

Nov. 6, 1951

B. H. FOSTER

2,574,029

METHOD OF MAKING ALL-TEXTILE ELASTIC FABRICS

Filed July 10, 1946

Fig. 1

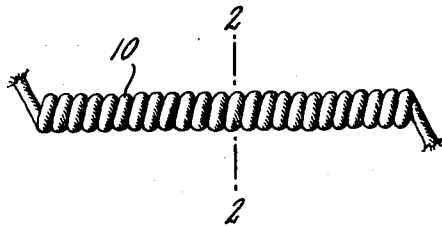


Fig. 2



Fig. 3

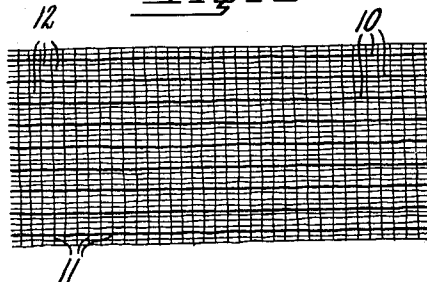


Fig. 4

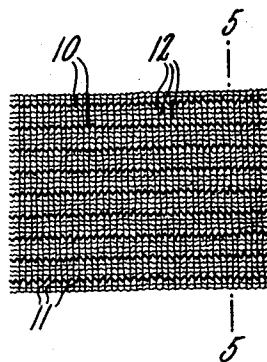


Fig. 5

INVENTOR.
BOUTWELL H. FOSTER
BY
Charles B. Millson
ATTORNEY

UNITED STATES PATENT OFFICE

2,574,029

METHOD OF MAKING ALL-TEXTILE
ELASTIC FABRICSBoutwell H. Foster, Maplewood, N. J., assignor to
United States Rubber Company, New York,
N. Y., a corporation of New Jersey

Application July 10, 1946, Serial No. 682,580

2 Claims. (Cl. 28—76)

1

This invention relates to a method of making high stretch, all-textile, woven elastic fabrics.

It has been proposed heretofore to make all textile woven fabrics having a substantial range of stretch by embodying in such fabrics in the direction in which the stretch is desired highly twisted yarns such as crepe twisted yarns, these yarns however, are harsh to the feel and tend to impart harshness to the stretchable fabric constructed of such yarns.

In many fabrics having stretchable or elastic properties, such as body or limb bandages, stretchable fabrics for covering upholstery, bathing suits, wearing apparel and the like, a fabric having a high degree of stretchability and softness to the feel is desired.

The present invention contemplates a highly stretchable, all-textile woven fabric that contains no rubber, has a range of stretch of from 50 to 100% or more, is highly compressible and soft to the feel, has a high degree of air permeability, and when worn next to the body is cool and comfortable and has good non-slipping properties. Such a fabric is ideally suited for use as body or limb bandages, bathing suits, certain types of wearing apparel and for many other purposes.

An extremely important feature of the highly stretchable all-textile fabric of the present invention resides in the fact that it has the soft feel of a terry fabric when in its contracted or relaxed condition. This imparts to the fabric the desired properties of softness, high compressibility, and high air permeability; and causes it to cling to the portion of the body it may engage without slipping.

The method contemplated by the present invention may be used to produce one-way stretch woven fabrics or two-way stretch woven fabrics as desired and the percentage of stretch and strength of the contractive action of the fabric may be varied throughout a wide range as desired.

The high stretch or elastic properties are imparted to the fabrics herein contemplated, without the use of rubber, by employing in such fabrics as warp or weft or as both warp and weft, a highly stretchable yarn such as shown, described and claimed in my Patent No. 2,387,320 granted October 23, 1945, and which yarn is a helically coiled high twist fibrous yarn having a long stretch and good contracting properties. If desired a fabric constructed in accordance with the present invention may have plain ordinary commercial yarns forming the entire warp or the entire weft of the fabric, but it also has interwoven

2

therewith in the direction in which the fabric is to stretch the helically coiled yarns of said patent, and such helically coiled yarns may be used alone in the direction the fabric is to stretch or may have associated therewith in parallel relation therewith one or more plain yarns for each helically coiled yarn, depending on the amount of contractive force or other properties desired in the finished fabric.

