

July 3, 1934.

G. GASTRICH
RUNPROOF KNITTED FABRIC AND ARTICLE SUCH AS
STOCKINGS AND METHOD OF MAKING THE SAME
Filed Jan. 31, 1933

1,965,034

6 Sheets-Sheet 1

FIG. 1.

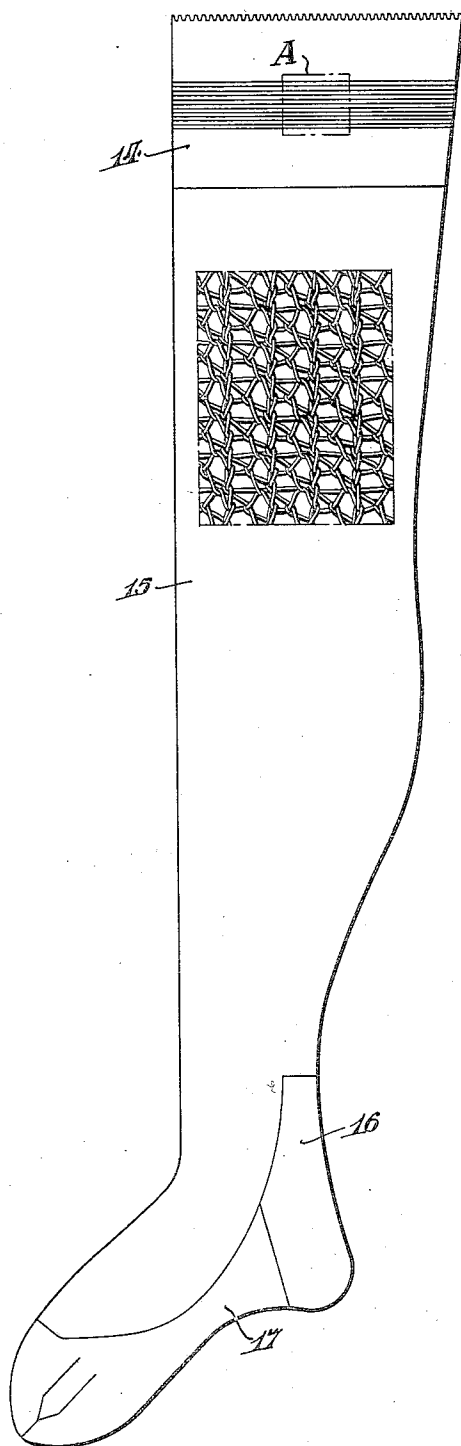


FIG. 4.

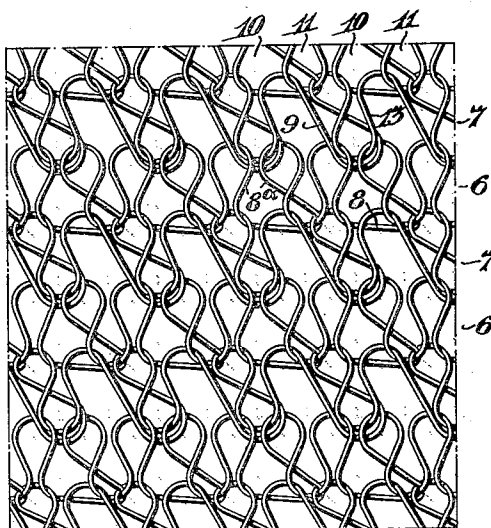
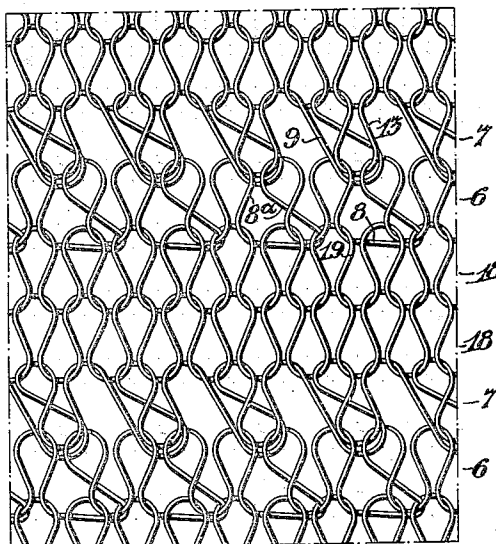


FIG. 5.



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FIG. 2.

