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D. GUAY

2,114,021

KNITTED FABRIC AND METHOD OF MAKING THE SAME

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Fig. 1

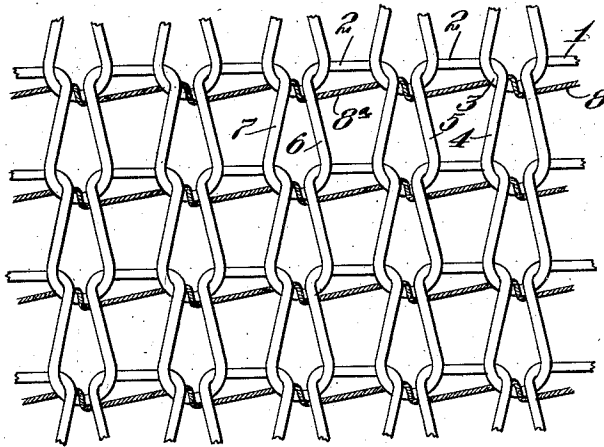


Fig. 2

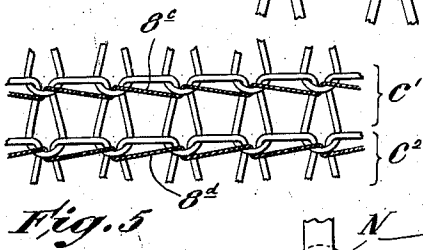
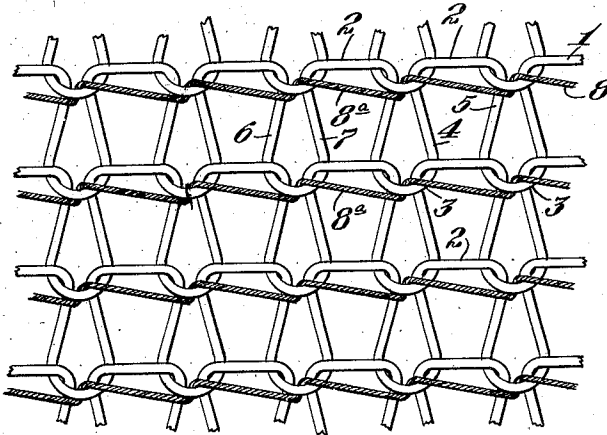


Fig. 5

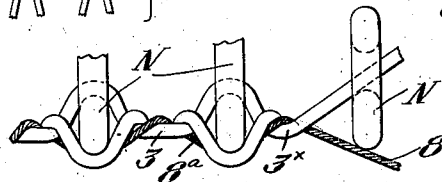


Fig. 3

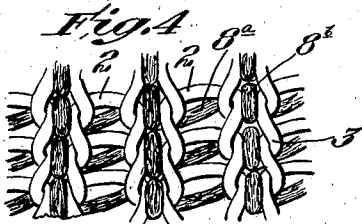


Fig. 4

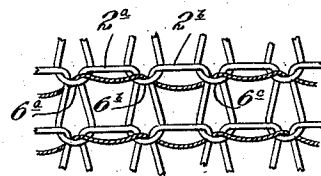


Fig. 6

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UNITED STATES PATENT OFFICE

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KNITTED FABRIC AND METHOD OF MAKING
THE SAME

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15 Claims. (Cl. 66—190)

This invention pertains to knitted fabrics and to a method of making the same, and relates more particularly to a fabric of anti-run type. Many attempts have heretofore been made to devise a knitted fabric including stitch formations such as to prevent or lessen the formation or extent of runs in fabric, and while fabrics having these characteristics have been produced, they have almost invariably been of a close heavy texture wholly unsuitable for use in hosiery and the like where a sheer and highly elastic fabric is demanded by the trade. Furthermore, the methods previously resorted to in making such anti-run fabrics, for example the incorporation of so-called warp yarns or the transfer of stitches from one needle to another, are so expensive as to be of doubtful commercial value and in most cases greatly reduce the elasticity of the material.

The principal object of the present invention is to provide a knitted fabric of anti-run type which, in a preferred embodiment, does not differ in a marked degree either in appearance or elasticity from plain knitted goods such as is commonly employed in the manufacture of hosiery, etc., and which may be made at high speed, but which offers substantial resistance to the starting and elongation of a run when for any cause one or more of the constituent loops of the fabric are ruptured.

