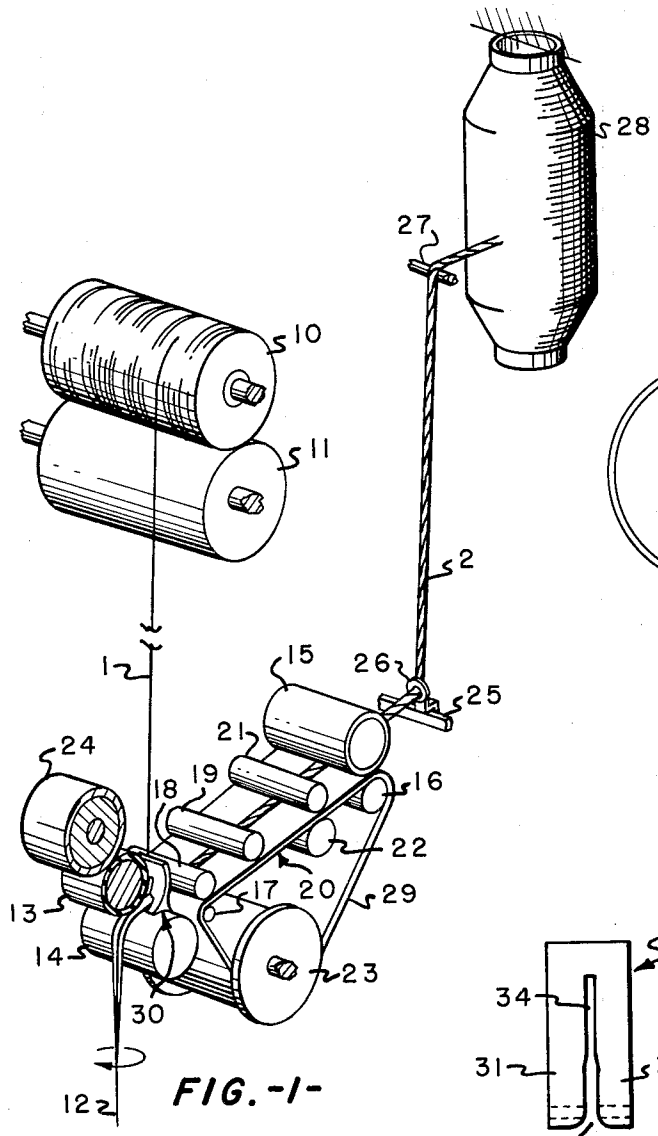


FIG.-1-

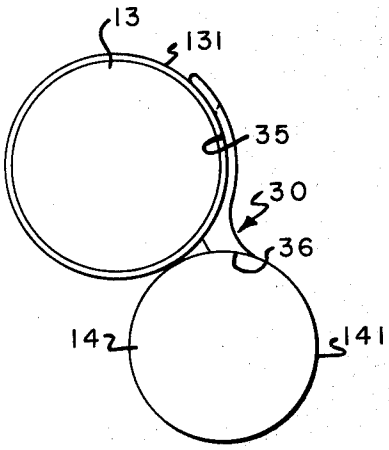


FIG.-2-

FIG.-3-

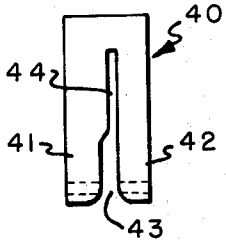


FIG.-4-

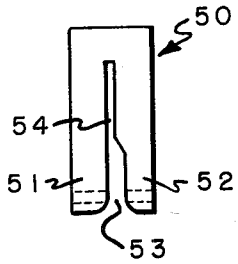


FIG.-5-

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United States Patent Office 3,255,579 Patented June 14, 1966

3,255,579

PRODUCTION OF COMPOSITE STRETCH YARNS

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Filed Sept. 3, 1963, Ser. No. 306,191
8 Claims. (Cl. 57—12)

This invention relates to the art of producing composite stretch yarns. In particular, it relates to apparatus for producing stretch yarns by spinning a non-elastic fibrous covering about an elastic core.

An important type of elastic yarn is one wherein an elastic core yarn is covered with a substantially non-stretchable or non-elastic textile fibrous material. Such yarns are often formed by tensioning the elastic thread, constituting the core, and then spinning about the elastic thread or core a non-elastic textile fibrous covering material. This is generally done by feeding the tensioned elastic thread into the nips of one pair of a set constituted of at least two pairs of drafting rollers wherein a ribbon like roving is formed and then matted or twisted about the elastic core. This type of spinning is shown, for example, by reference to U.S. 3,017,740 and U.S. 3,038,295.

