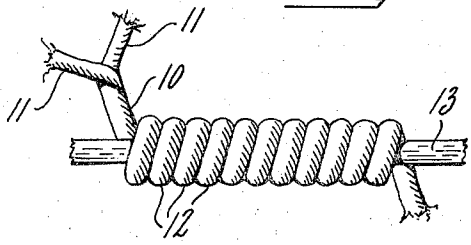
Oct. 23, 1945. N. HADDAD 2,387,321

METHOD OF MAKING HIGHLY STRETCHABLE TEXTILE YARN

Filed Nov. 22, 1944

Fig. 1



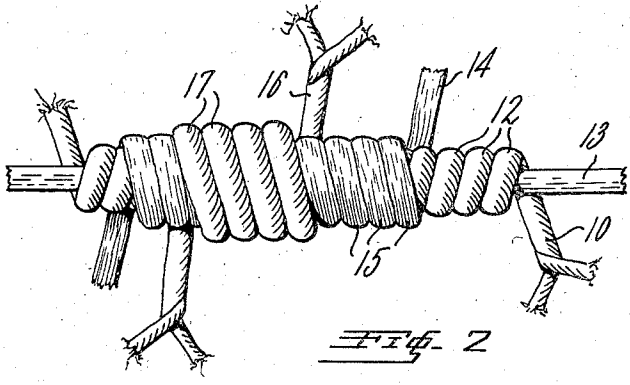


Fig. 2

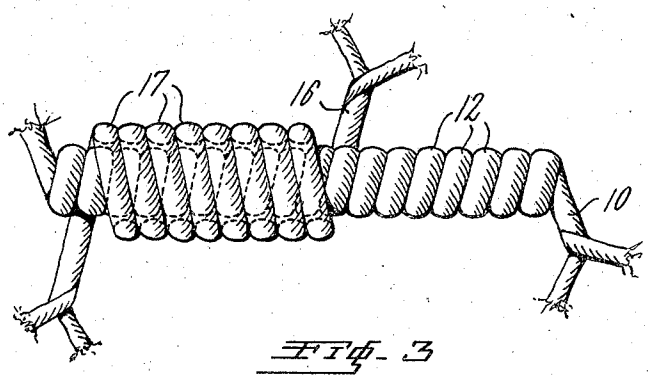


Fig. 3

INVENTOR.
NASSIB HADDAD
BY
Lester E. Bradley
ATTORNEY

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METHOD OF MAKING HIGHLY STRETCHABLE TEXTILE YARN

Nassib Haddad, Iselin, N. J., assignor to United States Rubber Company, New York, N. Y., a corporation of New Jersey

Application November 22, 1944, Serial No. 564,566

4 Claims. (Cl. 57—160)

This invention relates to a method of making an all textile yarn having high stretch characteristics and good contractive action, and more particularly to a method of improving the highly stretchable yarn described and claimed in the Boutwell H. Foster application, Serial No. 548,268 filed August 5, 1944.

High stretch or crepe yarns having a twist two or three times that of ordinary yarns of the same material are well known. These crepe yarns as constructed heretofore have a stretch range up to about 50% and a comparatively weak and slow return, and they are usually difficult to handle as they tend to buckle, kink and snarl when relieved from tension. This tendency of such yarns to kink makes them difficult to work and is the cause of much annoyance and loss of time.

The yarn contemplated by the above cited Foster application has an elastic extensibility range that is greater than that of the crepe yarns employed heretofore, and this increase in stretch range is secured without imparting to the yarn a serious tendency for the same to kink or snarl.

The said Foster application discloses several different types of all-textile yarn having good stretch characteristics, and one of the highly stretchable yarns disclosed in such application is a balanced elastic yarn, formed of a crepe yarn having a large number of helical coils, wound in the direction of its twist, and a second crepe yarn twisted in the opposite direction and having a large number of helical coils wound in the direction of its twist over the first helical coils.

The present invention contemplates a method of improving such balanced stretchable yarn of the Foster application.

In the construction just described of the Foster application the outer yarn is wound over the coils of the inner yarn in direct contact therewith, with the result that the frictional engagement between the outer and inner coils tends to interfere to some extent with the stretching and retraction of this highly stretchable yarn.

