

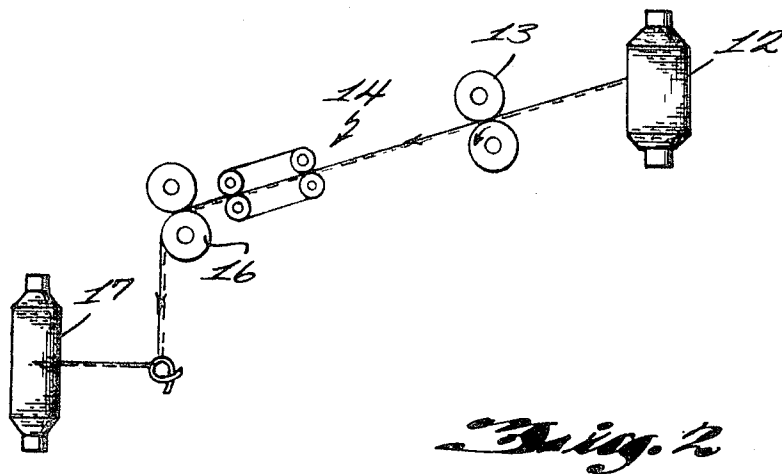
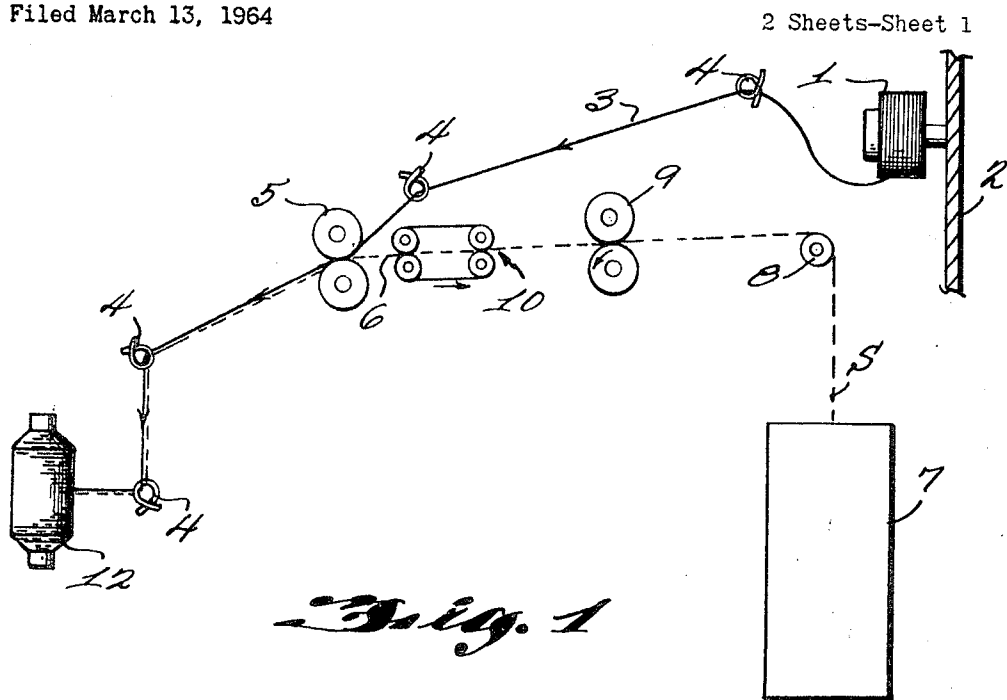
Aug. 12, 1969

