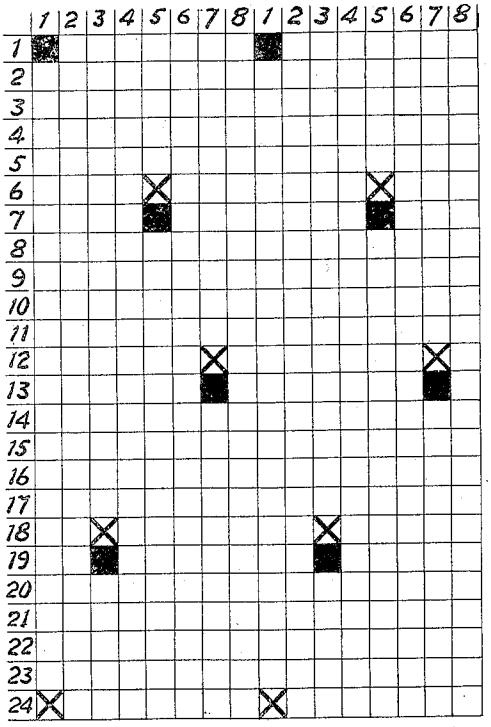
Nov. 17, 1936. E. C. LOCHHEAD 2,060,882

KNITTED FABRIC

Filed Dec. 1, 1934



□ = NORMAL STITCH

⊠ = DRAW STITCH

■ = FLOAT

FIG. 1.

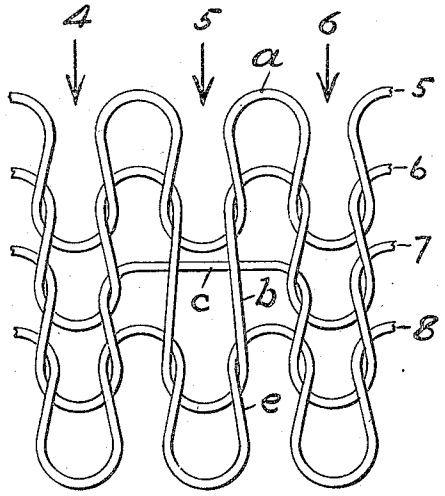


FIG. 2.

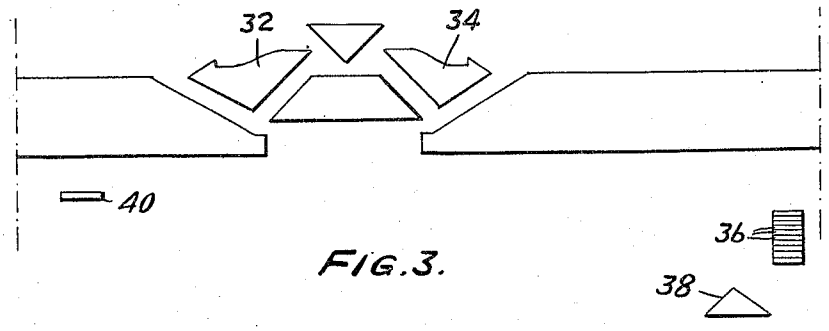


FIG. 3.

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2,060,882

KNITTED FABRIC

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Application December 1, 1934, Serial No. 755,534

5 Claims. (Cl. 66—169)

This invention relates to a knitted fabric particularly designed for stockings and the method of making the same, the fabric being characterized by a substantial resistance to the production of runs, as will be hereafter brought out.

Ordinary knitted fabric of either plain or ribbed type is subject to destruction by the occurrence of runs which start whenever a course of the fabric is ruptured or fraying occurs at the end of the fabric. Such rupture is very liable to occur in the case of knitted fabrics or stockings inasmuch as they are generally placed under tension by garters or subject to wear or breakage by contact with furniture or shoes. Heretofore, various modes of knitting have been devised for reducing the tendency for such fabrics to run in the direction of the wales if a single course or a plurality of adjacent courses are ruptured. In general, however, the fabrics of this type have been somewhat objectionable in that they are of comparatively heavy weight as compared with the simple plain or ribbed fabrics, or, if they are light in weight, have an unconventional appearance due to the presence of other than normal stitches, giving rise to a lace-like effect which, being unusual, is not acceptable to many persons.

It is the broad object of the present invention to provide a fabric adapted for high-grade hosiery which is substantially completely resistant to the production of downward runs, in that such runs are definitely limited after extending through only a small number of courses, and which, at the same time, is to a certain degree resistant to the upward production of runs such as sometimes occur. Furthermore, the improved fabric is of substantially conventional appearance, a single yarn being used throughout, and the abnormal stitches which result in the resist run characteristics being widely spaced and substantially unnoticeable.

It is a further object of the invention to provide a method for the production of such fabric whereby the fabric may be produced as rapidly as conventional fabric upon ordinary types of circular knitting machines.

