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Indarte

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[54] **SPINNING A FILAMENT-WRAPPED STAPLE FIBER CORE YARN**

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[73] Assignee: **The United States of America as represented by the Secretary of Agriculture**

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[52] **U.S. Cl.**.....**57/144**, 57/160

[51] **Int. Cl.**.....**D02g 3/04**, D02g 3/36

[58] **Field of Search** ....57/3, 12, 5, 144, 160, 140 BY

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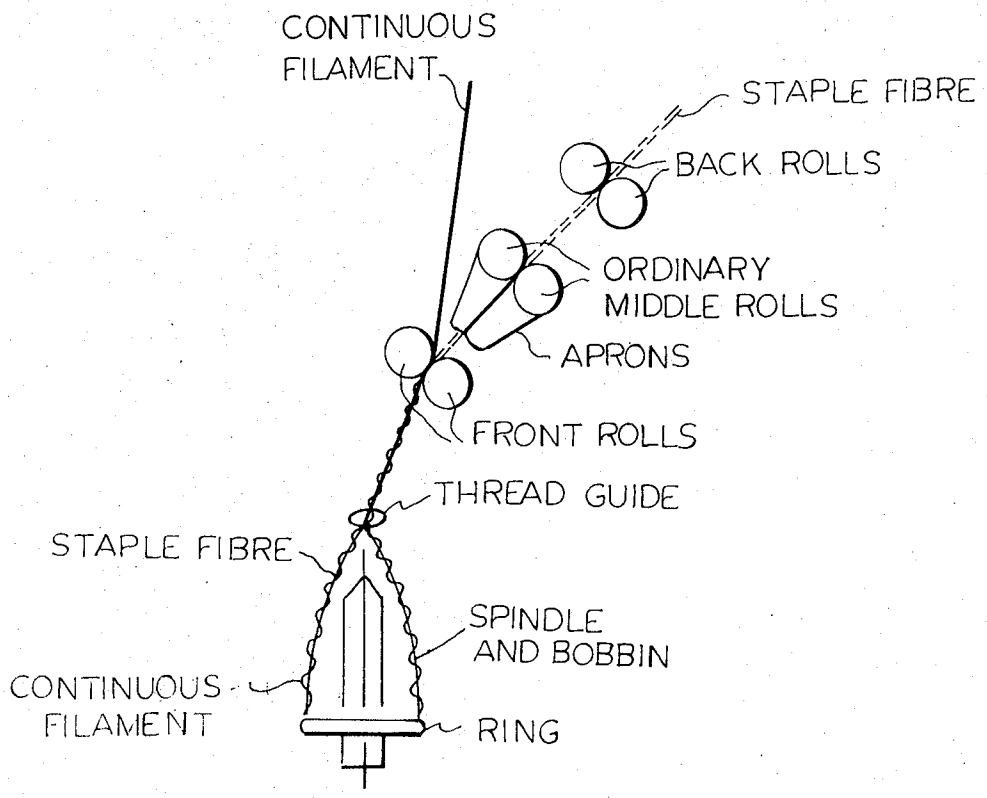
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[57] **ABSTRACT**

Continuous filament nylon of from 15 to 40 denier has been wrapped and twisted around a cotton core during spinning to produce yarns which are superior in uniformity, strength, and strength variability and can be spun at much higher speeds than the cotton control.

