Jan. 13, 1931. W. C. KEMP 1,789,180

ELASTIC STITCHING

Filed Jan. 27, 1928

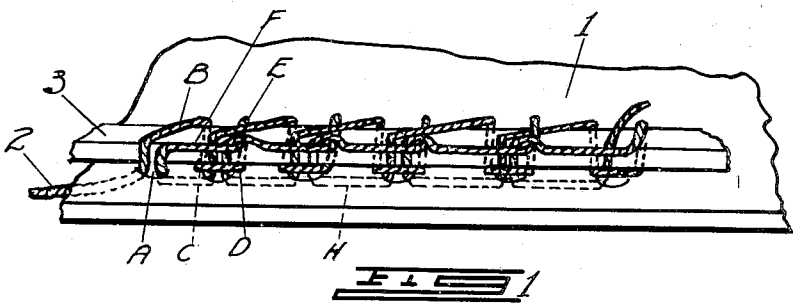


Fig. 1

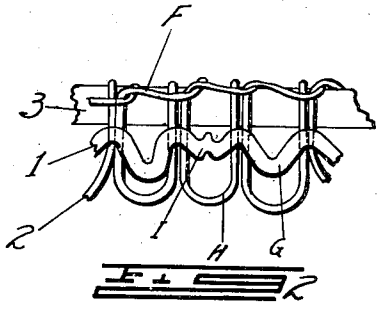


Fig. 2

INVENTOR.
William C Kemp

BY

Allen & Allen

ATTORNEYS

Patented Jan. 13, 1931 1,789,180

UNITED STATES PATENT OFFICE

WILLIAM C. KEMP, OF NORWOOD, OHIO, ASSIGNOR TO THE PAPER SERVICE COMPANY, OF LOCKLAND, OHIO, A CORPORATION OF OHIO

ELASTIC STITCHING

Application filed January 27, 1928. Serial No. 250,045.

It is an object of my invention to form a stitching which will give when the fabric is stretched. There is in most fabrics which are ordinarily subjected to sewing operations a stretchability particularly along lines diagonal to the direction of crossing of the warp and woof threads which is advantageous in most articles made therefrom. But ordinary stitching is inelastic, and the threads forming it reach their elastic limit under a very light stretch, whereupon they snap and the stitching is rendered useless. When the stitching forms part of a seam, the seam opens up and the utility of the article is greatly impaired.

My invention is designed to produce a stitching which is not only elastic in itself, but which may be formed under tension of both fabric and stitching so that when it normally contracts the fabric will be held in a contracted condition, and so that the stitching and fabric can be greatly expanded without throttling, as will hereinafter be more fully explained. It will thus be seen that the effect of my stitching is to increase the permissible give in a stitched fabric without tearing the fabric at the stitches or breaking the stitches, and also that a natural and uniform tucking with full elasticity, is provided.

I accomplish my object by utilizing elastic filaments in the stitching operation which are held under tension, or in a stretched condition during the stitching operation, and by holding the fabric against contraction, or actually expanded while it is being sewed. Hitherto, in order to effect an elastic gathering of a fabric it has been the practice to sew in it a tubular pocket or casing and run an elastic filament therethrough, or to sew an elastic fabric held under tension to the fabric to be gathered. Further, elastic fabrics have been made by using elastic filaments under tension as part of the warp or woof threads thereof. In my invention, however, I am concerned with a stitching which is itself elastic, and which is independently applied to a fabric as distinguished from the mere fastening of an elastic fabric to an inelastic one by means of inelastic stitching, or the weaving of an elastic filament into a fabric as a part of the manufacture thereof. My invention is characterized by the use of elastic filaments in forming the stitching, and while in one embodiment thereof I may use a stitch which would still hold together were the elastic filament withdrawn, it will be observed that the filament not only normally tends to contract the fabric but has an effect upon the stitching itself making it capable of stretching. Again, while my invention may be used to produce an elastic gathering in the fabric itself, the tension and elasticity may be so proportioned that the stitching, when normally contracted, will merely hold the fabric in a normally contracted condition, but the stitching itself will have a much greater elastic limit than the natural give or stretch of the fabric.

It has also been proposed to form an elastic stitching by sewing a rubber thread to a fabric with an over-stitch or by using the rubber filament in a stitch in place of an inelastic filament. I do not claim as novel the use of a rubber thread in a stitch. My invention is directed to the production of an elastic stitching composed of an elastic thread and at least one inelastic thread, which will have unusual amounts of stretch. If a stitching is made comprising an elastic filament and an inelastic filament the stretch of the stitching will obviously be limited by the inelastic filament. In a stitching, some play is always present; when stretching occurs, an elastic filament, such as rubber, may be diminished in cross section, allowing still further play of the threads; but stretching cannot be carried to any great degree before the threads begin to bind, and if stretching is carried beyond this point, they will break. Consequently in the past where an unusual amount of stretch has been required in a stitching, it has been the practice to use filaments all of which were elastic. My invention is applicable to the production of elastic stitching upon fabrics of great stretchability, such as creped paper, used in the manufacture of tire covers, in accordance with a patent of William Wallace Rowe, No.

