

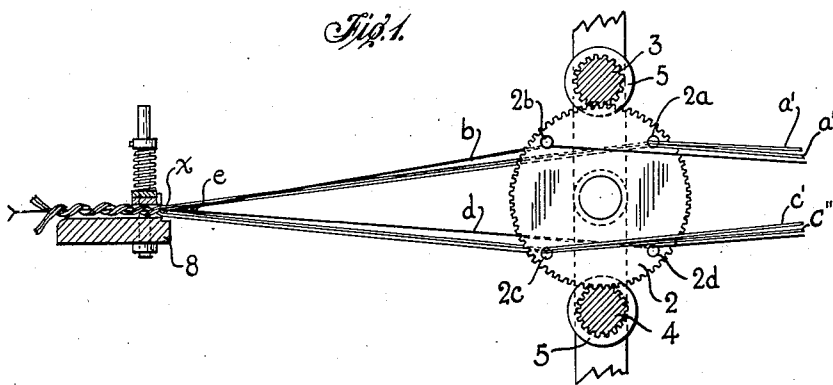
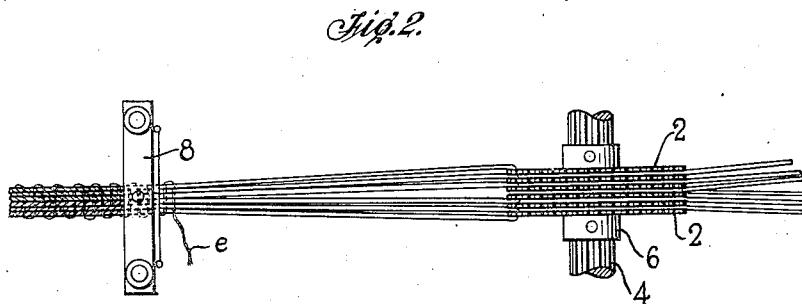
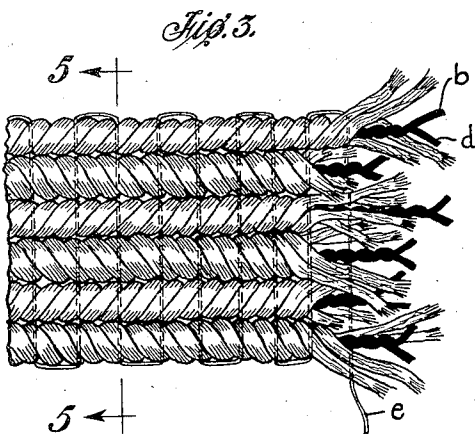
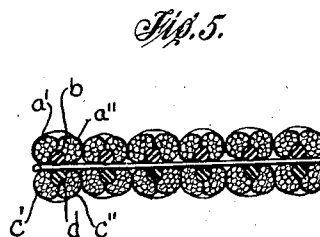
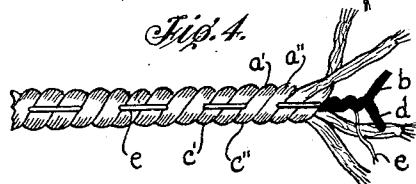
March 12, 1946.

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2,396,483

ELASTIC FABRIC AND PROCESS OF MAKING SAME (DUAL ELASTIC)

Filed May 22, 1944



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2,396,483

ELASTIC FABRIC AND PROCESS OF MAKING
SAME (DUAL ELASTIC)Sterling W. Alderfer, Akron, Ohio, assignor of
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Application May 22, 1944, Serial No. 536,831

15 Claims. (Cl. 139—421)

The present invention relates to a new and improved elastic fabric in which threads or strands of rubber or other elastic material are combined with cotton, rayon or other textile material. In the usual type of elastic fabrics a plurality of rubber threads, each covered by a winding or plurality of windings of textile material are woven or knitted into a fabric. These methods require at least two operations, one the covering of the elastic core and the other the fabrication of the complete fabric structure.

The present invention is for an improvement in the methods heretofore employed in the manufacture of commercial elastic fabrics in that the covering of the elastic cores and the weaving of the fabric are done in a single operation. This is accomplished by wrapping the outer covering elements about the several elastic cores to form a series of parallel cables which are to constitute the warp threads or elements of the completed fabric and concurrently with the formation of cables, passing a weft or pick thread through the cables to form the completed fabric in a single operation. In these respects the method partakes of the method shown and described in my prior copending application, Serial No. 534,631 filed May 8, 1944.