Composite elastic yarns produced in such manner have met with wide commercial acceptance. There is an inherent deficiency in present methods and apparatus for producing such yarns, however, and this relates to the problem of "grinning." This means that the elastic core, instead of being completely covered by the non-elastic covering yarn lies exposed to the surface in some places; the uncovered spots showing through as spots or streaks. Such spots or streaks in the yarns are unsightly and degrade the yarns, or fabrics woven therefrom. Also, where grinning occurs the dye is not uniformly applied in subsequent dying or the dye does not adequately color the spots or streaks, this sometimes intensifying the unsightly bright spots or streaks.

Because of these and other prior art deficiences it is an object of the present invention to provide new and improved method and apparatus suitable for the reduction or elimination of grinning. Specifically, it is the objective of this invention to provide new and improved apparatus for up-grading the quality of stretch yarns made by the spinning of non-elastic fibrous coverings about an elastic core. In particular, it is an object to provide new and novel apparatus for producing improved quality stretch type yarns, especially those made by core spinning. More particularly, it is an object to provide a novel though simplified traversing device for use in textile core spinning machinery. These objects, and others, will be apparent in view of the following description of the invention.

Composite yarns of superior quality can be formed upon the apparatus combination of this invention which provides for the relative positioning of the core yarn and roving even while these materials are traversed through a series of several pairs of drafting rollers.

In accordance therewith is provided a bifurcated yarn guide member having a concave face, or faces, which mates with the convex surface, or surfaces, of the front pair of a series of drafting roll pairs and wherein the fork or branches of the bifurcated guide provides an upper and lower contiguous pair of notches or slots opening into the nips of the front pair of rolls within which notches can be positioned a tensioned elastic core yarn and a non-elastic textile fibrous roving, respectively. By the use of such device the relative positioning of the core yarn and the roving can be maintained while the roving is drafted and laterally traversed upon the rolls and while the roving is twisted about the core to form a composite yarn. The present novel guide member, in fact, floats laterally back

and forth upon the inner face of the front pair of drafting rolls as the roving and yarn are traversed, maintaining the desired fixed relative positioning between the core and roving. In so doing the guide provides far better covering of the core with the roving than heretofore believed possible.

The yarn guide member, and its use in the desired combination will be more fully explained in the following detailed description and by reference to the attached figures wherein:

FIGURE 1 is an isometric diagrammatic view of the apparatus combination with a section of the front pair of rollers cut away to show the relationship of the yarn guide to the overall apparatus, and the manner in which the device is used,

FIGURE 2 gives a side elevation view showing a yarn guide member fitted upon a front pair of rolls,

FIGURE 3 shows a front view of a guide member, and illustrates in some detail the notches and their relationship one to the other, and

FIGURES 4 and 5 show embodiments wherein the upper notch is off-set to provide an S twist and Z twist, respectively.

Referring to FIGURE 1 there is shown drafting apparatus **20** whereupon is being drafted a non-elastic textile roving **2**, which roving **2** is being spun about a tensioned elastic core yarn **1** to form the composite yarn **12**.

The drafting apparatus **20** includes generally a series of carrier rolls and roll pairs (or rollers and roller pairs) including a front pair of rolls **13, 14** and a back pair of rolls **15, 16**. Intermediate these pairs of rolls are other rolls; and also including a presser roll **24** mounted adjacent and in contact with upper front roll **13**. A flexible apron **29** runs around the bottom back roll **16**, over the lower rolls **17, 22** and then about the driving roller **23** which furnishes power for turning the apron **29** via driving means not shown. The bottom carrier rolls **16, 22** and **17** act as a support for the apron **29** and provide a lateral surface upon which the roving **2** is drafted. It is apparent, however, that the apron could be omitted and the roller pairs used directly for drafting the roving **2**. Thus, the drafting could be performed between roller pairs **15, 16; 21, 22** and **17, 18**. Without the apron **29** roller **19** would preferably be omitted.

The roving **2**, from supply roll **28**, is brought downwardly around the directing member **27** through trumpet **26**, which is rigidly affixed upon traversing frame **25**, and thence through the nips of the series of drafting rollers; back pair of rollers **15, 16** between pairs of rollers **21, 22**; under the intermediate rollers **17, 18** and thence between the front pair of rollers **13, 14**.

In such drafting apparatus **20**, a traversing frame **25** carries roving **2** laterally back and forth and causes it to traverse within the nips of the series of rolls. Between the back pair of rolls **15, 16** and the middle pairs of rolls, e.g., rolls **21, 22** and rolls **17, 18** the roving **2** is broken by a differential speed applied upon these rollers by means not shown. Between these middle pairs of rolls, e.g., **21, 22** or rolls **17, 18** and the front rolls **13, 14** the roving **2** is formed into a ribbon-like formation. Upon core yarn **1**, supplied under tension by the differential peripheral speeds of drive roll **11** and the fastener peripherally moving front rolls **13, 14**, is applied the ribbon-like roving **2** by means of a bifurcated guide member **30**.

