May 22, 1934. R. K. MILLS 1,960,161

KNITTED FABRIC

Filed Jan. 8, 1930 3 Sheets-Sheet 1

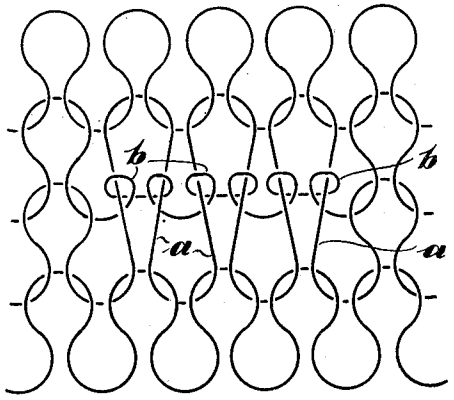


FIG. 1.

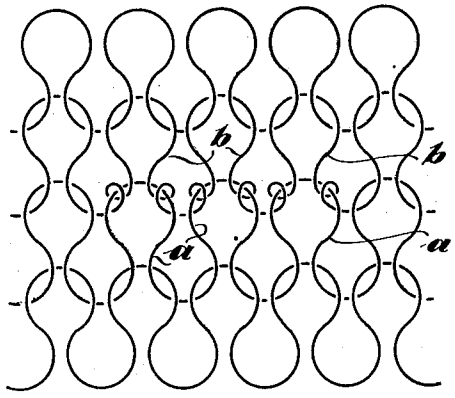


FIG. 2.

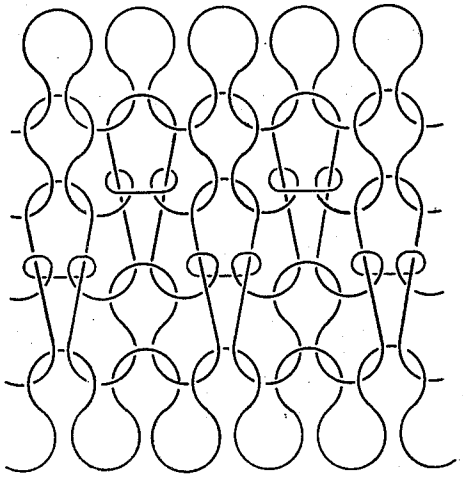


FIG. 3.

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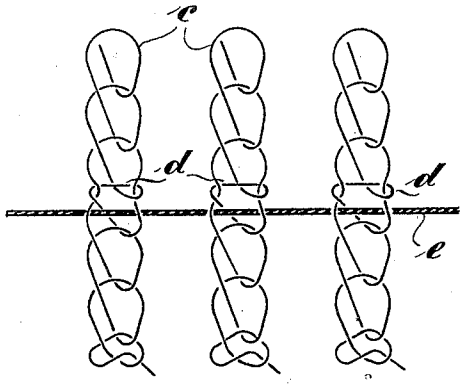
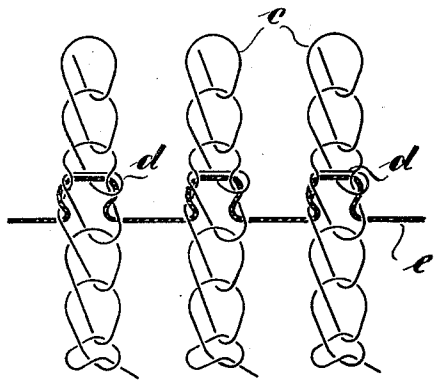


FIG. 4.

FIG. 5.



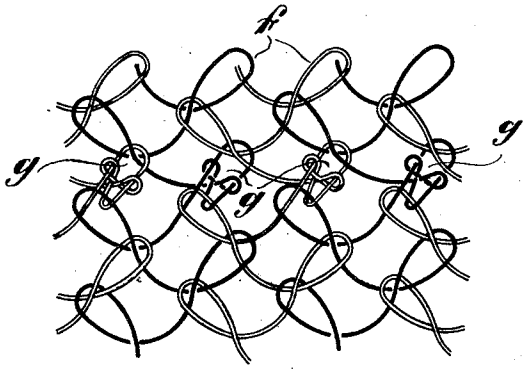


FIG. 6.

