

Sept. 10, 1935.

M. NEBEL

2,014,026

KNITTED FABRIC

Filed July 14, 1932

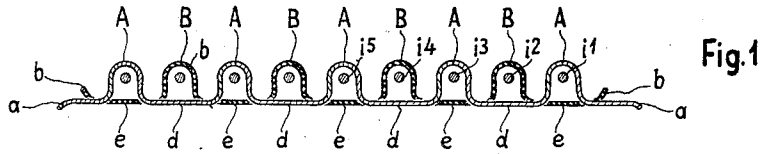


Fig. 1

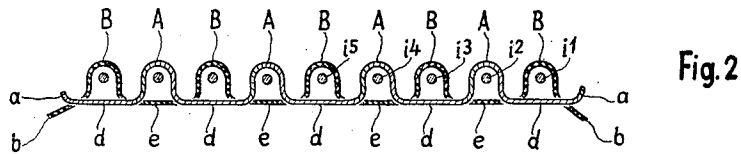


Fig. 2

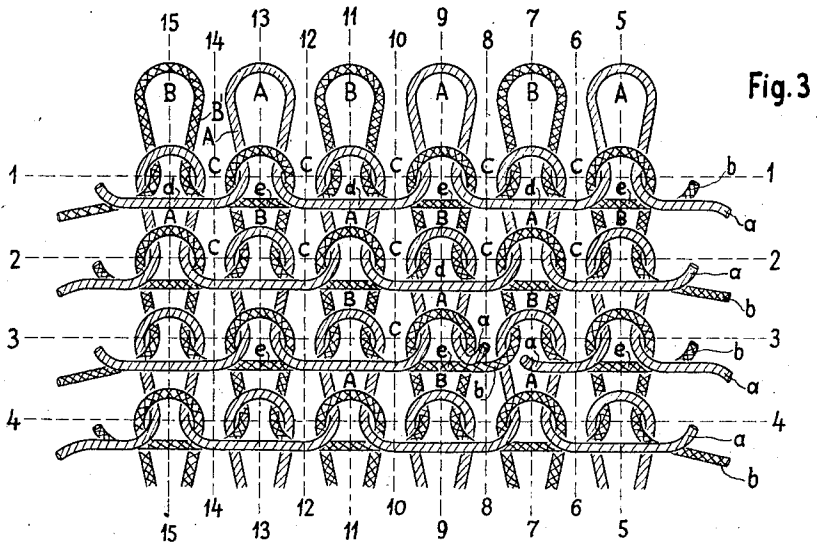


Fig. 3

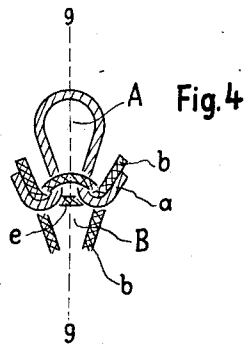


Fig. 4

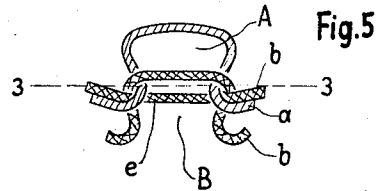


Fig. 5

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UNITED STATES PATENT OFFICE

2,014,026

KNITTED FABRIC

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Application July 14, 1932, Serial No. 622,486

In Germany July 20, 1931

2 Claims. (Cl. 66—169)

My invention relates to plain knitted fabrics, such as hosiery, frame-work, knit goods, and the like. The fabrics may be knit with any desired pattern, or combined with a ground fabric or backing, and may be made on any knitting machine, hosiery machine, and the like.

It is an object of my invention to provide a run-resisting fabric. To this end I form the courses of needle loops and the wales in the fabric from two threads both of which are knitted into every course. One of the threads is knitted into alternate wales and floated across intervening wales in alternate courses, and knitted into intervening wales and floated across alternate wales in intervening courses. The other thread is knitted into intervening wales and floated across alternate wales in alternate courses, and knitted into alternate wales and floated across intervening wales in intervening courses.

Preferably the loops formed from the individual threads are staggered throughout the courses so that the wales, like the courses, consist of alternating loops from one and from the other thread.

