Dec. 17, 1946. C. R. BURNS 2,412,869

WARP KNIT FABRIC AND METHOD OF MAKING THE SAME

Original Filed Jan. 13, 1941

Fig. 3.

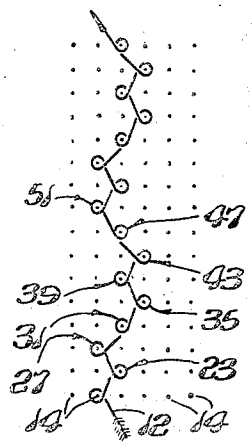


Fig. 1.

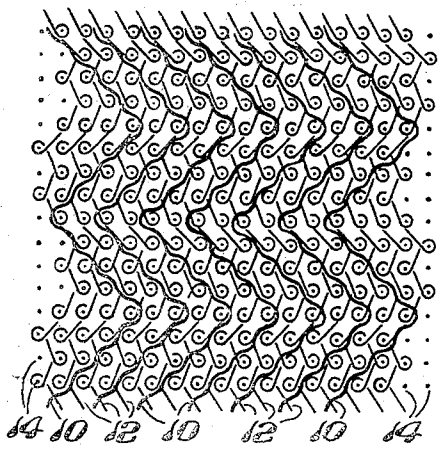


Fig. 2.

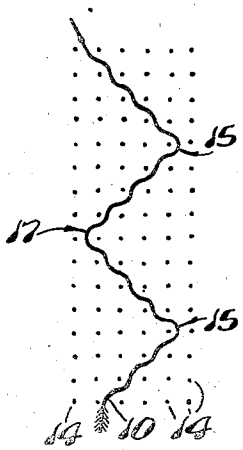


Fig. 4

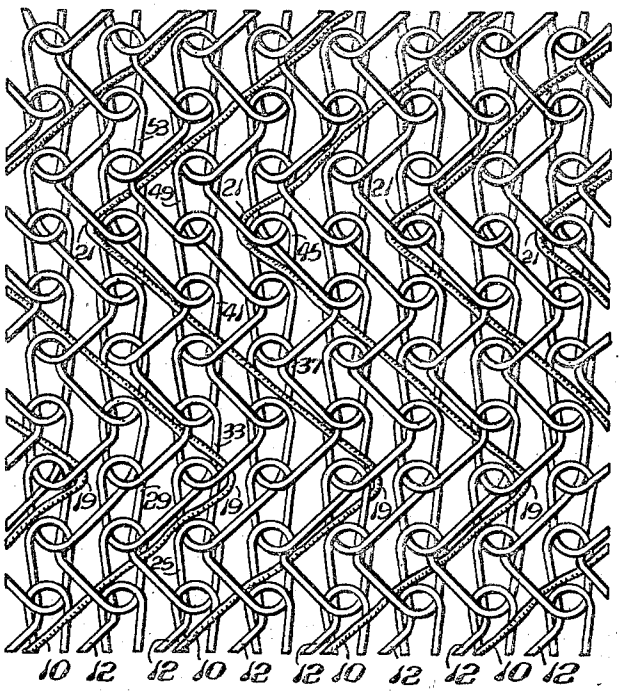
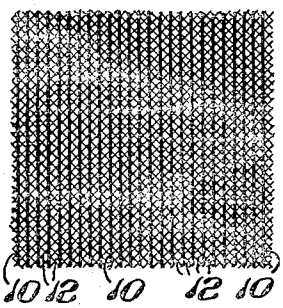


Fig. 5.



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Patented Dec. 17, 1946

2,412,869

UNITED STATES PATENT OFFICE

2,412,869

WARP KNIT FABRIC AND METHOD OF MAKING THE SAME

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Original application January 13, 1941, Serial No. 374,219. Divided and this application August 26, 1944, Serial No. 551,305

6 Claims. (Cl. 66—192)

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The present invention relates to warp knit fabric and the method of making the same, and has for its basic object the provision of stretchable warp knit fabric possessing a greater amount of snap than is usually present in known fabrics of this kind, and this application is a division of my application Serial No. 374,219 for Letters Patent No. 2,356,819.