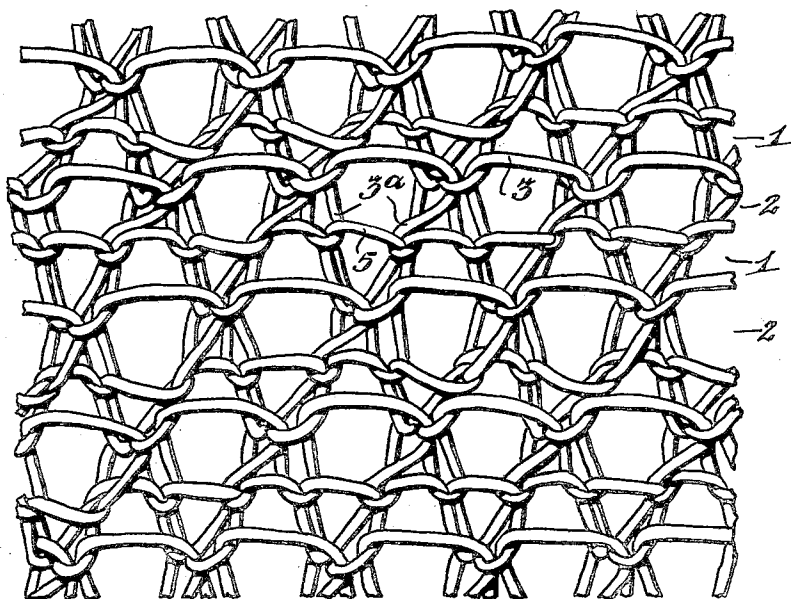
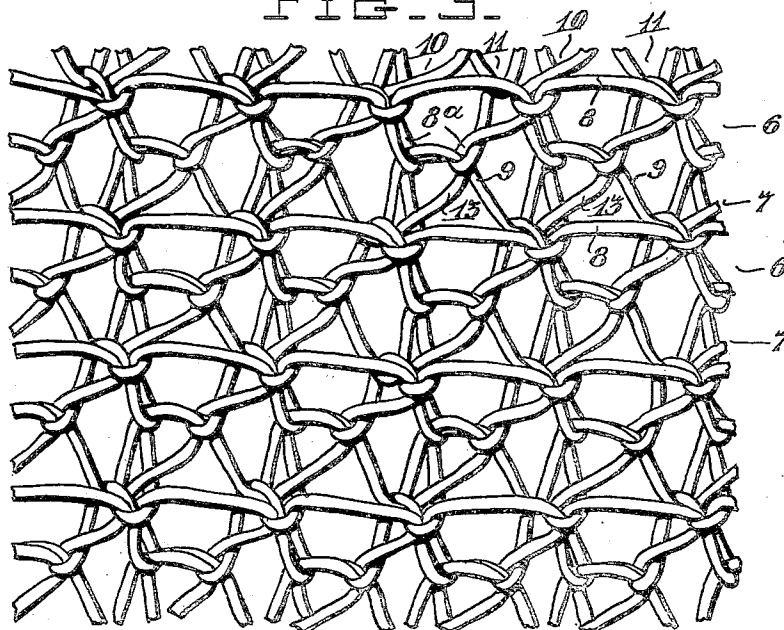


FIG. 3.



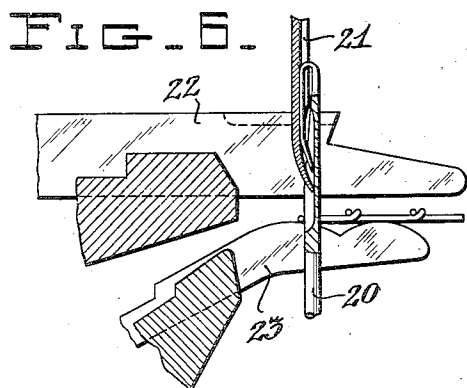
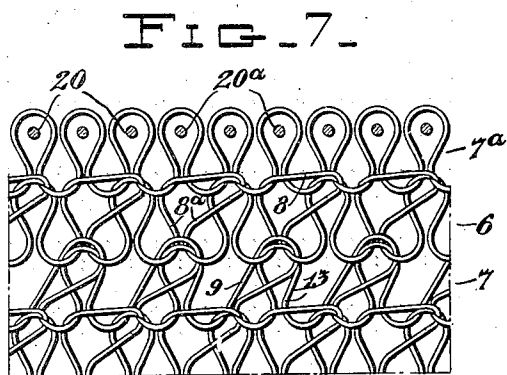
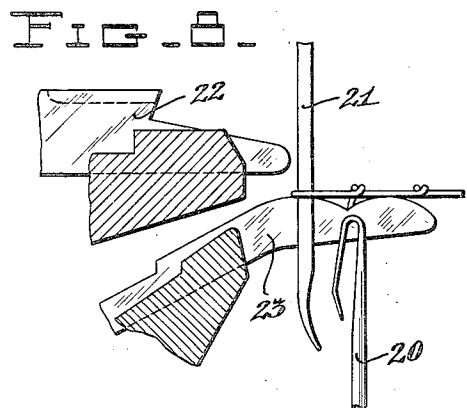
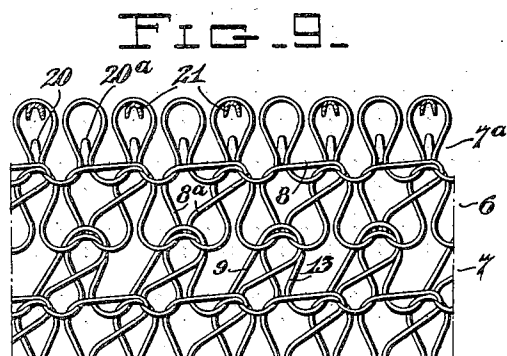
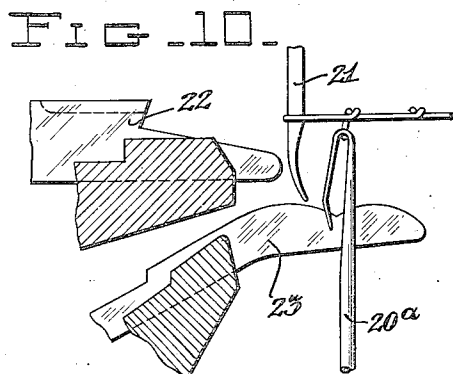
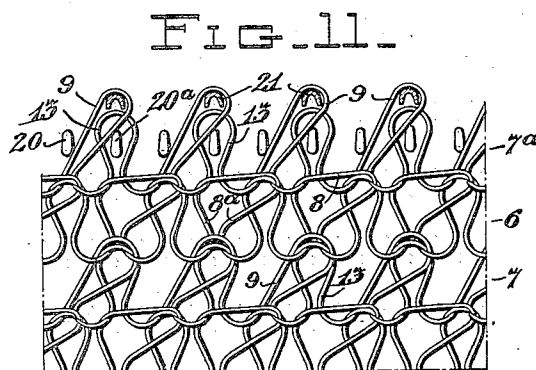
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FIG. 12.

