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KNITTED ELASTIC FABRIC AND METHOD FOR PRODUCING THE SAME

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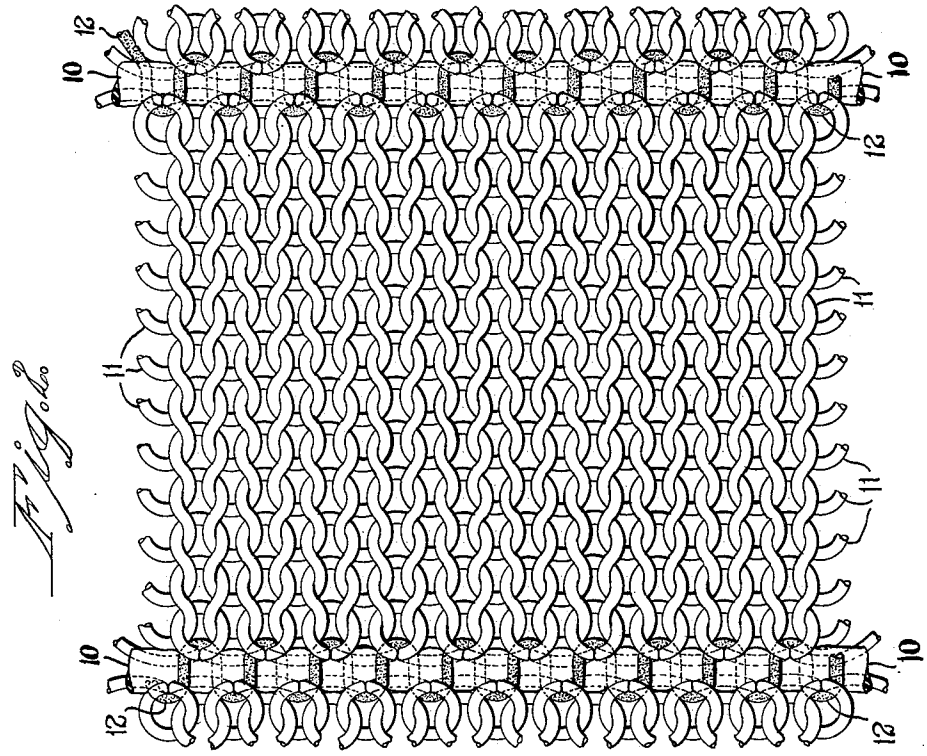


Fig. 1a.

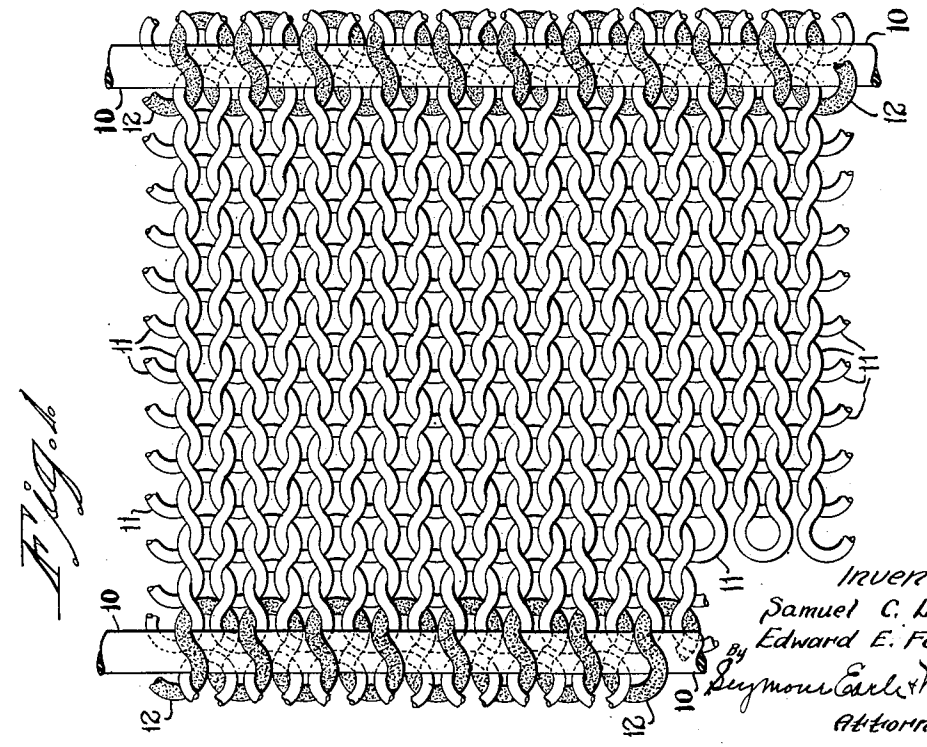


Fig. 1b.

