

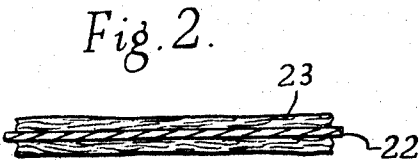
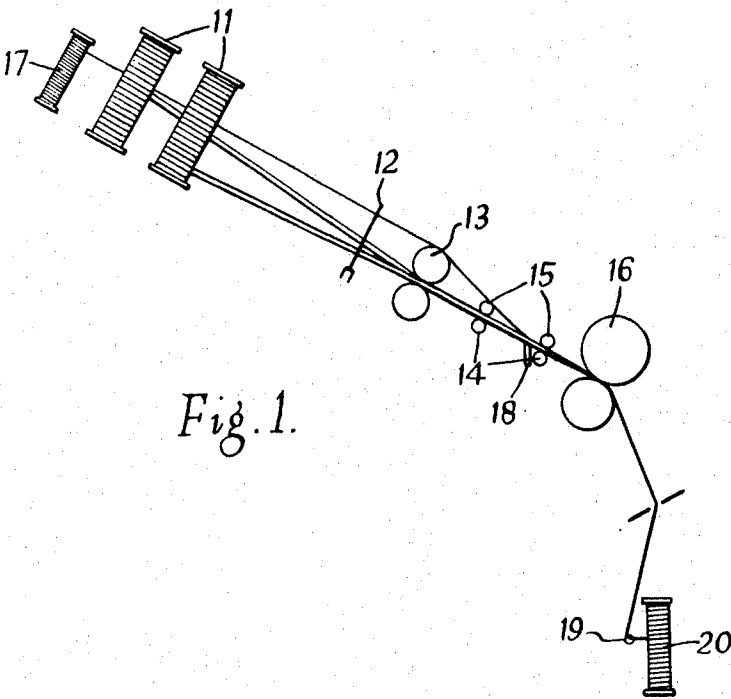
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PRODUCTION OF YARN

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PRODUCTION OF YARN

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ABSTRACT OF THE DISCLOSURE

A textile yarn is produced by drafting and spinning a cover strand around a core strand such that the twist in the core strand is greater than the twist in the cover strand whereby when the yarn is relaxed the high twist core contracts and the yarn bulks.

The present invention relates to the production of yarn, and provides a complex yarn of interesting and unusual properties, and stretchable fabrics derived therefrom.

According to the invention a complex yarn comprises a core strand having relatively high twist and at least one covering strand of staple fibre of relatively low twist spun around the core strand.

Various natural and synthetic textile fibres can be used, for example, cotton, polyamides, polyesters, rayon and wool. The strands can be made of the same or different materials, although the cover strands are preferably made partly or wholly of wool fibres.

The invention provides a method for the production of such a complex yarn from staple fibres, the method comprising drafting and spinning at least one cover strand directly round a core strand to produce a yarn in which the twist in the core strand is greater than the twist in the cover strand. In one preferred procedure, the already spun core strand having relatively high twist is fed through the front rollers of a conventional spinning frame while a roving is fed through the back and front rollers and is drafted and thereafter spun round the core.

When the yarn according to the invention is relaxed in hank or fabric form by treatment in water or aqueous solutions of swelling agents or with steam, the high twist core contracts and the yarn bulks. The bulked yarn is capable of extension under small loads and returns to its original length when the load is removed. The twist in the core and in the cover strands may be varied, as may the relative thickness of the core and covering components, according to the effect required. The amount of twist in the core strand can be varied between wide limits, for example, from 10 to 80 turns per inch, and preferably from 30 to 50 turns. An even larger number of turns may also be used with advantage, depending upon the material forming the strand. The extent of twist in the cover strand can also be varied, although within narrower limits. Preferably the cover strand should have as little twist as possible, that is to say, from 0 to 10 turns per inch, but as many as 30 turns can sometimes be present. When the cover strand is to have appreciable twist the extent of such twist should, nevertheless, always be substantially less than that of the core strand, and preferably at least 10 turns per inch less.

The desired complex yarn can be arrived at in different ways. For example a cover strand of the required twist can be initially spun round a core strand also of required twist. Alternatively, a cover strand of known initial twist can be spun round with a core strand also of known initial twist and the resulting complex yarn can then be twisted in a direction which results in both the core and the

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cover strands requiring a final and desired degree of twist. This method can be employed conveniently in the manufacture of a complex yarn of zero or low twist, for which purpose a complex yarn is first made in which both the core and the cover strands have a known twist. This yarn is then twisted in a direction opposed to the direction of twist of the cover strand until all or most of the twist in the latter has been removed. When this method is employed care is required to ensure that the direction and extent of twist of the core strand is such that when the operation has been completed the core strand becomes neither twisted excessively nor has too much twist removed. Two or more complex core-spun yarns or core-spun and normal yarns may be twisted together, if desired.

