Feb. 11, 1936. N. E. RANDALL 2,030,610

ELASTIC YARN AND METHOD OF MAKING SAME

Filed May 22, 1935

Fig. 1.

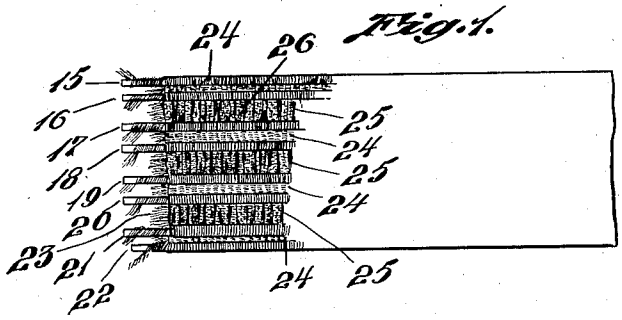



Fig. 2.

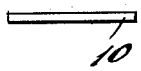



Fig. 3.

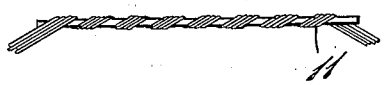
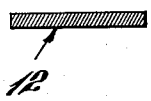



Fig. 4.




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# UNITED STATES PATENT OFFICE

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## ELASTIC YARN AND METHOD OF MAKING SAME

Norman Elmer Randall, Shannock, R. I.

Application May 22, 1935, Serial No. 22,774

6 Claims. (Cl. 117—34)

This invention relates to an elastic webbing; and has for one of its objects the provision of an elastic web which will have little or no creepage or contraction after it is finished and which heretofore has occurred due to the heat of the body or to laundering to which it is subjected.

Another object of the invention is to provide a webbing having little or no contraction in the usages to which it is to be put; and yet one which will be of relatively open work mesh in contrast to one in which the picks are crowded in to govern the stretch as is usual in the manufacture of fabrics of this character at the present time.

Another object of the invention is to exercise control over the elastic strands as they are being prepared and prior to their assembly in the finished or woven fabric so that the character of the fabric produced from these strands will have a predetermined desired quality and no unusual procedure need occur in the weaving.

Another object of the invention is the provision of an elastic fabric which will have a longer life than a fabric in which the elastic threads are under tension and stretched to a considerable degree.

With these and other objects in view, the invention consists of certain novel features of construction, as will be more fully described, and particularly pointed out in the appended claims.

In the accompanying drawing:

Fig. 1 is a top plan view of a fragmental portion of an elastic webbing incorporating my invention;

Fig. 2 is an elevation or plan view of a section of the rubber core;

Fig. 3 illustrates this core as elongated during covering;

Fig. 4 is a view of a fragmental portion of a covered strand which is contracted after covering.