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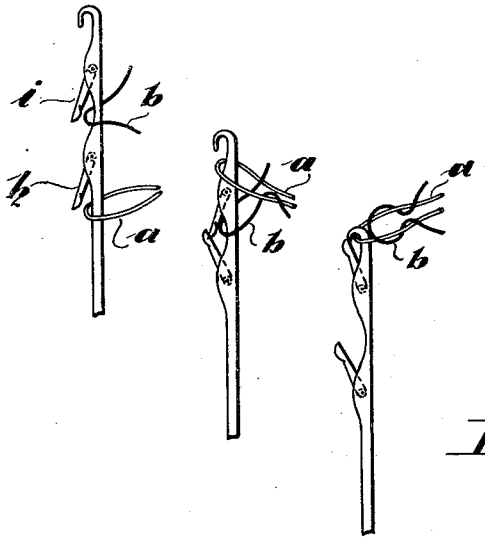


FIG. 7

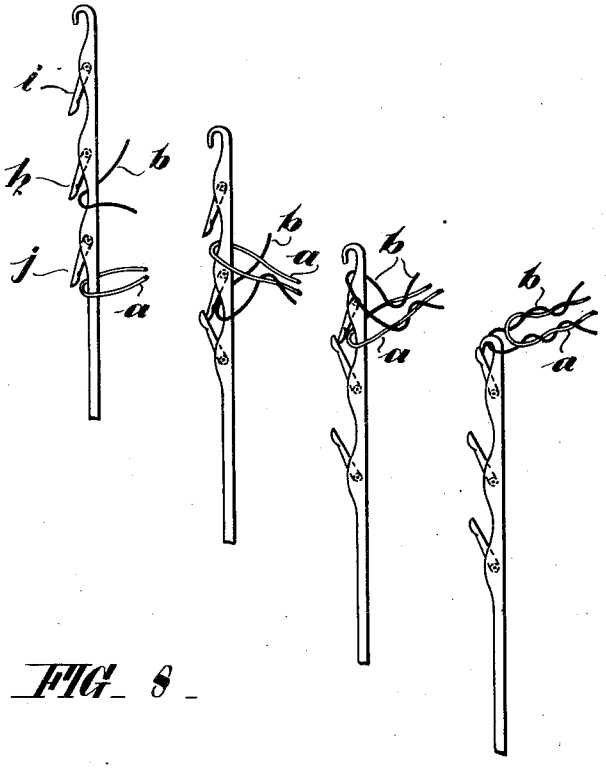


FIG. 8

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UNITED STATES PATENT OFFICE

1,960,161

KNITTED FABRIC

Robert Kirkland Mills, Sherwood, England, assignor to Hosiery Developments Limited, Nottingham, England

Application January 8, 1930, Serial No. 419,228
In Great Britain March 28, 1929

15 Claims. (Cl. 66—169)

This invention relates to improvements in knitted fabrics and in the method of producing same. By the expression "knitted fabric" is to be understood any fabric which is composed of or incorporates knitted or intermeshing thread loops.

The main object of the invention is to provide a knitted fabric wherein the tendency to rove or ladder is eliminated or minimized.

According to the present invention a knitted fabric is provided wherein selected of the intermeshing loops extend through and also around or over other loops.

It is to be understood that where the expression "selected" is employed in this specification as applied either to intermeshing loops or stitch loops or to courses of stitches such expression is intended, where the context so permits, to include either one or more of such loops or courses, the word "selected" being used in the sense of predetermined or predestined.

The thread loop which extends through and around another loop in accordance with this invention effects a locking or tying of one loop upon another, and if in a knitted fabric embodying such locked or tied loops any unravelling or laddering should occur, this is effectively checked by said loops which prevent or minimize any further tendency to unravel.

The thread loop which is locked or tied upon another loop may be constituted by a single thread or by a group of threads. In particular said thread may be the same as that constituting the knitted loops or stitches in the fabric.

Additionally, the number of times a thread loop may be passed through and around another loop may be varied as desired.

For the purpose of more fully describing the nature of this invention reference will now be made to the accompanying drawings, wherein:—

Figure 1 illustrates a portion of plain knitted fabric incorporating locked or tied stitches in accordance with one embodiment of the invention, while Figure 2 shows similar fabric with a modified form of locked stitch.

Figure 3 illustrates one method of applying the invention to a ribbed knitted fabric.

Figure 4 illustrates the invention applied to separate knitted chains and shows a weft thread held in position, while

Figure 5 illustrates the weft thread being so incorporated as to constitute part of the locking means.

Figure 6 illustrates the application of the invention to a warp fabric.

Figure 7 illustrates a method of producing a simple lock stitch, while

Figure 8 shows the production of a modified lock stitch.

In the production of knitted fabric in accordance with Figure 1, needle loops *a* formed on selected needles (the term needle embracing any instrument capable of producing a knitted loop) each have a second loop *b* drawn therethrough, but instead of casting the first or needle loop off the needle and proceeding to knit with the second loop at the next course as in ordinary knitting, said needle loop is drawn through said second loop and retained on the needle. In this way the second loop *b* is drawn through and passed over or around the needle loop and becomes locked or tied thereon.