2 Claims, 3 Drawing Figures



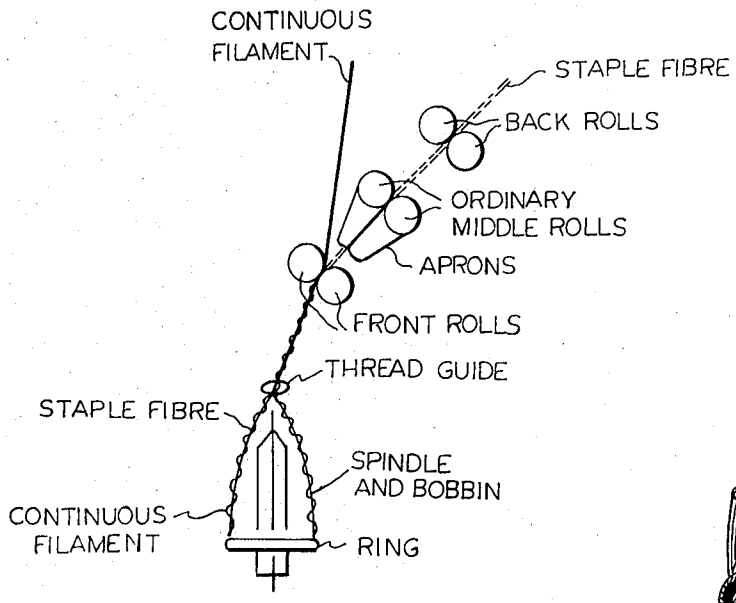


FIG. 2

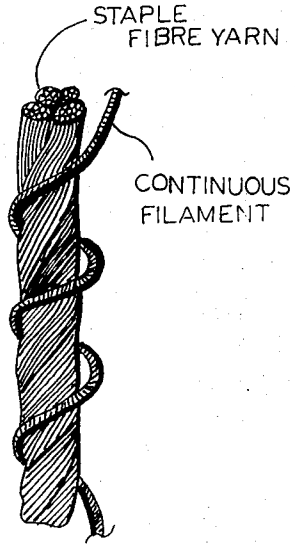


FIG. 1

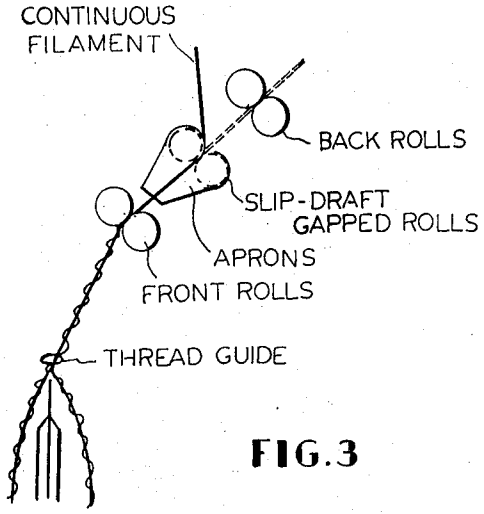


FIG. 3

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SPINNING A FILAMENT-WRAPPED STAPLE FIBER CORE YARN

A non-exclusive, irrevocable, royalty-free license in the invention herein described, throughout the world for all purposes of the United States Government, with the power to grant sublicenses for such purposes, is hereby granted to the Government of the United States of America.

This invention relates to yarn blending methods. Specifically, this invention relates to improved spinning techniques and yarn quality by blending a continuous filament with a fibrous core. More specifically, this invention relates to method for wrapping a continuous man-made filament around a fibrous cotton core during the spinning process. Yarns spun by the method of this invention have been found superior in strength and strength variability over a plain cotton control yarn. The yarns produced by the method of this invention also are spun at much faster speed than that possible with cotton control.

PRIOR ART

DuPont, Chemstrand, and U.S. Rubber, as well as some less known organizations have investigated the production of the various types of core yarns. Among these processes there are some which to date are very well accepted. For example, Spandex, the product of E.I.duPont de Nemours & Co., is currently employed in the production of girdles, support hose, football pants, bras, bathing suits, and many other articles. Spandex is defined by the Federal Trade Commission as a manufactured fiber in which the fiber-forming substance is a long-chain synthetic polymer comprised of at least 85 percent of a segmented polyurethane. This elastomer has excellent resiliency and long life in use, and it is generally employed as a core material which is sheathed in staple fibers of other materials such as Type 65 dacron, Type 200 nylon, various types of orlon, and certain types of cotton. There are very many advantages to the use of this elastomer; however, the use of Spandex is generally limited to instances where a bulkyness in the finished product is desired.

Another technique that has been tried is the sheathing of man-made monofilamentous material with stapled fibers, such as cotton. This particular idea has been rather disappointing in that much skinning occurs — the sliding of the sheath on the core — whenever abrasion is applied. *Textile World* in 1965 reported the certain disadvantages, among which is that "roll speed is slower than on conventional spinning."

The method of the present invention overcomes many of the disadvantages of the known techniques, and processing of the yarns in the making of the desired fabrics proceeds at a much greater speed. While the use of spandex satisfies the requirements of elasticity in the end product the method of our invention satisfies the requirements of rapid spinning at the mill and high absorbency and aesthetic properties at the consumer level.

The most common blends of man-made yarns with cotton have required a mixture of about 50—50, weightwise. Now we have discovered that by the method of this invention a larger proportion of cotton can be employed, and a more rapid spinning can be accomplished. The blends of cotton with nylon by the method of our invention have been very satisfactory where 8.3 to 22.2 percent of nylon filament has been spun on a fibrous core of cotton comprising 91.7 to 77.8 percent of the total weight.

The method of our invention teaches the principle of utilizing light-weight staple fiber yarns as a core and surrounding this core with a monofilament of a man-made fiber. Most of our investigative work has been with lightweight single-strand cotton core and spinning a 15 to 40 denier nylon monofilament along the periphery of the core and twisted around that of the cotton core. By the method of our invention spinning speeds have been increased considerably.

The main object of the present invention is to provide a method of improving the spinability, weavability and knittability of cotton and other staple fiber yarns by means of a very thin continuous filament that is wrapped around the staple fiber core during spinning.

The method of our invention is based upon "-doubling" or putting together staple fiber yarn and a continuous filament of a low denier (10 to 50 denier). The filament is twisted around the staple fiber yarn as it emerges from the spinning frame. Care must be taken that the filament stays on the surface of the yarn only. The filament would be though of as a sheath which wraps the core yarn along its entire length. Obviously, correct tension must be imparted to the filament sheath while it is being fed. An excess tension would cause the filament to sink into the core of the yarn and none of the desired advantages would be imparted to the core yarn. Too little tension would not get the desired binding effect desired.