In weaving the fabric herein contemplated the helically coiled yarns when used either as warp or weft are preferably maintained under sufficient tension while they are being woven into the fabric to hold them in a fully extended or straight line condition, and when so woven into the fabric the yarns extending at right angles to the direction of stretch should be spaced much further apart than is desired in the fabric when relaxed and ready for the market. When a fabric is woven with such helically coiled yarn while they are stretched to their fully extended condition, the fabric will come off the loom as a loosely woven open weave fabric that has almost no stretch either longitudinally or transversely, but the desired elastic properties are easily imparted to such fabric by soaking it for a short time, while free of tension, in hot water or boiling water.

The helically coiled yarns used in the fabric as herein contemplated may be formed of cotton fibres, wool fibres, rayon filaments or other textile fibres or filaments, since the hot water will cause such helically coiled yarns after they have become straightened out to return to the form of a tightly coiled or contracted helix. Particularly good results have been secured in this respect with helically coiled cotton yarns.

One field of use in which the fabric herein contemplated has been used with excellent result is that of longitudinally stretchable body or limb bandages. Such bandages may be made up in different widths ranging from say 2 to 6 inches wide and about 5½ yards long when stretched. The range of stretch of such bandage fabric may vary from about 50 to 100%, and the longitudinal stretch is imparted to such bandages by employing in the weft plain textile yarns and in the warp both plain yarns and helically coiled yarns, there being one, two or possibly three plain warp yarns for each helically coiled warp yarn. Another important field of use for the fabric of the present invention is that of upholstery material in which a wide fabric is woven with sufficient helically coiled yarns extending either warp-wise or weft-wise to impart the desired elastic properties to the fabric. Still a third important field in which

3

the fabric of the present invention may be employed is that of bathing suits or certain garments wherein the fabric is given stretch properties in one or two directions by embodying the helically coiled yarns in the warp or weft or in both the warp and weft as desired. In all these uses the present fabric presents an exceptionally soft terry feel.

The above and other features of the present invention will be further understood from the following description when read in connection with the accompanying drawing wherein

Fig. 1 is an enlarged side elevation of an all textile helically coiled yarn employed in the elastic fabric herein contemplated.

Fig. 2 is a sectional view taken on the line 2-2 of Fig. 1.

Fig. 3 is a plan view of a short length of fully extended woven fabric having plain yarns throughout the weft thereof and both plain and helically coiled yarns in the warp thereof, the latter being shown in a fully extended condition.

Fig. 4 is a plan view of the fabric of Fig. 3 after it has been contracted by treating it with hot water while in a relaxed condition; and

Fig. 5 is a sectional view taken on the line 5-5 of Fig. 4.

The helically coiled yarn shown on an enlarged scale in Figs. 1 and 2 of the drawing is an all textile yarn, such for example as a cotton yarn having the stretch characteristic or elastic extensibility range of the order of 100% or more, and is preferably constructed in accordance with my patent above cited. This helically coiled yarn may be formed of a single yarn or of a plied yarn which is so coiled, the former is preferable in many cases because single yarn is cheaper to construct than plied yarn. This coiled yarn which is designated by 10 in the drawing is preferably made similar to the yarn shown in Figs. 2 and 3 of said patent, and it may as above stated, be used either in the warp or the weft of a fabric or in both the warp or weft as desired. Furthermore such helically coiled yarn may be used solely in one or both directions of the fabric, or one, two or more plain yarns may be introduced in the fabric along side of and in parallel relation with each helically coiled yarn.

The fabric shown in Fig. 3 of the drawing is of a type that is well adapted to produce the above mentioned body or limb bandage, and as shown plain yarns alone are used to form the wefts or picks 11 of the fabric, while the warps of this fabric comprise three plain warp ends 12 for each helically coiled warp end 10. The helically coiled yarns 10 are woven into this fabric while they are in a fully extended or straight condition and this is why all of the interwoven yarns shown in Fig. 3 of the drawing appear as straight lines. After the fabric of Fig. 3 has been removed from the loom and soaked in hot water for a few minutes while free from tension, or treated with wet steam, the stretched helically coiled yarns 10 of Fig. 3 will contract as shown in Fig. 4 to contract the fabric anywhere from a small amount to as much as one-half its previous length, and it should be noted that as the helically coiled yarns 10 contract to form the contracted helices they will cause the plain yarns 12 to assume the wavy line position shown in Fig. 4. When the coiled yarns 10 contract they will contract the adjacent plain yarns 12 sufficiently to cause these yarns 12 to form outwardly extending puffs or loops, and it is these loops of the plain yarn that give the fabric the soft feel of a terry fabric which

4

is very different from that of the stretchable, all-textile fabrics known heretofore. The disposition of the yarns 10, 11 and 12 in the fabric of Fig. 4 will be further understood from an examination of the sectional view of Fig. 5.

