April 17, 1934. J. A. GOODMAN 1,955,364

RAVEL STOP FOR KNITTED STOCKINGS

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Fig. 1.

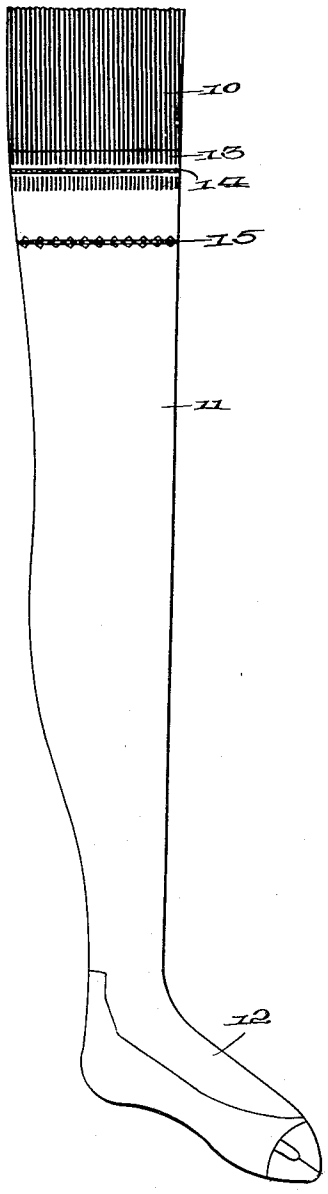


Fig. 2.

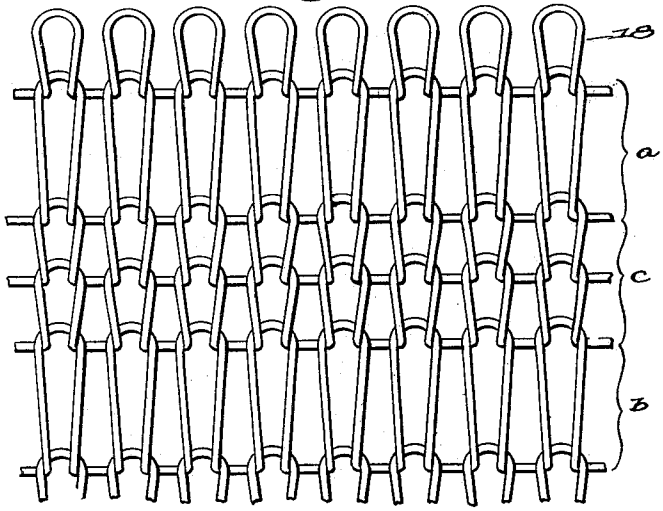


Fig. 3a.

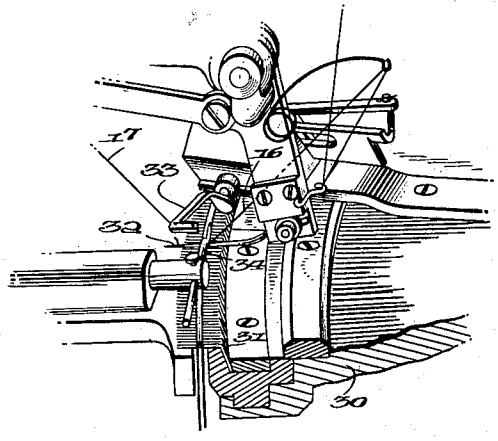
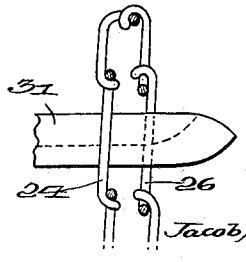


Fig. 3b



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Fig. 4.

