Nov. 30, 1937. W. J. FOX 2,101,004

ELASTIC STRAND

Filed Feb. 23, 1937

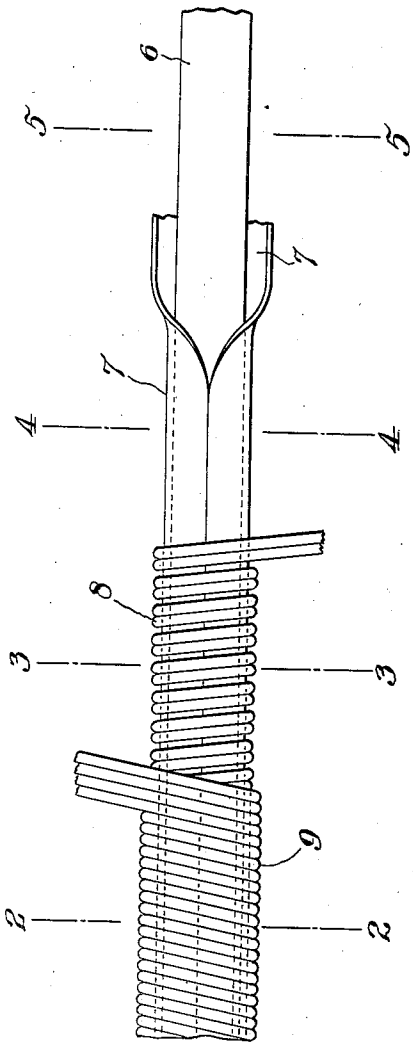


Fig. 1.

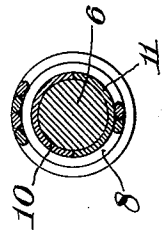


Fig. 6.



Fig. 5.

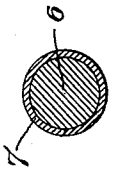


Fig. 4.

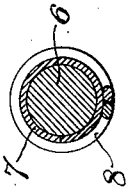


Fig. 3.

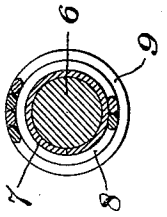


Fig. 2.

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ELASTIC STRAND

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Application February 23, 1937, Serial No. 127,288

19 Claims. (Cl. 117—57)

This invention relates to improvements in elastic strands for use in the manufacture of elastic fabrics of the character employed in the manufacture of articles of wearing apparel and surgical appliances.

Such strands comprise elastic, stretchable rubber confined within surrounding covering threads which extend spirally around the rubber in a manner to permit the strand as a whole to be stretched longitudinally and to return to its condition before it was stretched.

The elastic fabrics in which such strands are used comprise the strands and binding threads therefor, the strands being arranged side by side and the binding threads cooperating with the strands to form the fabrics and retain the strands therein in a manner to permit the fabrics in their entireties to be stretched in directions longitudinally of the strands.

When the elastic fabrics are subjected to sewing operations, it frequently happens that the sewing needle penetrates the rubber of some of the strands, leaving holes or broken edges therein, and, at times, leaving the sewing thread extending through the rubber; and when any or all of these things occur they often cause breakage in the impaired rubber of the strands, under the frequent stretching and releasing of the fabric, and thereby cause impairment and deterioration in the fabric.

An object of the invention is to provide an elastic strand of novel and advantageous construction wherein low manufacturing costs are combined with efficiency in the normal operations of the strands, and wherein the impairment of the strands and the fabrics, from the causes above referred to, and the detrimental effects resulting therefrom, are reduced to a minimum.

Another object is to provide an elastic strand containing two or more rubber elements extending longitudinally within the covering threads thereof and possessing different characteristics whereby advantages are gained in the durability of the strand coupled with economy in the manufacture thereof.

Another object is to provide an elastic strand containing two or more rubber elements extending longitudinally within the covering threads and having different resistances to stretching, whereby the desired resistance to stretching of the complete strand may be economically provided.

Another object is to provide an elastic strand containing two rubber elements extending longitudinally within the covering threads and so related to each other that one rubber element will substantially surround and confine the other and prevent the contact of covering threads with the inner element and also protect the same against contact with outside air and moisture and thereby prevent the deleterious effects heretofore caused by such contacts.

The invention resides in the elements and the combinations of them in the improved strand, as will be hereinafter described and claimed.

In the accompanying drawing, illustrating the invention,

Figure 1 is a side view of an elastic strand, greatly enlarged, constructed in accordance with the invention, showing in the region of the line 2—2 the appearance of the complete strand, showing in the region of the line 3—3 the appearance of the strand after the removal of the outer covering threads, showing in the region of the line 4—4 the appearance of the strand after the removal of the inner covering threads, and showing in the region of the line 5—5 the appearance of the strand after the removal of the outer and inner covering threads and the outer rubber element.