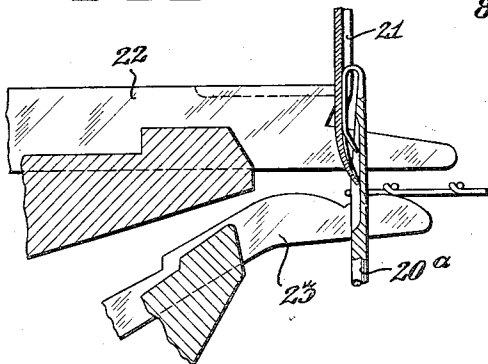


FIG. 13.

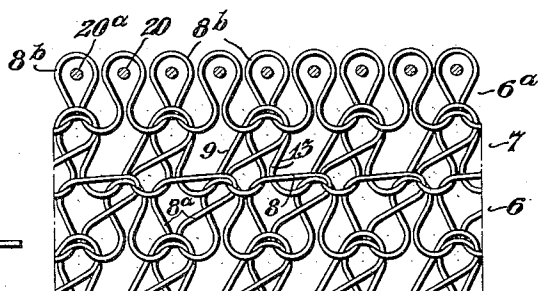


FIG. 14.

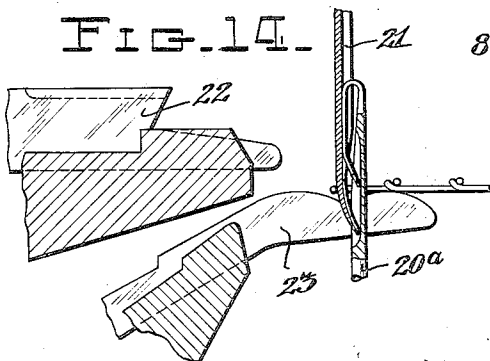


FIG. 15.

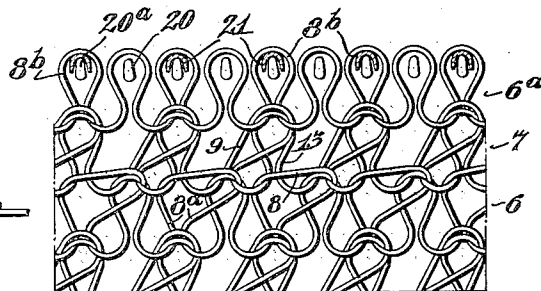


FIG. 16.

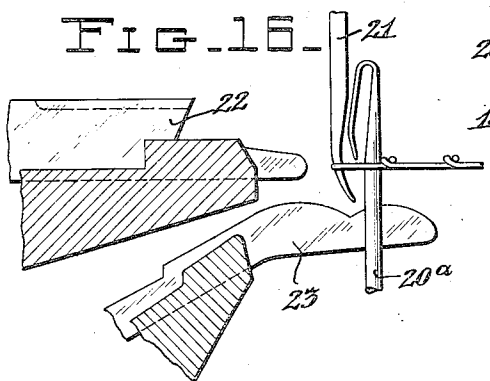
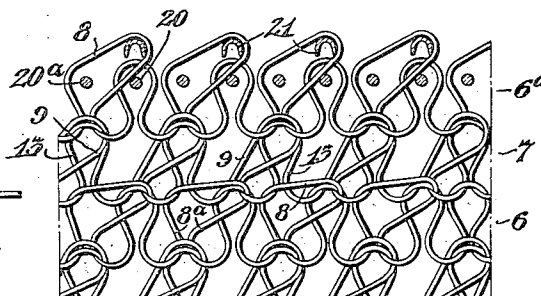


FIG. 17.