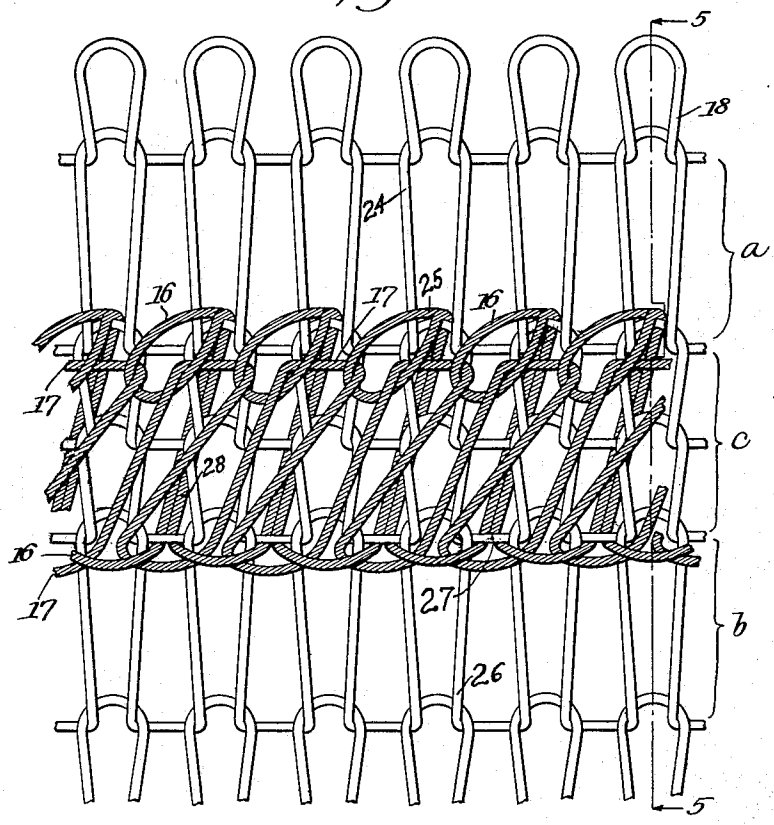


Fig. 5.

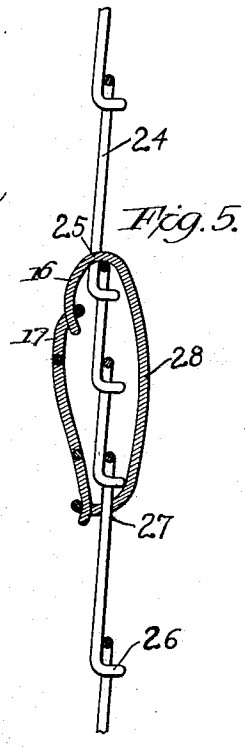
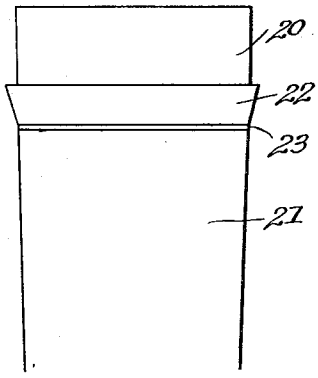


Fig. 6.



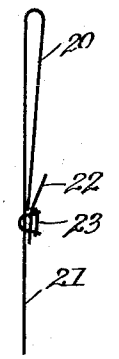


Fig. 7.

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UNITED STATES PATENT OFFICE

1,955,364

RAVEL STOP FOR KNITTED STOCKINGS

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Application February 1, 1932, Serial No. 590,254

5 Claims. (Cl. 2—240)

This invention relates to knitted fabric articles, particularly hosiery, and involves novel means for preventing the raveling of the fabric beyond a predetermined line therein when one or more of the interlocking thread loops breaks under wear or tension of the fabric.

The invention may readily be applied to any knit fabric but is particularly useful in connection with the type comprising successive courses of interlocked loops which is most susceptible to runs. In such fabric when the yarn in a needle loop is broken, the fabric will run in one direction, i. e., loops in that needle wale in one direction beyond the break will progressively release each other. If a sinker loop is broken the run will follow the sinker wale in exactly the same manner, except that it will run in the opposite direction.

With this in view my invention in its broadest aspect comprises the art of locking one loop in each of the needle or sinker wales or in both included in that area of fabric which is to be protected. I lock needle loops to prevent runs in one direction or sinker loops to prevent runs in another direction or both needle and sinker loops to prevent runs in both directions.

The ravel stop of the present invention is produced by superposing upon the stocking fabric along any desired line an independent stitch formation comprising additional thread and including a continuous series of loops which are interknit with the thread loops in successive wales of the stocking fabric and which traverse the fabric area to be protected. Such construction may be, and preferably is, applied to the fabric after the same has been fully knit and, therefore, does not necessitate any special attachment for the machine by which the fabric is produced. It may, therefore, be applied with equal advantage at any desired point. Furthermore, while for full protection in all wales of the fabric the present ravel stop should have a direction generally transverse thereof, it is not necessary that the same extend coursewise or in a straight line.