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3,460,338

STRETCH YARN

Filed March 13, 1964



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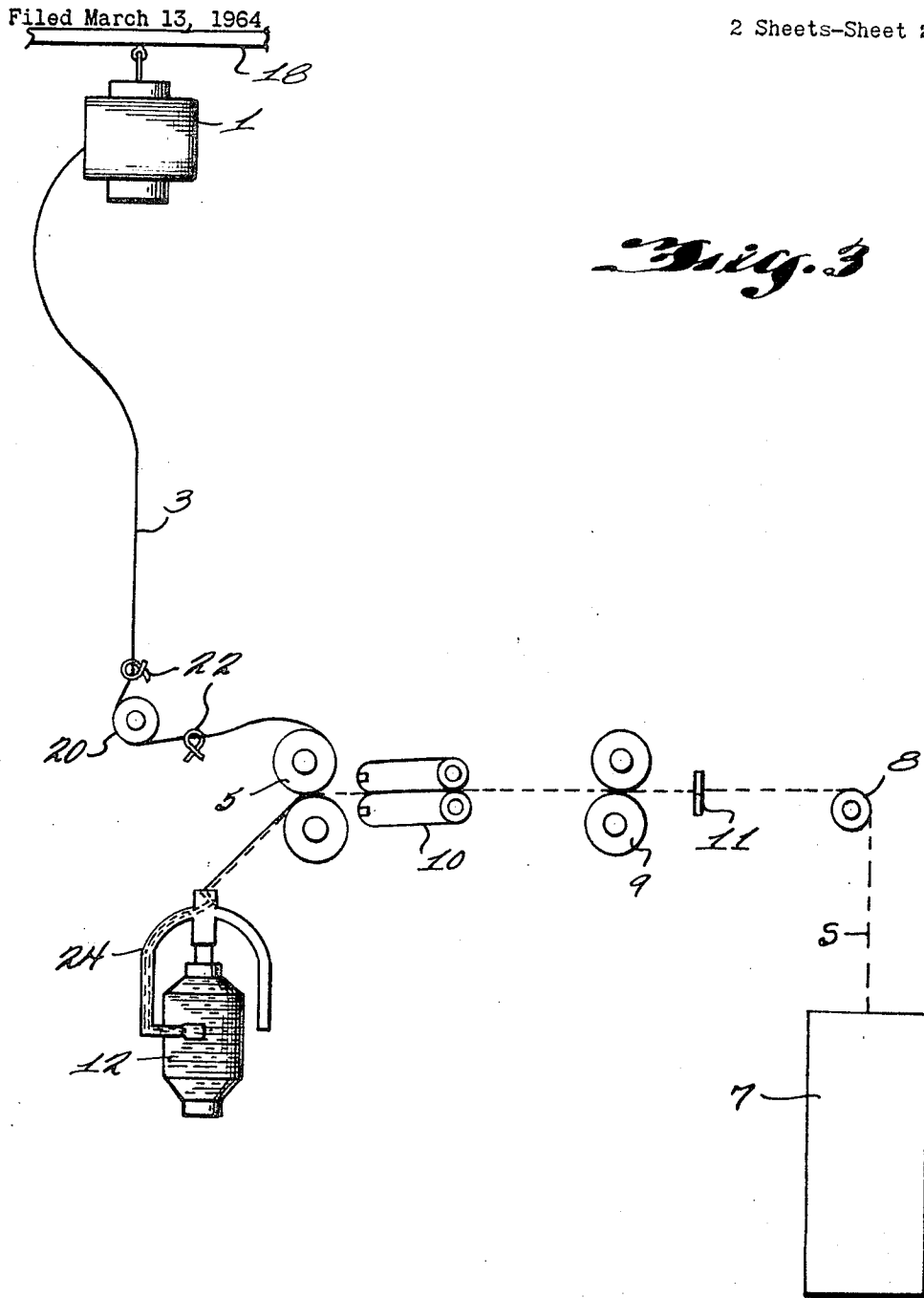
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STRETCH YARN

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15 Claims

ABSTRACT OF THE DISCLOSURE

A stretch yarn prepared by drafting fibers on a roving frame and feeding on elastic yarn into the resulting fibers. The combined roving and elastic yarn are then drafted on a spinning frame.

The present invention relates to the preparation of stretch yarn comprising an elastic core covered with a sheath of staple fibers.

The preparation of an elastic high-bulk yarn by core spinning one or more rovings about an elastic core is described in U.S. Patent 3,038,295. In the process described in said patent, the roving is drafted in the drafting zone of a spinning frame and the elastic core, which may comprise one or more spandex filaments or the like, is inserted into the drafted roving just behind the front draft rolls of the spinning frame. The thus combined drafted roving and core are then twisted as they pass through the front rolls to give the desired stretch yarn comprising elastic core covered with a sheath of roving fibers.