One application of the complex yarn of the present invention is in the production of fabrics which combine high stretch qualities with considerable softness. This contrasts with the harsh handle of stretch fabrics produced from conventional high twist yarns. The fabrics can be produced in different ways, for example, the core-spun yarns can be converted into a fabric which is thereafter relaxed or, alternatively, the yarn is first relaxed and then converted into the fabric. In general, the first method is to be preferred because of the greater ease in knitting or weaving a yarn before it has acquired its highly stretchable qualities. The present complex yarns can be present in woven fabrics both as warp and weft threads although in preferred woven fabrics conventional threads are used in the warp direction and the complex yarns provide the weft threads.

When stretch fabrics produced from yarn according to the invention are subjected to a flat setting treatment, a substantial increase in stretch properties results.

Examples of the production of complex yarns and a stretch fabric according to the invention will now be described, with reference to the accompanying drawing, in which

FIGURE 1 is a schematic diagram of one example of a spinning frame employed in the production of a core-spun yarn, and

FIGURE 2 is a diagrammatic section of the resulting yarn.

As shown in FIGURE 1, two rovings are fed from bobbins 11 through a guide 12 to the back rollers 13 of the frame and are drawn thence between the carriers 14 and tumblers 15 of the drafting zone to the front rollers 16. Simultaneously a previously spun core yarn is drawn from a bobbin 17 between the last pair of carrier and tumbler in front of which a pin 18 is placed to serve as a guide, and thence through the front rollers. The guide pin keeps the core yarn in a central position between the rovings so that it is completely covered by them at the spinning stage; in the absence of this pin, there is a tendency for the core yarn to wrap round one of the rovings preferentially.

The drafted rovings are then spun round the core yarn on insertion of the twist at the ring 19 to form the complex core-spun yarn, which is taken up on the bobbin 20.

The resulting yarn has the structure shown in FIGURE 2, where a central core strand 22 is surrounded by the fibres 23 of the surrounding cover strands.

The following are some examples of the production of complex yarns and fabrics according to the invention.

Example 1

A single core-spun yarn was produced from 1/36s worsted, 21 turns/inch, Z twist. This was fed as a core into the front roller of a spinning frame and a 1/36s worsted yarn spun round it with 21 turns/inch. This was woven as weft across a fabric with a warp consisting of 2/40s worsted, 48 ends/inch. The fabric was then relaxed in

water, and shrunk approximately 19% in the weft direction. When dry, the fabric was found to stretch approximately 20% under a load of 500 g./cm. of width, and to recover almost immediately to the original dimensions when the load was removed.

Example 2

A bulked or stretch yarn was produced by spinning two ends of a 12-drams per 40 yd. worsted roving round a central highly twisted yarn consisting of 1/18s worsted, 40 turns/inch Z twist, using a draft, (that is, the ratio of the superficial speed of the front roller to that of the back roller) of 11 and a twist of 5 turns/inch in the spinning process. The core yarn was then 3-ply, using 2¼ turns/inch, S twist in the folding. The yarn was wound into hank and relaxed in water. This produced a highly bulked and extensible yarn.

Example 3

A number of fabrics having respectively 44 and 48 ends/inch were plain woven from complex yarns of woollen staple fibres. In producing the complex yarns, the spinning was carried out in such a direction that the twist in the core strand increased by the same amount as the twist introduced into the cover strand. After the fabrics had been made they were relaxed by steeping them in water containing 1% by weight of a wetting agent and having a temperature of 40° C. The fabrics were then dried and found to have very soft handle and excellent stretch properties when tested according to the method described below.

Similar pieces of fabric were then woven and after they had been dried they were flat set by subjecting them to the action of steam for 5 minutes. The fabrics were then subjected to the core stretch test and, as will be seen from the results shown in the table, the setting treatment considerably improved the stretch qualities of the fabrics.

In testing the stretch qualities of the fabrics a piece of each fabric, measuring 60 x 6 cm. was held in clamps which extended over the width of the piece under test. The pieces were then suspended vertically and a weight of 2.5 kg. was attached to the lower clamp. The extension in length of the test pieces was then measured and expressed as a percentage increase of the initial length.