In the former application referred to each cable is composed of a single elastic thread or core and a plurality of covering strands which are wrapped around the core, this result being due to the fact that the elastic core is maintained under a considerable tension during the cable forming operation. In the present application, however, each elastic core is composed of a plurality of elastic threads which are twisted together under tension to form a cable, the covering strands wrapping themselves about the central cable.

One advantage of any fabric made in accordance with the present invention is that in the event either of the elastic threads constituting the core should be broken, it will be held more firmly even than in the fabric made by the method of the prior application referred to. An objection to the ordinary types of elastic fabric which preceded my improvements referred to, is that when an elastic thread, which is always under tension, is broken, it will retract on either side of the break and the elasticity of the fabric or webbing is thereby impaired. In a fabric made in accordance with the present invention each of the elastic threads or filaments which constitute a single elastic core is gripped not only by the pick thread which is woven through the cable, but each elastic filament is wrapped about

its companion filament so that it grips and holds the other filament. As a consequence, if one of the filaments breaks, it is effectively held by its companion filament, as well as by the presence of the embedded pick thread. It very rarely occurs that both filaments of the core will break at the same point; therefore at any point where a single filament is broken, its ends will be interlocked and gripped by the other filament of the core and the tendency of the broken filament to retract from the point of the break will be greatly reduced.

Another advantage of the present invention over the prior art and over that shown in my prior application is that the elastic core is in the nature of a dual filament, that is to say, it is made up of at least two filaments which are more or less independent of one another. The most frequent cause of failure of an elastic core is that it is nicked by the needles used in manufacturing garments or other articles of apparel. In the fabric illustrated herein it is extremely unlikely that a needle will nick both filaments at the same point. This means that only one filament will break due to such a cause and the remaining filament will be unaffected and will continue to function.

The fabric has the additional advantage over all other types of elastic fabric in that even if both elastic filaments should break at the same point, the filaments, being twisted together, will tend to knot, due to the fact that they must rotate to retract. Any knot thus formed will be intercepted by an adjacent pick which lies between the two filaments and further retraction of the filaments will be halted.

Other objects and advantages are achieved by practicing the invention as illustrated and described herein. In the drawing the new method of manufacturing elastic fabrics or webbing and the new product produced thereby are shown with sufficient detail to enable those familiar with the art to practice the invention. It will be understood, however, that the showing is merely illustrative and that variations and modifications may readily be conceived that would not alter the basic principles of the invention.

In the drawing:

Figs. 1 and 2 are, respectively, a side elevation and a plan view of the basic elements required for making the new type of elastic fabric by the method of the invention. In these views six cables are shown as constituting the finished fabric or webbing, but it will be understood that the number of cables constituting the warp threads

of the fabric may be increased or diminished to any desired extent. In these views also the cable-twists are arranged so that the cables are grouped three and three, i. e. with three right hand and three left hand twists. It is desirable to balance the twists more or less equally in the several cables which make up the warp threads and the method illustrated is one means of securing this result. Also the pattern of the finished fabric is determined by the direction of cable-twists.

Fig. 3 is a plan view of another type of fabric made by the use of the invention, this view illustrating a six cable fabric or webbing in which the twists in the cables are alternated.

Fig. 4 is an edge view of the fabric shown in Fig. 3.

Fig. 5 is a section on the line 5—5 of Fig. 3.

When the invention has been disclosed it is possible to devise many variations and modifications and to secure a great variety of patterns which it would be impractical to detail completely. The illustrations given in the drawing and in the specification are merely explanatory and not to be construed as confining or limiting the invention to those forms.

The method consists of providing a plurality of closely arranged parallel disks or "cards" equal to the number of cables which are to be woven as warp threads of the complete fabric or webbing. Each of these disks is provided with a plurality of holes through which the elastic threads and the desired number of textile covering threads are passed. The holes are arranged near the periphery of each disk and as the disks are rotated the several elements which pass through each disk are twisted to form a cable. In the specific embodiment of the method which has been chosen for illustration, four equally spaced holes are provided and elastic filaments are threaded through two of these holes. In the preferred method the elastic filaments are passed through diametrically opposite holes. Through the intermediate holes in each disk are passed the covering threads. In the embodiment of the invention shown herein two covering threads are passed through each of the remaining holes so that each cable is composed of two elastic filaments and four covering threads. The purpose of providing a number of covering threads in excess of the elastic filaments is to assure that the elastic core will be completely covered by the textile elements.