The spandex or elastic yarn used as the core in the process referred to above, is taken from an appropriate creel or like supply, usually positioned above the spinning frame, and it is stretched to the desired length before being fed into the drafted roving at the front draft rolls of the spinning frame. This presents a number of processing and operational disadvantages as noted in more detail below. Accordingly, the principal object of the present invention is to provide a novel way of preparing stretch yarn of the type indicated wherein prior problems are obviated. Other objects will also be hereinafter apparent.

More particularly, the invention contemplates the preparation of stretch yarn as indicated by inserting the spandex or elastic core material under essentially no tension into a sliver as the latter is being processed on the roving frame. In a particular embodiment, the invention contemplates adding the core material at a point directly behind the front rolls of a roving frame. At this stage, only partial drafting has occurred, drafting being subsequently completed in the drafting zone of a spinning frame on the combined roving and core obtained from the roving frame. As will be appreciated, this is basically and critically different from the process of 3,038,295 where the core is inserted just behind the front rolls of the spinning frame, i.e. at a point where the roving has been substantially completely drafted.

The present process has several advantages over the prior procedure discussed above. For one thing, the invention eliminates the need for special creel means or the equivalent for stretching the spandex before its introduction into the roving. Elimination of the stretching operation obviates or reduces breakage and the problems incident thereto. In fact, with the present arrangement, breaks are self-healing. Additionally, the invention makes it possible to use any conventional roving and spinning frame for preparation of the stretch yarn contemplated herein. Furthermore, it has been found that drafting of the spandex or the like with the roving results in a product having superior coverage characteristics in that the core is positioned better in the center of the roving. This is especially

important in the case of fine count yarns (e.g. 1/30s worsted system or finer) where the invention results in a substantially reduced amount of "grin" in fabric containing the present yarns. In the past, "grin" has presented a real problem, especially in the case of fine count yarns, because spandex has a different dye index from the sheath fibers and tends to show through the fabric surface. Other advantages of the present invention include eliminating the breakage problems presented.

The present process may be described as one comprising the following steps: introducing the spandex or elastic core in the relaxed condition, or under very little tension (e.g. sufficient only to position the elastic core in the roving) into substantially the center of roving at a point behind the front rolls of a roving frame; creeling or otherwise collecting the combined roving and core; drafting the thus collected roving and core in the drafting zone of a spinning frame and twisting the resulting product into stretch yarn. Stated another way, the process involves introducing sliver into the drafting zone of a roving frame and drafting the sliver to form a partially drafted roving; feeding the essentially unstretched core yarn into the partially drafted roving; completing the drafting of the roving after adding the core yarn thereto and then spinning a stretch yarn from the thus drafted roving and core yarn. It will be recognized that the amount of drafting carried out on the roving frame and spinning frame will vary depending on other operating factors, e.g. the type and denier of the spandex yarn, the nature of the sheath fibers, etc. However, generally speaking, it may be said that the combined roving and core will be drafted in the range of around 1-6 times in the drafting zone of the spinning frame. In the roving frame, the sliver may be drafted in the range of 10 to 25 times although the amount of drafting may be outside this range depending on the materials used, as indicated above.

The invention is described in more detail by reference to the accompanying drawings wherein:

FIGURES 1 and 2 are schematic representations of the operations on the roving frame and spinning frame, respectively; and

FIGURE 3 is a schematic view of another modification of the invention showing a preferred way of feeding the core yarn to the roving frame.

Referring more particularly to the drawings, FIGURE 1 shows a package 1 of spandex or the like in monofilament or multifilament form, creeled on an end-over-end type creel 2. The spandex 3 is threaded through a series of tension guides 4 into the back of the front draft rolls 5 of a conventional roving frame. At this point, the spandex is fed in the relaxed or essentially tension-free condition into the roving, designated by the numeral 6. Preferably, but not necessarily, the core is fed into the center of the roving.

Sliver S, from which the roving 6 is prepared, is fed from a sliver can 7 across a lifter roll 8, between the back draft rolls 9 of the roving frame and then through the draft zone 10 to the point where it is joined with the spandex 3. At this point, the combined roving and spandex are passed through the front draft rolls 5 onto a conventional roving bobbin 12. As a typical example, the spandex may be 70 denier monofilament polyurethane and the sliver may be a wool sliver having a weight of 35 grs./yd., the sliver being drafted with a 21 draft into a 7.5 hank roving. Obviously, however, other combinations may be used.