In the manufacture of elastic webbing, it is usual to cover the rubber strands while stretching the rubber strand to substantially its elastic limit, that is, if the rubber is capable of 500% stretch, this 500% stretch will be given the rubber during covering, and this covered strand will be stretched during weaving to substantially this full 500% of its original length and if it be desired to produce the finished fabric which will have a certain percentage of stretch less than 500%, say for instance 100% stretch, or there will be 50% contraction in the strand after covering, it is then arranged to cover the naked elastic or rubber so that it cannot contract to its original position but rather will be continually under tension tending to return to the length it was in the naked rubber state. For example, a one inch rubber if stretched 500% would become six inches long. If 100% elongation were desired, the covering would be arranged to permit contraction to three inches and there be limited. The rubber core would constantly be tending to return to a one inch length. Other methods of controlling the stretch in the finished fabric were such as crowding into the fabric during weaving a sufficient number of picks to control the stretch or to crowd with a larger number or heavier warp ends so that when the cloth comes from the loom, if 100% stretch be desired, the pulling will give just this 100% stretch and a larger percentage of the stretch prevented by reason of the fact that the cloth does not go back under contraction to its full extent. A fabric of this character has its elastic threads constantly under tension. There is thus a tendency of these elastic threads to be pulling at all times to shorten their length so long as they have any life at all. A fabric so formed is found to creep or contract to a considerable extent. For instance, an average might be 15% to 20% and this contraction will take place during hot or damp weather or while the fabric is worn on the body and subjected to the heat of the body and also during laundering. It is found that where a webbing is used to extend about the body, such for instance as in men's and women's underwear, and pyjamas, shorts, etc., that this creeping takes place to such an extent that the band about the body becomes so tight as to be uncomfortable due to shrinkage and much discussion exists to overcome this undesirable effect. The problem has been solved in a woven fabric of strand rubber, as herein shown, and I have found that I can control this stretch to such a degree that less than 5% contraction will occur by following certain steps which are a radical change to those usually thought necessary to be employed in the preparing and weaving of a covered elastic thread; and to accomplish my result, I start with a rubber strand and instead of elongating it 500% or to its limit as is usual, I elongate it from 150% to 200% and then wrap it in such a manner as to limit its further elongation and permit its full contraction so that the rubber core is practically at rest and the same length as the naked rubber before wrapping. I then weave the elastic strand in the customary manner. In this way, I may obtain a definite contraction of the fabric after it is woven, giving a desired definite

stretch and the elastic warps are substantially under no tension in the fabric or under so little tension that they are not constantly exerting that great pull or tension tending to contract, as has heretofore been present; and the following is a more detailed description of the present embodiment of this invention, illustrating the preferred means by which these advantageous results may be obtained:

With reference to the drawing, **10** designates a short section of the rubber core which for the sake of comparative purposes I have illustrated as one inch in length. This one inch section illustrates the naked rubber at rest or in other words, the rubber has no tendency to contract further than shown here in Figure 2. It will be understood that this naked rubber is of a continuous length of many yards and that I am illustrating only one short section for the sake of comparison. This rubber core will be elongated about 150% or one inch will be extended to approximately two and one-half inches as illustrated in Figure 3, and covered with a suitable non-elastic covering **11**. This covering, as applied, will limit the extensibility of the strand so that one inch of the naked rubber will never stretch beyond the 150% or two and one-half inches in length. On the other hand, the covering is so arranged that the rubber core will contract to substantially its naked rubber length or back to approximately one and one-tenth inches, such as shown at **12** in Figure 4. It will be realized, however, that the rubber will not contract quite back to its original length in the naked state because of the covering, but there will be no more than ten inches of covered rubber for every nine inches of naked rubber, which is quite in contrast to the heretofore usual condition of having about ten inches of covered rubber for every three to six inches of naked rubber.

After treating my rubber warp strands in this manner so that they may contract and come substantially to rest without any longitudinal tension, I weave them into a fabric in somewhat the usual manner, that is, the rubber or elastic strands are under full tension so that where 150% elongation is to be obtained as above pointed out, one inch of the naked rubber after covered will be two and one-half inches but cannot stretch further because of this covering. In such weaving, of course, there will be some restriction to the contraction due to the picks placed across the warp strands,—perhaps 50% elongation will be taken out; however, instead of crowding in picks to limit the contraction, I place these picks in a rather loose manner so as not to limit the contraction but permit the rubber strands to contract to substantially their full extent and come back to a position substantially at rest in the finished material after it leaves the roll of the loom. The fabric woven from the elastic strands having 150% stretch will have substantially 100% elongation or stretch after weaving.

I have illustrated in Figure 1 a typical elastic webbing in which I have provided elastic strands **15, 16, 17, 18, 19, 20, 21** and **22** each consisting of a rubber core covered in the manner above mentioned. The non-elastic threads in between these elastic strands are designated generally **23** and consist of non-elastic warp threads. The picks placed in the fabric are arranged to provide a one and one weave with the warp threads as at **24** between two closely adjacent rubber strands, while the picks are arranged to have a two and two weave with the warp threads as at **25** in the wider spaces between the groups of rubber strands. These wider spaces pucker as at **26** in a typical fabric as shown in Figure 1, when contracted.

