June 5, 1934. J. S. COLDWELL 1,961,961

TWO-WAY STRETCH ELASTIC FABRIC

Filed April 15, 1933

Fig. 1.

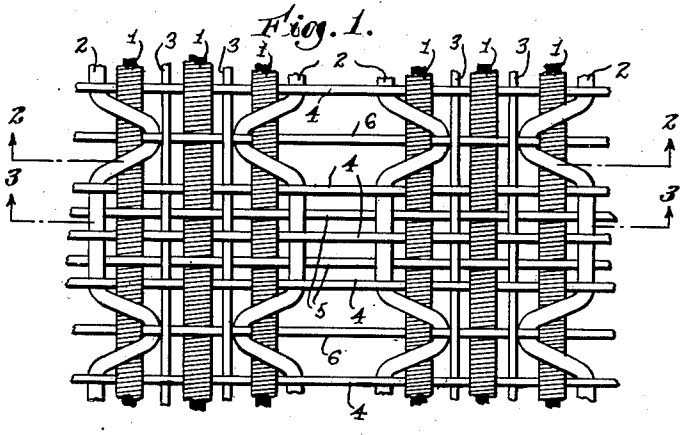


Fig. 2.

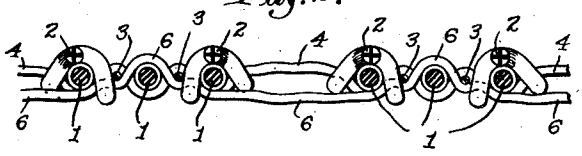


Fig. 3.

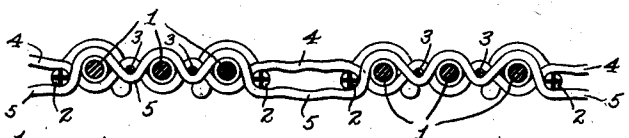


Fig. 4.

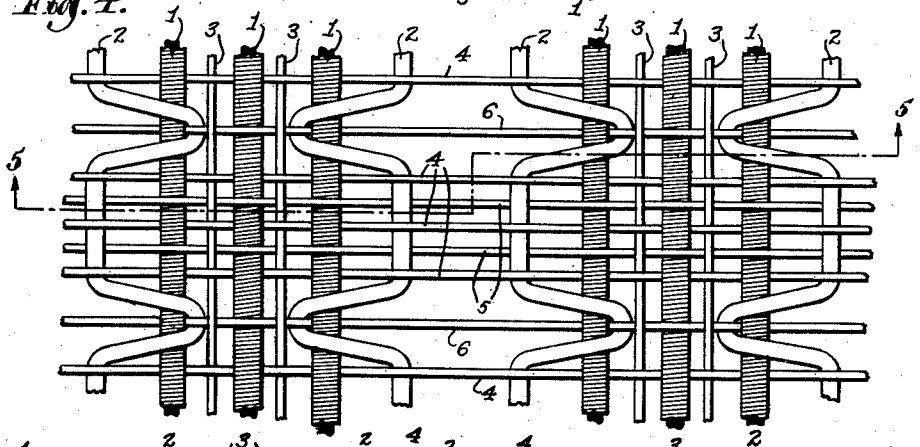
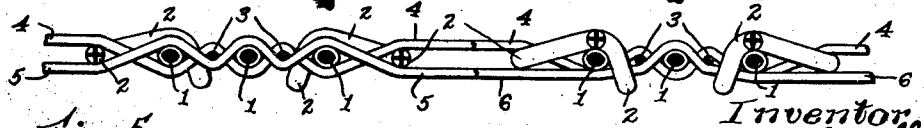


Fig. 5.



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UNITED STATES PATENT OFFICE

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TWO-WAY STRETCH ELASTIC FABRIC

John S. Coldwell, Fall River, Mass.

Application April 15, 1933, Serial No. 666,289

1 Claim. (Cl. 139—421)

This invention relates to an elastic woven fabric and is intended to provide a woven fabric or webbing which shall be elastic both warp-wise and filling-wise, while using elastic threads in the warp only, thereby avoiding the difficulties attendant upon the use of using an elastic filling thread in the weaving process.

With this end in view, the invention consists in a two-way elastic fabric whose elasticity in both directions is due to the novel association of elastic doup threads with main warp threads of elastic material, both of which are interwoven with inelastic filling threads in such a manner as to render the fabric, made in accordance with this invention, very elastic or stretchable both ways.

The invention is characterized by the use of main elastic warps arranged in laterally spaced groups that are separated by intervening spaces produced by the omission at intervals of a main warp thread combined with elastic doup warps or threads extending along their associated main warps in criss-cross relation, thus forming lateral loops on either side of their associated main warps, which loops are interwoven with the filling threads that pass over and under the main warp threads in meshed relation thereto, so that the contraction of the main warps and doups after weaving is completed acts normally to draw the filling threads into a devious or zigzag path which results in the contraction of the fabric filling-wise as well as warp-wise. This and other features of the invention will be more particularly explained in the following specification and will be defined in the claim hereto annexed.

In the drawing I have illustrated one form of weave illustrating the principles of this invention, but it will be understood that the precise arrangement herein shown and described may be varied within the limits of the invention as hereinafter defined.