The invention more particularly contemplates the provision of a stretchable warp knit fabric produceable on a usual warp knitting machine of the type commonly known as tricot machines; the machine, however, being operated according to an improved method in order to produce a fabric of usual knit construction which imparts to said fabric an increased ability to stretch and, at the same time, supply the fabric with an inherent ability to snap back to its normal intended and original form.

It is one of the most important features of the invention to provide a warp knit fabric wherein the yarns are so laid as to acquire a particular characteristic formation which gives the fabric an extraordinary degree of stretchability and snap.

Another important feature of the invention is found in the provision of a warp knit fabric wherein certain yarns are so related with certain other yarns as to assume a zig-zag or accordion formation, whereby said fabric, by reason of the zig-zag or accordion formation of said certain yarns, inherently and constructionally acquires an extraordinary degree of elasticity.

Among specific objects of the invention is the provision of a fabric knitted in tricot fashion from a set of inelastic yarns and a set of elastic yarns, the inelastic yarns being knitted into a base fabric and the elastic yarns being laid in zig-zag direction and tied within said fabric in such a manner as to produce a finished fabric of uniform surface by preventing said elastic yarns from crawling or creeping which is known to be one of the primary causes of the production of a wrinkled effect in such fabrics.

The invention is specifically characterized in that it results in the production of fabric possessing a great many desirable advantageous features such as strength, elastic stretchability, and distinctive surface appearance.

Other important objects, features, and advantages of the invention will be in part obvious and in part pointed out hereinafter.

The improved fabric, in accordance with the invention, is made on a tricot warp knitting machine employing a needle bar and two yarn guide bars respectively known as the back guide bar and the front guide bar. The needle bar is provided with a bank of needles which vary in number according to the gauge, and each guide bar has a bank of yarn guides corresponding to the number of needles in the needle bar. The guide bars are slidable in reverse directions longitudinally of the needle bar, each guide bar being controlled by individual cam or cams. Both guide bars, moreover, are swingable transversely of the needle bar.

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Also, in accordance with the present invention, every other yarn guide of the back guide bar is threaded with a warp yarn (preferably an elastic yarn), and every yarn guide of the front guide bar is threaded with a warp yarn (preferably an inelastic yarn). Thus there are twice as many inelastic yarns as there are elastic yarns.

According to one aspect of the invention, the back and front guide bars respectively slide longitudinally of the needle bar, at times in the same direction, and at other times in the opposite direction, but the sliding motion of one guide bar (specifically, the back guide bar) occurs only in front of the needles, whereas the sliding motion of the other guide bar (specifically, the front guide bar) occurs either in front of or in back of the needles. One guide bar, that is, the back guide bar, has a sliding motion longitudinally of the needle bar a certain number of needles at a time for the distance of a predetermined fixed number of needles in one direction and for the distance of a predetermined fixed number of needles in the other direction, and the other guide bar, that is, the front guide bar, has a sliding motion longitudinally of the needle bar a certain number of needles at a time for the distance of a predetermined variable number of needles in one direction and for the distance of a predetermined variable number of needles in the other direction.

Thus, to give a specific example: Each yarn in the back guide bar laps over four needles, one needle at a time, and then drops back over four needles, one needle at a time, whereas each yarn in the front guide bar laps over one needle, under one needle, and drops back over one needle, under one needle, and then laps over two needles, under one needle, this relative lapping and dropping back of yarns in the rear and front guide bars being repeated throughout the length of the fabric.

As a result of this particular procedure, there is produced a warp knit fabric consisting of courses knitted from the yarns in front of the

guide bar, certain spaced courses being formed of non-reversing closed stitches on which the yarns in the rear guide bar are hung. Further, the particular procedure results in that the yarns in the rear guide bar are laid in zig-zag or accordion-like fashion so that said yarns, upon being relieved of the tension under which they are laid, tend to straighten out, causing the loops of the courses knitted from the yarns in the front guide bar to gather, accordingly producing a fabric having an increased ability to stretch and snap back, and possessing a characteristic surface appearance.

In order that the invention and its mode of operation may be more readily understood by those skilled in the art, I have, in the accompanying drawing and in the detailed description based thereon, set out the specific example of the invention hereinbefore mentioned.

