July 16, 1968 H. J. WOODS 3,392,521

METHOD OF MAKING STRETCH YARN

Filed March 13, 1964

Fig. 1

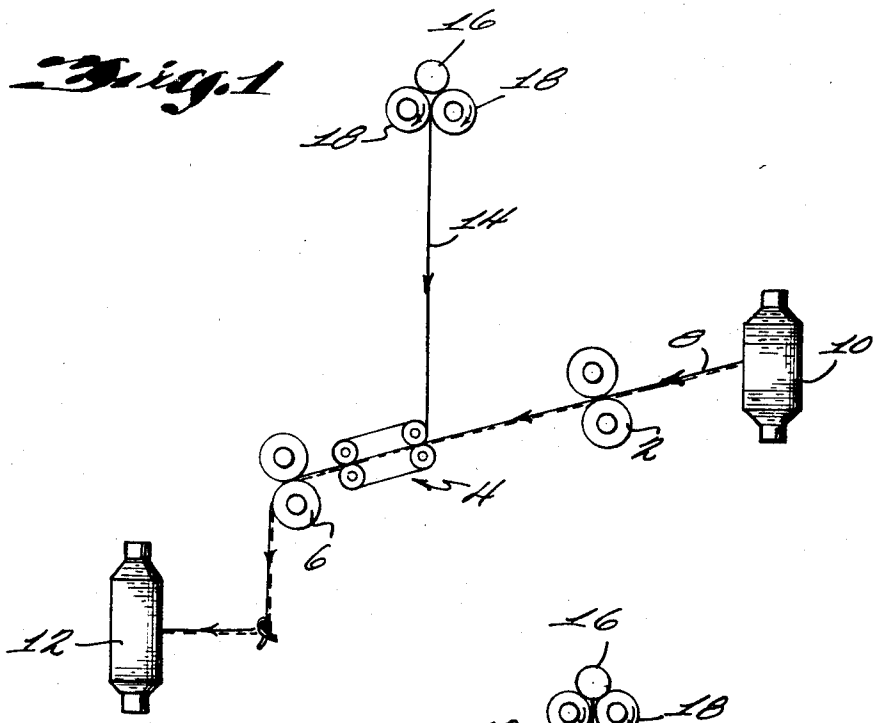
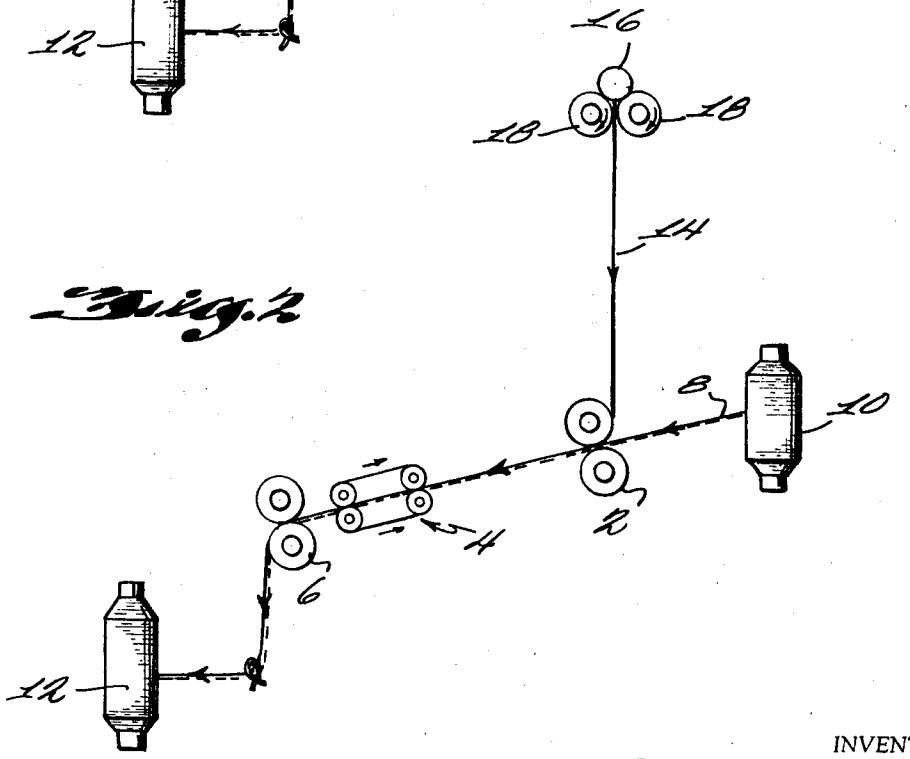


