Dec. 6, 1938. N. SCHWARTZ 2,139,607

KNITTED FABRIC

Filed Oct. 18, 1937

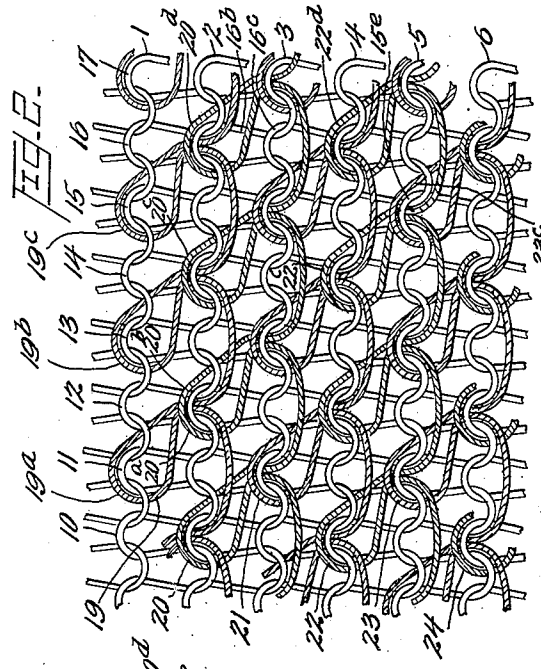

FIG. 2.

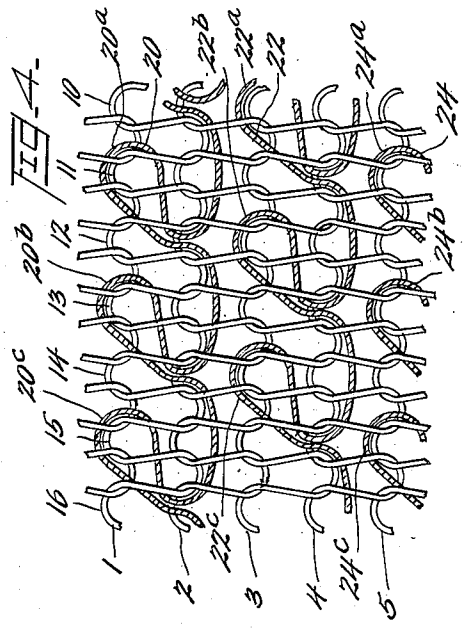

FIG. 4.

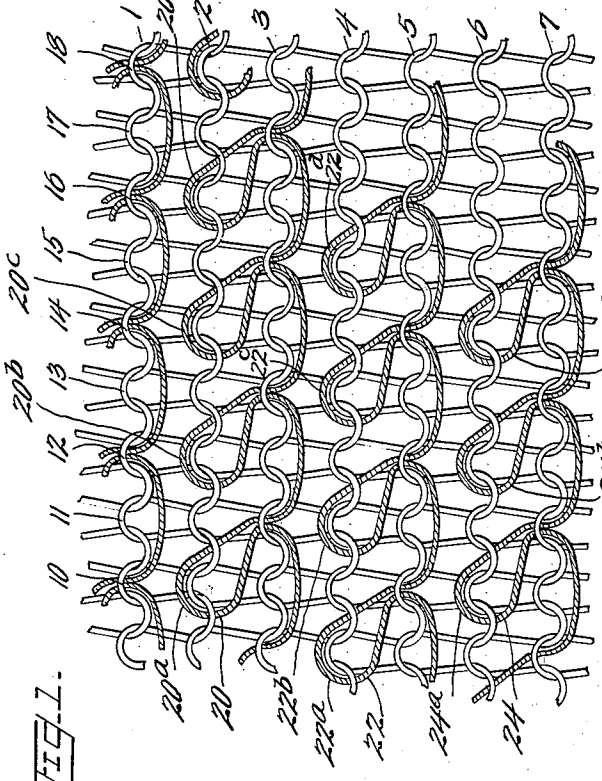

FIG. 1.