A further object of the invention is to provide a fabric of novel and ornamental appearance also embodying the anti-run principle. A further object of the invention is to provide a novel procedure such as to produce the improved fabric of the present invention. Other objects and advantages of the invention will be made manifest in the following more detailed description and by reference to the accompanying drawing in which

Fig. 1 is a fragmentary front view of a piece of plain circular knitted fabric embodying the present invention, the fabric being shown to large scale so as clearly to illustrate the stitch structure;

Fig. 2 is a rear view of the fabric of Fig. 1;

Fig. 3 is a diagrammatic view, in the nature of a fragmentary plan of a row of knitting needles illustrating the mode of presenting the yarns in position to be taken by a needle preparatory to drawing a stitch;

Fig. 4 is a view similar to Fig. 1 but illustrating a modified construction resulting from the employment of yarns of substantially the same size;

Fig. 5 is a view similar to Fig. 1 but illustrating the appearance of the fabric when made by reciprocating knitting, for example, on a straight machine; and

Fig. 6 is a view similar to Fig. 1 but illustrating a further modification pertaining to a fabric of ornamental character, but involving the same general principle of knitting as that illustrated in the preceding figures.

Referring to the drawing, Fig. 1 illustrates a piece of plain knitted fabric such as may be knit by hand on hand knitting needles or which may be knitted upon a knitting machine comprising a series of needles to which the yarn is delivered by appropriate means and which in conjunction with accessory instrumentalities draws the yarn into stitches to form course after course of knitting. In this view the body yarn 1 is that which forms the plain knitted fabric as above described. While a single yarn 1 is here illustrated for simplicity in delineation it is to be understood that any number of independent strands may be associated in accordance with usual practice in the knitting art to take the place of the single yarn here illustrated.

As is common in plain knitting, the yarn 1 is drawn into horizontal rows of stitches 2, such rows constituting courses which extend transversely across the fabric, while corresponding stitches of successive courses form the needle wales which extend longitudinally of the fabric. For convenience in description, each stitch or needle loop 2 may be considered as consisting of a bight of yarn having a closed upper end and the spaced upwardly divergent legs 4 and 5. Intervening between adjacent stitches are the downwardly directed bights 3 closed at their lower ends and which for convenience are hereinafter referred to as "sinker" loops, or bights—corresponding sinker loops longitudinally of the fabric constituting the sinker wales. Each sinker loop may be regarded as consisting of a bight closed at its lower end, as above referred to, and having spaced downwardly divergent legs 6 and 7, it being understood that the legs of a sinker loop also constitute legs of adjacent stitches.

In accordance with the present invention there is associated with certain at least of the courses of stitches (as here illustrated with each course of stitches) a locking yarn 8 which in the preferred embodiment of the invention is of substantially smaller diameter than the body yarn 1. If an elastic fabric be desired, this locking yarn may be elastic, for example a fine rubber thread. This locking yarn follows a sinuous path along

each course of knitted loops and in following such path it extends forwardly (Fig. 1) through the narrow upper part of each sinker loop, thence rearwardly through the lower closed end of the sinker loop of the course above, thence at the rear face of the fabric across the needle loop, and again forwardly through the next sinker loop of the first-named course. In this respect the present construction is to be sharply distinguished from many prior arrangements in which locking yarns have been interwoven with the wales of a knitted fabric so as first to cross both legs of a sinker loop or stitch at one side of the fabric and then to cross both legs of the adjacent sinker loop or stitch at the other side of the fabric, it being noted that in the present instance, as above described, the locking yarn actually passes through the sinker loop, being wrapped around the body yarn forming the closed lower end of each sinker loop. Since the portion 8^a of the yarn 8, which lies at the rear of the fabric, forms a free float and is disposed very close to the closed upper end of the stitch, and since this yarn 8 is preferably of smaller diameter than the body yarn, the completed fabric, in normal dimensions, does not differ materially in appearance from a simple plain knitted fabric, and since the locking yarn reeves freely through the sinker loops it does not substantially detract from the capacity of the fabric to stretch in any direction. Thus the resultant fabric may be of a sheer and dainty appearance, proper for use in the manufacture of hosiery or like articles, but at the same time by reason of the presence of the locking yarn, the breakage of the body yarn at any point does not necessarily result in the formation of a run of any substantial size, it being noted that each sinker loop is securely sustained by the locking yarn which passes directly through the sinker loop so that if one loop be broken the following loop is not released.