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KNITTED ELASTIC FABRIC AND METHOD FOR PRODUCING THE SAME

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8 Claims. (Cl. 66—190)

The present invention relates to improvements in knitted elastic fabrics in which elastic strands of rubber or its equivalent are combined with interknitted relatively-inelastic strands. The present application constitutes a division of our co-pending application Serial No. 446,580 filed June 11, 1942 and, like the same, is based on the disclosure of our now-superseded application Serial No. 376,438 filed January 29, 1941.

One of the objects of the present invention is to provide a superior knitted elastic fabric in which the elastic strands incorporated therein are attached to the relatively-inelastic strands of the knitted fabric in such manner as to guard against the creepage or run-back of the said elastic strands relative to the inelastic strands, in the event that the said elastic strands should become severed.

Another object of the present invention is to provide a superior method for producing knitted elastic fabrics in which the elastic strands are gripped against relative slippage in the fabric and whereby the knitting operation may be carried to completion without requiring the employment of adhesives which interfere with the functioning of knitting machinery.

A further object of the present invention is to provide a superior method whereby a knitted elastic fabric may be readily knitted without special handicap and whereby following the knitting operation, the fabric may be subjected to a step which will effectively grip the elastic strands to the remaining relatively-inelastic portions of the knitted fabric.

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 in any separate application.

In the accompanying drawing, in which certain modes of carrying out the present invention are shown for illustrative purposes:

Fig. 1 is a schematic face view of a fragment of a knitted elastic fabric produced in accordance with the present invention and showing the said fabric prior to the same being subjected to the heat-treatment of its heat-shrinkable gripping-strands; and

Fig. 2 is a view corresponding to Fig. 1 but schematically showing the fabric subsequent to its being heat-treated.

In the accompanying drawing is shown a knitted elastic fabric which includes two laterally-spaced-apart parallel elastic strands 10—10 which may be of round, rectangular or other suitable cross-sectional form and which may be composed of rubber or other suitable elastic material. The said elastic strands 10—10 or their equivalent may be individually covered by wrappings or the like, as is well known in the elastic-fabric art, or the said elastic strands may be bare as shown.

The elastic fabric also includes a plurality of relatively-non-elastic strands 11 interknitted in the fabric in the areas intermediate the elastic strands 10—10 and in the areas on the outer sides thereof. The said relatively-non-elastic strands 11 may be composed of any suitable textile material such, for instance, as cotton, regenerated cellulose, silk, wool, etc., and when in place in the fabric they follow a sufficiently undulatory or serpentine path to thereby permit the fabric to be stretched against the tension of the elastic strands 10—10 or their equivalent.

Extending substantially helically around and hence substantially crosswise of each of the elastic strands 10—10 is one (or more) gripping-strands 12 formed of heat-shrinkable material either in whole or in part. In Fig. 1 the said strands 12 are shown in their heat-shrinkable condition, whereas in Fig. 2 the said strands are shown after having been thermally shrunk or contracted. The aforesaid heat-shrinkable gripping-strands 12 are formed either in whole or in part of heat-shrinkable artificial resin or resins and extend crosswise of the complemental one of the elastic strands 10—10 into interknitted relationship with respect to the relatively-non-elastic strands 11 on both sides thereof. As before noted, the heat-shrinkable gripping-strands 12 or their equivalent may be formed entirely of heat-shrinkable artificial resins or partly thereof, the requirement being that the complete gripping-strand be inherently capable of being shrunk by heat to effect a binding or anchoring effect, as will hereinafter be described.

The heat-shrinkable gripping-strands 12 or their equivalent may be twisted or untwisted and formed, for instance, wholly or in part of a co-polymer of vinylacetate and vinylchloride, polyamides, vinylidenechloride or the like. Preferably, however, heat-shrinkable artificial resin strands, threads or ribbons are formed by the well-known stretch-spinning process or by a process involving stretching subsequent to spinning.