In the drawing:

Figure 1 indicates the combined motions of the front and rear guide bars of a tricot machine operated to produce one fabric construction in accordance with the invention;

Figure 2 indicates the motion of the back guide bar in the making of said fabric construction;

Figure 3 indicates the motion of the front guide bar in the making of said fabric construction;

Figure 4 illustrates on a greatly enlarged scale the loop formation of the fabric construction as knitted on the machine; and

Figure 5 is a diagrammatic representation of one face of the fabric construction upon being completed.

It is pointed out that, for the sake of clarity in illustration, the motion of the back guide bar is shown in heavy lines, and the motion of the front guide bar is shown in light lines in Figures 1 through 3.

Referring to the fabric construction shown in Figures 1 to 5 inclusive, it will appear from Figure 1 of the drawing that in the manufacture of the fabric illustrated, two sets of warp yarns **10** and **12** are employed, one set of warp yarns **10** being elastic and the other set of warp yarns **12** being inelastic. It will be noted that the elastic yarns **10** and the inelastic yarns **12** at times are laid in front of the needles **14** in opposite directions, and at other times are laid in front of the needles in the same direction, and that moreover, while the number of inelastic yarns **12** is equal to the number of needles **14**, there are only half the number of elastic yarns **10**.

The movement of the guides for the respective yarns **10** and **12** are represented separately in Figures 2 and 3. As clearly appears in Figure 2, each elastic yarn **10** is moved, for instance, to the right in front of the needles one needle at a time for a certain number of needles, and then to the left in front of the needles one needle at a time for a certain number of needles. In the example shown, the movement of each elastic yarn to the right and to the left is over four needles, although it will be understood that such movement may be over a different number of needles than that specified in either or both directions.

It is to be noted particularly that each elastic yarn, in its movement to the right and to the left, does not lap around any one needle at any time, but is merely laid in a lengthwise position in front of the needles, the yarn at its reversal points indicated at **15** and **17** (Figure 2) becoming hung, as shown at **19** and **21** in Figure 4.

As shown in Figure 3, each inelastic yarn **12** is moved to the right over one needle, under one needle, so that the yarn is wrapped around the needle as shown at **23** in Figure 3, forming a reversing closed stitch as shown at **25** (Figure 4). Then the inelastic yarn is moved to the left over one needle, under one needle, so that the yarn is wrapped about the needle as shown at **27** (Figure 3) forming a reversing closed stitch shown at **29** (Figure 4). Thereafter, the inelastic yarn is moved again to the right over two needles, under one needle, so that the yarn is wrapped about the needle as shown at **31** (Figure 3) to form a non-reversing closed stitch as shown at **33** (Figure 4), and continues to move to the right over one needle, under one needle, so that the yarn is wrapped about the needle as shown at **35** (Figure 3) forming a reversing closed stitch as shown at **37** (Figure 4). Then the inelastic yarn is moved to the left over one needle, under one needle, so that the yarn is wrapped about the needle as shown at **39** (Figure 3) forming a reversing closed stitch as shown at **41** (Figure 4). Then the inelastic yarn is moved to the right over one needle, under one needle, so that the yarn is wrapped about the needle as shown at **43** (Figure 3) forming a reversing closed stitch as shown at **45** (Figure 4). Thereafter, the inelastic yarn is moved to the left over two needles, under one needle, so that the yarn is wrapped about the needle as shown at **47** (Figure 3) to form a non-reversing closed stitch as shown at **49** (Figure 4) and continues to move to the right over one needle, under one needle, so that the yarn is wrapped about the needle as shown at **51** (Figure 3) forming a reversing closed stitch as shown at **53** (Figure 4). This constitutes one repeat, which is duplicated throughout the length of the fabric.

The relative movements of the elastic yarns **10** and inelastic yarns **12** cause the interknitting of the inelastic yarns and the tying in of the elastic yarns in the manner more clearly illustrated in Figure 4 of the drawing, from which it will be observed that the elastic yarns lie in a plane between the chain loops and the floats connecting the chains. It will be further observed that the inelastic yarns pass back and forth between adjacent needles for several courses and then pass over to a third needle and that the number of courses between consecutive bights of elastic yarn is equal to the number of chains or wales between such bights.