As shown in FIGURE 2, the roving bobbin 12 containing the resulting composite strand of staple fibers and spandex is processed on a conventional spinning

frame by passing the composite through the back draft rolls 13, apron draft zone 14 and then out between the front draft rolls 16 onto a conventional spinning bobbin 17. Typically, the amount of drafting in the spinning frame drafting zone is in the range of 1-6 depending upon the elastic properties of the spandex fiber being used. For example, in the specific illustration given above using 70 denier monofilament polyurethane and a wool sliver drafted into a 7.5 hank roving, the hank roving may be drafted on spinning four times to give a 1/30s stretch yarn. The resulting product comprises a highly desirable stretch yarn having an elastic core covered by a sheath of staple fibers.

The sliver or roving used herein to provide the sheath around the elastic core may comprise any textile fiber available in staple form. This includes the natural fibers such as cotton and wool, and synthetic fibers, such as rayon, nylon, polyacrylonitrile, polyethylene terephthalate, etc. Blends of two or more of these fibers may be used, for example 50/50 mixtures of wool or cotton and polyethylene terephthalate or like polyesters.

The elastic core may comprise any commercially available spandex type material in monofilament or multifilament form. A polyurethane elastomer thread is especially desirable for use herein. One example of a suitable polyurethane elastomer is disclosed in U.S. Patent 2,953,839. Others are described in U.S. Patents 2,813,775, 2,813,776, 2,957,852 and British Patent 779,054. The amount of core elastomer used can be widely varied depending on the end use contemplated but, as an illustration, it may be said that the core may advantageously constitute 2-8% by weight of the finished yarn and usually it is not necessary to go beyond a 30-40% core content.

The amount of twist in the final product can also be varied depending, for example, on the degree of bulkiness desired, etc. Usually, however, the twist is such as to give a twist multiplier factor below 4 according to U.S. Patent 3,038,295.

Stretch yarn of any desired weight or count may be prepared according to the invention. Especially advantageous results are obtained in the production of fine count yarns as aforesaid where prior problems of "grin" are obviated.

The elastic yarns of this invention are useful in woven, knitted and non-woven fabrics for use in wearing apparel, e.g. socks, shirts, suits, etc.; household and industrial products, such as sheets, upholstery, tapes and webbings; and medical and surgical products such as bandages, elastic dressings, surgical stockings and the like.

The amount of stretch yarn used in the abovementioned products will depend on various factors such as the degree of stretch desired. In many cases, a stretch in the area of 15-25% is satisfactory although a stretch outside this range may be desirable in some situations depending on the fabrics involved and uses contemplated.

Typical elastomer and sheath combinations used herein may be, for example, 70 or 140 denier monofilament and/or multifilament polyurethane core (such as Lycra or Vyrene) covered with 100% wool staple to give products having a core content of 2-10% and a twist multiplier in the area of 2-4.

While the embodiment shown in FIGURES 1 and 2 is satisfactory, the modification shown in FIGURE 3 is preferred for use herein because the system illustrated in FIGURE 3 insures that the spandex or elastic core yarn will be kept in the relaxed condition as it is unwound from its supply package and fed into the roving behind the front rolls of the roving frame. It is extremely difficult to maintain consistent tension conditions on the core yarn as it is unwound and fed into the roving due primarily to the relatively high speed of the front rolls 5. However, highly effective and consistent results are obtained using the arrangement shown in FIGURE 3 where-

in the package 1 of spandex or elastic core yarn 3 is supported by a creel 18 holding the package in an upright position, the yarn being pulled end-over-end by a feed roll 20 of aluminum or the like and held in desired position by guides 22. Spandex yarn has a tremendous frictional force or attraction for metal such as aluminum which requires that the yarn only touch approximately 120° of the surface of roll 20 for satisfactory operation. As the roll 20 pulls the yarn end-over-end from package 1, the yarn has a tendency to unwind with a wide tension variation, but if the package is suspended at least 2½ feet from the feed roll 20, this tension variation levels out before it is released by the roll. A slight overfeed of approximately 105-115% is ideal between feed roll 20 and front roll 5 to insure that the yarn is in the relaxed state.