1,755,133, dated April 15, 1930, in which the stretching is of the order of say 200% or thereabouts.

My invention contemplates the production of a stitching, which in its normal or contracted condition, possesses the required amount of stretch in the fabric, in the elastic filament, and in the inelastic filament or filaments. In the production of such a stitching, it is not sufficient that the elasticity reside alone in the fabric and in the elastic filament. My invention contemplates the formation of such a stitching, while the elastic filament is tensioned, and while the fabric is either tensioned or held against contraction. This procedure produces a stitching which when contracted will be characterized by a looseness or play in the inelastic filament, sufficient to permit the required amount of stretch, together with a much greater number of stitches per unit length, as is illustrated in Figure 2, hereinafter specifically referred to. In the contracted condition of my stitching, the fabric may be puckered or not, depending upon the degree of tension placed upon it during stitching with relation to the degree of tension placed upon the elastic filament; but in any event, no greater stretchability is required in a stitching than sufficient to take care of the maximum stretchability of the fabric.

Neglecting the complex stitching used in machine embroidery and the like, stitching generally falls within four general types. The first is a running stitch in which the thread and needle pass through the fabric from side to side forming such a stitch as is used in basting. One or more threads may be used. The second is the so-called chain stitch, in which a threaded needle pierces a fabric and is withdrawn leaving a loop of thread upon the reverse side, and each loop so formed is caused to encircle the next succeeding loop. The third is a type in which the needle forms a fair line of stitches upon one side of the fabric and loops on the reverse, the loops being intertwined with one or more other threads on the said reverse side of the fabric. The fourth is the well known lock stitch.

The third type of stitch lends itself best to my invention. The rubber may be used upon a bobbin or reel and the tension adequately controlled. The stitch may be so arranged that the rubber does not penetrate the fabric, but is held to its reverse side by the loops, while the whole stitching is rendered elastic thereby.

In the drawings I have illustrated a preferred embodiment of my invention.

Figure 1 shows the stitching and the fabric expanded, and illustrates its appearance when formed.

Figure 2 shows the stitching contracted in a case where the tension and elasticity have been proportioned so as to cause a perceptible gathering of the fabric.

Both drawings are upon an enlarged scale.

In Figure 1 I have indicated a fabric 1 represented as being under tension, and which may be understood as of one layer, or composite, or of more than one layer as in a seam or plait, a thread 2, and an elastic filament 3 which is represented here as under tension. The thread passes through the hole *a* formed by the needle in the fabric, passes over the filament, as at *b*, under it as at *c*, around the next succeeding loop at *d* beneath and over the filament 3, around and beneath the next succeeding loop at *e*, and back at *f* to pass again through the hole *a*. This is a type of stitching easily effected upon a sewing machine. It will be observed that in this type of stitch the withdrawal of the filament 3 would leave merely a series of loops which would not of themselves form a stitch. The filament is therefore a keying member, an inseparable part of the stitching.

When the tension upon the fabric 1 and the filament 3 is released, the filament contracts and thickens as shown in Figure 2. If the stitching has been done under sufficient tension, the material 1 may be puckered or gathered as at *g* or at *i*. This loosens the threads particularly in the running portions *f* and *h* thereof with the result of making the stitched portions expandible, and also for the purpose of loosening the encircling loops which bind the filament to accommodate the thickening thereof.

The form of stitching illustrated in Figures 1 and 2 is a standard stitching, effected by a standard sewing machine, which is well known and needs no description by me. In ordinary use the filament 3 is inelastic thread, the same as the filament 2. In the practice of my invention the filament is, as explained, an elastic filament, preferably of rubber, which in the operation of the machine, is held upon a suitable bobbin or reel, and may be tensioned by either retarding the rotation of the bobbin, or by drawing the rubber through a pierced member affixed to the machine frame, which will retard the travel of the rubber sufficiently to establish in it the desired tension. A tension of the fabric is most conveniently effected by hand in the manufacture of tire covers in accordance with the co-pending application referred to above, which is an exemplary use for my elastic stitching. The operator manually holds back on the creped paper, thereby stretching it to some extent. The amount of stretch placed in the fabric will be proportioned to the amount of stretch desired in the finished stitching. As hereinbefore indicated it may be so proportioned that when the stitching is normally contracted, the fabric will be held in a normally unexpanded condition, or in a

contracted and puckered condition, as is shown at 1 in Figure 2. It is essential, however, that the stitching be so produced as to cause contraction of the fabric after the stitching is formed, whether that contraction be to its normal condition or to a puckered condition. It is not sufficient merely to fasten a rubber filament to a fabric by a stitching, which stitching will be tight when normally contracted, for the reason that such a stitching in spite of the fact that it contains an elastic filament, will not stretch very appreciably until the threads begin to bind or throttle the rubber, whereupon further stretching is impossible short of the breaking of the threads.