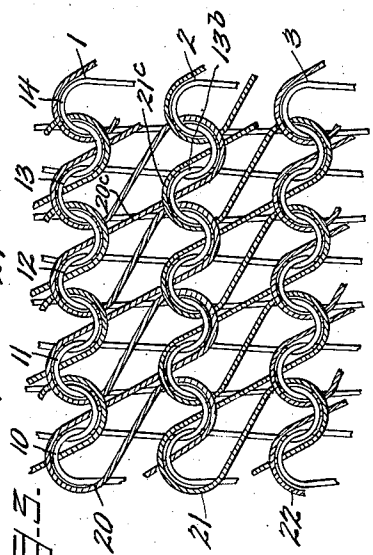

FIG. 3.

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KNITTED FABRIC

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14 Claims. (Cl. 66—198)

The object of the invention is to produce a non-run knitted fabric; that is, a fabric in which so-called "runs", due to the breaking of loops, can not take place; or at least can not extend for any substantial distance. While such a fabric is adapted for general use, it is particularly useful in the manufacture of hosiery, where "runs" destroy, or at least greatly impair, the usefulness of the garment.

In certain broad aspects, such a fabric is disclosed in my earlier patent, No. 1,470,490, granted October 9, 1923, wherein certain of the loops or stitches of the fabric are spread laterally and supported or interlocked in adjacent wales. This construction protects the fabric against runs, but the spreading of the loops or stitches gives the fabric an appearance somewhat simulating so-called "lace" work, which to some persons is objectionable. My present invention avoids this effect, for the normal or face loops of the fabric are in no way distorted, and the face of the fabric has the general appearance of standard knitted goods. But these normal loops are nevertheless protected against runs. This is effected by the use of auxiliary courses of special loops or stitches, preferably in the back of the standard fabric. These special loops are knit with the normal loops, and are themselves supported in wales adjacent to those in which they originate, so that the breakage of a loop in any particular wale will not result in the unroving of the succeeding loops; at least, not beyond the first auxiliary loop of that particular wale. These special or auxiliary loops may be provided for every loop of every course of normal loops; but sufficiently effective protection is given by providing each wale with more or less closely spaced auxiliary loops, so that no run of substantial length can occur, and such breaks as may arise can be readily repaired.

By this construction, the auxiliary or interlocking loops do not in any way affect the appearance of the face side of the fabric, and yet the fabric is fully protected against runs due to breakage of loops. No run can extend farther than to the next auxiliary or supporting loop, and since these special loops will follow each other directly, or at least closely, in every wale, or in substantially every wale, no run of substantial length can occur.

These special courses may be used with every normal course, and in every wale; but usually every second or third course will suffice; and every second or third wale in the course. By alternating these special loops in successive wales, so that every wale, or substantially every wale, is protected, the entire fabric is rendered runproof, or substantially runproof.

Fig. 1 is a view, greatly enlarged, of the back of a piece of knitted fabric embodying my invention, with the protecting loops or stitches in alternate courses and alternate wales.

Fig. 2 is a view similar to Fig. 1, but with the protecting loops or stitches in every course, but in alternate wales.

Fig. 3 is a view, still further enlarged, of the fabric, but with the protecting loops in every course and every wale.

Fig. 4 is a face or front view of a portion of the fabric shown in Fig. 1, with the threads and loops greatly enlarged.

In the drawings, Fig. 1 shows the rear side of a standard knitted fabric with my invention applied thereto or embodied therein, the elements of the fabric being enlarged for purposes of illustration, and ease of explanation. This figure shows the fabric as comprising a series of normal or regular courses, arranged in a series of normal or regular wales, the loops of any course supporting the loops of the preceding course, as is usual in the knitting of any standard fabric. For convenience, these courses are numbered 1 to 7, inclusive, while the wales are numbered from 10 to 18, inclusive.