In the particular fabric shown in the accompanying drawing, the given heat-shrinkable gripping-strand 12 adjacent a given elastic strand 10 extends completely around the said elastic strand though interknitted at each side of the latter with the relatively-non-elastic strands 11.

Instead of knitting the gripping-strands 12 around the elastic strands 10, the said elastic strands may be drawn into position after the fabric has been knitted, though the latter practice is not preferred over the former.

After the various strands 10, 11 and 12 or their equivalent have been fabricated as illustrated schematically in Fig. 1, the knitted fabric may be subjected to a heating operation either while wet or dry, to a temperature above the softening point of the artificial-resin gripping-strands 12 to thereby cause the said strands to contract. The temperatures and the periods of exposure to such temperatures may vary widely and in most instances variations in temperature and/or times of exposure to such temperatures will cause variations in the degree of shrinkage of the heat-shrinkable gripping-strands 12. Generally speaking, an exposure to a temperature in the vicinity of 175° F. for about one to five minutes will effect the desired shrinkage, which latter is preferred to be in the order of 30% to 40% contraction. It will be understood that relatively-thin and light-weight fabrics require less time of exposure to heat than the thicker heavier fabrics such, for instance, as multi-ply fabrics.

The heat-treatment above referred to will cause the gripping-strands 12 to contract sufficiently to squeeze the elastic strands 10—10 and the interknitted portions of the relatively-non-elastic strands 11, as is shown in Fig. 2. The result of the shrinkage just referred to will be to cause the elastic strands to be anchored or clamped to the relatively-non-elastic strands 11 at repeated closely-spaced intervals along the lengths of the said elastic strands. Thus, should a given elastic strand 10 or its equivalent be severed, it will be held against creeping or retraction in the knitted fabric beyond predetermined limits.

It is to be noted that after the gripping-strands 12 have been thermally shrunk, they extend substantially helically around their complemental elastic strands 10 so that the said elastic strands may be stretched without appreciable restraint by the said heat-shrinkable strands, since the convolutions of the latter will merely steepen their respective pitches as the said elastic strands are stretched.

In knitting fabrics, a given strand may be knitted back and forth in manners well understood in the art, though since each reach may independently follow its prescribed knitted path, the fabric may be properly regarded, for instance, as incorporating a plurality of relatively-non-elastic strands such, for instance, as those designated by the reference character 11 or 12 or combinations thereof.

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.

We claim:

1. A method for producing knitted elastic fabrics which includes: fabricating together a plurality of laterally-spaced-apart elastic strands and a plurality of interknitted relatively-inelastic strands including a plurality of heat-shrinkable gripping-strands of artificial resin; at least one of the said heat-shrinkable gripping-strands having a multiple number of reaches extending crosswise of a given elastic strand and interknitted on the respective opposite sides thereof with other relatively-inelastic strands occupying the spaces between the laterally-spaced-apart elastic strands; and then subjecting the heat-shrinkable gripping-strands to the action of heat to cause the same to contract to grip the said elastic strands and couple the same to the knitted fabric with a high degree of resistance to longitudinal slippage with respect thereto.

2. A method for producing knitted elastic fabrics which includes: fabricating together a plurality of laterally-spaced-apart elastic strands and a plurality of interknitted relatively-inelastic strands including a plurality of heat-shrinkable gripping-strands of artificial resin; at least one of the said heat-shrinkable gripping-strands extending substantially helically around a given elastic strand and interknitted on the respective opposite sides thereof with other relatively-inelastic strands occupying the spaces between the laterally-spaced-apart elastic strands; and then subjecting the helically-disposed heat-shrinkable gripping-strands to the action of heat to cause the convolutions thereof to grip the said elastic strands and couple the same to the knitted fabric with a high degree of resistance to longitudinal slippage with respect thereto.