Figures 2, 3, 4 and 5 are transverse sections through the strand and parts thereof, on lines 2—2, 3—3, 4—4, and 5—5, respectively of Fig. 1.

Fig. 6 is a transverse section through a modified form of the strand.

Referring to the drawing, the improved strand comprises an inner, centrally located, rubber element or core 6, a rubber element 7 located outwardly of the core 6, inner covering threads 8 surrounding the rubber elements 6 and 7, and outer covering threads 9 surrounding the inner covering threads 8.

The inner rubber element or core 6 is characterized by being elastic and stretchable; it may be of any known and approved quality, manufactured in any approved manner; and it may be of any desired form in cross section. When the inner core is manufactured by being cut from a sheet of suitable rubber, the core will be normally square in cross section, but it will be deformed into substantially round cross section by the rubber element 7 and the surrounding covering threads 8 and 9.

The rubber element 7 has the characteristics of being elastic and stretchable, and, in its normal condition it is in the form of a flat ribbon which may be manufactured under the known methods in the rubber art. This ribbon is of a suitable width to enable it to be deformed transversely to cause it to embrace and substantially surround the inner core 6 in contact therewith,

as clearly shown in Figs. 1, 2, 3 and 4 of the drawing.

The covering threads 8 and 9 may be of cotton or other suitable material employed in this art for rubber covering purposes. Usually a plurality of threads 8 is employed in the inner covering for the rubber elements, and a plurality of threads 9 is employed in outer covering. The number of threads employed in each covering may vary in accordance with variations in the character of the rubber elements and in accordance with the characteristics desired in the complete strand. As herein illustrated, the inner covering 8 is comprised of two threads, and the outer covering 9 is comprised of four threads. The threads 8 are wrapped spirally around the rubber elements 6 and 7, and the threads 9 are wrapped spirally around the rubber elements and the threads 8 reversely of the threads 8, as illustrated in the drawing, such wrapping preventing the strand from twisting and kinking.

In producing the improved strand the rubber ribbon 7 is applied to the rubber core 6, the inner threads 8 are applied to the ribbon 7 and the outer threads 9 are applied to the inner threads 8, in the order named, in a continuous operation, while the rubber elements are maintained in a longitudinally stretched condition in accordance with the character of the rubber elements, and in accordance with the result desired in the finished strand. The threads 8 and 9 are each applied by the usual means employed in this art for covering rubber cores, the threads 8 being applied in advance of the application of the threads 9; and, when the inner threads are applied, they automatically deform the rubber ribbon 7 from its normally flat condition and cause it to embrace and substantially surround the core 6 inwardly of the threads 8 and in contact with the core. After the application of the threads 8 and 9, and the release of the rubber elements 6 and 7, such elements contract longitudinally and expand transversely until they are stopped by the surrounding threads 8 and 9 which then hold or retain them in a stretched condition; and, while the threads 8 and 9 hold the elements 6 and 7 in a stretched condition, such condition is far from the limit to which the elements may be stretched. The greater the extent to which the threads hold the enclosed rubber elements stretched, the greater will be the resistance of the elements to further stretching when the complete strand is stretched, and, therefore, it will be understood that the stretch resisting characteristics of the rubber elements will determine the extent to which it will be necessary for the covering threads 8 and 9 to maintain them stretched from their normal lengths, to provide the desired stretch resistance in the complete strand.

The development in the rubber art has been such that rubber elements for use in elastic strands in this art are now obtainable which have sufficient resistance to being stretched from the normal lengths thereof as not to be required to be held by the covering threads in a stretched condition at all or stretched only to a very little or limited extent. One or more of the rubber elements of my improved strand may be formed of rubber having such or similar resistance and the covering threads may enclose such elements in an unstretched condition in the strand or in a condition in which only one or both of such elements are held stretched from the normal length thereof.

The expense in obtaining rubber elements for use in elastic strands in this art varies with the form thereof and the resistance thereof to stretching, and, usually, the expense is greater in the flat or ribbon form and in the greater resistance to stretching regardless of the form.

My aim is to accomplish the objects of my invention by obtaining the desired results in the strand, while keeping the expense of manufacturing the same well within the bounds of economy. To this end, I have obtained good results in the form of embodiment of the invention herein illustrated, and by the use therein of rubber elements of such character that by having the rubber core 6 stretched to a length many times its normal length and almost to its elastic limit, and by having the rubber ribbon 7 stretched to a lesser extent with relation to its normal length during the application of the covering threads 8 and 9 thereto, and by having the covering threads related thereto so that thereafter each three inches of the finished strand will have therein a length of core 6 held by the covering threads stretched from a normal length of approximately one and one-eighth inches, and a length of ribbon 7 held by the covering threads stretched from a normal length of approximately one and three-quarters inches. This relationship of the parts provides an elastic strand which will not twist or kink and which will have an appropriate resistance to stretching for use in elastic fabrics.