As the sliver S is fed from a silver can 7, it passes over the lifter roll 8 and sliver guide 11, between the back draft rolls 9, through the apron roll zone 10 into the bit of the front rolls 5 where it is joined by the spandex or elastic yarn 3. At this point, the sliver is in a wide ribbon sheet formation which makes it very easy to place the core yarn somewhere on top of the sliver sheet formation. It is not necessary to place the core yarn directly in the center of the sheet because as the twist is inserted, the core yarn is automatically thrown to the center. As the staple fibers and core yarn are delivered from the front rolls 5 of the roving frame, the composite product passes through a conventional flyer 24 and is wound onto the roving bobbin 12. From this point on, the composite of staple fibers and core yarn is processed on the spinning frame system illustrated in FIGURE 2 or the equivalent in the manner indicated heretofore.

Various other modifications may be made in the invention described herein. Hence, the scope of the invention is defined in the following claims wherein.

It is claimed:

1. A process for preparing a stretch yarn which comprises introducing a sliver of staple fibers into the drafting zone of a roving frame; feeding an elastic core into the resulting roving on the roving frame; collecting the combined roving and core; drafting the thus collected roving and core on a spinning frame; and spinning a yarn from the drafted roving and core.

2. The process of claim 1 wherein the core is fed into the roving in an essentially tension-free condition.

3. The process of claim 2 wherein the elastic core is fed into substantially the center of the roving at a point just behind the front draw rolls of the roving frame.

4. The process of claim 1 wherein said roving is drafted from 1-6 times on the spinning frame.

5. A process for preparing a stretch yarn which comprises introducing a sliver of staple fibers into the drafting zone of a roving frame; feeding an elastic core into said fibers on the roving frame; collecting the thus combined fibers and core and drafting the collected composite on a spinning frame; and then spinning a stretch yarn from the thus drafted composite product.

6. The process of claim 5 wherein said elastic core yarn is fed into said staple fibers on the roving frame in the relaxed condition.

7. The process of claim 6 wherein said core yarn is withdrawn from a supply above the front rolls of the roving frame by a feed roll positioned intermediate said supply and said front rolls, the supply being at least 2½ feet away from the feed roll.

8. The stretch yarn product obtained by the process of claim 1.

9. The stretch yarn product obtained by the process of claim 5.

10. Method of making a yarn having an elastomeric core of continuous filament and a covering of staple fibers, the method comprising associating the core in an approximately unextended condition with a roving of the staple fibers so as to form a composite roving, winding this into a supply package, and subjecting the composite roving

5

from the supply package to a drafting operation in which the core filament is extended and then to a twisting operation to form a yarn.

11. Method of making a yarn having an elastomeric core and a covering of staple fibers, the method including as to the staple fibers successive stages each comprising a drafting step followed by a winding step, the method being characterized by bringing the elastomeric core into association with the staple fibers before the winding step of a stage before the last of such stages, so that in the last of such stages the core, as a part of a composite roving is subjected to the elongation of the drafting imparted to the staple fibers.

12. Method of making a yarn having an elastomeric core and a covering of staple fibers, the method including as to the staple fibers successive stages each comprising both drafting and twisting steps, the method being characterized by associating the elastomeric core with the staple fibers before the twisting step of a stage preceding the last of such stages so as to tend to equalize residual twist remaining in the core and in the staple fibers at the end of the drafting of the last of said stages.

13. Method of making a yarn having an elastomeric core and a covering of staple fibers, the method including as to the staple fibers successive stages each comprising both drafting and twisting steps, the method being characterized by associating the elastomeric core in an approximately twistless condition with the staple fibers before the twisting step of a stage preceding the last of said stages, so that both the core and the staple fibers are subjected to the twisting step of said preceding stage and are subjected to the drafting action of said last stage.

6

14. Method of making a yarn having an elastomeric core and a covering of staple fibers comprising subjecting the staple fibers to a roving operation including twisting and winding, introducing the core so that it participates in said twisting and winding along with the staple fibers, then spinning the core and staple fibers including drafting, twisting and winding.

15. Method of making a yarn having an elastomeric core of continuous filament and a covering of staple fibers, the method comprising associating the core in an approximately unextended condition with a roving of the staple fibers so as to form a composite roving, twisting this roving and winding the twisted roving into a supply package, and subjecting the composite roving from the supply package to a drafting operation in which the core filament is extended and then to a twisting operation to form a yarn.

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