

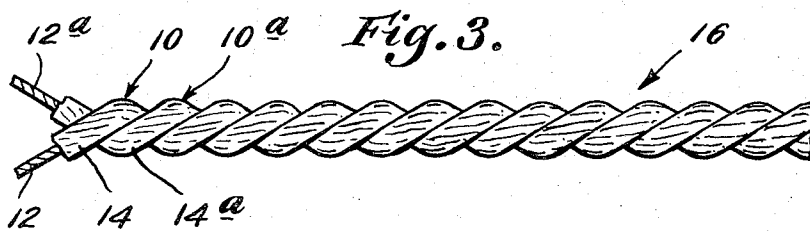
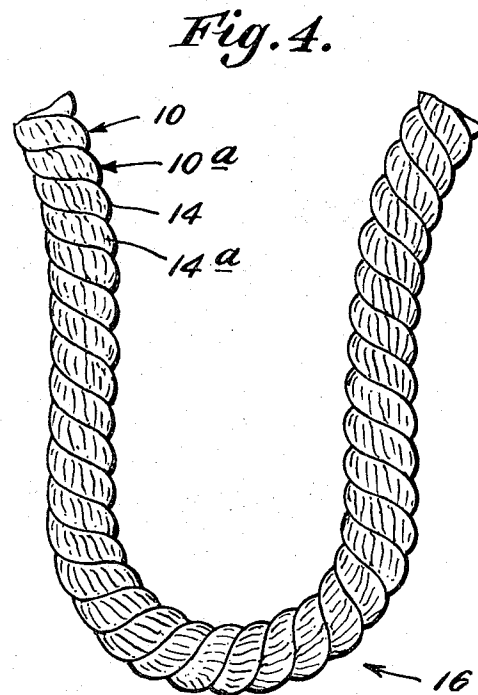
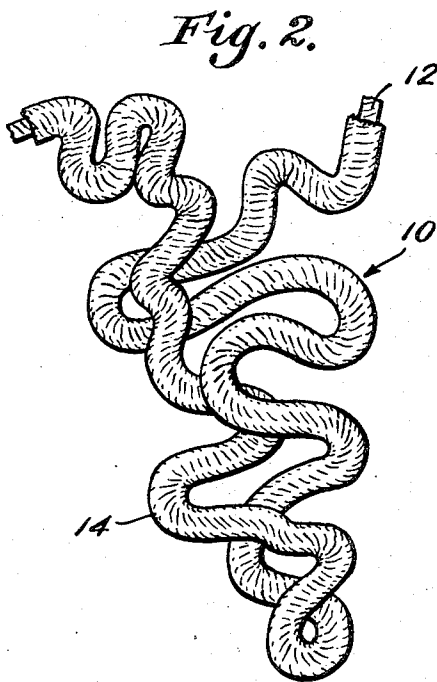
April 2, 1968

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3,375,655

ELASTICIZED YARN AND METHOD OF MAKING SAME

Filed July 26, 1965



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3,375,655

## ELASTICIZED YARN AND METHOD OF MAKING SAME

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Filed July 26, 1965, Ser. No. 474,981

5 Claims. (Cl. 57—140)

### ABSTRACT OF THE DISCLOSURE

A balanced elastic core-spun yarn comprising a plurality of individual elastic core-spun yarns each twisted in the same direction and having approximately the same number of turns per unit length, said individual yarns being twisted together while in an elongated state to provide a composite balanced yarn, the direction of twist of said composite yarn being opposite to that of said individual yarns, with approximately one-half the number of turns per unit length in said composite yarn as exists in the individual yarns.

Elasticized yarns have long been in use in connection with a wide range of products where stretch or resilience is a requisite. For example, such yarn has long been used in the manufacture of foundation garments, swim wear, support and surgical stockings, half-hose tops, and other wearing apparel, such as men's and boys' suits, slacks, sport coats, dress and sport shirts, walk shorts, rain wear, ski jackets, etc. Also, women's and children's dresses, blouses, slacks, walk shorts, sweaters, car coats, suits, ski wear, golf jackets, snowsuits, playsuits and the like are additional products that frequently require use of elasticized yarn. In addition, home furnishings, a wide variety of narrow fabrics, and numerous military and industrial end uses afford further market for elasticized yarn.

Until approximately five years ago, virtually the only elasticized yarn in conventional use was so-called covered-rubber yarn. Covered-rubber yarn, which is basically a balanced yarn, is made on rubber covering machinery, one type of such machine being known in the industry as the Arnold machine. When making rubber-covered yarn, it is necessary first to have a supply of spun yarn that is then fed to the rubber covering machine where it is rubber covered. The disadvantages of covered-rubber yarn are primarily its relatively high expense when considered with its relatively limited yield. Expressed differently, conventional rubber covering machinery can generally produce a maximum of 9,000 yards of covered-rubber yarn per pound, which, in the art, is a relatively limited yield.