The rotation of the disks forms a series of successive sheds at each quarter turn of the several disks and through the shed is passed a pick thread, usually a light cotton thread, by a suitable shuttle or pick-laying device (not shown) so that in the completed fabric the pick thread passes through the several cables and is firmly gripped by the elastic core and the outer wrapping layers.

In making elastic fabric by the present method the two elastic filaments are maintained under a considerable tension during the operation, with the result that these two filaments or threads twist together to form a central cable or core and the outer textile elements are wrapped around the elastic core. When the elastic filaments are located 180° apart on the disks these filaments are always on opposite sides of the shed so that each lay of the pick thread passes between the two twisted elastic filaments in the center of the fabric.

The direction in which the threads are twisted depends upon the manner in which they are threaded through the disks and the direction of rotation of the disks. Thus, as shown in Fig. 2,

the several strands on the upper three disks pass through the disks in one direction, while the strands in the lower three disks pass through the disks in the reverse direction, giving the right and left hand twists depicted at the left of Fig. 2.

As the elastic filaments are under a substantial tension they will twist tightly together and grip the pick thread. They will also grip each other and as the elastic threads still retain a substantial tension when the fabric is relaxed, these conditions will remain in the finished fabric.

It will be understood that the provision of two covering threads for each hole in the four-holed disk is optional, and that one thread or more than two threads may be used.

In Figs. 1 and 2 the several disks are designated as 2, the outer edges of the disks being provided with gear teeth which engage upper and lower pinions 3 and 4, one of which is driven. These pinions are usually elongated so that any number of disks may be mounted therebetween and around the pinions are located loose collars 5 which fit between the disks and maintain them in proper spaced relation. Set collars 6 hold the disk assembly together.

The four holes in the disks are designated as 2a, 2b, 2c and 2d, and through the opposite holes 2b and 2d the elastic filaments b and d are passed. Through the two holes 2a and 2c the covering threads a' and a'' and c' and c'' respectively, are passed.

On the left or far side of the disks all of the strands converge to the twisting point X where they are twisted together to form the cable, but as noted above, due to the substantial tension which is maintained in the elastic filaments b and d, these filaments will twist together to form the central cable while the textile threads a' a'' c' and c'' will merely wrap about the elastic cable.

At or near the twisting point a pick or weft thread e is passed through the shed as it is formed, the shuttle preferably making a pass through each successive shed as it is formed by 90° of revolution of the disks. As the pick thread is passed through the center of the shed, and as there is always one elastic filament above and one below the shed, the pick thread will always lie between the turns of the elastic core and be securely gripped and held by the convolutions of the elastic cable. It is not necessary that a pick thread pass through each shed as it is formed and it will also be understood that a double or single pick thread may be employed.

It will be further noted that when the textile strands are employed in duplicate, the pick thread will always lie between the two sets of strands. This condition is illustrated in Fig. 5.

It is desirable to pass a beater (not shown) through each successive shed so as to line up the twists across the fabric. A beater of any design may be employed, but for the best results it should be brought through the shed against the convolutions directly. This is preferable to using an ordinary comb or reed which would bear against the pick thread rather than against the twisted elements of the cable.

From the point X the completed fabric passes through a gathering guide 8 and thence to any suitable drawing or wind-up mechanism. In making an elastic fabric it is desirable to advance the fabric at a somewhat accelerated speed with respect to the speed of rotation of the disks which causes the outer covering elements to form as long spaced spirals as indicated at the left of

Fig. 1. This is to provide for the partial retraction of the elastic core when the fabric is released, whereupon the turns or convolutions of the covering move together as shown in Fig. 3.

In Fig. 3 a piece of complete webbing of six cables is shown in its normal or relaxed condition, this view showing a construction in which the cable twists are alternated. To the right of this view the several elements of the cable have been untwisted to show the construction.

In the edge view in Fig. 4 it will be noted that the pick thread *e* on the selvage encloses the two textile elements or threads.

