March 29, 1938. S. C. LILLEY 2,112,294

METHOD OF SECURING COVERING MATERIAL TO ELASTIC STRANDS FOR ELASTIC FABRICS

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Fig. 1.

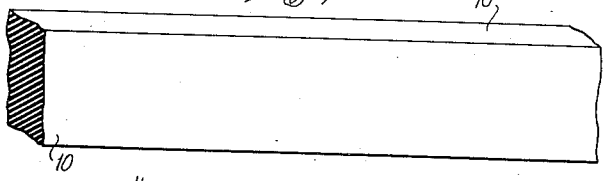
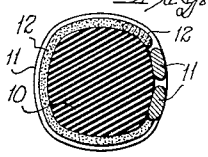


Fig. 3.



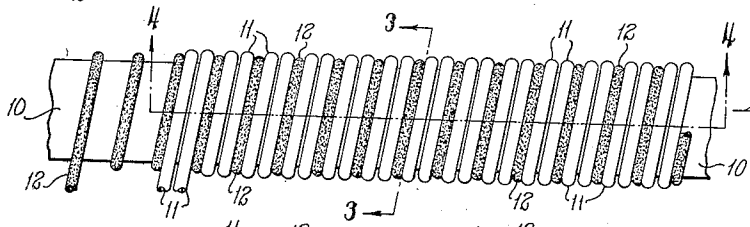


Fig. 2.

Fig. 4.

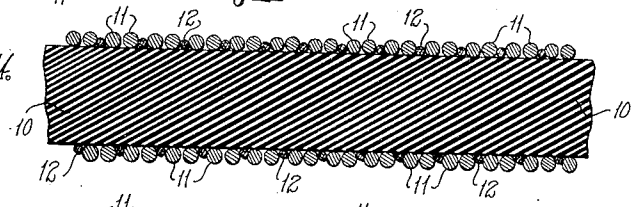


Fig. 5.

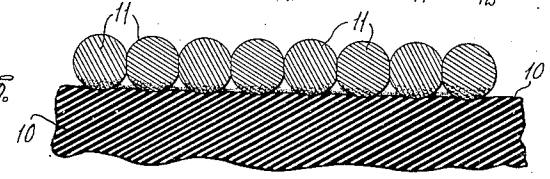


Fig. 6.

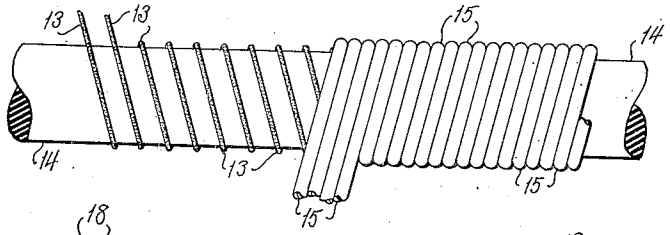


Fig. 7.

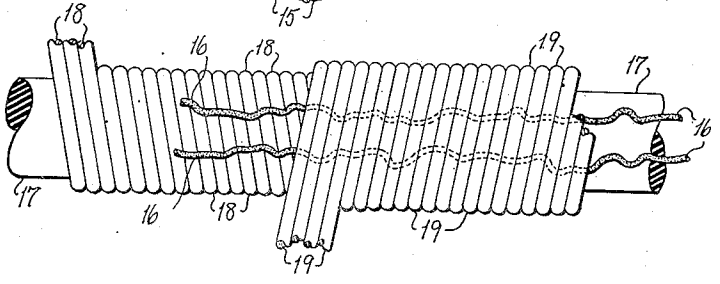
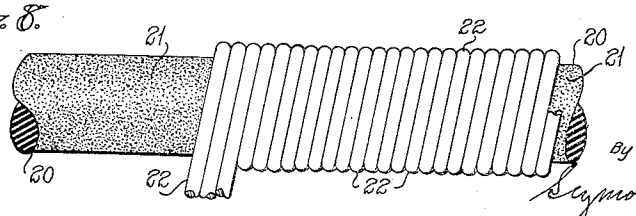


Fig. 8.



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METHOD OF SECURING COVERING MATERIAL TO ELASTIC STRANDS FOR ELASTIC FABRICS

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Application October 20, 1936, Serial No. 106,579

3 Claims. (Cl. 117—34.5)

This invention relates to an improvement in methods of making covered elastic strands and particularly to methods for securing or anchoring covering material to elastic core-strands, for incorporation into woven, knitted, netted, or the like elastic fabrics.

Heretofore methods of securing textile covering-strands to elastic core-strands have been proposed, all of which, however, have been open to one or more objections, such as difficulty of manufacture, high cost of manufacture, unsightliness of the product, interference with weaving or other fabricating operations, etc.

One of the objects of the present invention is to provide a superior method for the manufacture of covered elastic strands of the character referred to in which the covering material is effectively cemented to the elastic core-strand to guard against the creeping of the latter with respect to the former.

A further object is to provide a simple and economical method of securing covering material to elastic core-strands to guard against relative creeping.