The present invention contemplates a method of constructing such highly stretchable yarn whereby a clearance space is provided between the inner and outer coils so as to lessen the friction therebetween as the yarn is stretched and retracts. In carrying out the present method a temporary cover of any desired thickness is provided between such inner and outer coils to thereby determine the size of the clearance space between such coils. Then after the operation of winding the outer crepe yarn helically about such cover is completed the temporary cover and the core yarn are destroyed. Thus the desired clearance space is provided between the remaining inner and outer coiled crepe yarns which together form a balanced yarn having high extensibility and good retraction. A yarn constructed in accordance with the present method may have any desired range of stretch, i. e., extensibility, from 50% to 300% or more.

The above and other features of the present invention will be more fully understood from the following description when read in connection with the accompanying drawing illustrating the steps involved in carrying out the present method.

In the drawing:

Fig. 1 is a side elevation of an unbalanced coiled yarn constructed in accordance with an initial step employed in carrying out the present method.

Fig. 2 is a side elevation showing the unbalanced yarn of Fig. 1 after a temporary second cover and a third cover have been wound thereupon; and

Fig. 3 shows the construction of Fig. 2 after the core yarn and second cover have been removed to leave a central hole and a clearance space between the inner and outer windings of the crepe yarns.

Each crepe yarn used in constructing the highly stretchable yarn contemplated by the present invention may be formed of a single yarn or of a ply yarn as desired and may be formed of any preferred or well known textile fibers or filaments, such as cotton, wool, silk, or rayon. Such highly twisted or crepe yarn, designated by 10 in the drawing, is shown as a ply yarn formed by twisting together in the usual manner two ordinary single yarns 11 and giving them a high twist or crepe twist corresponding to a twist multiplier which is preferably from two to three times as high as that of the ordinary yarn of the same material. A high twist corresponding to a twist multiplier of from 7 to 8 has been found to be especially good. The number of twists per unit length of the yarn 10 may, however, vary considerably depending upon the nature and size of the yarn used and the amount of stretch desired in the finished highly stretchable yarn.

In carrying out one step of the present invention the highly twisted or crepe yarn 10 is coiled helically in the direction of its twist about a central axis to form the helical coils 12, and it is extremely important that the coils 12 be wound in the same direction as that in which the yarn 10 is twisted. For example, if the yarn 10 has an S twist, then the coils 12 likewise should be in the S direction.

In the construction shown the crepe yarn 10 is coiled helically upon a core yarn 13. The core yarn should be formed of a different type of fiber or filament from that of the yarn 10 so that the core yarn 13 may be chemically destroyed without injuring the crepe yarn 10, thus permitting the twisted and coiled yarn 10 to be stretched.

After the core 13 has had the yarn 10 wound helically thereupon as shown in Fig. 1, a second

cover, also of destructible material, is wound directly about the helical winding 12 of the first cover, either in the same direction or in the opposite direction. Such second cover may be formed of a yarn 14 of any desired size wound helically about the coils 12 as indicated by 15.

Over this second cover formed of the coils 15 is wound a highly twisted or crepe yarn 16 so as to form a third cover formed of the coils 17. It is highly important that the twist of the yarn 16 be in the opposite direction to that of the yarn 10 and it is also highly important that the helical coils 17 shall extend in the opposite direction to the coils 12, to form the balanced construction shown in Figs. 2 and 3 of the drawing. For example, if the twist and the coiling of the yarn 10 are in the S direction, then the twist and the coiling of yarn 16 should be in the Z direction.

The three covering yarns 10, 14, and 16 may conveniently be applied to the core yarn by means of covering machines having one bank of spindles or two or three banks of coaxial spindles, as will be apparent to those skilled in the art.

The range of stretch inherent in the helically coiled yarn 10 will depend largely upon the size of the coils 12, and the size of these coils depends upon the size of the core 13. When a long-stretch yarn is desired a large core 13 should be used and when a short-stretch yarn is desired a small core 13 should be used.

After the construction shown in Fig. 2 of the drawing has been formed the core 13 and the second cover 15 are dissolved away so that they will not interfere with the stretching of the helically wound yarns 10 and 16 and so that the desired clearance space is provided between the inner coils 12 and outer coils 17, thereby lessening the tendency of the coils 12 and 17 to interfere with each other when the balanced highly stretchable yarn shown in Fig. 3 is stretched or permitted to retract. As a result of this method of construction it follows that, when the compound yarn of Fig. 3, comprising the helical coils 12 and 17, is elongated, the effect will be to increase the twist in the already highly twisted yarns 10 and 16, thus setting up forces which tend to cause the compound yarn to return smoothly to its original length when the tension is released.