Superimposed on this fabric of normal courses and normal wales, and on what will be termed herein the back thereof, are special courses of auxiliary or supporting loops, formed from an independent yarn. These auxiliary courses of special loops, here numbered 20, 22 and 24, correspond in position to the alternate normal courses 2, 4 and 6 of the face of the fabric; and the loops of these special courses of auxiliary loops are here shown alternating with the normal loops of such normal courses. Moreover, these auxiliary loops in their successive courses are interspaced, so that the wales which are skipped in one course are locked by succeeding courses throughout the fabric. These auxiliary loops, while they originate in one wale, are shifted over and knitted in adjoining, or at least adjacent, wales; and this protects the wales in which these loops originate and prevents runs from passing the point in which such loops have their origin.

The auxiliary or interlocking course 20 has its loops 20^a, 20^b, 20^c and 20^d originating in normal course 3, but their bights are all displaced to the right or left (here shown to the left), and knitted into the loops of normal course 2. Thus,

loop 20^a, which originates in normal course 3, wale 11, has its bight displaced and supported in course 2, wale 10; and loop 20^b, which originates in the same course 3, but in wale 13, has its bight displaced and supported in course 2, wale 12; likewise, loops 20^c and 20^d, which also originate in course 3, each has its bight diverted or displaced one wale, here shown to the left, and locked in the following course 2, 20^c, in wale 14, and 20^d, in wale 16.

The loops of auxiliary courses 22 and 24 are similarly knitted into the fabric; but the loops of auxiliary course 22 are staggered with respect to the loops of auxiliary course 20; and the loops of the course 24 are again staggered with respect to the loops of course 22. Thus, auxiliary loop 22^a of auxiliary course 22 originates in normal course 5, wale 10, but is locked in normal course 4, in the wale next to the left (unnumbered); loop 22^b originates in the same normal course 5, wale 12, and is locked in course 4, wale 11; loop 22^c originates in normal course 5, wale 14, and is locked in course 4, wale 13; and loop 22^d originates in normal course 5, wale 16, and is locked in normal course 4, wale 15.

The loops of auxiliary course 24, namely, loops 24^a, 24^b, 24^c, etc., all originate in the normal course 7, and all have their bights locked in normal course 6, the bight of each loop being displaced one wale to the left and locked therein; loop 24^a, in wale 10; loop 24^b, in wale 12; and loop 24^c, in wale 14.

In the above description, the protecting or interlocking loops are described as being in auxiliary courses. This is correct, but from one point of view the courses in which these special loops are knit may be described as forming, with the face loops, special courses, comprising regular loops and special loops; and some of the claims are framed in these terms.

As will be explained later, this arrangement of auxiliary or interlocking loops may be much varied; and these auxiliary loops may have their bights displaced either to the right or to the left; and they may be displaced two wales either right or left instead of only one wale. Furthermore, they may be interlocked in the second, or even the third course from that in which they originate. Still further, these auxiliary loops may be formed in every course, and in every wale of every course; the principle of the invention being the use of auxiliary interlocking and supporting loops, each of which supports a normal loop in one wale and is itself supported in some other wale. In the form shown in Fig. 1, the auxiliary loops are relatively short, and the amount of yarn used in this arrangement is less than in the other possible forms; but it is to be understood that all other possible arrangements of these auxiliary loops are within the scope of my invention.

In Fig. 2, the invention is applied to the fabric in every course, instead of in every other course, as in Fig. 1; but with the auxiliary loops in every other wale as in Fig. 1. The normal courses 1, 2, 3, 4, 5 and 6 correspond to the normal courses 1 to 6, inclusive, of Fig. 1; and the normal wales 10, 11, 12, 13, 14, 15, 16 and 17 correspond to the normal wales 10 to 17, inclusive, of Fig. 1. The auxiliary or interlocking courses are here numbered 19, 20, 21, 22 and 23, there being one such course for each normal course, instead of one for every other course of normal loops, as in Fig. 1. In this figure, it is not necessary to describe every loop, or even every course; but referring specifically to auxiliary course 19, the loop 19^a is shown as originating in normal course 2, wale 12, and having its bight deflected and locked in normal course 1, wale 11; loop 19^b originates in normal course 2, wale 14, and has its bight deflected and locked in normal course 1, wale 13; and loop 19^c originates in course 2, wale 16, and has its bight deflected and locked in normal course 1, wale 15. Similarly, in auxiliary course 20, the individual auxiliary loops 20^a, 20^b, 20^c and 20^d all originate in normal course 3, just as all similarly numbered loops in Fig. 1, and each loop has its bight deflected one wale to the left, and locked in normal course 2.