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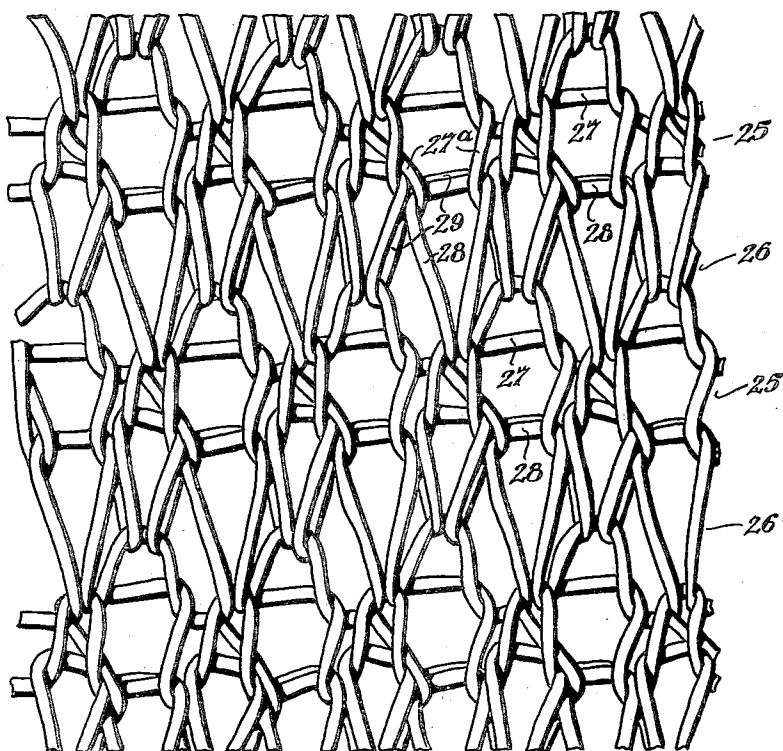
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FIG. 15.



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FIG. 19.

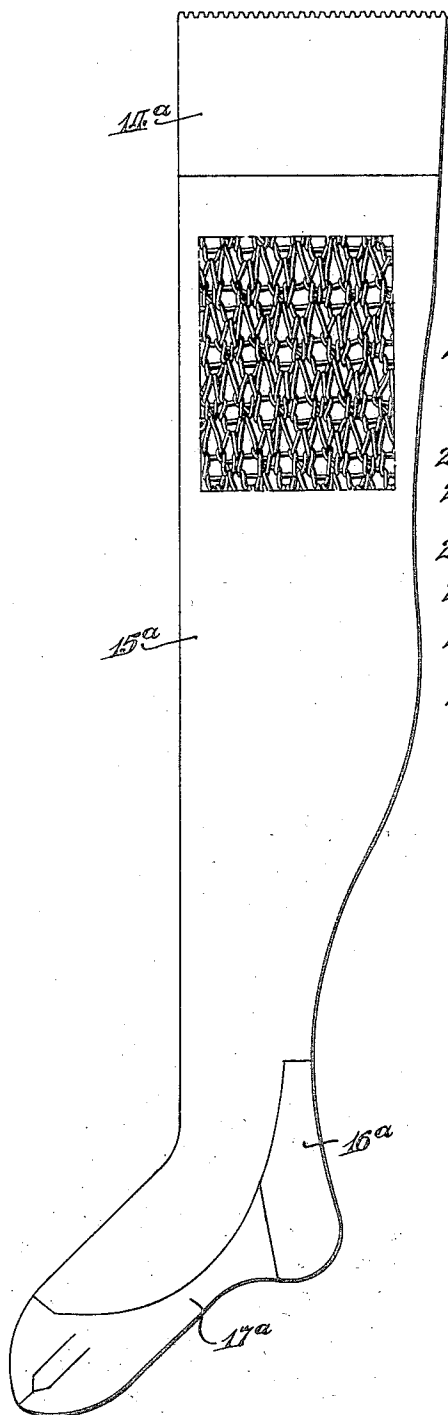
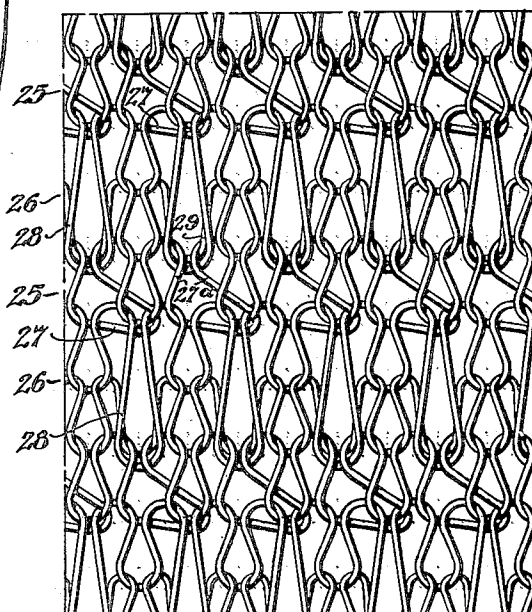


FIG. 20.