The independent stitch formation which according to the present invention is to serve as a ravel stop may comprise one or more additional threads formed by any of a variety of loop-forming mechanisms into a continuous line of interlocking loops, and superposed upon and interlocked with the fabric. The particular stitch formation is not important, it being only necessary that the same comprise or include a series of recurring loops which can be formed to engage and interlock loops of the fabric in a line transversely thereof. These recurrent loops may be closely spaced so that they interlock adjacent loops or they may interlock alternate or spaced loops. There can be a plurality of these independent stitch formations and especially in the latter instance this is desirable in order that all loops will be interlocked even though each stitch formation misses certain loops. As above stated, it is not necessary that the stitch formation extend directly coursewise or in a straight line. In case there are a plurality of lines, they may be parallel or angularly disposed. The primary requirement is that at least one interlocking loop passes through one loop in each needle wale or in each sinker wale or in a loop of each of both the needle and sinker wales, depending upon the type of auxiliary stitch formation resorted to and upon the direction in which running is to be prevented. Under any circumstances, and whether the ravel stop includes one or a plurality of lines of stitches, I deem it advisable to lock a loop in every needle wale and every sinker wale in the area of fabric to be protected.

Although the particular stitch structure of the interlocking stitch is of minor importance, I have found that a looping stitch formation of the type employed in joining the edges of adjacent portions of fabric, such as in the heel and toe of a full fashioned stocking, may be employed to advantage. A so-called "looping machine" may be used to attain the desired construction.

It is, of course, desirable that the stitch formation be substantially as elastic as the portion of the fabric with which it is to be associated in order not to bind the latter. Preferably also, as in the looping-stitch formation just referred to, two threads are used in forming the ravel stop, the same being formed into series of loops on both sides of the fabric and interlocked with each other at close intervals along spaced lines through the loops of the fabric. For ornamental purposes the two threads may be of different color. Such arrangement serves not only to lock the loops of the fabric along the line of the stitch formation, but causes a band of fabric to be encompassed between the two series of loops. The two lines along which the loops of the two series are interlocked should be in close proximity and the loops themselves should not be too tight as it is undesirable that the stitch formation should buckle or otherwise distort the fabric. In order to make the looping stitches elastic enough the machine is adjusted to make elongated stitches. However, that is a matter of the looping ma-

chine itself and requires no further discussion in this application.

I can, in the knitting process, elongate the knitting loops that are to receive the looping stitches. However, this is not necessary. It may be desirable, in order to facilitate the superposition of the stitch formation without injuring or distorting the fabric, to provide two courses of enlarged loops in the fabric during the course of knitting thereof, the same being calculated to receive the points of the looping machine and constitute convenient places in the fabric through which the loops of the stitch formation may be inserted to interlock the loops of the fabric. Preferably such courses of loops are closely spaced as it is ordinarily desirable that the ravel stop be relatively narrow.

My invention is applicable to stockings and other articles comprising open-meshed or ornamental stitch fabrics, including those in which some of the fabric loops are laterally transferred during the course of knitting. In the latter connection it may be noted that the provision of one or more courses of laterally transferred loops has in the past been resorted to for the purpose of providing a ravel stop line in hosiery. Without discussing the merits of such construction when used alone, it should be pointed out that the stitch formation of the present invention may be superposed upon and interlocked with a course or courses involving loop transfer to constitute therewith a ravel stop line which will positively assure the stoppage of runs without itself disintegrating. Furthermore, since the proposed stitch formation is substantially unobvious, it will not impair the appearance of open work fabric produced by lateral transfer of loops therein.

In addition to serving as a ravel stop, the proposed stitch formation may, if desirable, be used to attach a supplementary band of fabric or lacework to a stocking or other article. Thus, for example, a garter receiving band such as suggested in Thierfelder Patent No. 1,206,171 may be separately formed and firmly secured to a stocking by the ravel stop stitch formation.