FIG. **1** is provided to illustrate the basic effect desired.

FIGS. **2** and **3** are schematic elevation views which would illustrate embodiments of the method of the invention.

THE METHOD OF THE INVENTION

As can be seen in FIG. **2**, the filament of man-made fiber can be applied to the periphery of the staple core (cotton) by passing the filament through the front draft rolls at the spinning frame.

FIG. **3** illustrates the technique when the filament is passed through the middle (or apron) and front draft rolls. This can be done only when the apron rolls are recessed at their center, that is when the "slip draft" is used.

Another technique for applying the monofilamentous fiber to the periphery of the cotton core yarn would be that of joining the filament in the zone between delivery and package, but this would mainly apply to open end spinning.

There are several distinct advantages which the method of our invention has over the prior art. To name a few, there is (1) a decrease of end breakage in spinning. It must be recalled that one of the main causes of end breakage during spinning is generally wherever the weak points along the length of the yarn cause disengagement. The extra strength provided by the filament of man-made fiber significantly reduces the strength variability and eliminates this breakage to a large extent. Furthermore, the idea of spinning direct from sliver to yarn is obviously advantageous. (2) There is a lesser twist requirement below that of ordinary values. This, of course, yields a bulkier yarn and

increased machine production. (3) In view of (1) and (2) the spinnability of cotton would be improved, thus high micronaire or discount cottons could be spun into more acceptable yarns and yarns at finer count than is customarily spun from this type of cotton. The method would also enhance the use of cotton in tricot and Raschel knitting machines. One skilled in the art can well appreciate this.

(4) Breaks in winding, warping, and weaving are decreased.

(5) The strength of open-end spun yarns is improved.

To summerize, this invention is a method of making a novel type of blended yarn wherein a continuous, man-made fiber is spun around a core of cotton or other staple fiber yarn. The invention also includes the products thus prepared, which provides the textile industry with low weight strong yarns which have moisture regain and aesthetic characteristics equal to non-blended cottons.

EXAMPLE 1

A cotton of 28.86 mm upper half mean length was spun into a 11.6 tex yarn with a twist of 22.4 turns per inch by the method shown in FIG. 2. A 15 denier nylon filament was used as the wrapper or sheath. As a comparison the yarn was spun without the nylon filament wrapper. The breaking tenacity and coefficient of variation of breaking tenacity of the yarn with the filament wrapper was 13 g/tex and 9.16 percent CV respectively, while for the normal spun yarn it was 12.3 g/tex and 13.4 percent CV respectively. The appearance of the two yarns was practically the same. It was found that the minimum spinning twist of cotton yarns decreased considerably by this method of spinning. The figure obtained for this run was about 30 percent. The conclusion arrived at from these studies is that the spinnability of the cotton increases considerably.

EXAMPLE 2

A 20 tex yarn (29.5 Ne) was spun with nylon monofilament of 15, 20, and 30 denier. It was determined from the various observations that there is no limit applicable to the twist; however, it was learned that less twist is necessary to achieve the breaking strength of the 100 percent staple fiber yarn. This data was obtained with a 20 tex cotton core yarn:

Nylon Filament %	Denier of the Filament	TM* of the yarn which gives a Breaking Strength of 250 g
0	0	5.3
8.3	15	4.2
11.1	20	3.7
16.6	30	2.9

* Twist Multiple

EXAMPLE 3

Resistance to abrasion and mass irregularity evaluations were investigated using the same yarns of Example 2, and the data tabulated below. The mass irregularity was measured on the Uster Eveness Tester. Resistance to abrasion was determined by making a knitted fabric from the same yarn and determining the resistance to abrasion through measurement of loss of weight after 12,000 abrasion cycles.

Nylon Filament %	Denier of Filament	Mass irregularity (CV%)	Abrasion measured through loss of weight of the knitted fabric, %
0	0	20.0	25.00
8.3	15	18.6	24.0
11.1	20	18.0	22.5
16.6	30	16.9	20.5
22.2	40	15.6	18.0

Two observations were made in the evaluation of the data obtained. The yarn uniformity increases with percent continuous filament increase. And, there is an increase in abrasion resistance as the percent nylon filament in the yarn increases.

I claim:

1. A method of producing blended yarns containing a stapled core and a continuous man-made filament to achieve improved spinnability as well as other physical improvements, comprising:
   a. spinning a light-weight yarn from staple fibers to form a core having a yarn count of about 11.6 tex and a twist of about 22.4 turns per inch to provide about from 75 to 95 percent of the weight of the final yarn, and
   b. wrapping a continuous man-made filament around the spun yarn of (a) as the spinning takes place and maintaining a feeding tension on the filament of not more than about 0.5 g/tex (equivalent to 0.055 g/denier) to provide about from 25 to 5 percent of the weight of the final yarn.

2. A blended yarn produced by the method of claim 1 wherein the continuous man-made filament is nylon, and the staple fibers of the core are cotton.

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