In all the drawings the weaving elements are shown on a greatly enlarged scale and in a very open arrangement to better illustrate the arrangement shown and described.

Fig. 1 is a plan view showing on an exaggerated scale, as near as may be, the arrangement of the various constituents of the fabric when the fabric is in normal unstretched condition after its removal.

Fig. 2 is a cross section on the plane 2—2 of Fig. 1.

Fig. 3 is a similar cross section on the plane 3—3 of Fig. 1.

Fig. 4 is a plan view illustrating approximately the arrangement of the woven elements when the fabric is laterally distended.

Fig. 5 is a transverse section on the offset plane 5—5 of Fig. 4.

In the practice of this invention according to the specific embodiment illustrated in the drawing, I employ a series of main warp elements 1 of elastic material, each of which ordinarily consists of an elastic rubber thread or core covered with a textile yarn winding, although the use of such winding is not essential to the present invention.

At intervals transversely of the fabric one of the warp elements is omitted to produce a wider spacing of two adjacent warps for the purpose of opening up the weave and thereby facilitating the stretching action, which will be hereinafter explained.

Associated with each main warp 1 of each widely spaced pair of warp elements is a doup thread 2, also made of elastic material. Each doup thread 2 extends along its associated main warp in a zigzag or criss-cross relationship to form alternating loops on opposite sides of its associated main warp.

Preferably, the loops formed between or inside the two widely spaced warp elements are longer in a warp-wise direction than the loops formed on the outside of said main warp elements. A series of filling threads 4 and 5 are interwoven with the warp threads and with the doup threads to form a woven mesh partly filling up the intervening or open spaces or intervals between the two widely separated warp elements 1. The filling threads 4 pass over the inside loops of the doup threads and dip underneath the main warp elements with which the doup threads are directly associated. The filling threads 5 pass under the doup threads and over the associated warp elements 1 in alternation with the filling threads 4. The outer loops of the doup threads 2, as actually shown herein, are anchored to the associated main warps 1 by means of a single filling thread 6, which is shown as passing under the main warps 1 and over the outer narrower loops of the doup threads 2.

Any number of intermediate elastic warp elements may be employed in the spaced groups and, furthermore, as shown in the drawing, I also employ interposed warp threads 3 of textile fabric or relatively inelastic material for a purpose presently to be described.

Ordinarily elastic fabric is woven with the elastic warps under tension so that after the fabric is woven and the tension relieved there

is a contraction in the length of the fabric, not only by the actual shortening of the elastic elements therein but by reason of the folding or looping of the inelastic supplemental warps which are, so to speak, puckered up by the contraction of the elastic elements. The advantage of using supplemental inelastic warp elements interposed between the elastic warp elements is that when these elements have been straightened out, as the fabric is stretched in the direction of the elastic elements, they then, due to their inelasticity, prevent further or undue stretch of the fabric. In other words they limit the stretching capacity of the fabric short of the danger point.

It is the function of the loops of the elastic doup elements to contract the fabric laterally, that is, in a filling-wise direction, by drawing up that portion of the filling extending across the spaced interval between the groups of warp elements, this action resulting in producing offset folds or loops in the filling threads which results in contracting the fabric as a whole in the filling-wise direction. On the other hand, when the fabric is stretched transversely the filling threads tend to straighten out and, as the doup threads are elastic, the loops of the doup threads yield to the pull then exerted by the filling threads and allow the fabric to stretch transversely to the limit that is permitted when the filling threads assume a straight-line position across the fabric.

It will of course be understood that the term "inelastic" as applied to a textile yarn is a relative term, since all spun yarn has a very slight degree of stretch not in any way approaching the distensibility of an elastic rubber thread.

With the principle of weaving illustrated in the drawing and described herein, it is possible to make a fabric that is very elastic or distensible in both directions and which, in its normal state, contracts to normal dimensions due to the use of the elastic threads in the manner described, while at the same time the fabric is protected against excessive stretch or strain both in a lateral and in a longitudinal direction by the presence of the inelastic supplemental warp threads and the inelastic filling threads.

By comparing the spacing of the adjacent groups of warp elements in Fig. 1 with the position of the same groups and of the loops of the doup threads in Fig. 4, and correspondingly in Fig. 5, it will be seen how this principle of weaving results in producing a fabric that is really elastic in both directions, permitting distension from its normal condition while securing contraction to that normal position by reason of the action produced by the elasticity of the group threads.

What I claim is:

A two-way stretch woven elastic fabric comprising pairs of main elastic warp threads, the threads of each pair being spaced apart through omission of intermediate warp threads, a doup thread of elastic material associated with each thread of such pair in criss-cross relation thereto and forming series of lateral loops on opposite sides of its associated elastic warp thread, and inelastic filling threads interwoven with the elastic warp threads and with the doup thread loops located between the elastic warp threads of each pair, each such filling thread crossing two of such loops on the same side of the fabric, whereby the doup threads, when relaxed from weaving tension, coact to produce distortion, relative to the plane of the fabric, of said crossing portion of the filling thereby rendering the fabric distensible filling-wise as well as warp-wise.

JOHN S. COLDWELL.