The bifurcated guide member **30** through which the roving **2** is passed is provided just behind the front pair of rollers **13, 14** and drifts laterally back and forth upon the inside faces of these rollers **13, 14** as the roving **2** is laterally traversed. This unique device is the focal point of the present novel combination, and it is this device which brings together and maintains the relative positioning of

core yarn 1 and the roving 2 during spinning. Its operation, function and construction shall be discussed in detail as the description proceeds.

Core yarn 1, under a predetermined amount of tension, is thus fed downwardly from supply roll 10 through upper notch 34 of the bifurcated guide member 30, which core yarn 1 is brought into contact with roving 2 which is positioned within the lower notch 33 of guide member 30. It will be observed that the contiguous notches 33, 34 are, of course, formed by the branches or forks 31, 32 of the bifurcated member 30.

The bifurcated yarn guide member 30 is adapted for fitting snugly against the convex surfaces 131, 141 of rolls 13, 14. Preferably the guide member 30 is one having a pair of concave faces 35, 36 which mate with the convex surfaces 131, 141 of rollers 13, 14, respectively. The yarn guide member 30 is, in this manner, maintained in fixed position relative to rollers 13, 14, except as to lateral movement. This is due, primarily, to the force exerted by the roving 2 as it passes through lower notch 33 of said guide member 30. In the same manner the lateral movement of the guide member 30 upon the rollers 13, 14 is also assured by force exerted from the roving 2. In this manner also the fixed relative positioning of core yarn 1 is assured as core yarn 1 is carried with the roving 2 as the latter is traversed upon the rollers. Thus, proper positioning of the core yarn 1 and roving 2 is provided by their passage through the notches or slots 33, 34 respectively, and this positioning is maintained during traversing.

The relative dimensions of notches 33, 34 are critical, the lower notch 33 being necessarily of greater width than upper notch 34. The lower notch 33 must provide a width corresponding generally to the diameter of the roving passing therethrough while upper notch 34 should correspond generally in width to the diameter of core yarn 1. In absolute dimensions, however, it is also found that the lower notch 33 must be at least about 1.5 times the width of upper notch 34 and can range as high as about 10 times the width of upper notch 34. A device having a lower notch 33 twice the width of upper notch 34 has been found to provide excellent results. Moreover, it is essential that the upper notch 34 and lower notch 33 join together above the location of entry to the nips of the pair of rollers 13, 14; the nips of the rollers 13, 14 being defined as their point of tangency to each other.

Preferred types of bifurcated yarn guide members 40, 50 are also demonstrated by references to FIGURES 4 and 5. In FIGURE 4 is demonstrated a yarn guide member preferably used for applying an S twist and in FIGURE 5 is shown a guide member 50 preferably used for applying a Z twist to composite yarn 12. In the guide device 40 wherein an S twist is to be applied to elastic yarn 12 upper notch 44 is offset to the right of lower notch 43. Conversely, FIGURE 5 shows upper notch 54 offset in the opposite direction—viz to the left—in relation to lower notch 53 in forming a Z twist in composite yarn 12. These devices thus provide for the deliberate alignment of the core yarn 1 to the right or left, respectively, contingent upon whether an S or Z twist is to be applied to the composite yarn 12. In these guide devices 40, 50 it is understood, of course, that the notches are formed by spaces located between branches 41, 42 and branches 51, 52 of bifurcated guide members 40, 50, respectively.

To further illustrate, when an S twist is to be applied to form the composite yarn, the core yarn 1 is placed within upper notch 44 and consequently upon the upper right edge of the roving 2. In this fashion, the roving 2 is picked up and radially moved, in clockwise direction, about core yarn 1 which lies generally at the axis or center of the motion. Conversely, when a Z twist is applied to form composite yarn 12, the core yarn is placed within upper notch 54 and consequently upon the upper left edge of roving 2 whereupon the roving 2 is picked up and radially moved in counterclockwise direction, about core yarn 1 which lies at the center of motion. In either situation,

the roving 2 upon leaving the front rolls 13, 14 is twisted about core yarn 1 by the rapid rotation of a spindle (not shown) and a composite yarn 12 is rapidly produced.

The surprising and outstanding feature of a composite yarn 12 produced in accordance with these described apparatus combinations is that grinning can be virtually eliminated. This will be demonstrated by reference to the following comparative data.