The specific objects of the invention will be apparent from the following description read in conjunction with the accompanying drawing in which:

Fig. 1 is a diagrammatic view showing two constructional repeats measured along a course and a single constructional repeat measured in the direction of the wales;

Fig. 2 is a diagrammatic view showing the formation of the run-arresting stitches; and

Fig. 3 is a diagrammatic view of certain of the knitting elements for the preferred production of the fabric including the needle cams and cams adapted to act on needle controlling jacks shown in developed form.

Tnere is illustrated in Fig. 1 a preferred embodiment of the invention which is found to produce the most satisfactory type of fabric. The fabric comprises a repeat involving eight wales and twenty-four courses, there being illustrated in Fig. 1 two repeats involving sixteen wales. The different wales constituting a repeat are numbered consecutively at the top of the figure while the twenty-four courses constituting a repeat are numbered consecutively at the left of the figure. The stitches are designated by the legends indicated at the bottom of the figure. It will be seen from this figure alone that the great majority of the stitches are normal and that draw stitches and floats occur only at considerable intervals, there being in a total of 192 stitches only eight abnormal arrangements of the yarn. This gives rise to a fabric which has a substantially conventional appearance, the abnormal arrangements of the yarn being scarcely noticeable.

In Fig. 2 there is illustrated one of the abnormal arrangements involving a draw stitch and a float. A single yarn *a* is used throughout the formation of the main portion of the fabric which constitutes the leg of a stocking. In the formation of a run arresting arrangement a draw stitch *b* is drawn from, say, the course 6 in wale 5 and is anchored by a normal loop drawn in course 8 of wale 5. A float *c* in course 7 floats across the wale 5.

Describing more specifically the construction of the preferred fabric and designating the draw stitches as belonging to the courses in which they are drawn, the course designated 1 has a float across the wale 1, there being behind this float a draw stitch drawn in the preceding course 24 and anchored by the course 2. The loops of course 1 occurring in wales 2 to 8 inclusive are normal. All of the loops drawn in courses 2, 3, 4 and 5 are normal.

In the following course 6 a draw stitch is drawn in wale 5, being anchored by course 8 and extending over a float formed in course 7 across wale 5. A series of normal loops are then formed throughout courses 8, 9, 10, and 11 whereupon in courses 12 and 13 the abnormal structure is repeated, this time in wale 7. This construction is

again repeated in courses 18 and 19 in wale 3 and then again in courses 24 and 1, the last being in the next repeat.

From the above it will be seen that the odd-numbered wales contain the abnormal construction once in each repeat of twenty-four courses. On the other hand, the even numbered wales contain only normal loops. The construction limits downward runs very effectively throughout the fabric. Downward runs, it may be noted, occur along the so-called "sinker wales" between the needle wales which are here primarily considered. Every sinker wale has occurring in a needle wale adjacent to it, within the limits of a single repeat, a draw stitch and float, the latter of which is possibly primarily instrumental in arresting the run. In the actual fabric it is found to be quite difficult to cause the runs to continue beyond such arresting points. The resistance to the continuation of the runs is so effective that it is practically impossible in ordinary use for a run to extend through more than the short distance corresponding at a maximum to approximately twenty-four courses of the fabric.

It is also found that there is a substantial resistance to the production of upwardly extending runs in the needle wales possibly due to the localized limitation of elasticity at the positions of the floats which tend to prevent the separations of the wales which must occur for runs to result.

The fabric just described may be readily produced upon conventional machines which are capable not only of knitting the leg of a stocking but also the foot including the heel and toe. In general, the fabric just described will extend through the leg and instep and may, if desired, be continued in the foot and also by a suitable adjustment of the machine in the heel and toe. If an auxiliary yarn is introduced in the sole of the foot or in the heel or toe, the same fabric may be continued causing the two yarns to extend together forming draw stitches and floats as described. To illustrate one method of producing the fabric there are illustrated in Fig. 3 certain elements of a Scott and Williams spiral float stitch machine which, by cooperation with needles and the well known type of tilting pattern jacks, will serve to produce the fabric. This machine includes two stitch cams 32 and 34 of which 32 is operative in the present instance to draw stitches in the rotary production of the leg portion of a stocking. In the general operation of this machine other than for the production of the fabric of this invention, the cam 34 is ordinarily used during rotation to move the needles upwardly so that stitches previously formed and held within the hooks thereof will drop below the latches prior to the taking of yarn at the feed. In the production of the present fabric the cam 34 is retracted so as not to raise the needles and so that, except for other provisions hereafter described, draw stitches would be produced without any castoff.

In the Scott and Williams machine referred to there is provided a cam 38 which is arranged to engage lower butts on tilting jacks to raise the jacks when their lower ends are rocked inwardly by the action of selector fingers 36 on butts on the jacks, these selector fingers 36 being controlled in their movements by the action of well known pattern mechanism. By a suitable combination of pattern mechanism and butts on the tilted jacks the needles corresponding to the jacks may either move past the position of cam 38 without rising or may be raised at this place by the action of cam 38 on the jacks. A cam 40 tends to move the lower ends of all of the jacks outwardly prior to a new selection by the action of the selector fingers 36.