Twist (Turns/Inch)			Percent Stretch			
Initial Core	Cover	Resultant Core	48 Ends/Inch		44 Ends/Inch	
			Unset	Flat Set	Unset	Flat Set
20-----	16	36	14.1	16.2	17.2	19.4
24-----	12		11.9	14.3	12.9	15.3
27-----	9		11.4	14.2	12.8	16.7
30-----	6		12.1	14.6	13.3	17.8
27-----	15	42	16.7	18.0	16.1	22.9
30-----	12		16.0	18.0	16.7	23.0
33-----	9		13.0	17.7	13.1	18.3
36-----	6		14.2	16.5	17.0	21.1
36-----	6	48	14.2	16.5	17.0	21.1
33-----	15		20.4	24.6	21.5	29.3
36-----	12		16.5	21.0	18.9	22.7
39-----	9		19.5	24.6	21.4	27.8
42-----	6		18.1	22.0	20.5	23.5

Example 4

An all-wool core-spun yarn was constructed by feeding a 36s worsted yarn with 39 turns/inch, Z twist, through the front roller of a spinning frame, and two rovings, each of a weight of 2 draws/40 yd. through the back roller with the draft adjusted to 8. A further 9 turns/inch of Z twist were inserted at this stage, giving a resultant core twist of 39+9=48 turns/inch, and a resultant core-spun yarn count of approximately 18s worsted count.

The resultant core-spun yarn was woven as weft with 58 picks/inch across a warp consisting of 2/36s worsted, 48 ends/inch using a 2/2 twill weave. The fabric was then relaxed in water containing 1 g./litre wetting agent, scoured in a non-ionic detergent, and dried in a relaxed condition. After drying the fabric was found to have

an extension of 19.5% when tested under a load of 500 g./cm. of width and a reversible contraction on wetting of 2.3%.

A normal fabric woven with the same number of ends and picks/inch produced from yarns of a similar count had a stretch of 20.7% and an expansion on wetting of 3.3%. There was little appreciable difference in the handle of the two fabrics.

The core-spun yarn fabric was "flat set" after scouring by padding in monoethanolamine sesquisulphite to give 2% by weight of the reagent on the fabric. The fabric was then wound between layers of cotton wrapper on to a perforated cylinder and steam blown through for 5 minutes. After drying free from tension, the fabric was found to extend 24.6% under a load of 500 g./cm. of width and display a reversible expansion on wetting of 0.8%.

A normal fabric woven with the same number of ends and picks/inch produced from yarns of a similar count and finished in the same way had a stretch of 15.4% and a reversible expansion on wetting of 7.3%.

Example 5

An all-wool core-spun yarn was constructed by feeding a 36s worsted yarn with 36 turns/inch, Z twist, through the front roller and two rovings, each of 2 drams/40 yd. through the back roller with a draft of 8. A further 6 turns/inch of Z twist were inserted at this stage giving a resultant core twist of 36+6=42 turns/inch, and a complex yarn of approximately 18s worsted count.

The resultant core-spun yarn was woven as weft with 58 picks/inch across a warp consisting of 2/36s worsted, 44 ends/inch using a 2/2 twill weave. The fabric was then relaxed in 1 g./litre wetting agent, scoured in a non-ionic detergent, and dried in a relaxed condition. After drying, the fabric was found to have an extension of 17.0% when tested under a load of 500 g./cm. of width and a reversible contraction on wetting of 0.5%.

A normal fabric woven with the same number of ends and picks/inch and produced from yarns of a similar count had a stretch of 9.6% and an expansion on wetting of 2.5%. There was little appreciable difference in the handle of the two fabrics.

The core-spun yarn fabrics was "flat set" after scouring by padding in monoethanolamine sesquisulphite to give 2% by weight of the reagent on the fabric, and steaming for 5 minutes. After drying free from tension, the fabric was found to extend 21.1% under a load of 500 g./cm. of width and display a reversible expansion on wetting of 2.2%.

A normal fabric woven with the same number of ends and picks/inch from yarns of a similar count and finished in the same way had a stretch of 11.7% and a reversible expansion on wetting of 5.8%.

What I claim is:

1. A process of making a bulked yarn which comprises the steps of: providing a twisted core strand of textile fibers; drafting an untwisted roving of staple fibers; bringing together said core strand and said untwisted roving; twisting together said roving and said core to form a complex yarn in which said roving provides a cover for said core, said core having an amount of twist which is greater than said cover; and treating said complex yarn with moisture to relax said yarn and thereby to cause longitudinal contraction of said core and consequent bulking of said cover.

2. The process defined in claim 1 wherein the twisting together of said roving and said core is carried out such that the formed yarn has from about 10 to 80 turns per inch in the core portion and from 0 to 30 turns per inch in the cover portion.

3. The process defined in claim 1 wherein the twisting together of said roving and the core is carried out such that the formed yarn has from about 30 to 50 turns per inch in the core portion and at least 10 turns per inch less in the cover portion.

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4. The process defined in claim 2 wherein the core strand and the roving are formed predominantly from wool fibers.

5. The process defined in claim 2 wherein the treatment of the complex yarn with moisture is carried out subsequent to forming the complex yarn into a fabric.

6. A bulked yarn produced by the process defined in claim 2.

7. A stretch fabric formed from bulked yarn produced by the process defined in claim 2.

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