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UNITED STATES PATENT OFFICE

1,965,034

RUNPROOF KNITTED FABRIC AND ARTICLE
SUCH AS STOCKINGS, AND METHOD OF
MAKING THE SAMEGustav Gastrich, Wyomissing, Pa., assignor to
Textile Machine Works, Wyomissing, Pa., a cor-
poration of Pennsylvania

Application January 31, 1933, Serial No. 654,399

10 Claims. (Cl. 66—198)

This invention relates to a novel and improved knitted fabric and method of making the same, and more particularly to "run-proof" or "run-resist" fabrics and articles of wearing apparel, such as stockings, made therefrom, in which selected loops are spread over adjacent wales in the same course, or in succeeding courses, in such manner as to form interlocking or barrier courses throughout the fabric.

In knitting the barrier or interlocking courses of run-resist or run-proof knitted fabrics of the type employing spread interlocking loops, plain loops are first formed and then certain of the loops, for example, alternate loops, are spread or extended by means of a row of coacting shifting points from the needles about which the loops are originally formed to other needles thereby to produce locking or barrier stitches for limiting or preventing runs in the fabric due to thread rupture. When a loop is spread or extended from one needle to another needle its length is considerably greater than that of a plain loop, and since the loop prior to spreading was a plain loop of usual length, the spread loops are under appreciably greater thread tension than the plain loops.

The increased tension present in spread loops gives rise to various undesirable effects. For example, the tension on the legs of the spread loops causes a severe yarn strain to be imposed on the loops of the plain courses ordinarily interposed between and engaging with successive interlocking courses. This is particularly so with respect to the needle loops, each of which is required to hold the strain of both legs of the spread loop with which it is engaged. In articles of wearing apparel, and particularly in a full fashioned stocking which is tightly stretched on the leg of the wearer, a breaking strain is liable to be imposed upon one or more loops of the plain courses, resulting in thread rupture at that point.

Other undesirable effects present in run-proof fabrics heretofore produced are loop distortion and the formation of relatively large openings caused by the spread loops, so that the fabric is of uneven texture and does not have the desired uniform appearance. Also, the run-proof fabrics heretofore produced have had an objectionable flat appearance or absence of any well defined pleasing effect, such as, for example, the riblike effect characteristic of stocking and other fabrics in which, due to the pull exerted on the fabric by the take-off mechanism during the knitting process, the sinker loops are narrow in width relative to the needle loops. Since various articles of wearing apparel, especially ladies' stockings, are sold principally on their appearance, this has been an important factor in preventing run-proof stockings and other such articles from achieving greater popularity.

An object of the invention is the production of a run-proof or run-resist fabric in which the foregoing disadvantages are obviated or minimized, and having courses of special loops interposed between and engaging with the spread loops of successive interlocking courses in such manner as to substantially reduce or prevent the yarn strain normally caused by the spread loops.

Other objects are to minimize or prevent loop distortion occasioned by the spread loops; to reduce the size of the openings of the spread loops; and to produce a run-proof fabric of even texture.

A further object is to enhance the appearance and quality of run-proof stockings, particularly the leg portions thereof, and to eliminate the objectionable flat appearance ordinarily associated therewith.

With these and other objects in view, which will become apparent from the following detailed description of the illustrative embodiments of the invention shown in the accompanying drawings, my invention resides in the novel fabrics and articles, and method of producing the same, as hereinafter more particularly pointed out in the claims.

In the drawings:

Fig. 1 shows a stocking substantially composed of fabric in accordance with the invention;

Fig. 2 is an enlarged plan view of a patch of run-proof fabric formed by barrier courses in the welt of the stocking of Fig. 1;

Fig. 3 is an enlarged plan view of a patch of run-proof fabric in accordance with the invention, and comprising the leg portion of the stocking of Fig. 1;

Fig. 4 is a diagrammatic view of the loop arrangement of the fabric of Fig. 3;

Fig. 5 is a diagrammatic view of a modified form of loop arrangement;

Figs. 6 to 17 diagrammatically illustrate various steps in the method of making the fabric of Fig. 3;

Fig. 18 is an enlarged view of a patch of fabric in accordance with another form of the invention;

Fig. 19 shows a stocking composed of the fabric of Fig. 18; and

Fig. 20 is a diagrammatic view of the loop arrangement of the fabric of Figs. 18 and 19.

Fig. 1 illustrates the fabric of Fig. 3 as it appears in a full fashioned stocking (except that it is enlarged to disclose the loop formation) and therefore shows the reverse side of the fabric of Fig. 3 with its lower edge uppermost. The stocking comprises a welt 14 comprised of the fabric of Fig. 2, a leg portion 15 composed of the fabric of Fig. 3, a high spliced heel 16 and a foot portion 17.

Fig. 2 shows a patch of run-proof fabric (dia-

grammatically indicated by the rectangle A in the welt of the stocking of Fig. 1) formed by a plurality of barrier courses of the well known spread loop type, located in that part of the welt commonly engaged by garters or other stocking supporters. In Fig. 2 the patch is enlarged approximately twenty times, and discloses the actual formation and arrangement of the loops. The fabric is shown in the position in which it comes from the machine while knitting the stocking, and is of the type consisting of plain courses 1 and interlocking courses 2 composed of spread loops 3, the interlocking courses being formed by spreading and interlocking certain loops and arranging these loops in staggered relationship in succeeding interlocking courses so as to give the patch of fabric run-proof characteristics and thereby prevent garter runs in the welt.