This fabric is rather loosely woven so far as the crowding of the picks is concerned, and will have a substantially 100% stretch or any definite desired amount of stretch predetermined upon certain calculated operations governed largely by the winding of the rubber core, and yet the rubber strands when the fabric is contracted will be substantially at rest and exert little or no pull in a longitudinal direction. By reason of the absence of longitudinal pull when contracted, the fabric will not shrink when exposed to the heat and sweat of the body or to laundering operations.

Further, a very flexible fabric is provided which is highly desirable for use where it is worn about the body, especially where an extended length is used such as on underwear, pyjamas or the like.

Further, when rubber which is porous is stretched a large percentage of its mass is exposed to the action of the oxygen of the air and deterioration from the outside rapidly occurs while in the present fabric as the rubber is under no tension its pores are closed to a much greater degree and there is less opportunity for any such oxidation; thus, the life of the fabric formed as herein set forth is greatly increased.

It will of course be apparent that while I have referred to a fabric as made upon a loom that this invention may also be employed in fabrics which are braided, knitted or otherwise fabricated or put together, and I use the term woven or weaving in the claims in a broad sense to include the usual product from a loom or a braided or knitted structure where the threads are intermeshed or interlaced one with the other.

The foregoing description is directed towards the method and construction illustrated, but I desire it to be understood that I reserve the privilege of resorting to all the equivalent changes to which the construction and method are susceptible, the invention being defined and limited only by the terms of the appended claims.

I claim:

1. An elastic strand for fabrication comprising a rubber core and a non-elastic covering thereover, said rubber core being substantially at rest and of a length but slightly longer than the length of the naked rubber core uncovered, said covering being arranged to limit the extension of the strand to substantially the extent of elongation as when the covering is applied, the same having a definite multiple of its length when at rest, said limit being substantially less than the limit of stretch of the naked rubber without a covering thereon.

2. An elastic strand for fabrication comprising a rubber core and a non-elastic covering thereover, said rubber core being substantially at rest and of a length but slightly longer than the length of the naked rubber core uncovered, said covering being arranged to limit the extension of the strand to substantially the extent of elongation as when the covering is applied, the same having a definite multiple of its length when at rest, said limit being substantially less than the limit of stretch of the naked rubber without a covering thereon, said covering comprising convolutions so spaced when the strand is stretched as to permit contraction of the elastic core to a substantially at rest position and at such contracted position substantially completely enveloping the core.

3. The method of preparing a covered elastic strand for fabrication which consists in stretching the core to an extent substantially less than its elastic limit, then covering the elastic core to prevent any substantial further elongation thereof, said covering being disposed at such a helical pitch with its convolutions so spaced that the core may contract to substantially its naked state at rest when released with the covering practically completely enveloping the core when the core is at rest.

4. The method of preparing a covered elastic strand for fabrication which consists in stretching the core to an extent substantially less than its elastic limit, then covering the elastic core to prevent any substantial further elongation thereof, said covering being disposed at such a helical pitch with its convolutions so spaced that the core may contract to substantially its naked state at rest when released.

5. The step in the method of preparing a substantially non-shrinking elastic fabric which consists in covering the elastic core of the strand to be used when under substantially less than its full amount of stretch by helically disposing the covering at such a pitch as to limit the further extension of the core but with its convolutions so spaced as to permit the core to return substantially to an at rest position and then weaving the strand in the fabric in the usual manner.

6. An elastic fabric comprising interwoven threads some of said threads comprising a rubber core and a non-elastic covering thereover, said rubber core being substantially at rest and of a length but slightly longer than the length of the naked rubber core uncovered, said covering being arranged to limit the extension of the strand to substantially the extent of elongation as when the covering is applied thereto, said limit being substantially less than the limit of stretch of the naked rubber without a covering thereon.

NORMAN ELMER RANDALL.