In order to overcome the above discussed disadvantages of covered-rubber yarn, the industry has, in the past five years, turned to the development of so-called core-spun yarn. Core-spinning is a process in which a filament yarn is fed to the front drafting roll of a spinning frame where it is combined with a roving to produce a core yarn. This core yarn is formed as the staple fibers wrap around a core of filament yarn during twisting on the spinning frame. The basic requirement in producing a core-spun yarn with elastic qualities is to stretch the filament core yarn before entering the spinning frame. This will provide elasticity in the final yarn because the elastic core yarn relaxes when stress is removed. The core-spun yarn can be stretched to the point where the inelastic fibers in the outside sheath prevent further extension. Such stretchable yarns can be produced on worsted, cotton or wollen spinning systems.

With the advent of spandex yarns approximately five

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years or so ago, core-spun yarn has replaced covered-rubber yarn in certain applications for the basic reason that core-spun yarn impressively overcomes the cost and yield disadvantages of covered-rubber yarn. Also, since core-spun yarn is made on the same equipment that is making the spun yarn, i.e., core-spun yarn is made at the same time and in the same operation that the yarn is being spun, this represents a decided advantage over the manufacture of covered-rubber yarn, whereas, as afore-described, the spun yarn must first be made and then must be introduced to a rubber covering machine.

However, in spite of the many advantages of elasticized core-spun yarn, and the tremendous acceptance it has enjoyed in the industry, there are some definite disadvantages to this yarn and some definite limitations in its use. Specifically, it has been found that elasticized core-spun yarn is characterized by relatively pronounced kinking, which not only contributes to an unsightly appearance, but also makes the yarn somewhat difficult to handle. Because of these problems, it has heretofore not been practical to use elasticized core-spun yarn in connection with finely woven garments, nor has it been practical to combine elasticized core-spun yarn with regular yarn, since the former, because of its kinkiness, is noticeably different from the regular yarn, thus detracting from the appearance of the fabric. Attempts have been made to overcome these shortcomings in elasticized core-spun yarn, such as by heat stabilization, but these attempts have not proven to be completely satisfactory, and elasticized core-spun yarn, up until the present time, still experiences the aforesaid disadvantages and limitations.

It is therefore a primary object of the instant invention to provide an elasticized core-spun yarn that is characterized by a greatly reduced degree of kinking.

Another object of this invention is the provision of an elasticized core-spun yarn that is easier to handle.

A further object is the provision of an elasticized core-spun yarn that more closely approaches regular yarn in appearance and hence may be combined therewith in the manufacture of textile fabrics.

Another object is the provision of an elasticized core-spun yarn that may be effectively used in finely woven garments.

Still another object is the provision of an elasticized core-spun yarn wherein a greater percentage of spandex is present for a given degree of stretch.

Other objects, features and advantages of the invention will become apparent as the description thereof proceeds when considered in connection with the accompanying illustrative drawings.

In the drawings which illustrate the best mode presently contemplated for carrying out the present invention:

FIG. 1 shows a conventional elastic core-spun individual yarn in an elongated state;

FIG. 2 shows the yarn of FIG. 1 in a relaxed state;

FIG. 3 shows a balanced composite core-spun elastic yarn constructed in accordance with the instant invention in an elongated state; and

FIG. 4 shows the yarn of FIG. 3 in a relaxed state.

It is generally known that in order to arrive at a balanced composite yarn, one will take individual yarns of opposite twist and ply or twist them together. In the instant invention, a balanced composite core-spun yarn is achieved by doing substantially the opposite. More specifically, in carrying out the instant invention, a plurality of individual yarns, one of which is shown generally at 10 in FIG. 1, are each twisted in the same direction. The individual yarn 10, which is shown in FIG. 1 in a stretched or elongated state, is a conventional core-spun yarn made in a manner well known in the art and comprises an elasticized core 12, which may be spandex, covered with an outer wrap 14 of staple fibers. As previously stated, each

of the plurality of individual yarns 10 are twisted in the same hand or direction, and each of the yarns 10 has approximately the same number of turns per unit length. Although each of the individual yarns should have approximately the same number of turns per unit length, it has been found that the objectives of the instant invention can be satisfactorily achieved where no one of the yarns has more than 50 percent more turns per unit length than any of the other yarns. For example, if one yarn has twelve turns per inch, then no other yarn would have no more than eighteen turns per inch. It is absolutely essential, however, that each of the yarns be twisted in the same direction.