Here it will be seen that the auxiliary loops of the auxiliary courses support both the corresponding normal loops of that course, and the auxiliary loops of the next preceding auxiliary course. Thus, the auxiliary loop 19^c, Fig. 2, supports the bight of normal loop 16^b of course 2, wale 16, and also the auxiliary loop 20^d, which has its origin in course 3, wale 17, and is deflected to course 2, wale 16; and to carry the description further, auxiliary loop 22^c, for instance, supports normal loop 15^e, in normal course 5, and also the bight of auxiliary loop 23^c. And in like manner, every other auxiliary loop supports a normal loop and an auxiliary loop.

It will be seen that in this form, the auxiliary or interlocking loops are closer together in the several wales than they are in the construction shown in Fig. 1, and any breakage that may occur can not run more than two loops. For instance, should normal loop 16^b be ruptured, the normal loop 16^c immediately below will be released, but the next lower loop will be protected, and the run stopped by auxiliary loop 22^d. And this is true throughout the fabric.

Fig. 3 shows the rear side of a piece of fabric in which every normal loop has its own auxiliary or supporting loop. There is an auxiliary course for each normal course, and each auxiliary course has a loop in each normal wale; thus there are as many auxiliary loops as there are normal loops. The knitted structure is here shown further enlarged, so that the construction can readily be understood. The several courses of normal loops are numbered 1, 2, 3, etc., as in Figs. 1 and 2; while the normal wales are designated 10, 11, 12, 13 and 14 as in said prior figures. The auxiliary courses are numbered 20, 21 and 22, and correspond to the similarly numbered courses in Fig. 2. This form of fabric does not need extended description, for the auxiliary loops function just as in the other figures; the only difference is that, since each normal loop has a corresponding auxiliary or interlocking loop, every normal loop is supported, and the effect of a single broken loop is limited to that particular loop, and no run, or unroving of any other loops, can take place. For instance, auxiliary loop 20^c, which has its origin in auxiliary course 21, wale 13, and has its bight deflected and supported in normal course 1, wale 12, supports the bight of normal loop 13^b, and the bight of deflected auxiliary loop 21^c. Similarly, every other auxiliary loop is supported in some adjacent course and wale, and itself supports both a normal loop in some other course and wale and some other auxiliary loop. Thus, in this form of fabric, every loop of every wale is protected. Broken loops are not prevented; but individual loops, if broken, can not develop into runs.

This form of the invention thus gives the best possible protection, but of course uses more yarn, and makes a heavier fabric, than do the forms shown in Figs. 1 and 2.

Fig. 4 illustrates the face of the fabric shown in Fig. 1; that is, there is an auxiliary course for every alternate course of normal loops, and each auxiliary course supports the normal loops of alternate wales. And the auxiliary loops of succeeding courses are interspersed with the loops of preceding auxiliary courses, so that every wale is provided with interlocking loops throughout the extent of the fabric. The reference characters here used are the same as those employed in Fig. 1, but since this figure shows the reverse side of that fabric, the reference characters also are reversed. The courses of normal loops are numbered 1, 2, 3, 4 and 5; and the normal wales, 10, 11, 12, 13, 14, 15 and 16, as in Fig. 1; and the auxiliary courses are numbered 20, 22 and 24. Since the construction of the fabric has been given in the description of Fig. 1, such description will not be repeated here.