For the various reasons above pointed out and others which will appear hereinafter, I limit the use of the fabric of Fig. 2 to the welt, and preferably to an intermediate portion thereof, as indicated in Fig. 1, the remaining portions of the welt being composed of plain knit fabric, or ornamental fabric, or both, and in stockings of the better grades it will be found desirable to form the welt portion thereof, either partially or entirely, of the fabric of Fig. 3, without utilizing the fabric of Fig. 2. As shown in Fig. 2, the opposite legs 3a of the spread loops 3 of the interlocking courses engage with and are held by the plain chain loops 5 of the plain courses 1. The loops 5 are each composed of a single yarn which takes the greater part of the strain exerted by both legs of the spread loops, and since the strain on the fabric is appreciably increased when the stocking is worn, this produces a severe yarn strain on the loops 5 which may result in thread rupture of one or more of the loops. Thread rupture results in the formation of loose ends, holes or other irregularities, thus causing the fabric to have an unsightly appearance, so that the fabric is not desirable for use in the leg portion of the stocking where good appearance is the most important consideration. Also, due to the increased tension present in the spread loops, the legs 3a of each spread loop tend to spread apart or open up, resulting in the formation of relatively large openings in the fabric thus causing it to have an uneven texture and undesirable appearance which is particularly in evidence in uninterrupted areas of considerable extent, such as in the leg portion of a stocking.

Fig. 3 shows a patch of my novel run-proof fabric having various characteristics which make it especially suitable for the leg portion of a stocking. The patch is enlarged twenty times, and discloses the actual formation and arrangement of the loops. The fabric is shown in the same position as the fabric of Fig. 2, i. e., as it comes from the machine while knitting the stocking, and consists of interlocking courses 6 interconnected with special courses 7 of transferred loops 9. Loops 8 of the interlocking courses are spread, as from wales 10 to wales 11, in a manner well known in the art, except that the loops are not formed by spreading, interlocking and staggering loops in succeeding interlocking courses, as in the arrangement of Fig. 2, the spread loops 8 of Fig. 3 being spread into the same wales in succeeding interlocking courses. In the fabric illustrated, the loops are spread to the right, although it will be understood that they may be spread to the left, or to the left and right in succeeding interlocking courses, if desired.

Courses 7 are produced by transferring alternate loops 9 from wales 11 to wales 10 throughout the courses, the loops engaging with both legs 8a of the adjacent spread loops 8. Since the loops 13 which have not been transferred also engage both legs 8a of the spread loops, this causes the strain exerted by the legs of each spread loop to be equally divided between the loops 9 and 13, thus preventing excessive yarn strain in any one loop. By reason of the combined effect and opposite directions of pull of the loops 9 and 13, respectively, the opposite legs 8a of the spread loops are brought closer together and the openings caused by the spread loops are materially reduced in size, whereby the fabric has a substantially even and uniform texture, as distinguished from the uneven texture of the fabric of Fig. 2. Due to the coaction of loops 9 and 13, the liability of thread cutting and rupture of loops 8, 9 and 13 is minimized since the surface presented to the thread of the spread loops is doubled at the points of greatest strain, viz., where the loops 9 and 13 engage the legs 8a.

The arrangement of spread loops and transferred stitches in the manner disclosed obviates the necessity of staggering the spread loops 8 in succeeding interlocking courses in order to make the fabric run-proof in every wale, the loops 8 locking the wales 10 from which they are spread and the loops 9 locking the wales 11 from which they are transferred. It will be understood, however, that the spread loops may be staggered in succeeding interlocking courses, if desired, in which case the transferred loops are preferably likewise staggered in succeeding courses.

The fabric of Fig. 3 possesses an important advantage in that it does not have the objectionable flat appearance characteristic of the fabric of Fig. 2; on the contrary, it has a desirable riblike effect extending walewise of the fabric, more clearly seen in Fig. 1.

The usual arrangement of interlocking courses, in which the locking loops of all the courses throughout the fabric are spread or displaced laterally in one and the same direction has disadvantages, particularly when the fabric is made in the form of a full fashioned stocking blank. Spreading or displacing the locking loops of the usual formation in the same direction places the knitted fabric under such tension along one edge of the blank that the blank when completed is shorter along its high tensioned edge than it is along its opposite edge, and in view of the fact that the opposite edges of the stocking blank must be matched and then looped or stitched together to complete the stocking, the fabric containing locking stitches all running in the same direction presents serious difficulties in the formation of full fashioned stockings. Also, the lines produced crosswise of the stockings by the courses of stitches are distorted, thereby detrimentally affecting the appearance of the stocking. Another disadvantage is that the stocking when completed twists spirally throughout its length, tending to displace the back seam of the stocking from its intended straight position up the back of the wearer's leg. In the fabric of the invention, the transferred loops give a greater flexibility and an increased elasticity to the fabric which minimizes and tends to neutralize the foregoing distortional effects.