In a modification (see Figure 2) the second formed loops *b* are drawn through the needle loops *a* twice, this being accomplished by first passing the second loop *b* through the needle loop *a*, then passing loop *a* through loop *b* and finally again passing loop *b* through the loop *a*. In this last described fabric it will be seen that the needle loops *a* are cast off and the newly drawn loops *b* retained on the needles to constitute part of the stitches in the next succeeding row or course, thus greater elasticity is provided in the fabric. The locking stitch is produced at intervals in the fabric as desired; thus for example a course of such locking stitches may be produced at every other course, the intermediate course being knitted in the usual manner.

In the application of the invention to rib knitted fabric the locked stitches may be produced on selected needles of both the frame and machine needles or only on the needles of one set on selected courses. Advantageously the locked stitches occur only on one face of the fabric in any one course and the courses having said locked stitches on one face alternate at predetermined intervals with courses having such stitches on the opposite face, as illustrated in Figure 3.

The invention is also applicable to knitted chains *c* (Figures 4 and 5) the locked stitches being indicated at *d*, said stitches being produced as before described by passing a loop of thread through and also over or around a thread loop just previously produced. In this arrangement a fabric may be composed of a series of these chains simultaneously produced on separate needles, and the locked stitches *d* serve to grip in said chains weft threads such as shown at *e* laid in position by any known or suitable means.

Alternatively the weft thread *e* may be so laid upon the needles forming the knitted chains *c* as to be passed with the locking loops through and around the loops to be locked, said weft thread thus forming part of the stitch locking means.

Although the foundation of the fabric illustrated in Figures 4 and 5 is composed of chains each produced from a separate warp thread and connected by weft thread *e*, as distinguished

from the fabric in Figures 1 to 3 composed entirely of weft thread, i. e., thread extending weftwise from wale to wale, it will be appreciated that the principle of stitch-locking is identical in all cases. It is well known that if the same thread is fed at successive stitch-forming operations to the same needle a knitted chain is produced, and machines which simultaneously make a series of such chains are also well known. Now each chain so produced is in the fabric according to Figures 4 and 5, the equivalent of a stitch wale in the fabric according to Figures 1 to 3 and the locking of a thread loop or stitch in the chain fabric is accomplished by passing a thread loop through and also around the loop to be locked. The traversing of the weft *e* by any known or suitable thread-traversing means is so timed as to cause such weft either to be embraced by the chain stitches without actually forming part of the stitch-lock as in Figure 4, or so as to be associated with and form a part of the stitch-lock as in Figure 5.

In Figure 6 is shown one method of applying the invention to a warp knitted fabric which is of a type well known to those versed in the art of knitting and is composed of warp threads *f* which are traversed laterally to the extent of one needle in opposite directions on successive courses, the locked stitches which are here indicated at *g* being produced in the manner before described.

In each of the above examples of fabric, it will be appreciated that the locking of a thread loop or stitch is accomplished by a thread which passes around one side bar of said loop then across the loop and finally around the opposite side bar thereof, and it is to be understood that such locking or tying may be accomplished by a plurality or group of threads instead of by a single thread. Also the thread or thread which is entwined about the loop to be gripped may be caused to encircle each side bar of said loop a plurality of times.

The invention is in no way restricted to the types of fabric before described but is applicable to any fabric embodying intermeshing or knitted loops.

In a convenient method of producing locked stitches in a fabric in accordance with this invention, the whole or selected of the needles employed may be provided with a plurality of pivoted latches spaced one below the other on the same side of the shank. For example two latches may be provided in which case when the lowermost latch is fully raised its extremity bears upon and slightly overlaps the upper latch in its down position.

In Figure 7 is shown the production of a locked stitch as illustrated in Figure 1. The needle is raised to a height suitable for clearing the previously formed needle loop *a* to a position below the lower latch *h* and to permit of new thread *b* being fed between the two latches *h, i*. On the initial part of the downward movement of the needle the lower latch *h* is pivoted upwards and bears at its end upon the end of the downturned upper latch *i*, the old loop *a* passing over the two overlapping latches into the hook of the needle. Continued movement of the needle causes the new loop *b* to close the upper latch *i*, said loop being cast off while the old loop *a* is retained in the needle hook. In this way the needle loop *b* is first drawn through the old loop *a* as shown in the second position in Figure 7 and then passed around same as shown in the final position thus tying itself upon said old loop.

The production of the locked stitch shown in Figure 2 is illustrated in Figure 8. For this purpose a needle with three displaceable latches is provided, the middle latch *h* and lowermost latch *j* being each adapted when in their fully raised position to abut against and slightly overlap the latches disposed next above.

The function of the needle is in this case similar to that before-described, the needle being elevated to such position that the old loop *a* passes beyond the lowermost latch *j* and new thread *b* is laid on the shank of the needle between the middle and lower latches *h, j*.