Fig. 2



INVENTOR.
HERBERT J. WOODS
BY
Cushman, Darby & Cushman
ATTORNEYS

United States Patent Office 3,392,521
Patented July 16, 1968

3,392,521

METHOD OF MAKING STRETCH YARN

Herbert J. Woods, Greensboro, N.C., assignor to Burlington Industries, Inc., Greensboro, N.C., a corporation of Delaware

Filed Mar. 13, 1964, Ser. No. 351,646
7 Claims. (Cl. 57—163)

ABSTRACT OF THE DISCLOSURE

A process for making a stretch yarn which includes the step of feeding an elastomeric core yarn through feed rolls to insure that it is fed in an untensioned condition into a roving of staple fibers which composite is subsequently drafted and spun.

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 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 behind the front draft rolls of the spinning frame. This presents a number of operational disadvantages. For one thing, the process requires the elastic yarn to be initially stretched to a considerable degree (e.g., 100–600% its relaxed length) before it is fed into the roving at the front rolls of the spinning frame. In view of this, breakage may occur and if this happens, it is difficult to locate the broken end and rethread the same into the apparatus without discontinuing operation of the entire frame. Additionally, it is difficult for the operator of the frame to work around the stretched elastic yarn between its supply and the front rolls as he carries out other necessary operations, e.g., creeling the roving in the spinning creel. Another problem results from the fact that the core yarn is unwound by simply resting the yarn package or supply on a pair of parallel driven cylinders and there is considerable slippage of the package on the unrolling cylinders due to the stresses involved and vibration of the frame.

In view of the foregoing, the principal object of the present invention is to provide a novel method for preparing stretch yarn of the type indicated whereby prior art problems are eliminated. Other objects will also be hereinafter apparent.

Broadly stated, the present invention contemplates preparing stretch yarn of the kind mentioned by feeding the elastic yarn under little or no tension (i.e., sufficient only to avoid slack and to properly position the yarn) into the roving while the latter is being drafted on the spinning frame so that the desired degree of stretch in the core yarn is obtained simultaneously and in conjunction with the drafting of the roving. This may be accomplished by introducing the elastic core yarn into the roving in the drafting zone of the spinning frame, i.e., behind the drafting apron, if such apron is used, behind the back rolls or behind an intermediate pair of rolls as desired rather than behind the front rolls of the spinning frame where the roving has been completely drafted by the time the core is added thereto.

The invention is more fully described with reference to the accompanying drawings wherein FIGURES 1 and 2 are schematic representations of two alternative arrangements for carrying out the present process.

Referring more specifically to the drawings, FIGURE 1 shows a conventional type of spinning frame including the back rolls **2**, drafting apron **4**, which may also take the form of an intermediate pair of rolls or the equivalent, and the front rolls **6**. As shown, roving **8** is taken off package **10** and fed through the back rolls **2**, the apron **4** and front rolls **6** onto a conventional spinning bobbin or package **12**.

The elastic core yarn **14** is unwound from the package **16** by the two parallel cylinders **18** which are driven at a delivery speed sufficient only to keep the yarn in motion while avoiding any significant sag. As shown in FIGURE 1, the yarn **14** is fed into the roving behind the drafting apron **4** so that the resulting composite of core yarn and roving is drafted between apron **4** and front rolls **6**. It will be appreciated that the amount of drafting will vary widely depending upon other operating factors but the amount of draft should, in any case, be selected to simultaneously give the desired elongation in the core and the required draft. In other words, the draft is so adjusted in relation to the roving and the yarn to be produced that the desired stretch ratio (e.g., 1–6 times the original unrelaxed elastic core length) is obtained along with the required drafting. This type of operation offers greater uniformity in the final product and if there is any breakage in the core yarn due to stresses in drafting, the breaks are self-healing and there is no necessity for stopping the frame to rethread.