Another object is to provide a superior method whereby covering material may be secured to elastic core-strands without materially impairing the efficiency or appearance of the covering material.

A still further object is to provide a superior method for producing elastic strands (comprising an elastic core and a covering cemented thereto) which may be readily incorporated into fabric without interfering with the operation of looms or other fabric-producing machinery.

With the above and other objects in view, as will appear to those skilled in the art from the present disclosure, this invention includes all features in the said disclosure which are novel over the prior art and which are not claimed by me in a separate application.

As will be apparent from the following, the present invention contemplates securing the covering material to an elastic core-strand by subjecting previously-applied potential adhesive-forming material to the action of a suitable solvent while the said covering material is in situ.

In the accompanying drawing:

Fig. 1 is a perspective view of a bare elastic core-strand preparatory to being provided with a cemented-on covering material;

Fig. 2 is a view in side elevation of the elastic core-strand shown as slightly stretched and showing adhesive-forming strands and covering strands applied thereto preparatory to softening the said adhesive-forming strands to adhere the covering-strands in place to the elastic core-strand;

Fig. 3 is a transverse sectional view taken on the line 3—3 of Fig. 2;

Fig. 4 is a longitudinal sectional view taken on the line 4—4 of Fig. 2;

Fig. 5 is a broken view substantially corresponding to Fig. 4 but on a larger scale and showing the covered strand after the adhesive-forming strands have been softened and largely dispersed to adhere the covering-strands to the elastic core-strand, which latter is substantially relaxed;

Fig. 6 is a broken view in side elevation illustrating another mode of applying adhesive-forming strands and covering-strands to an elastic core-strand;

Fig. 7 is a similar view of still another mode of applying adhesive-forming strands and covering-strands to an elastic core-strand; and

Fig. 8 is a broken view in side elevation illustrating another mode of adhering covering material to an elastic core-strand.

In carrying out the present invention as illustrated in Figs. 1 to 5 inclusive, a core-strand 10 is employed, which may be of rectangular, round or other cross-sectional form and of such cross-sectional dimensions as will enable it to be incorporated into elastic fabrics after it has been covered in a manner as will hereinafter appear.

The core-strands of the present invention may be formed of a variety of elastic materials such, for instance, as the vulcanized rubber compounds common in the industry. The following compound may be mentioned as suited for the production of elastic core-strands when cured for about 45 minutes at approximately 260° F.:

	Parts by weight
Rubber	100
Sulphur	3⅔
Stearic acid	1
Symmetrical di-beta-naphthyl-para-phenylenediame	1
Zinc sulphide	5
Phenylhydrazine	½
90% zinc salt of mercaptobenzothiazole 10% di-ortho-tolylguanidine	1
Zinc oxide	5
Methylacrylic ester	20

The said core-strand 10, preferably while in a partly-stretched condition, has helically wrapped around it one or more covering-strands 11 of suitable textile material such, for instance, as cotton, silk, wool, regenerated cellulose, etc. The

core-strand 10 also has helically wrapped around it one or more strands 12 formed of suitable material (specific examples of which are hereinafter recited) which will become tacky or adhesive under the action of a suitable softening material, which latter will, for convenience of description, be referred to as "solvent" material or fluid, examples of which will also be hereinafter given. The strands 12, also for the purpose of convenience of description, may be properly designated as "adhesive-forming" material or strands, inasmuch as they may be viewed as potential adhesives and do not become fully effective until treated with the so-called solvent material, as will more fully hereinafter appear.

The convolutions of the solvent-softenable adhesive-forming strands 12 are, as shown in Fig. 2, interspersed between the convolutions of the covering-strands 11 before referred to, both of which types of strands may be concurrently applied to the elastic core-strand 10 or they may be separately applied thereto if desired.

After both the covering-strands 11 and the adhesive-forming strands 12 are in place upon the elastic core-strand 10, the partly-finished strand may be immersed in or otherwise subjected to the action of a suitable solvent, which will render the said adhesive-forming strands or their equivalent sufficiently soft or tacky to adhere the covering-strands or their equivalent to the elastic core-strand. The adhesive-forming strands, such as 12, may be caused to substantially lose their identity as strands by using a sufficiently-strong solvent over a short period of time or a relatively-weaker solvent over a longer period of time, and be caused to penetrate portions of the covering material such as 11, as is indicated in Fig. 5.

The material from which the adhesive-forming material or strands may be formed in accordance with the present invention, as well as the solvents therefor, may vary widely, and the following is given by way of illustration:

Solvent-softenable adhesive-forming materials	Solvents
Methyl-polyacrylate	Acetone, ether, acetone and alcohol, ether and alcohol, etc.
Cellulose acetate	Acetone, acetone and alcohol, etc.
Cellulose nitrate	Butyl-acetate, acetone, ether, acetone and alcohol, ether and alcohol, etc.