In a fabric made in accordance with the drawing the elastic filaments are bare when they enter the disks. If a further covering for the elastic filaments were desirable, each of these filaments could be individually wrapped before it enters the rotating disks. It is also possible, without departing from the principles of the invention to incorporate one or a group of cables made up in accordance with the invention in the body of a woven fabric.

The rotation of the disks will create a twist in the individual cables on both sides of the disk and in a loom for the manufacture of the improved fabric, provision may be made to remove the twist from the several cables on the incoming side of the disks or the rotation of the disks may be reversed periodically.

The above are merely examples of the way in which the invention may be modified and adapted for commercial practices by those skilled in this art, for the production of a variety of fabrics or patterns, without departing from the principles of the invention as herein described and claimed.

What is claimed is:

1. In the art of making an elastic fabric, the steps of twisting together a plurality of elastic threads while under tension to form a central cable, and simultaneously wrapping a series of textile threads about the central cable, and passing a pick thread through the cable in advance of the twisting point.

2. In the art of making an elastic fabric, the steps of twisting together a plurality of elastic threads while under tension to form a cable, wrapping a textile covering about the cable, and passing a pick thread between the elastic threads in advance of the twisting point.

3. In the art of making an elastic fabric, the steps of passing two elastic threads and threads of a covering material through holes in a rotary disk, maintaining the elastic threads under tension, rotating the disk to twist the elastic threads to form a central cable and to wrap the covering threads about the cable, said operation forming successive sheds between the several threads, and passing a pick thread through successive sheds.

4. In the art of making an elastic fabric, the steps of passing two elastic threads and threads of a covering material through holes in a rotary disk, maintaining the elastic threads under tension, rotating the disk to twist the elastic threads to form a central cable and to wrap the covering threads about the cable, said operation forming successive sheds between the several threads, and passing a pick thread through successive sheds and between the elastic threads.

5. In the art of making an elastic fabric, the steps of passing two elastic threads and threads of a covering material through holes in a rotary disk, maintaining the elastic threads under ten-

sion, rotating the disk to twist the elastic threads together to form a cable and to wrap the covering threads about the cable, the rotation of the disk creating successive sheds between the threads, and passing a pick thread between successive sheds, the rotation of the disk being so related to the progression of the threads as to form spaced spirals in the covering threads which will close together when the tension on the fabric is released.

6. In the art of making an elastic fabric, the steps of forming a plurality of parallel cables from groups of warp threads by twisting the several groups of threads together, each group of threads containing two elastic threads which are maintained under tension during the twisting operation, and passing a pick thread through the several cables in advance of the twisting point.

7. In the art of making an elastic fabric, the steps of forming a plurality of parallel cables from groups of warp threads by twisting the several groups of threads together, each group of threads containing two elastic threads which are maintained under tension during the twisting operation, and passing a pick thread through the several cables and between the elastic threads in advance of the twisting point.

8. In the art of making an elastic fabric, the steps of forming a plurality of parallel cables from groups of warp threads by twisting the several groups of threads together, each group of threads containing a plurality of covering threads and two elastic threads which are maintained under tension during the twisting operation, and passing a pick thread through the several cables in advance of the twisting point.

9. In the art of making an elastic fabric, the steps of forming a plurality of parallel cables from groups of warp threads by twisting the several groups of threads together, each group of threads containing a plurality of covering threads and two elastic threads which are maintained under tension during the twisting operation, and passing a pick thread through the several cables and between the elastic threads in advance of the twisting point.

10. A process in accordance with claim 1 in which a plurality of parallel cables are formed by the method set forth and in which the pick thread is passed through all of the cables.

11. A process in accordance with claim 2 in which a plurality of parallel cables are formed by the method set forth and in which the pick thread is passed through all of the cables.

12. An elastic fabric comprising a plurality of parallel cables, each cable consisting of an elastic core containing two elastic filaments twisted together and a plurality of covering threads spirally wrapped about the core, and a pick thread passing transversely through the several cables and between the elastic filaments.

13. A fabric as described in claim 12 in which the elastic core is under tension.

14. An elastic fabric comprising a plurality of parallel cables, each cable consisting of an elastic core containing two elastic filaments twisted together and a plurality of textile threads spirally wrapped around the core, and a pick thread passing transversely through the centers of the several cables and between the several textile threads and the elastic filaments.

15. A fabric in accordance with claim 14 in which the elastic cores are under tension.

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