In addition to the foregoing characteristics of my improved strand which guard against rubber breakage, I provide other means to guard against such breakage by forming the core or element 6 and the ribbon or element 7 each of rubber which differs characteristically from the rubber of the other in that the rubber of one element, the core 6 in the present instance, offers greater resistance to being stretched than that offered by the other element, the ribbon 7 in the present instance; and by relating the rubber elements to each other and to the covering threads so that the threads will maintain one element, the core 6 in the present instance, stretched from its normal length under a tension which is greater than the tension of the other element, the ribbon 7 in the present instance.

I have discovered that the relations and characteristic differences of the parts of the strand as herein shown and described, separately and collectively considered, materially reduces the breakage of the rubber elements heretofore caused by needle punctures. The relation and characteristic differences of the rubber elements enables me to provide the desired resistance to stretching in an elastic strand containing two rubber elements one of which is held by the covering threads under less tension than the other, and, therefore, is less liable to snap or break after being punctured by a needle. Should the rubber element held under the greater tension snap or break, the remaining rubber element will, in most instances, remain intact and, in a large measure, prevent the other element from having pronounced detrimental effects.

The use of the two forms of rubber elements 6 and 7, related as herein shown and described, enables me to protect the element 6 by the element 7, and, at the same time, provide the entire strand with the desired resistance to stretch in an economical manner, because the cost of the rubber in the form of the core 6 is less than the cost of the rubber in the form of the ribbon 7.

By having the rubber ribbon 7 embrace or surround the rubber core 6 in contact therewith,

the core is protected against contact with air and moisture and the deleterious effects thereof upon the core, and the core 6 is also separated from the covering threads and protected against the chafing action thereof which would be present if the ribbon 7 were eliminated and which would cause deterioration of the core and thereby shorten the period of its useful service.

In the modification shown in Fig. 6, I employ two rubber ribbons 10, 11 in lieu of the single ribbon 7, shown in the other figures of the drawing, and I arrange the two ribbons 10, 11 on opposite sides of the core 6 and deform them transversely so that they will embrace opposite sides of the core, and I bring their longitudinal edges into close relationship, so that together they will substantially surround the core 6 in contact therewith. In this construction the ribbons 10, 11 will exert the same pull on opposite sides of the strand, and there will be no tendency to kink the same even though the ribbons 10, 11 do not bear the same relation to the other parts of the strand as that borne by the single ribbon 7.

I claim:

1. An elastic fabric strand comprising a stretchable, elastic, rubber core extending longitudinally of the strand; a stretchable, elastic, rubber ribbon extending longitudinally of the strand; and covering threads surrounding said core and said ribbon and transversely deforming the ribbon into contact with the rubber core.

2. An elastic fabric strand comprising a stretchable, elastic, rubber core extending longitudinally of the strand; a stretchable, elastic, rubber ribbon wider than said core and extending longitudinally of the strand; and covering threads surrounding said core and said ribbon and transversely deforming the ribbon into contact with the rubber core.

3. An elastic fabric strand comprising a stretchable, elastic, rubber core extending longitudinally of the strand; a stretchable, elastic, rubber ribbon wider than said core and extending longitudinally of the strand; and covering threads surrounding said core and said ribbon and transversely deforming the ribbon into embracing contact with the rubber core.

4. An elastic fabric strand comprising a stretchable, elastic, rubber core extending longitudinally of the strand; a stretchable, elastic, rubber covering substantially surrounding said rubber core in contact therewith; and covering threads surrounding said rubber covering and said core.

5. An elastic fabric strand comprising a stretchable, elastic, rubber core extending longitudinally of the strand; a stretchable, elastic, rubber ribbon extending longitudinally of the strand; and covering threads surrounding said core and said ribbon and transversely deforming the ribbon into contact with the rubber core and maintaining the core stretched longitudinally to a length greater than its normal length.

6. An elastic fabric strand comprising a stretchable, elastic, rubber core extending longitudinally of the strand; a stretchable, elastic rubber ribbon wider than said core and extending longitudinally of the strand; and covering threads surrounding said core and said ribbon and transversely deforming the ribbon into contact with the rubber core and maintaining the core stretched longitudinally to a length greater than its normal length.