If it is desired to limit the softening or solvent action of the so-called solvent, the said solvent may be diluted, if desired, to such a degree that the adhesive-forming strands will not entirely lose their identity, but will still serve their purpose of adhering the covering-strands to the elastic core-strand.

Furthermore, if it is desired to render the cementing resulting from the softening of the adhesive-forming material more plastic, such material may be treated prior to softening with a suitable plasticizer such, for instance, as diethyl-phthalate.

The adhesive-forming material chosen should be (as are those before listed) insoluble in water after having been treated with a solvent, in order to permit the fabrics in which the covered elastic strands of the present invention are incorporated, to be laundered.

As before indicated, the elastic core-strands, covering material, the adhesive-forming material, and the solvents may vary widely, and in selecting them for combination, care should be taken to insure that neither the covering material nor the elastic core-strand will be deleteriously affected by the adhesive-forming material or by the solvent employed for softening the latter. All of the solvent-softenable adhesive-forming materials and all of the solvents above referred to may be freely used without harmful results in connection with elastic core-strands of vulcanized rubber, and with covering materials of cotton, silk, wool and regenerated cellulose.

If desired and as shown in Fig. 6 one or more strands 13 of solvent-softenable adhesive-forming material may be applied as an inner coating to an elastic core-strand 14, after which one or more covering-strands 15 may be helically wrapped over the strands 13 and the core-strand 14 in a direction reverse to the inclination of the said strands 13.

The partly-completed covered-strand structure of Fig. 6 may be subjected to the action of a suitable solvent which will penetrate the covering material 15 and effect the softening of the strands 13 so as to cause the same to adhere the covering-strands 15 and the elastic core-strand together.

If desired and as shown in Fig. 7, a suitable number of solvent-softenable adhesive-forming strands 16 may be extended longitudinally of an elastic core-strand 17. In the covered-strand structure now being described, the strands 16 are interposed between a group of inner covering-strands 18 helically applied directly to the elastic core 17 and an outer series of covering-strands 19 helically applied in a direction opposite to the inclination of the inner covering-strands 18.

When the covered-strand structure of Fig. 7 is subjected to the action of a suitable solvent the adhesive-forming strands 16 may be caused to become so fluid as to penetrate the inner covering 18 and bond the same to the elastic core-strand 17. By this procedure, the outer covering-strands 19 may also be adhered to the inner covering-strands 18 before referred to.

Instead of applying the adhesive material in the form of a strand, a core-strand 20 may be provided with an all-over coating 21 of a solvent-softenable adhesive-forming material as illustrated in Fig. 8. When the coating 21 is sufficiently dry and free of tackiness, covering-strands 22 may be applied in one or more layers. Upon subjecting the partly-completed covered-strand structure of Fig. 8 to the action of a suitable solvent, the coating 21 will become sufficiently softened to adhere the covering-strands 22 to the elastic core 20.

It will usually be found that after the partly-completed covered elastic strands of the present invention have been treated with a suitable solvent, preferably when substantially relaxed and either before or after their incorporation into a fabric, that some adhesion will exist between the abutting wrapped or braided covering-strands. The initial stretching of the completed and dried strand, however, will in most cases break the bond between the various convolutions of the covering material without, however, breaking the bond between the covering material and the core-strand.

From the foregoing, it will be seen that by means of the present invention, covering material may be adhered to an elastic core-strand to guard against relative creeping, in a simple, reliable and effective manner without rendering the completed strand unsightly and without "gumming up", so to speak, looms, knitting machines

or other apparatus employed for incorporating the strands of the present invention into a fabric.

The invention may be carried out in other specific ways than those herein set forth without departing from the spirit and essential characteristics of the invention, and the present embodiments are, therefore, to be considered in all respects as illustrative and not restrictive, and all changes coming within the meaning and equivalency range of the appended claims are intended to be embraced therein.

I claim:

1. A method of securing covering material to elastic strands for incorporation into elastic fabrics comprising: first stretching an elastic core-strand; then applying an adhesive-forming material and a covering material in strand form to the elastic core-strand while the same is stretched; and then subjecting the covered strand thus produced to the action of a solvent to effect the softening of the said adhesive-forming material to cause the same to adhere the said covering material to the said core-strand.

2. A method of securing covering material to elastic strands for incorporation into elastic fabrics comprising: first stretching an elastic core-strand; then applying an adhesive-forming material in strand form and a covering material also in strand form to the elastic core-strand while the same is stretched; and then subjecting the covered strand thus produced to the action of a solvent to effect the softening of the said adhesive-forming material to cause the same to adhere the said covering material to the said core-strand.

3. A method of securing covering material to elastic strands for incorporation into elastic fabrics comprising: first stretching an elastic core-strand; then applying an adhesive-forming material in strand form and a plurality of oppositely-inclined layers of covering material also in strand form to the elastic core-strand while the same is stretched; and then subjecting the covered strand thus produced to the action of a solvent to effect the softening of the said adhesive-forming material in strand form to cause the same to adhere the said covering material to the said core-strand.

SAMUEL C. LILLEY.