The individual core-spun yarns 10 described in the paragraph supra are first elongated to substantially the same degree, and for purposes of simplicity, it is preferred that each of the individual yarns be elongated to its maximum stretch. While so elongated, the individual yarns 10 and 10a in FIG. 3 are then plied together by applying thereto a reverse twist of approximately one-half the number of turns per unit length as existed in the individual yarns. This last step can be performed on conventional equipment, such as a spinning frame or twister frame. Also, although the composite yarn 16 is characterized by approximately one-half as many turns per inch as exist in the individual yarns, it has been found that the objectives of this invention can be satisfactorily achieved where the number of turns in the composite yarn is anywhere between 35 and 65 percent of the number of turns in the individual yarns. If the number of turns in the individual yarns varies with respect to each other, then the ratio of turns in the composite yarn is based on the average number of turns in the individual yarns.

In FIG. 4 the composite yarn 16 is shown in a fully relaxed state, with the spandex cores 12 and 12a contracted. As will be noted, the relaxed composite yarn 16 forms a substantially perfect U, thus denoting a perfectly balanced elastomeric yarn. Contrast this with FIG. 2 wherein an individual yarn 10 has been relaxed. As shown in FIG. 2, the relaxed yarn 10 is wild and kinky and spirals upon itself, thus not creating a perfect U and hence denoting an unbalanced yarn that is difficult to handle.

The following specific examples are given to illustrate the afore-described invention:

#### Example A

Two conventional core-spun yarns, each having a right-hand twist of 12 turns per inch, were taken. These two individual yarns were then elongated to their maximum stretch and were then plied together in a conventional spinning frame. Specifically, the two individual yarns were twisted together in a left-hand direction, the resultant yarn having six turns per inch.

The resultant yarn was characterized by an extremely minimal degree of kinking, was easy to handle, and exhibited good control characteristics.

#### Example B

Three conventional individual core-spun yarns were taken, each yarn being twisted in a left-hand direction. One yarn had 10 turns per inch, another yarn 12 turns per inch, and the third yarn 14 turns per square inch. These three yarns were each elongated to about 90 percent of the maximum stretch and were then twisted together in a right-hand direction on a conventional twister frame. The resultant yarn had five turns per inch.

The resultant yarn exhibited substantially the same characteristics as described in connection with Example A.

#### Example C

Three conventional individual core-spun yarns were taken, each of the individual yarns having a right-hand twist. Two of the individual yarns had 10 turns per inch, while the third yarn had 13 turns per inch. All of the yarn were elongated to their maximum stretch and were

then twisted together in a left-hand direction on a conventional spinning frame. The resultant yarn had six turns per inch.

The resultant yarn exhibited substantially the same characteristics as those described in Example A supra.

It will therefore be seen that the hereinbefore enumerated objectives of the instant invention have been quite amazingly achieved by a composite yarn manufactured in accordance with the foregoing description. While the present invention has been described with particular reference to preferred embodiments thereof, it will be understood, of course, that certain changes, substitutions, modifications and the like may be made therein without departing from its true scope.

What is claimed is:

1. The method of making a balanced elastic core-spun yarn, comprising the following steps:

A. Taking a plurality of individual core-spun yarns, each having the same direction twist and approximately the same number of turns per unit length;

B. Stretching said yarns so that each has approximately the same degree of elongation;

C. Plying said stretched yarns into a single yarn by twisting said yarns together in a direction opposite to that of the twist of the individual yarns; and

D. Imparting approximately one-half the number of turns per unit length during the performance of Step C as were in the individual yarns.

2. The method of claim 1 further characterized in that during the performance of Step B the yarns are elongated to their maximum stretch.

3. The method of making a balanced elastic core-spun yarn, comprising the following steps:

A. Taking a plurality of individual core-spun yarns, each having the same direction twist, said yarns being characterized in that no one yarn has more than 50 percent more turns per unit length than any other one;

B. Stretching said yarns so that each has approximately the same degree of elongation;

C. Plying said stretched yarns into a single yarn by twisting said yarns together in a direction opposite to that of the twist of the individual yarns; and

D. Imparting 35 to 65 percent of the average number of turns of the individual yarns during the performance of Step C.

4. A composite balanced elastic core-spun yarn comprising a plurality of individual core-spun yarns, each twisted in the same direction and having approximately the same number of turns per unit length, said individual yarns being twisted together in a direction opposite to the twist of the individual yarns, the number of turns per unit length in the composite yarn being approximately one-half the number of turns in the individual yarns.

5. A composite balanced elastic core-spun yarn comprising a plurality of individual core-spun yarns, each twisted in the same direction, no one of said individual yarns having more than 50 percent more turns per unit length than any other one, said individual yarns being twisted together in a direction opposite to the twist of the individual yarns, the number of turns per unit length in the composite yarn being between 35 and 65 percent of the average number of turns in the individual yarns.

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