In the present machine the cam 38 serves to effect the raising of needles to such extent that loops carried within the hooks thereof will be located below the latches so as to be cast off the needles during the drawing of loops of the next course. The needles associated with jacks which do not ride up the cam 38 will fail to cast off the stitches of a previous course and draw stitches will result.

Besides the above action effected by the selective raising of needles by cam 38 the feed fingers for the yarn *a* are located so that the yarn will be taken only by those needles which have been raised by the action of cam 38 but not by those needles which move at the lower level so as to fail to cast off the loops thereon and thus produce draw stitches. The attainment of the structure illustrated in Fig. 2 will accordingly be obvious. During the formation, for example, of the course 7 the needle corresponding to the wale 5 will not be raised by the action of cam 38 on its corresponding jack and, accordingly, not only will the loop *b* be held thereon to form a draw stitch but the needle will fail to engage the yarn and thus produce a float as indicated at *c*. In the next subsequent course the same needle will be raised by the action of cam 38 to cast off the draw stitch *b* after taking the yarn to form the loop *e*.

While the fabric already described is the preferred form, it will be obvious that numerous other arrangements within the scope of the invention may be produced by modifications. The sparse distribution of the draw stitches and floats produces a fabric very closely approaching a conventional appearance while at the same time there are sufficient of these run arresting stitches to prevent the formation of long downward runs of objectionable length along the sinker wales. The short runs which may result may be readily mended. On the other hand a substantial resistance is provided against the initiation of such runs as might be produced primarily by tension upon the fabric since the localized limitation of separation of the wales appears to distribute the strains and thereby prevents the beginning of runs. The resistance to the occurrence of upward runs has been noted above. It will be obvious, of course, that the arrangement of the stitches may be substantially different from that illustrated. Other satisfactory distributions will be obvious to those skilled in the art, which distributions will, at the same time, result in the production of a fabric having substantially conventional appearance. It may be pointed out that one noteworthy feature of the arrangement which is illustrated is the absence of any draw stitches and floats in alternate needle wales, upward runs in which are limited by the presence of the draw stitches and floats in adjacent wales.

In circular knit hosiery it is sometimes customary to produce at the rear of the leg portion tuck stitches to form openwork resembling upon casual observation the transfer marks occurring in full-fashioned hosiery. The fabric formation described above is entirely compatible with the formation of such markings and will prevent the extension of runs therethrough. Furthermore, the fabric construction which has been described

does not interfere with the provision of mesh arrangements formed by tuck stitches and floats commonly provided at the upper portion of the leg.

It will be clear that numerous modifications may be made in the embodiments of the invention without departing from the scope thereof, as defined in the following claims.

What I claim and desire to protect by Letters Patent is:

1. A run-resistant knitted fabric having substantially the appearance of a plain knitted fabric, at least a portion of which comprises constructional repeats of substantial extent in the directions of both wales and courses, there being within one such repeat, in alternate wales only, draw stitches and floats in the following courses extending across said draw stitches, no more than one draw stitch in any course, and between any pair of courses containing draw stitches a plurality of plain courses.

2. A run-resistant knitted fabric having substantially the appearance of a plain knitted fabric, at least a portion of which comprises constructional repeats of eight wales and twenty-four courses, there being within one such repeat, in alternate wales only, draw stitches and floats in the following courses extending across said draw stitches, no more than one draw stitch in any course, and between any pair of courses containing draw stitches a plurality of plain courses.

3. A run-resistant knitted fabric having substantially the appearance of a plain knitted fabric, at least a portion of which comprises constructional repeats of substantial extent in the directions of both wales and courses, the extent in the direction of the courses being at least six wales, there being within one such repeat, in alternate wales only, draw stitches and floats in the following courses extending across said draw stitches, no more than one draw stitch in any course, and between any pair of courses containing draw stitches a plurality of plain courses.

4. A run-resistant knitted fabric having substantially the appearance of a plain knitted fabric, at least a portion of which comprises constructional repeats of substantial extent in the directions of both wales and courses, the extent in the direction of the courses being at least six wales, there being within one such repeat, in alternate wales only, draw stitches and floats in the following courses extending across said draw stitches, no more than one draw stitch in any course, and between any pair of courses containing tuck stitches a plurality of plain courses, said draw stitches being out of diagonal alignment.

5. A run-resistant knitted fabric having substantially the appearance of a plain knitted fabric, at least a portion of which comprises constructional repeats of eight wales and twenty-four courses, there being within one such repeat, in alternate wales only, draw stitches and floats in the following courses extending across said draw stitches, no more than one draw stitch in any course, and between any pair of courses containing draw stitches a plurality of plain courses, said draw stitches being out of diagonal alignment.

ELMER C. LOCHHEAD.