On the first part of the downward movement of the needle the lowermost latch *j* is reversed to abut against the middle latch *h* and the old loop *a* guided over the abutting latches and the newly laid thread *b* covered thereby, and passing toward the shank of the needle between the upper and middle latches *i* and *h*. On further downward movement of the needle the middle latch *h* is reversed by the newly laid thread loop *b* and abuts against the uppermost latch *i*. The newly laid loop is thereby guided over the abutting latches *h, i* covering the old loop *a* and passes toward the hook of the needle; the old thread loop *a* subsequently reverses the uppermost latch *i* and is thereby cast off the needle.

Compared with the stitch or chain produced by a two latch needle the result obtained is that the newly formed thread loop *b* is once more drawn through the old loop to produce a double intertwining effect.

It will be appreciated that when a plural latch needle is utilized for producing an ordinary unlocked stitch, it is only raised to a height sufficient to permit of new thread being laid in the hook and to clear the old loop beneath the uppermost latch.

I claim:—

1. A fabric wherein each of selected stitch loops composed of knitting yarns is locked or entwined by a knitting yarn which passes around the one side bar of said loop, then across the loop and finally around the opposite side bar of said loop.

2. A fabric wherein each of predetermined or selected stitch loops is locked or entwined by a thread which encircles each of the two side bars of the loop a plurality of times and extends across said loop, all of said stitch loops and threads being knitting yarns.

3. A fabric embodying a plurality of intermeshing thread loops of knitting yarn, each of selected said loops extending through another loop and wrapped around the legs thereof whereby said selected loops are interlocked or intertwined with said other loops.

4. A fabric embodying a plurality of intermeshing thread loops of knitting yarn, selected of said loops extending through other loops and around the legs thereof, whereby said selected and other loops are locked or intertwined with one another, and all of said loops are composed of the same yarn.

5. A fabric embodying a plurality of intermeshing thread loops of knitting yarn, selected of said loops extending through other loops and around the legs thereof, whereby said selected and other loops are locked or intertwined with one another, and said selected loops being composed of different yarn from the other loops.

6. A fabric embodying a plurality of intermeshing thread loops of knitting yarn and in

which selected of said loops appertaining to selected courses extend through other loops appertaining to the immediately preceding course and around the legs of said other loops whereby said selected and other loops are locked or intertwined.

7. A fabric embodying a plurality of intermeshing thread loops of knitting yarn and in which selected of said loops appertaining to selected courses extend through other loops appertaining to the next succeeding course and around the legs of said other loops whereby said selected and other loops are locked or intertwined.

8. A fabric embodying intermeshing thread loops of knitting yarn wherein on selected courses, selected loops are locked by other loops extending therethrough and around the legs thereof, and wherein said locked loops alternate with ordinary plain or unlocked loops in the same stitch row.

9. A fabric embodying intermeshing thread loops of knitting yarn wherein selected loops are locked by other loops extending therethrough and around the legs thereof, and wherein on selected courses the locked stitches appear on one face of the fabric, and on other courses the locked stitches appear on the other face of the fabric.

10. A fabric embodying intermeshing thread loops of knitting yarn in selected wales of which each of selected of the loops constituting such wale passes through a preceding loop of the same wale and embraces or encircles said preceding loop, thus forming a locking loop.

11. A fabric embodying ordinary knitted stitches and locking stitches, the ordinary stitches appertaining to one knitted course, the locking stitches appertaining to another knitted course and said locking stitches being constituted by loops which pass through and also embrace or encircle the ordinary stitch loops of the first-named course.

12. A fabric embodying ordinary knitted stitches and locking stitches, the ordinary stitches appertaining to one course, the locking stitches appertaining to another knitted course and said locking stitches being constituted by loops which pass through and also embrace or encircle the ordinary stitch loops of the first-named course, the said ordinary stitches and locking stitches being composed of independent yarns.

13. A knitted fabric comprising knitted chains each consisting of intermeshing thread loops and each of selected of said loops passing through a preceding loop in the same chain and also embracing or encircling said preceding loop to lock the latter.

14. A knitted fabric comprising knitted chains, each chain consisting of intermeshing thread loops, each of selected of said loops passing through a preceding loop in the same chain and also embracing or encircling said preceding loop to lock same, and a weft thread extending across said chains, said weft thread being gripped in the chains by the locked stitches.

15. A knitted fabric comprising knitted chains, each chain consisting of intermeshing thread loops, each of selected of said loops passing through a preceding loop in the same chain and also embracing or encircling said preceding loop to lock same, and a weft thread extending across the chains and gripped therein by the locked stitch loops and said weft thread constituting part of the stitch locking means.

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