7. An elastic fabric strand comprising a stretchable, elastic, rubber core extending longitudinally of the strand; a stretchable, elastic, rubber ribbon wider than said core and extending longitudinally of the strand; and covering threads surrounding said core and said ribbon and transversely deforming the ribbon into embracing contact with the rubber core and maintaining said core stretched longitudinally to a length greater than its normal length.

8. An elastic fabric strand comprising a stretchable, elastic, rubber core extending longitudinally of the strand; a stretchable, elastic, rubber covering substantially surrounding said core in contact therewith; and covering threads surrounding said rubber covering and said core and maintaining said core stretched to a length greater than its normal length.

9. An elastic fabric strand comprising a stretchable, elastic, rubber core extending longitudinally of the strand; a stretchable, elastic, rubber ribbon extending longitudinally of the strand; and covering threads surrounding said core and said ribbon and transversely deforming the ribbon into contact with the core and maintaining said core and said ribbon each stretched longitudinally to a length greater than its normal length.

10. An elastic fabric strand comprising a stretchable, elastic rubber core extending longitudinally of the strand; a stretchable, elastic, rubber ribbon wider than said core and extending longitudinally of the strand; and covering threads surrounding said core and said ribbon and transversely deforming the ribbon into contact with the rubber core and maintaining said core and said ribbon each stretched longitudinally to a length greater than its normal length.

11. An elastic fabric strand comprising a stretchable, elastic, rubber core extending longitudinally of the strand; a stretchable, elastic, rubber ribbon wider than said core and extending longitudinally of the strand; and covering threads surrounding said core and said ribbon and transversely deforming the ribbon into embracing contact with the rubber core and maintaining said core and said ribbon each stretched longitudinally, to a length greater than its normal length.

12. An elastic fabric strand comprising a stretchable, elastic, rubber core extending longitudinally of the strand; a stretchable, elastic, rubber covering substantially surrounding said rubber core in contact therewith; and covering threads surrounding said rubber covering and said core and maintaining them each stretched to a length greater than its normal length.

13. An elastic fabric strand comprising a stretchable, elastic, rubber core extending longitudinally of the strand; a stretchable, elastic, rubber ribbon extending longitudinally of the strand; covering threads surrounding said core and said ribbon and transversely deforming the ribbon into contact with the rubber core and maintaining said core and said ribbon each stretched longitudinally to a length greater than its normal length; and the extent to which the covering threads maintain the core stretched from its normal length being greater than the extent to which the covering threads maintain the ribbon stretched beyond its normal length.

14. An elastic fabric strand comprising a stretchable, elastic, rubber core extending longitudinally of the strand; a stretchable, elastic, rubber ribbon wider than said core and extending longitudinally of the strand; covering threads surrounding said core and said ribbon and transversely deforming the ribbon into contact with the

rubber core and maintaining said core and said ribbon each stretched longitudinally to a length greater than its normal length; and the extent to which the covering threads maintain the core stretched from its normal length being greater than the extent to which the covering threads maintain the ribbon stretched beyond its normal length.

15. An elastic fabric strand comprising a stretchable, elastic, rubber core extending longitudinally of the strand; a stretchable, elastic rubber ribbon wider than said core and extending longitudinally of the strand; covering threads surrounding said core and said ribbon and transversely deforming the ribbon into embracing contact with the rubber core and maintaining said core and said ribbon each stretched longitudinally to a length greater than its normal length; and the extent to which the covering threads maintain the core stretched from its normal length being greater than the extent to which the covering threads maintain the ribbon stretched beyond its normal length.

16. An elastic fabric strand comprising a stretchable, elastic, rubber core extending longitudinally of the strand; a stretchable, elastic, rubber covering substantially surrounding said rubber core in contact therewith; covering threads surrounding said rubber covering and said core and maintaining them each stretched to a length greater than its normal length; and the extent to which the covering threads maintain the core stretched from its normal length being greater than the extent to which the covering threads maintain said rubber covering stretched beyond its normal length.

17. An elastic fabric strand comprising two stretchable, elastic, rubber elements, and covering threads surrounding said elements, one of said elements being held by said threads stretched from its normal length and under a tension greater than the tension of the other element.

18. An elastic fabric strand comprising two stretchable, in independently movable, elastic, rubber elements, and covering threads surrounding said elements, the rubber of which one element is formed possessing the characteristic of offering greater resistance to stretching than that offered by the other element.

19. An elastic fabric strand comprising two stretchable, elastic, rubber elements, and covering threads surrounding said elements, one of said elements being held by said threads stretched from its normal length and under a tension greater than the tension of the other element and the rubber of which one element is formed possessing the characteristic of offering greater resistance to stretching than that offered by the other element.

WILLIAM J. FOX.