In the specific form illustrated in Figs. 3 and 4, there are no plain courses interposed between or interconnecting with the interlocking courses,

although one or more plain courses 18 may be employed, as illustrated diagrammatically in Fig. 5. Preferably, and as shown, the special courses 7 are positioned so that the transferred loops 9 engage the legs 8a of the spread loops and the loops 19 of the plain courses 18 engage the intermediate or bight portions of the spread loops, although under certain conditions it may be found unnecessary to utilize the transferred loops for holding the strain imposed upon the legs of the spread loops, in which case the various courses 6, 7 and 18 may be arranged in any desired order throughout the fabric and so long as the loops 9 are transferred from the wales into which the loops 8 are spread, the transferred loops and spread loops will coact to lock all wales of the fabric and produce a run-proof fabric having the desirable characteristics mentioned above.

Figs. 6 to 17 diagrammatically illustrate the relative movements of the transfer points and needles of the well known "Reading" full fashioned stocking knitting machine in producing the fabric of Figs. 3 and 4, although it will be understood that the fabric may be produced on other machines, or by hand, if desired. Fig. 6 shows one each of a series of needles 20, transfer points 21, sinkers and dividers 22, and knockover bits 23, and Fig. 7 is a corresponding plan view showing the loop formation and position of the needles relative to the loops. The needles are mounted in the usual manner in a needle bar which is given the necessary vertical and horizontal movements by the needle bar actuating mechanism, and the points are held in the usual manner in a point bar supported by the narrowing machine which, during the spreading and transferring operations, gives the necessary vertical movements to the points in time relation with the movements of the needles. Only those parts of the knitting machine necessary for an understanding of the invention are shown in the drawings; the various other parts, mechanisms and their manner of operation are well known in the art and are omitted for the sake of simplicity.

In Figs. 6 and 7 there is shown a course 7a composed of sinker and needle loops which have been formed about the needles 20 by the action of the sinkers and dividers 22, the points 21 having descended to engage alternate needles 20 in the row of needles. The points and needles now move downwardly together into the knockover bit structure until the points have entered the selected loops, after which, as shown in Figs. 8 and 9, the points move away from needles, carrying with them the loops removed therefrom. The points then rise until they have cleared the knockover bits and are shifted in the usual manner one needle distance to the right, shown in Figs. 10 and 11, in order to transfer the selected loops onto adjacent needles 20a in the subsequent upward rising movement of the needles, whereby loops 9 will be superposed on loops 13, thus producing a transferred course 7 in which there is an accumulation of loops in alternate wales of the course.

In Figs. 12 and 13 the transferred course 7 has been completed, and a new course 6a of sinker and needle loops has been formed, alternate loops 8b of which have been passed through the loops of the transferred course. The points 21 have descended into engagement with alternate needles 20a for the purpose of producing an elongation of the loops 8b and spreading or extending the same into position to engage pairs of compan-

ion needles. Figs. 14 and 15 show the points in engagement with the loops to be spread. The points now move away from the needles, carrying with them loops 8b which are shifted one needle distance to the right, as shown in Figs. 16 and 17, so that the loops are spread or extended from the wales in which they originate into adjacent wales, the needles descending into the knockover bit structure and then rising so that the needles 20 will pass through the loops 8, thus completing the loop spreading operation and forming a new interlocking course 6. It will be seen that both legs of the spread loops 8 are caused to engage with and are held by both loops 9 and 13 of the transferred course.

Fig. 18 shows a patch of another form of run-proof stocking fabric, enlarged approximately twenty times, in which interlocking courses 25 are separated by tuck stitch courses 26. The interlocking courses are formed by spreading and interlocking certain loops 27 and arranging these loops in staggered relationship in succeeding interlocking courses in a manner well known in the art, but instead of engaging with plain courses, as heretofore, the loops 27 of the interlocking courses are passed through and are interengaged with loops 28 and 29 of the tuck stitch courses, so that the strain exerted by the legs 27a of each spread loop is equally divided between the loops 28 and 29 thereby preventing excessive yarn strain in any one loop. By reason of the combined effect of these loops the legs of the spread loops are brought closer together, and the fabric has a more uniform texture than the fabric of Fig. 2. The tuck stitches enhance the appearance of the fabric, and also increase the elasticity of the fabric and thus reduce or neutralize various of the distortional effects referred to hereinbefore.

Fig. 19 illustrates the fabric as it appears in the leg portion 15a of a full fashioned stocking (except that it is enlarged to show the loop formation), and Fig. 20 is a diagrammatic view of the fabric. In the form shown, the loops 27 are spread to the right, but it will be understood that they may be spread to the left, or to the right and left in succeeding interlocking courses, if desired. Preferably, the welt 14a is also formed from the fabric of Fig. 18, although it will be understood that it may be formed in the manner of Fig. 2, or from various other fabrics, if desired.

The tuck stitch courses 26 are formed in the well known manner by causing alternate loops 28 to be extended from the needles in the course in which they are originally formed to the same needles in a succeeding course, and thus causing an accumulation of loops 28 and 29 in alternate wales in the tuck stitch courses. The spread loops 27 of each interlocking course 25 are passed through the tuck stitches in substantially the same manner as above described with reference to the transferred stitches of the preceding modification. In the fabric of Figs. 18 to 20 the loops 27 are spread into different wales in successive interlocking courses 25, so that there will be a number of spread interlocking loops in every wale of the fabric. The tuck stitches 28 also prevent runs in the sinker wales of the fabric and thus contribute to the non-run character of the fabric.