The principle of operation employed in making this novel fabric is illustrated in a diagrammatic way in Fig. 3, it being understood that the same principle can readily be employed in using hand knitting needles, as will be obvious to those skilled in the art. Referring to Fig. 3, portions of three needles N of knitting machine type are indicated in plan, the two needles at the left of the figure having bights of the previously formed fabric at the rear sides of their shanks and new bights of the body yarn 1 beneath their hooks. The needle N at the right-hand side of this figure is shown as having risen to receive the body yarn 1, but in so rising it passes in front of the locking yarn 8, which is thus disposed at the rear of the needle. At the portion 3^x of the body yarn, intervening between the two right-hand needles, and which will form the next sinker loop between these needles, the yarn 8 is wrapped about the yarn 1. To perform this wrapping operation it is contemplated that the yarn 8 will be wound upon a bobbin or shuttle of suitable type, and just before the yarns are presented to be taken by a needle, the shuttle will be caused to revolve about the yarn 1, thereby wrapping the yarn 8 about the yarn 1, the shuttle taking up such a position at the end of the wrapping operation as to place the yarns 1 and 8 in widely divergent relation, as shown in Fig. 3, so that the needle N may rise between them and take the yarn 1 in its hook while allowing the yarn 8 to float at the rear. After the needle N at the right has taken the yarn 1 in its hook, the shuttle or bobbin carrying the yarn 8 will again

complete a revolution about the yarn 1 so as to wrap the yarn 8 about yarn 1 at a point between the needle and the guide eye through which the yarn 1 is delivered, thus forming a new wrap of the yarn 8 about that portion of the yarn 1 at the right of the next needle which will form the next succeeding sinker loop. This operation is continued stitch after stitch during the formation of the fabric, resulting in the production of material such as shown in Figs. 1 and 2.

While in preparing an anti-ravel fabric such as above described, useful for hosiery or the like, it is proposed to use a locking yarn 8 which is of small diameter, as compared with the body yarn, I have observed that ornamental effects may be produced, for example by employing a locking yarn 8 of a diameter as great or greater than that of the body yarn, and if desired of a contrasting color. Under such circumstances, as illustrated in Fig. 4, wherein the body yarn 1 forms the stitches 2 and the sinker loops 3, the locking yarn 8^a, which is of a size substantially equal to that of the body yarn, will be seen to form substantially vertical runs 8^b, each substantially filling one of the sinker loops and thus collectively producing the effect of a narrow vertical stripe within the confines of the sinker wale, an effect which is both pleasing and novel. In this instance, since the locking yarn 8^a is of large size, its floats which are at the back of the fabric appear conspicuously as diagonal runs extending across the stitches.

The fabric illustrated in Figs. 1 and 2 is as above described, that resulting from circular knitting, but if the fabric be knitted by reciprocation, either by hand,—on a circular machine, or on a straight machine, an effect similar to that of Fig. 5 results. In this instance, in successive courses C', C², etc. the floats 8^c, 8^d, respectively, at the rear of the fabric, slope first in one direction and then the other, but if the locking yarn be a small size as in the fabric of Figs. 1 and 2, these floats are inconspicuous and the effect at the front side of the fabric is not substantially different from that of Fig. 1.

In Fig. 6 I have illustrated a further modification wherein fabric having substantially the same capabilities, so far as anti-ravel is concerned, are obtained, but in this instance the floats which extend across the knitted stitches are disposed first at the face of the fabric and then at the rear. This effect is produced if, instead of causing the locking yarn 8 to revolve about the body yarn continuously in the same direction, it be reversed after the formation of each stitch, so as to wrap about the body yarn first in one direction and then in the other. Thus, as shown at the left-hand side of Fig. 6, the locking yarn passes from rear to front about the sinker bight 6^a, then across the front of both legs of the stitch 2^a, then from the front above and to the rear of the next sinker bight 6^b and thence across both legs of the next stitch 2^b and thence forwardly through the following sinker bight 6^c etc. Since this fabric has floats at both sides, it might not be so useful for hosiery or the like, but it is contemplated that it may have utility as an ornamental fabric or for purposes in which the presence of floats at the front side is unobjectionable.

While certain desirable embodiments of the invention have herein been illustrated and described by way of example, it is to be understood that the invention is not necessarily to be limited to these precise embodiments, but is to be con-

sidered as of broad utility and susceptible of all variations such as fall within the purview of the appended claims.