In knitted fabrics as made heretofore, the loops in each course are formed from a single thread which is sunk to form bights, and the bights are interlaced with the loops of the preceding course which is also made of a single thread. In this manner, the individual courses of loops make up the known plain fabric which is readily stretched in all directions. Fabrics of this kind involve the drawback that if a thread breaks and a loop runs in consequence, all loops in the wale in which the fault has occurred, beginning with the faulty loop, will also run. This occurs upon the slightest pull and particularly if the pull is exerted in the longitudinal direction, i. e., in the direction of the wales. The running of the loops, however, is not limited to the wales but involves the courses, and finally ladders form not in the faulty wale alone but in two, three or more adjacent wales, the courses are involved, and the result is a hole in the fabric.

It has been suggested to prevent the running of knitted fabrics by interlacing the individual loops with preceding or laterally adjacent loops. Running is in fact prevented by this but the appearance of the fabric is changed altogether, and the fabric also becomes much thicker than the normal fabric, so that it is unsuitable for comparatively thin fabrics, such as stockings, gloves and similar articles, even with threads of the thinnest gauges and with the smallest pitches of loops.

According to my invention the formation of ladders not only in the needle-loop wales, but also in the sinker-loop wales, and the formation of holes in the fabric in consequence of the breaking of a thread, are eliminated altogether without substantially altering the appearance and the thickness of the fabric, as compared with a fabric

of the normal kind from threads of the same gauge and with the same pitch of loops.

Patterns such as lace, laddering, clock pattern and the like may be obtained in my fabric in the usual manner and with the usual means. My fabric may also be narrowed or widened, as desired. Apart from its particular structure with two threads and the advantages resulting therefrom, as explained above, my novel fabric is not distinguished from existing plain and single-threaded fabrics.

In the drawing affixed to this specification and forming part thereof a fabric embodying my invention is illustrated diagrammatically by way of example.

In the drawing

Fig. 1 shows the laying of the two threads in front of and behind the needles of a knitting machine for one course of loops,

Fig. 2 shows the laying for the next course of loops,

Fig. 3 shows a portion of the fabric according to my invention, drawn to a larger scale,

Figs. 4 and 5 illustrate the behaviour of two interlaced loops in a wale under a pull acting, respectively, in the direction of the wales and in the direction of the courses.

Referring now to the drawing and first to Fig. 1, *a* and *b* are the two threads. The thread *a* is shown in plain sectioning and the thread *b* is cross-hatched. Elements i^1 to i^5 are a row of needles on a flat or a circular hosiery frame, or any other suitable machine.

After sinking and before knocking off the needle loops of the preceding course from the needles *i*, the thread *a* is laid alternately on opposite sides of each needle. Thus, it is laid in front of the needles i^1 , i^3 and i^5 etc., and behind the needles i^2 and i^4 etc. Conversely, the thread *b* is laid behind the needles i^1 , i^3 , i^5 , etc., and in front of the needles i^2 , i^4 , etc. In the next course, Fig. 2, the laying of the threads *a* and *b* is reversed, i. e., the needle loops *A* formed from the thread *a*, in one of the courses are staggered with respect to the needle loops *B* formed from the thread *b* in the next course, and so are the needle loops *B* from the thread *b*.

In other words, the threads *a* and *b* alternately form the needle loops *A* and *B* in each course, and in each wale a needle loop *A* from the thread *a* in one course is interlaced with a needle loop *B* from the thread *b* in the next course, and vice versa.

Referring now to Fig. 3, 1—1, and 3—3 are alternate, and 2—2 and 4—4 are intervening courses of needle loops *A*, *B* and sinker loops *C*. 5, 7, 9 . . . are the alternate needle-loop wales and 6, 8, 10 . . . are the intervening sinker-loop wales. It will appear that the needle loops *A*

and B are alternately formed from the threads *a* and *b* and that the sinker loops C in each wale are formed by the shanks A' and B' of the needle loops A and B of the two adjacent wales. The straight loop-connecting or floated portions of the thread *a* float across the open ends of the loops B from the thread *b* at *d*, and the straight portions of the thread *b* float across the open ends of the loops A from the thread *a* at *e*. Thus, viewed from the right side of the fabric as in Fig. 3, each loop connecting or floated portion *e* is below the closed end of the corresponding loop B from the thread *b* in the next course, and, viewed from the left side of the fabric, each portion *e* of the thread *b* is below the straight portions *d* of the thread *a* at its opposite ends. In this manner, each loop A in a given course is interlaced with the closed end of the loop B of the next course at its open end in the same wale, and with the floated portion *e* of the thread *b*. The floated portions *d* and *e* are quite taut in the fabric and therefore if the fabric is stretched in the direction of a wale for instance 9, Fig. 4, or in the direction of a course, for instance the alternate 3—3, Fig. 5, the floated portion *e* is, upon the slightest pull in the direction of the arrows drawn toward the closed end of the loop B in the same wale but in the next or intervening course 4—4 so that the loop A is locked at its open end in opposite directions by the loop B and the floated portion *e*. Obviously, the same occurs with respect to the locking of each loop B by the corresponding straight portion *d* of the thread *a* and the corresponding loop A in the same wale but in the next course.