The specific stitch shown is a modified form of the so-called two thread or double chain stitch, which is stitch No. 401 of class 400 of the United States Government master specifications for stitches.

In this stitch normally the needle thread makes tight loops upon the reverse side of the fabric which loops are passed through a loop of the looper thread extended from the last preceding stitch. The succeeding loop of looper thread is then passed through the loop of the needle thread and is extended one stitch length, at which point it is entered by the next succeeding loop of the needle thread. In this particular stitch as in the other stitches of class 400, the looper thread passes back and forth between the loops of the needle thread and is intertwined therebetween as explained. This results normally in very much more looper thread being used than needle thread. In making my stitch, a rubber filament is substituted for the looper thread or looper threads as may be. It is used under tension and its effect is to pull out the loops of needle thread to a quite abnormal length as shown. Since the looper thread is intertwined between loops, the straightening of the looper thread results in an interengagement of loops of the needle thread and an intertwining thereof about the looper thread,—the rubber piece 3. In the specific stitch shown, if the rubber filament 3 were removed, there would remain not a lock stitch but a series of loops of needle thread on the reverse side of the fabric of much greater than normal length. This extension of the loops of the needle thread contributes to the great stretchability of my sewn fabric. If the loops of needle thread were short as normally is the case in stitch type 401 illustrated, and the other stitches of class 400, the stretchability of the sewn fabric would be limited by the length of the needle thread. In my stitch there is sufficient stretchability in the rubber filament, and the needle thread is abnormally lengthened so that it will not break before the maximum stretchability of the fabric is realized.

It will be understood that my stitching is applicable to a wide variety of fabrics, both elastic and inelastic, and plain or creped. It is applicable to woven fabrics such as cloth, membranous fabrics, such as leather and the like, and felted fabrics such as paper. It is particularly adapted for the fabrication of articles from the creped and waterproofed material described in Patent No. 1,628,515, of May 10, 1927. It will be further understood that where in the following claims I have used the word "fabric" I intend to include a fabric of one or more layers, a seam or a plait.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. An elastic stitching having a thread and an elastic filament, and comprising, in an expansible fabric, a fair line of stitches upon one side and loops upon the reverse side of said fabric formed of said thread, each of said loops passing over and beneath said elastic filament which is substantially straight, and each succeeding loop passing through a bend of each preceding loop between said filament and said fabric, whereby said filament is encircled by said loops.

2. An elastic stitching having a thread and an elastic filament, and comprising, in an expansible fabric, a fair line of stitches upon one side and loops upon the reverse side of said fabric formed of said thread, each of said loops formed by the said thread passing through said fabric over said filament, between said filament and said fabric, then around the next succeeding loop, then between said filament and said fabric, then over said filament, again around said next succeeding loop and again through said fabric, whereby said loops engage each other as described, and whereby said filament is encircled by said loops.

3. An elastic stitching having a thread and an elastic filament, and comprising, in a puckered fabric, a fair line of stitches upon one side and loops upon the reverse side of said fabric formed of said thread, each of said loops passing over and beneath said elastic filament which is substantially straight, and each succeeding loop passing through a bend of each preceding loop, whereby said filament is encircled by said loops.

4. An elastic stitching having a thread and an elastic filament, and comprising, in a puckered fabric, a fair line of stitches upon one side and loops upon the reverse side of said fabric formed of said thread, each of said loops passing over and beneath said elastic filament which is substantially straight, and each succeeding loop passing through a bend of each preceding loop, whereby said filament is encircled by said

loops, said loops of thread being loose about said filament.

5. An elastic stitching having a thread and an elastic filament, and comprising, in an expansible fabric, a fair line of stitches upon one side and loops upon the reverse side of said fabric formed of said thread, each of said loops encircling said filament and engaging with the next succeeding loop, whereby the length of thread in said loops is at least sufficient to encircle said filament plus sufficient to extend to an adjacent loop.

6. An elastic stitching having a thread and an elastic filament, and comprising, in an expansible fabric, a fair line of stitches upon one side and loops upon the reverse side of said fabric formed of said thread, both strands of each of said loops passing over and beneath said elastic filament, and each of said loops being secured to a succeeding loop.

7. As a new article of manufacture, a piece of crepe paper having constricting means in the form of an elastic stitching, said elastic stitching consisting of a thread and an elastic filament, and comprising a fair line of stitches upon one side and loops upon the reverse side of said fabric formed of said thread, said fabric being in puckered condition, each of said loops passing over and beneath said elastic filament which is substantially straight, and each succeeding loop passing through a bend of each preceding loop, whereby said filament is encircled by said loops.

WILLIAM C. KEMP.