In order that my invention may be clearly understood, I have in the accompanying drawings shown several embodiments and applications thereof, the same being illustrative, merely, and not to be taken as limiting my invention. In such drawings:

Fig. 1 is a diagrammatic representation of a stocking with several ravel stops according to the present invention applied thereto;

Fig. 2 is an enlarged view of a section of plain fabric to which my ravel stop may be applied, showing two spaced courses of enlarged loops, which may be desirable;

Fig. 3—*a* represents a conventional type of looping machine which may be utilized in accordance with the present invention;

Fig. 3—*b* is an enlarged fragmentary view showing particularly the manner in which the fabric to be protected is applied to the pins of a looping machine for the production of the ravel stop shown in Figs. 4 and 5;

Fig. 4 is an enlarged fragmentary view of a section of fabric similar to that of Fig. 2 showing one type of independent stitch construction superposed thereon to constitute a ravel stop according to the present invention;

Fig. 5 is a section taken on the line 5—5 of Fig. 4;

Fig. 6 is a diagrammatic view of a modification; and

Fig. 7 is a vertical section, slightly enlarged, of the construction shown in Fig. 6.

With reference to the drawings, generally, it should be pointed out that the same are all more or less diagrammatic and that while they are accurate structurally, correct proportioning of the various parts has to some extent been sacrificed for purposes of clarity.

Fig. 1 shows a knitted stocking comprising a welt portion 10, a leg portion 11, and a foot portion 12. Below the welt at the upper end of the leg is a band of reinforced single fabric 13, the same being optional and not essential to the present invention. Such stocking may comprise successive courses of loops forming a fabric of the type generally illustrated in Fig. 2. A circumferential ravel stop 14 comprising an independent stitch formation superposed upon and interlocking with a line of loops of the stocking fabric is shown in the reinforced single fabric 13 below the welt. Similar ravel stops may be located at any place in the length of the stocking from the upper edge to the toe, the place selection being governed simply by the particular need of ravel prevention in any particular case. Thus, an illustrative example would be a ravel stop such as 15 located in the leg portion 11. In any event, the ravel stop may entirely encircle the stocking, but will at least traverse as much of the fabric area as it is desired to protect.

The stitch formation constituting the ravel stop should be such that a series of loops thereof will extend across the wales of the stocking fabric and interlock with the loops thereof. Preferably, as shown in Figs. 4 and 5, two threads 16 and 17 are used, the same being looped back and forth on both sides of the fabric 18 and interlocked together through the loops of the fabric. Such construction may be produced by a looping machine.

As seen from the drawings the looping loops pass through all the needle loops 24 of one course as indicated at the reference character 25. This prevents running in one direction. Looping loops pass through each of the sinker loops 26 at the points 27 to prevent raveling in the opposite direction. The arrangement is such that every needle loop and every sinker loop traversed by the ravel stop is locked against raveling, each loop 25 of the stitch formation passing through and interlocking a loop in a needle wale in one course with a loop in an adjacent wale and in a different course. This not only has the advantage of preventing raveling in both directions, but it has an additional advantage. Even though it be considered unnecessary to check running in both directions, as is the case in women's full fashioned stockings, for example, when it is deemed unnecessary to prevent running from the leg into the welt, nevertheless it is known that runs spread from wale to wale. By locking both needle wales and sinker wales against raveling, a run started, for example, in the welt of the stocking could not possibly find a vulnerable wale by way of which it could work through my ravel stop, because with my ravel stop absolutely every wale is protected. Therefore, in the preferred embodiment of my looping stitch, as illustrated in Figs. 4 and 5, such spreading of runs under no circumstance will permit a run to pass from one side of the run stop to the other in either direction. All the fabric on one side of the run stop might be removed and still there would be no running beyond the run stop.

As noted in Figs. 4 and 5 I use a looping stitch which requires two threads 16 and 17. The thread 16 is the one that passes through both the needle loops and sinker loops to lock both needle wales and sinker wales. The thread 17 interlocks with the thread 16 and does not pass through the fabric as is clearly seen from Fig. 4. It is clear from this that the thread 17 will appear only on one side of the fabric. In the embodiment of Fig. 4 it is shown on the wale or face side of the fabric. The portion of the looping stitch structure which includes the yarn 17 presents a more bulky appearance on that side of the fabric. The connecting loops 16 extend through the fabric and appear on the other face of the fabric simply as two bars 28 between the points 25 and 27 where this yarn extends through the fabric.

In the stocking these bars 28 lie very close to the fabric and are practically invisible if they are of yarn similar to the knitting yarn. On the opposite face of the fabric, that face of the fabric which has the yarn 17, the ravel stop is visible but by the proper selection of yarn it can be made almost imperceptible and hardly noticeable on casual observation. Thus, if it is desired to hide the ravel stop as much as possible and make it almost invisible, the threads 17 are placed on the inside or loop side of the fabric and yarns that simulate the knitting yarns are used in looping.