Examples

A series of runs were made on a drafting apparatus operated at a 10.4:1 draft ratio between the front pair and back pair of rollers. Single creel rovings of 64's grade wool, 2.5 hank roving (worsted count), and tensioned 140 denier polyurethane, stretched 4½ times its normal length, is core spun in this manner. The composite yarns produced had a 1/26 count, 13 twists per inch and a Z twist was imparted. The composite yarns were taken up on a spindle operated at 9000 r.p.m. These composite yarns were then unwound from the spindle and wound in uniform layers upon black fronted separate pieces of cardboard under substantially uniform constant tension. Actual counts were then made of the individual spots or streaks showing in the yarn. Results were then calculated on the basis of the average number of spots or streaks per square inch of area. In Run 1 the core spinning was effected with the use of a guide member similar to guide member 30 of the drawings. A second run, Run 2, was made under precisely the same conditions of traverse except that no guide member was used. The results are shown in the following table.

TABLE

Run:	Grin count
1	0.0
2	74.5

Thus, in Run 1 using the guide member of this invention there was absolutely no grin through. This is in striking contrast to Run 2 wherein grin count was 74.5 spots or streaks per square inch.

Even where a type of guide arm, mounted on the traversing frame is used to position the polyurethane strand, grinning is not substantially reduced. In fact, grin count was increased i.e. to 115.0. Moreover, other runs show that even where traversing is completely stopped, without the use of the novel guide of this invention grin count is on the order of 42.0. The advantages of the use of this novel guide are apparent.

It is obvious that some changes and variations can be made in the present invention without departing its spirit and scope.

Having described the invention, what is claimed is:

1. In an apparatus combination for covering an elastic core yarn by drafting a roving of non-elastic textile fibers, and twisting same about said core yarn wherein is provided

a plurality of pairs of drafting rolls, including a front pair of rolls and a back pair of rolls between the nips of which the roving is drafted and laterally traversed,

means for rotating said drafting rolls, the front pair of rolls at a greater peripheral speed than the back pair of rolls to effect said drafting of the roving,

means for supplying a tensioned elastic core yarn upon the roving and between the nips of the front pair of rolls,

the improvement comprising,

a bifurcated yarn guide member having a concave face for mating with the front pair of drafting rolls,

the two branches of said bifurcated member providing a contiguous upper notch and lower notch which opens into the nips of said front pair of rolls, the upper notch for holding the tensioned elastic core yarn and the lower notch for holding the roving, one in close proximity to the other,

said lower notch having greater width than that of the upper notch and which notches maintain the relative

positioning of the core yarn and roving one in regard to the other while these are laterally traversed upon the front pair of rollers and core spun to form a composite yarn.

2. In an apparatus combination for covering an elastic core yarn by drafting a roving of non-elastic textile fibers and twisting same about said core yarn wherein is provided

a plurality of pairs of drafting rolls, including a front pair of rolls and a back pair of rolls between the nips of which the roving is drafted and laterally traversed,

means for rotating said drafting rolls, the front pair of rolls at a greater peripheral speed than the back pair of rolls to effect drafting of the roving.

means for supplying a tensioned elastic core yarn upon the roving and between the nips of the front pair of rolls,

the improvement comprising

a bifurcated yarn guide member having a pair of concave faces which mate with the convex surfaces of the front pair of drafting rolls,

the two branches of said bifurcated member providing a contiguous upper notch and lower notch which opens into the nips of the said front pair of drafting rolls,

the upper notch for holding the tensioned elastic core yarn and the lower notch for holding the non-elastic fiber roving,

said lower notch ranging in width from about 1.5 to about 10 times the width of the upper notch, which relative sizes of the notches maintain proper positioning of the core yarn and roving while these are laterally traversed upon the front pair of rolls and core spun to form a composite yarn.

3. The apparatus of claim 2 wherein the width of the lower notch is approximately twice the width of the upper notch.

4. The apparatus of claim 2 wherein the upper notch is offset to the right of the lower notch.

5. The apparatus of claim 2 wherein the upper notch is off-set to the left of the lower notch.

6. In a process for producing a composite stretch yarn wherein is provided a roving of textile staple fibers which is drafted and broken into a continuous ribbon of staple length fibers, and wherein is supplied a tensioned elastic core yarn, and wherein the roving is twisted about the tensioned elastic yarn to form a covered elastic yarn, the improvement comprising passing the elastic yarn through an upper zone of substantially similar lateral dimenisons as the diameter of the elastic yarn and immediately upon the drafted roving, and passing a roving through a lower zone adjacent and contiguous to said upper zone, which zone is of greater width than said upper zone and substantially of the same lateral dimensions as said roving.

7. The process of claim 6 wherein the centerline of core yarn is offset from the centerline of the roving.

8. The process of claim 6 wherein the centerline of the core yarn coincides with the centerline of the roving.

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