In order that the constructions contemplated by the present invention may be further understood the following tables are given but it is to be understood that numerous other types of fabric may be produced by employing the method of the present invention:

Table I

Analysis of the warp-wise stretchable fabric shown in Fig. 4:

Picks per inch, singles moderate twist—	
12's/1 cotton	29
Warp ends per inch:	
Plain warps moderate twist singles—	
12's/1 cotton	30
Helically coiled singles—12's/1* cotton	10
Type of weave	Modified broken twill
Range of fabric stretch	50%—100%
* 12's/1 before adding twist and coiling.	

Table II

Analysis of a filling-wise stretchable fabric constructed in accordance with the present invention:

	Extended	(Finished for market relaxed)
Picks per inch helically coiled singles—		
12's/1 cotton	26	26
Warp Ends per inch, singles 12's/1 cotton	30	51
Type of weave	Modified Broken Weave.	
Range of Fabric stretch	50%—75%	

* 12's/1 before adding twist and coiling.

While the fabric of the present invention may readily be constructed so that it has a stretch of 100% or more the recovery or contraction of the fabric will be slower than that of an elastic fabric made of rubber threads, but this is desirable in many cases, such for example as in a body or limb bandage where a slow recovery and moderately strong contractive force will suffice to keep the bandage in place upon the body or limb, and will not exert sufficient force on the flesh it engages to interfere with the circulation of the blood, and the softness of feel, high compressibility and high air permeability are all desirable properties when the fabric is used to form bandages, wearing apparel, or upholstery fabric where it will present a pleasing feel to the hand or body.

While an all textile fabric constructed in accordance with the present invention can be made with good elastic properties and a surprisingly strong contractive action, it may lose some of this contractive force if held stretched for a long period, but an extremely important property of the present fabric resides in the fact that its strong contractive action can be fully restored by simply wetting or washing the fabric in hot water and drying in a relaxed condition.

The twist imparted to the yarn 10 before the same is coiled is considerably higher than an ordinary yarn twist and is what is usually called a crepe twist. The coiled yarn used in the pres-

5

ent fabric is described in the claims as a coiled high-twist yarn, but the twist of such yarn before it is coiled need not be so high that it is a harsh yarn that tends to kink and snarl badly, because the desired elastic properties are imparted to the yarn by the combined action of the high twist and high number of helical coils and not by the twist alone.

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

1. The method of making an all-textile elastic fabric having a substantial stretch and the soft feel of a terry fabric when contracted, which consists in interweaving warp and weft yarns so as to space the weft yarns a substantial distance apart and introduce in the fabric in the direction it is to stretch substantially spaced helically—coiled high—twist fibrous yarns while these yarns are extended to an approximately straight condition, and introducing therebetween in parallel relation therewith about three ordinary yarns for each of said coiled yarns, then wetting the fabric while it is free of tension so that the extended coiled yarns will contract and form closely adjacent helical coils and at the same time compress said ordinary yarns lengthwise sufficiently to cause them to form outwardly extending puffs or loops that gives the fabric its terry feel.

2. The method of making an all-textile elastic fabric having a substantial stretch and the soft feel of a terry fabric when contracted, which

6

consists in interweaving warp and weft yarns so as to space the weft yarns a substantial distance apart and introduce in the fabric in the direction it is to stretch substantially spaced helically—coiled high—twist fibrous yarns while these yarns are extended to an approximately straight condition, and introducing therebetween in parallel relation therewith about twice as many ordinary yarns as there are coiled yarns, then wetting so that the extended coiled yarns will contract and form closely adjacent helical coils and at the same time compress said ordinary yarns lengthwise sufficiently to cause them to form outwardly extending puffs or loops that gives the fabric its terry feel.

BOUTWELL H. FOSTER.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,823,034	Dworsky	Sept. 15, 1931
1,823,053	Lawton	Sept. 15, 1931
1,922,943	Gobelle	Aug. 15, 1933
2,254,339	Wylde	Sept. 2, 1941
2,279,206	Randall	Apr. 7, 1942
2,387,320	Foster	Oct. 23, 1945
2,387,321	Haddad	Oct. 23, 1945
2,418,187	Moore	Apr. 1, 1947