In order that the construction contemplated by the present invention may be further understood, the following example is given.

Construction of Fig. 2

Materials:

Core: 2 ends of 150 den. acetate yarn
First cover: 1 end of 80 S/2 cotton yarn of S twist
Second cover: 1 end of 150 den. acetate yarn
Third cover: 1 end of 70 S/2 cotton yarn of Z twist

Yarn analysis:

Yards per pound	1,370
Overall gauge—inches	.029
Twist of yarn 10, per inch	45S
Wraps of yarn 10, per inch of core 13	107S
Length of yarn 10 in 1 yd. of covered core yarn—inches	158
Twist of yarn 16, per inch	45Z
Wraps of yarn 16, per inch of core 13	112Z
Length of yarn 16 in 1 yd. of covered core yarn—inches	320

Construction of Fig. 3

Yarn analysis:

Yards per pound	2,370
Range of useful elongation—Per cent—up to	230
Elongation at break—do	285
Breaking load—grams	340
Distance between gauge marks:	
Before dissolution of core—inches	36
After dissolution of core—do	37

If the core 13 and second cover 15 are formed of acetate yarn as indicated in the above example, and each of the first and third covers is formed of either cotton or viscose yarn, then the core 13 and cover 15 may be chemically destroyed without injuring the yarns 10 and 17, by soaking the construction of Fig. 2 in a solvent bath such as acetone and washing the treated yarn with fresh solvent until it is free of soluble cellulose derivative.

A highly stretchable yarn constructed in accordance with the present method will have a long stretch, i. e., high extensibility, and quick elastic recovery, but will have a lower elastic modulus than the usual rubber-covered elastic yarn. It is well adapted for use in light weight undergarments, bathing suits, tops of stockings, waist bands, etc.

Having thus described my invention, what I claim and desire to protect by Letters Patent is:

1. The method of making an all-textile yarn having high stretch characteristics, which comprises winding a crepe twist yarn about a destructible core yarn in the same direction as the twist of the crepe yarn to form a first cover, winding a destructible yarn thereover to form a second cover, winding a second crepe twist yarn that is twisted in the opposite direction to the first crepe yarn over said second cover in the same direction as the twist of the second crepe yarn to form a third cover, and thereafter destroying only said core yarn and second cover so that the remaining first and third covers together form a balanced yarn having high extensibility and rapid elastic recovery.

2. The method of making an all-textile yarn having high stretch characteristics, which comprises winding a crepe twist yarn about a core in the same direction as the twist of the crepe yarn to form a first cover, winding a destructible yarn thereover to form a second cover, winding a second crepe twist yarn that is twisted in the opposite direction to the first yarn over said second cover in the same direction as the twist of the second crepe yarn and opposite in direction to the windings of the first cover to form a third cover, and removing only said core and second cover so that the remaining first and third covers together form a balanced yarn having high extensibility and rapid elastic recovery.

3. The method of making an all-textile yarn having high stretch characteristics, which comprises winding a crepe twist yarn about a core in the same direction as the twist of the crepe yarn to form a first cover, winding a yarn thereover to form a second cover, winding a second crepe twist yarn that is twisted in the opposite direction to the first yarn over said second cover in the same direction as the twist of the second crepe yarn to form a third cover, and removing said core and second cover to provide a substantial space inside the first cover and a clearance space between the first and third covers so that

these two covers together will form a yarn having high extensibility and rapid elastic recovery.

4. The method of making an all-textile yarn having high stretch characteristics, which comprises winding a crepe twist yarn in touching helical coils about a core in the same direction as the twist of the crepe yarn, winding a yarn thereover to form a second cover, winding a second crepe twist yarn that is twisted in the opposite direction to the first yarn over the second cover in touching helical coils in the same direction as the twist of the second crepe yarn to form a third cover, and removing said core and second cover so that the remaining first and third covers together form a stretchable yarn having an extensibility of over 100 per cent.

NASSIB HADDAD.