Suppose now that the thread *a* breaks in the third course of wale 9. The two loops B in the wales 7 and 11 at opposite sides of the faulty loop A are not affected as they are formed of the unbroken thread *b* and the fabric is still held in the region of the fault. The only possibility is running of the loops A in the wales 5 and 13, provided that the pull in the direction of the course 3—3 could become so strong that one of the ends of the thread *a* is pulled free of its connection to the loop B of course 4—4 in the wale 5 or 13 where the thread *a* is locked by a loop B and the corresponding floated portion *e* of the thread *b*, as described. However, this is impossible on account of the clamping of the broken thread by the loop B in the course 4—4 and the corresponding floated portion *e*, the clamping action increasing with the pull. The same obviously will occur if the thread *b* breaks. Another reason why the broken ends cannot be pulled free is that under a pull in the direction of the courses, Fig. 5, the unbroken thread, *a* or *b*, prevents the pulling short of the loops to such an extent that a loop A or B which has become unlocked by the breaking of its thread *a* or *b*, slips from the loop of unbroken thread in which it is locked, for the loops from the unbroken thread, in the present instance, the loops B, permit pulling short of the loops only within the limits of the undamaged fabric, and consequently my fabric can never be stretched to such an extent that the ends of the broken thread are released.

The formation of ladders is also prevented by the interlacing of the loops. As a rule, ladders will form in the sinker-loop or intervening wales 6, 8, 10, 12, 14 as the sinker loops C are smaller than the needle loops and therefore a broken thread in a sinker-loop wale will slip more readily from its interlocking connection to the adja-

cent loops A and B and the floated portions *d* and *e* than in an alternate or needle-loop wale. Suppose now that the thread *a* breaks in course 3 and in the sinker-loop wale 8. The succeeding loops C will not become unmeshed, as the sinker loops C are formed of the two threads *a* and *b* together, one half of each sinker loop C being formed from the shank A' of the loop B in the adjacent needle-loop wale 7 and the other half being formed from the shank A' of the needle loop A in the adjacent wale 9. Therefore, one of the ends of the broken thread can only be pulled through as far as the sinker loop C in the wale 6 or in the wale 10, and the consequence would only be that the portion of the undamaged thread *b* which forms the shank B' of the faulty loop, assumes a transverse position to the wale 8, but the fault will not spread and the formation of a ladder is prevented as the second undamaged thread locks each loop. Moreover the broken thread is clamped by the cooperation of the corresponding loop B and the corresponding spanning portion *e* in the wales in the same manner as in the courses, as will appear from Fig. 4. This figure shows the breaking of the thread *a* in the needle-loop wale 9, but as a rule, for the reason stated, the threads will break in the sinker-loop wales 6, 8, 10, 12, 14.

It will appear that my fabric resists running under a pull in the direction of the courses as well as in the direction of the wales if a thread breaks. The clamping of the broken thread is in proportion to the pull which is exerted and the fault is thereby localized, so that ladders or holes in the fabric will never form.

I wish it to be understood that I do not desire to be limited to the exact details of construction shown and described for obvious modifications will occur to a person skilled in the art.

In the claims affixed to this specification no selection of any particular modification of the invention is intended to the exclusion of other modifications thereof and the right to subsequently make claim to any modification not covered by these claims is expressly reserved.

I claim:—

1. A plain-knitted run-resisting fabric comprising two threads both of which are knitted into every course; one of said threads being knitted into alternate wales and floated across intervening wales in alternate courses, and being knitted into intervening wales and floated across alternate wales in intervening courses; and the other of said threads being knitted into intervening wales and floated across alternate wales in alternate courses, and being knitted into alternate wales and floated across intervening wales in intervening courses.

2. A plain-knitted run-resisting fabric comprising two threads both of which are knitted into every course; one of said threads being knitted into alternate wales and floated across intervening wales in alternate courses, and being knitted into intervening wales and floated across alternate wales in intervening courses; the other of said threads being knitted into intervening wales and floated across alternate wales in alternate courses, and being knitted into alternate wales and floated across intervening wales in intervening courses, the floats being at the back of the fabric, and the floats of one of said threads being closer to the face of the fabric than the floats of the other thread.

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