It will be recognized that some drafting of the roving may also be accomplished between the back rolls **2** and the apron **4**. This may be desirable to provide for minor count regulation or correction by changing the speed of the back rolls with respect to the drafting apron **4**, or its equivalent, through appropriate gear means or the like. Thus, for example, if a 16/1 yarn (worsted system) having a core yarn stretched 400% is being prepared, a 4.00 hank roving may be run single creel using a draft of 4.00 between the front rolls **6** and the apron **4** and only a token break draft of tension amounting to approximately 1.05 to 1.09 may be employed between the apron **4** and back rolls **2** with minor adjustment in the back rolls as necessary to give the desired product.

In FIGURE 2, the elastic core yarn is fed into the roving behind the back rolls **2** rather than behind the apron **4** as in FIGURE 1. Other possible modifications include, as indicated above, replacing the drafting apron **4** with one or more sets of intermediate rolls or other equivalent drafting means.

The 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; British Patent 779,054 and 2,957,852. The amount of core elastomer used can be widely varied depending on the end use contemplated but, as an illustra-

tion, 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 yarns of any desired weight or count using various combinations of elastomer and sheath fibers may be prepared according to the invention. Thus, for example, single 20s or single 15s stretch yarn may be prepared using selected combinations of elastomer and sheath fibers as noted above with the appropriate amount of drafting and core stretch during drafting. 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. As an illustration, the elastomer yarn **14** in FIGURE 1 may be 100 denier spandex (e.g., Lycra) and the roving **8** taken off package **10** may be, for example, wool, cotton or Orlon, drafted 4 to 5 times in the drafting zone, the core yarn being stretched 4 to 5 times during drafting. The final product may have a twist multiplier factor of 1.50 to 4.50 with about 6.09% by weight of core yarn, with 100 denier spandex.

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 above-mentioned 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.

It is believed that the advantages of the invention will be apparent from the foregoing description. For example, with the elastic yarn being unwound in a slack form from its creel or package, there is no slippage of the package thus insuring greater uniformity of delivery. Additionally, any breakage in the core due to stretching occurs between rolls in the normal drafting system so that the broken end pieces itself up. This avoids the necessity for stopping the frame and going through all the difficulties of finding the free end and getting the end properly threaded with the frame standing idle. Additionally, the invention is not limited to using any particular drafting method. Thus, the drafting method can be either conventional spinning, two apron or Casablanca spinning, one apron or Roth spinning, one apron or Z spinning Bradford, or any other such drafting arrangement.

Obviously, various modifications may be made in the invention as described above. For example, double rovings may be used to produce yarns of coarser count, the elastomeric yarn forming the core being fed between or beside the roving.

The scope of the invention is defined in the following claims wherein:

I claim:

1. A process for preparing stretch yarn which comprises introducing a roving of staple fibers into the drafting zone of a spinning frame; unwinding a polyurethane core yarn from a package by passing the core yarn between two parallel cylinders driven at a speed sufficient only to keep the core yarn in motion while avoiding any significant drag, whereby the unwound core yarn is essentially relaxed; feeding the essentially relaxed elastomeric core yarn into the roving at any stage prior to completion of the drafting on said frame; drafting the roving and core yarn together and spinning a yarn from the thus drafted roving and core yarn.

2. The process of claim **1** wherein the core yarn is fed into the center of said roving.

3. A process for preparing a stretch yarn which comprises unwinding a polyurethane core yarn from a package by passing the core yarn between two parallel cylinders driven at a speed sufficient only to keep the core yarn in motion while avoiding any significant drag, whereby the unwound core yarn is essentially relaxed, feeding the essentially relaxed elastomeric core yarn into a partially drafted roving, completing the drafting of said roving and spinning a yarn therefrom.

4. A process for preparing a stretch yarn which comprises unwinding a polyurethane core yarn from a package by passing the core yarn between two parallel cylinders driven at a speed sufficient only to keep the core yarn in motion while avoiding any significant drag, whereby the unwound core yarn is essentially relaxed, introducing the essentially relaxed elastomeric core yarn into a roving of staple fibers, drawing the combined roving and core yarn and spinning a yarn therefrom.

5. The process of claim **4** wherein the roving and core are drawn from 1–6 times.

6. The process of claim **1** wherein said drafting zone includes a drafting apron and the core yarn is fed into the roving just before said apron.

7. The process of claim **1** wherein said spinning frame includes a pair of back rolls and the core yarn is fed into the roving before said back rolls.

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STANLEY N. GILREATH, *Primary Examiner.*

DONALD WATKINS, *Examiner.*