This illustration of the face of the fabric shows all loops enlarged, and with the yarns relatively fine, so that the construction may be clearly understood. In practice, the normal loops will be relatively small and close together, so that the auxiliary loops on the back of the fabric will not appear, or at least will be scarcely perceptible. And if the thread of these auxiliary loops is of the same color, or substantially the same color, as the thread or threads constituting the face of the fabric, as will usually be the case, the auxiliary loops, to all intents and purposes, will be invisible.

In the several figures above described, the special or auxiliary loops are shown as displaced laterally to adjoining wales, and locked in courses adjoining those in which these loops originate; but it is not essential that the locking be effected in the next wale or the next course; it is essential only that the locking wales and courses be relatively close to the origin of these loops. Each auxiliary loop may be displaced laterally and locked in the second wale from that in which it originates, or even in a more distant wale; and the course in which it is secured need not be the next adjacent course, but may be the second or even a more distant course.

In the above description, as well as in the following claims, the word "loop" is to be regarded as meaning the same as 'stitch"; and "normal", as the equivalent of "regular"; so that "normal loops" and "regular stitches" are to be considered equivalent descriptive expressions.

I claim:

1. A nonrun knit fabric having one face of regular loops knit from one thread in normal courses, and the other face of transferred loops only knit in continuous sequence in auxiliary courses from different thread.

2. A nonrun knitted fabric comprising courses each of which is formed of a plurality of threads, one knitted in regular loops and another knitted in a continuous series of auxiliary transferred loops.

3. A nonrun knitted fabric comprising courses alternate ones of which are formed of a plurality of threads, one knitted in regular loops and another knitted in a continuous series of auxiliary transferred loops.

4. A nonrun knitted fabric having courses formed of two threads, one knitted in regular loops and the other knitted in a continuous series of laterally transferred loops.

5. A nonrun knitted fabric having courses certain of which are formed of two threads, one knitted in regular loops and the other knitted in a continuous series of laterally transferred loops.

6. A nonrun knitted fabric having courses each of which is formed of two threads, one knitted in regular loops and forming one side of the fabric and the other knitted in a continuous series of laterally transferred loops on the other side of the fabric.

7. A nonrun knitted fabric having courses certain of which comprise two sets of loops, one set knitted in regular loops from one thread, and the other knitted from another thread in a continuous series of laterally transferred auxiliary loops.

8. A nonrun knitted fabric having courses certain of which are of regular loops only and others of which comprise two sets of loops, one set knitted in regular loops from one thread, and the other knitted from another thread in a continuous series of laterally transferred auxiliary loops.

9. A nonrun knitted fabric having courses composed of a thread knitted in regular stitches only and another thread knitted in a continuous series of laterally transferred stitches only.

10. A nonrun knitted fabric including courses each formed of a plurality of threads, one being knitted in regular loops, and another knitted in a continuous series of auxiliary loops which are drawn through the bights of certain of the regular loops and transferred to adjacent wales in a succeeding course.

11. A nonrun knitted fabric including courses each formed of a plurality of threads, one being knitted in regular loops, and another knitted in a continuous series of auxiliary loops which are drawn through the bights of certain of the regular loops and transferred to adjacent wales in the succeeding course, the auxiliary loops being in such close proximity as to render substantially the entire area of the fabric of a nonrun character.

12. A nonrun knitted fabric having courses formed of two threads, one knitted in regular loops, and the other knitted in each of a plurality of courses in a continuous series of auxiliary loops which are drawn through the bights of certain of the regular loops and transferred to adjoining wales in the succeeding course of regular loops.

13. A nonrun knitted fabric having courses formed of regular loops interspersed with courses formed of two sets of loops, one set being normal loops and the other auxiliary loops knit from a separate thread in continuous sequence, which auxiliary loops are drawn through and support the bights of normal loops and are themselves transferred to and supported in adjacent wales in succeeding courses.

14. A nonrun knitted fabric having courses formed of regular loops interspersed with courses formed of two sets of loops, one set being normal loops and the other auxiliary loops knit from a separate thread in continuous sequence, which auxiliary loops are drawn through and support the bights of normal loops in substantially every wale and are themselves transferred to and supported in adjacent wales in suceeding courses.

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