3. A method for producing knitted elastic fabrics which includes: fabricating together a plurality of laterally-spaced-apart elastic strands, a plurality of interknitted relatively-inelastic and relatively-non-heat-shrinkable strands, and a plurality of heat-shrinkable gripping-strands of artificial resin, the last two mentioned pluralities of strands being interknitted with each other; at least one of the said heat-shrinkable gripping-strands having a multiple number of reaches extending crosswise of a given elastic strand and interknitted on the respective opposite sides thereof with the interknitted strands occupying the spaces between the laterally-spaced-apart elastic strands; and then subjecting the heat-shrinkable gripping-strands to the action of heat to cause the same to contract to grip the said elastic strands and couple the same to the relatively-inelastic and relatively-non-heat-shrinkable interknitted strands of the knitted fabric with a high degree of resistance to longitudinal slippage with respect thereto.

4. A method for producing knitted elastic fabrics which includes: fabricating together a plurality of laterally-spaced-apart elastic strands, a plurality of interknitted relatively-inelastic and relatively-non-heat-shrinkable strands, and a plurality of heat-shrinkable gripping-strands of artificial resin, the last two mentioned pluralities of strands being interknittted with each other; at least one of the said heat-shrinkable gripping-strands extending substantially helically around a given elastic strand and interknitted on the respective opposite sides thereof with the interknitted strands occupying the spaces between the laterally-spaced-apart elastic strands; and then subjecting the helically-disposed heat-

shrinkable gripping-strands to the action of heat to cause the convolutions thereof to grip the said elastic strands and couple the same to the remainder of the knitted fabric with a high degree of resistance to longitudinal slippage with respect thereto.

5. An anti-creep knitted elastic fabric comprising: a plurality of laterally-spaced-apart elastic strands; and a plurality of interknitted relatively-inelastic strands including a plurality of heat-shrinkable gripping-strands of artificial resin; at least one of the said heat-shrinkable gripping-strands having a multiple number of reaches extending crosswise of a given elastic strand in binding relationship thereto and interknitted on the respective opposite sides thereof with other relatively-inelastic strands occupying the spaces between the laterally-spaced-apart elastic strands; the said heat-shrinkable gripping-strands being thermally contracted in situ into gripping engagement with the said elastic strands to couple the latter to the knitted fabric with a high degree of resistance to longitudinal slippage with respect thereto.

6. An anti-creep knitted elastic fabric comprising: a plurality of laterally-spaced-apart elastic strands; and a plurality of interknitted relatively-inelastic strands including a plurality of heat-shrinkable gripping-strands of artificial resin; at least one of the said heat-shrinkable gripping-strands extending substantially helically around a given elastic strand and interknitted on the respective opposite sides thereof with other relatively-inelastic strands occupying the spaces between the laterally-spaced-apart elastic strands; the helically-disposed convolutions of the said heat-shrinkable gripping-strands being thermally contracted in situ into gripping engagement with the said elastic strands to couple the same to the knitted fabric, with a high degree of resistance to longitudinal slippage with respect thereto.

7. An anti-creep knitted elastic fabric comprising: a plurality of laterally-spaced-apart elastic strands; a plurality of interknitted relatively-inelastic and relatively-non-heat-shrinkable strands; and a plurality of heat-shrinkable gripping-strands of artificial resin; the last two mentioned pluralities of strands being interknitted with each other; at least one of the said heat-shrinkable gripping-strands having a multiple number of reaches extending crosswise of a given elastic strand and interknitted on the respective opposite sides thereof with the interknitted strands occupying the spaces between the laterally-spaced-apart elastic strands; the said heat-shrinkable gripping-strands being thermally contracted in situ into gripping engagement with the said elastic strands to couple the latter to the relatively-inelastic and relatively-non-heat-shrinkable interknitted strands of the knitted fabric, with a high degree of resistance to longitudinal slippage with respect thereto.

8. An anti-creep knitted elastic fabric comprising: a plurality of laterally-spaced-apart elastic strands; a plurality of interknitted relatively-inelastic and relatively-non-heat-shrinkable strands; and a plurality of heat-shrinkable gripping-strands of artificial resin; the last two mentioned pluralities of strands being interknitted with each other; at least one of the said heat shrinkable gripping-strands extending substantially helically around a given elastic strand and interknitted on the respective opposite sides thereof with the interknitted relatively-inelastic strands occupying the spaces between the laterally-spaced-apart elastic strands; the said heat-shrinkable gripping-strands being thermally contracted in situ into gripping engagement with the said elastic strands to couple the latter to the relatively-inelastic and relatively-non-heat-shrinkable interknitted strands of the knitted fabric, with a high degree of resistance to longitudinal slippage with respect thereto.

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