I claim:

1. A knitted fabric comprising a body yarn disposed to form needle loops and intervening sinker loops, and a locking yarn so wrapped about the body yarn as at any given course to extend forwardly, between the legs of each sinker loop at the narrow upper part of such loop, to the front side of the fabric, thence rearwardly, through the closed lower end of the corresponding sinker loop of the next course above, to the rear side of the fabric, thence at the rear side of the fabric across both legs of the next needle loop of the first-named course, and then forwardly, between the legs of the next sinker loop of the first-named course, to the front face of the fabric.
2. A plain knitted fabric comprising courses of stitches formed from a body yarn, and a locking yarn associated with each course of stitches, the locking yarn being wrapped completely about the body yarn once for each stitch of a given course.
3. An anti-ravel knitted fabric comprising a yarn disposed in courses of stitch loops and intervening sinker bights, and a locking yarn associated with each course, said locking yarn making a complete turn about each such portion of the body yarn as constitutes each sinker bight of a course.
4. A knitted fabric comprising a body yarn disposed to form stitches and intervening sinker bights, and a locking yarn which overlies both legs of each stitch at one face of the fabric, but which passes from said face to the other face of the fabric between the legs of each sinker bight.
5. A plain knitted fabric comprising courses of needle and sinker loops formed from a body yarn or yarns, and a locking yarn disposed in free floats across both legs of each stitch of a course at one face of the fabric, said yarn intermediate each such float being so wrapped as to make a complete turn about that portion of the body yarn which constitutes the intervening sinker loop, the locking yarn always wrapping in the same direction about the body yarn in a given course.
6. A knitted fabric comprising courses of needle and sinker loops formed from a body yarn, and a locking yarn of substantially smaller diameter than the body yarn associated with certain at least of the courses of loops and which is so wrapped about the body yarn as to form a succession of complete turns about the latter, the locking yarn associated with each course of loops being free from engagement with the locking yarn of the next course.
7. That method of knitting fabric of the class described which comprises forming needle and sinker loops from a body yarn while so associating a locking yarn of a diameter substantially smaller than that of the body yarn with certain at least of the courses of loops of the body yarn as to cause said locking yarn to wrap and form a complete turn about the body yarn at regular intervals, the loops of body yarn being so drawn that the bights of locking yarn associated with a given course are free from engagement with the bights of locking yarn associated with the next course.
8. A knitted fabric each course of which comprises a pair of yarns one of which is knitted to form plain fabric comprising needle and sinker loops, the second yarn appearing at the front of the fabric in substantially straight runs disposed between the legs of the sinker loops of successive

wales of a given course, said runs extending in the direction of the sinker wales.

9. A knitted fabric comprising courses of loops formed from a body yarn, and a locking yarn associated with certain at least of said courses of loops, said locking yarn forming runs crossing both legs of recurrent loops at one face of the fabric and bights which are exposed at the other face of the fabric between the legs of intervening loops, the exposed portions of said bights of the locking yarn extending longitudinally of the fabric in the direction of the needle wales.

10. A plain knitted fabric of the class described comprising a body yarn disposed to form courses of stitch loops and sinker bights, and a locking yarn associated with certain courses at least, and which follows a zigzag path comprising substantially parallel inclined runs at one surface of the fabric, each such run being connected to the next by a bight which passes through the fabric and after wrapping a single sinker bight then returns to the first-named face of the fabric to join the next inclined run.

11. That method of forming a fabric of the class described which comprises helically wrapping a locking yarn at regular intervals to form a succession of complete turns about a body yarn and drawing stitches of the body yarn to form a knitted fabric while omitting the locking yarn from such stitches.

12. That method of knitting a fabric of the class described which comprises drawing stitches of a body yarn to form a plain knitted fabric and prior to the formation of each such stitch causing a locking yarn so to wrap about the body yarn as to form a complete turn about that portion of the body yarn which intervenes between successive stitches.

13. That mode of knitting a fabric of the class described which comprises wrapping a locking yarn about a body yarn at regular intervals, advancing a knitting needle between the body yarn and the locking yarn which is wrapped about the latter so that the locking yarn lies at the rear of the needle, and causing the needle to draw and cast off a stitch of the body yarn while the locking yarn remains at the rear of the needle.

14. That method of making fabric upon a knitting machine provided with independent needles which comprises delivering a body yarn to the needles to be taken by the latter, so manipulating the needles as to draw the body yarn into successive stitches, wrapping a locking yarn about the body yarn prior to the formation of each successive stitch and causing each needle as it advances to pass up between the body yarn and the locking yarn in such a way as not to include the locking yarn in drawing the stitch.

15. That method of knitting fabric of the class described upon a knitting machine having a series of needles, which comprises as steps causing the locking yarn to wrap about the body yarn, advancing the needle between the body yarn and the locking yarn so that the free portion of the locking yarn lies at the rear of the needle and the free portion of the body yarn is positioned to be taken in the needle hook, drawing a stitch of the body yarn, again causing the locking yarn to wrap about the body yarn, and thereafter causing the next needle of the series to advance between the body yarn at the locking yarn so as to take and draw a stitch of the body yarn while allowing the locking yarn to float at the rear.

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