Attention is particularly called to the fact that the elastic yarns **10** are necessarily laid under tension. Because of this, although the elastic yarns are laid in zig-zag directions as illustrated in Figures 1 and 2, and are hung at staggered points, as indicated at **19** and **21** in Figure 4, such elastic yarns come out straight in the completed fabric, as is diagrammatically represented in Figure 5. Thus the elastic yarns, in their straightening, are relieved of their tension without crawling and, therefore, do not cause a wrinkled effect in the fabric. Moreover, the straightening out of the elastic yarns relatively shifts and gathers in coursewise direction the loops of inelastic yarns constituting the base fabric, with the result that a considerable increase in stretchability and snap is imparted to the fabric. Also, as a result of the straightening of the elastic yarns and the shifting and gathering of the loops of the inelastic yarns, there is produced on one face of the fabric a distinctive grogram-like surface appearance, as diagrammatically illustrated in Figure 5.

What I claim is:

1. A warp knit fabric consisting of two sets of warp yarns, one set being knitted into loops constituting successive courses, the loops in certain of said courses at spaced intervals in the fabric being of the non-reversing closed type, the loops in the remaining courses in the fabric being of the reversing closed type, and the other set of yarns being laid into the fabric in zig-zag directions and hung unto said non-reversing closed loops.

2. A warp knit fabric consisting of two sets of warp yarns, one set consisting of inelastic yarns and the other set consisting of elastic yarns, the set of inelastic yarns being knitted into loops constituting successive courses, the loops in certain of said courses at spaced intervals in the fabric being of the non-reversing closed type, and the loops in the remaining courses in the fabric being of the reversing closed type, and the set of elastic yarns being laid into the fabric in zig-zag directions and hung unto said non-reversing closed loops.

3. In a method of making warp fabric from two sets of yarns, the steps of: knitting one set of yarns into loops for the formation of spaced series of multiple courses and of a course intermediate each series by lapping said one set of yarns in reverse direction to form reversing closed loops throughout the courses of each spaced series, and lapping said one set of yarns in non-reverse direction to form non-reverse closed loops throughout the courses intermediate each series; and laying in without knitting into loops the other set of yarns by lapping said other set of yarns continuously in one direction in relation to one series of multiple courses of reversing closed loops, and continuously in the reverse direction in relation to the adjacent series of multiple courses of reversing closed loops, whereby to hang the yarns of said other set unto the non-reversing closed loops of the course intermediate said series.

4. In a method of making warp knit fabric from a set of inelastic yarns and a set of elastic yarns, the steps of: knitting the set of inelastic yarns into loops for the formation of spaced series of multiple courses and of a course intermediate each series, by lapping said set of inelastic yarns in reverse direction to form reversing closed loops throughout the courses of each of said spaced series; and lapping said set of inelastic yarns in non-reverse direction to form non-reversing closed loops throughout the course intermediate each series; and laying in without knitting into loops the set of elastic yarns by looping said set of elastic yarns continuously in one direction in relation to one series of multiple courses of reversing closed loops and continuously in the reverse direction in relation to the adjacent series of multiple courses of reversing closed loops, whereby to hang the elastic yarns onto the non-reversing closed loops of the course intermediate said series.

5. A warp knit fabric comprising two sets of warp yarns, one of said sets forming warpwise extending rows of loops arranged in courses, each of the yarns of said last named set forming alternately reversing and non-reversing loops in consecutive rows and successive courses, the loops of one row being connected with loops of another row by floats integral therewith, and the other of said sets forming zig-zag floats having relatively straight sections each extending across a plurality of rows and a plurality of courses, said sections being connected by bights adjacent to non-reversing loops formed by said first set, and the number of rows and courses traversed by the respective straight sections aforesaid being equal.

6. The method of knitting warp fabric from two sets of yarns, one of which is elastic and the other relatively inelastic, which comprises knitting from said inelastic yarns a plurality of warpwise extending rows of loops, each such yarn forming alternately reversing and non-reversing loops in consecutive rows and successive courses and connecting them by floats, the loops in adjacent rows forming courses, and laying said elastic yarns in zig-zagged relatively straight sections across said rows and courses said straight sections being connected by bights adjacent to non-reversing loops aforesaid, the number of rows and courses traversed by a straight section being equal.

CHAS. R. BURNS.