In the foregoing examples the transfer points are spaced to contact with every other needle in the row of needles, and the loops are spread over companion pairs of needles, but it will be understood that the invention is not limited to the specific form shown since, by suitably spacing

the points relative to the needles and spreading and interlocking only certain loops at predetermined intervals and skipping the intervening loops in the interlocking courses, rather than by spreading and interlocking alternate loops in a course, many interlocking variations may be effected with resulting production of different appearing fabrics. Also, by shifting the points laterally a distance equal to two or more needles in the interlocking courses, the loops may be spread over three or more needles, if desired.

For brevity in the specification and claims, the term "spread loop" defines a locking loop which extends from the needle creating the loop to another needle in the same course or in a succeeding course to lock the wale from which the loop is extended or spread; the expression "run-proof fabric" is used in a generic sense and includes a non-run fabric in which a run will not take place or a run-resist fabric in which a run is limited, dependent upon the specific arrangement of locking stitches employed; and the term "transfer point" is used to designate any form of point or equivalent instrumentality for engaging or coacting with predetermined needles to produce stitches formed by the coaction therebetween. In the detailed description of Figs. 2, 3 and 18, it is stated that the fabrics of the figures are shown enlarged twenty times—this refers to the application drawings; in the reduction to patent size the enlargement is approximately two-thirds of that above stated.

The patentable subject-matter herein disclosed and not covered by the claims is not dedicated to the public, but is claimed in my copending application Serial No. 728,401, filed May 31, 1934.

Of course, the methods and loop formations specifically shown and described, by which I obtain the above results, can be changed and modified in various ways without departing from the scope of the invention herein described and hereinafter claimed.

I claim:

1. The method of knitting a run-proof fabric which comprises forming alternate courses of transferred stitches and interlocking courses of the spread loop type substantially throughout the fabric, and causing both legs of the spread loops of each interlocking course to pass through and engage with the transferred stitches of the preceding course.

2. The method of knitting a run-proof fabric which comprises forming a course having transferred loops in alternate wales thereof, forming a succeeding course of loops while the needles are within the transferred loops, and spreading the loops passing through said transferred loops each from one wale into an adjacent wale of the fabric.

3. A run-proof knitted fabric comprising interlocking courses alternating with transferred courses substantially throughout the fabric, said interlocking courses having loops spread from the wales in which they originate into adjacent wales in the fabric, said transferred courses having needle loops transferred from the wales into which the locking loops are spread, said spread loops interconnected with the transferred loops.

4. A run-proof knitted fabric comprising interlocking courses alternating with transferred courses substantially throughout the fabric, said interlocking courses having loops spread from the wales in which they originate into adjacent

wales in the fabric, said transferred courses having needle loops transferred from the wales in which they originate into the wales from which the locking loops are spread, said spread loops passing through and interconnected with the transferred loops.

5. A run-proof knitted fabric comprising interlocking courses alternating with transferred courses substantially throughout the fabric, said interlocking courses formed by spreading alternate loops from the wales in which they originate into adjacent wales, and the transferred courses formed by transferring alternate loops, from the wales into which the locking loops are spread, into the wales in which the spread loops originate, said spread loops passing through and interconnected with the transferred loops.

6. A run-proof knitted fabric comprising interlocking courses alternating with transferred courses substantially throughout the fabric, said interlocking courses formed by spreading alternate loops from the wales in which they originate into adjacent wales, and the transferred courses formed by transferring alternate loops, from the wales into which the locking loops are spread, into the wales in which the spread loops originate, the spread loops being positioned in the same wales in successive interlocking courses and interconnected with the transferred loops.

7. A full fashioned stocking comprising a portion having interlocking courses alternating with special courses, the interlocking courses formed by loops spread from the wales in which they originate into adjacent wales in the stocking, said special courses formed by transferring loops into the wales from which the locking loops are spread, said spread loops passing through and interconnected with the transferred loops.

8. A full fashioned stocking having a leg portion composed of interlocking courses alternating with transferred courses, the interlocking courses formed by spreading alternate loops from the wales in which they originate into adjacent wales in the same course, and the transferred courses formed by transferring alternate loops, from the wales into which the locking loops are spread, into the wales in which the spread loops originate, the spread loops being positioned in the same wales in successive interlocking courses and having both legs passing through and interconnected with the transferred loops.

9. A full fashioned stocking comprising a portion having interlocking courses alternating with transferred courses substantially throughout said portion, said interlocking courses having loops spread from the wales in which they originate into adjacent wales in the fabric, said transferred courses having needle loops transferred from the wales into which the locking loops are spread, said spread loops interconnected with the transferred loops.

10. A full fashioned stocking comprising a portion having interlocking courses alternating with transferred courses substantially throughout said portion, said interlocking courses having loops spread from the wales in which they originate into adjacent wales in the fabric, said transferred courses having needle loops transferred from the wales in which they originate into the wales from which the locking loops are spread, said spread loops passing through and interconnected with the transferred loops.

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