The run stop can, however, be made to function as ornamentation in addition to run prevention means. If this is desired, the interlocking thread 17 can be made to appear on the wale side of the fabric. The manner in which the yarn 17 can be made to appear on either the wale side or loop side of the fabric will be readily understood by those skilled in the art. Various ornamental effects can be produced by this looping operation, depending upon the selection of looping yarn and various adjustments in the looping machine. However, that is a factor that need not be elaborated upon in this case.

To prevent distortion of the fabric due to the stitch formation, the loops of the threads 16 and 17 should preferably be long enough to easily encompass without binding as many courses of fabric as it is desired to incorporate in the ravel stop portion. I have shown two courses between the points 25 and 28 where the looping extends through the fabric. In the preferred embodiment of the invention, it is desirable that the points 25 and 28 be closely spaced so that only a very narrow band of fabric be encompassed by the looping stitches. With this arrangement the fabric will lie flat and will not be bunched or otherwise distorted by the ravel stop even though a relatively tight looping stitch be used. However, as many courses as are desired may be confined within the ravel stop looping, depending upon whether the ravel stop is to be practically invisible or ornamental. This can be done by proper adjustment of existing machines or, if necessary, by the revision of machines in a manner that need not be discussed herein. With the looping stitches loose so that they readily encompass the ravel stop courses, the ravel stop will lie flat, as shown in Fig. 5, and in addition will be elastic. In fact, it will be just as elastic as if there were no ravel stop there. Peculiarly enough by making the ravel stop looping with loose stitches, it can be made less visible than bunched ravel stops. This looseness of ravel stop looping also facilitates ornamentation if ornamentation is desired, and such ornamentation would not be possible with bunched ravel stops.

For best results in a stocking having plain knit fabric in the area in which a coursewise ravel stop is to be introduced, it is desirable to provide two courses *a* and *b* of enlarged loops through which the loops of thread 16 may pass, the same being separated by a band *c* which will be encompassed and locked by the stitch formation. Such an arrangement is illustrated in Figs. 2 and 4.

As above indicated, the ravel stop is preferably produced upon a looping machine, the same having the advantage of assuring that a loop in every needle wale and every sinker wale will be positively locked by the stitch formation constituting the ravel stop. Thus a looping machine of a conventional type such as illustrated in Fig. 3—*a* may be employed, the same including as its essential elements a rotating dial 30 carrying a series of looping pins 31, and a stitch forming mechanism comprising a thread carrying needle 32, a thread carrying looping finger 33 and a chaining finger 34. In applying the stocking fabric to the looping machine, the same is folded along a transverse line, and the doubled fabric empaled upon the series of looping pins 31 along a line just below the fold line. In order that every needle loop and every sinker loop be engaged by the stitch formation to be formed, a fabric loop in a wale of the fabric on one side of the fold line is empaled upon a pin together with a loop in an adjacent wale in a course of the fabric on the other side of the fold line. In producing the ravel stop of Figs. 4 and 5, above described, each fabric needle loop 24 is empaled upon a pin with an adjacent sinker loop 26 as illustrated in Fig. 3—*b*. The needle 32 of the machine which carries the looping thread 16 will when the needle traverses along each looping pin pass a loop through each pair of needle and sinker loops 24 and 26, and the loops so formed will be locked in position through the cooperation of the looping finger 33 which carries the locking thread 17.

The formation of the closely spaced courses of elongated loops designated as *a* and *b* in Fig. 4 facilitates the application of the fabric to the pins of the looping machine. The fold in the fabric will be made between the two elongated courses and the fabric will be applied to the machine by empaling the sinker loops in one of the courses upon the pins with the needle loops in the other course.

To insure against distortion of the stocking fabric when the same is unfolded after the formation of the ravel stop stitching, it is important that the machine produce a relatively loose stitch. To this end it is desirable that a minimum of tension be employed on the middle thread 16 and the locking thread 17. Also the chaining finger 34 may be positioned slightly away from the fabric to insure the same end.

Where, however, open work fabric comprising laterally transferred loops is provided at suitable portions of the stocking, the ravel stop stitch formation may conveniently be superposed thereon, the combined arrangement being admirably suited as a positive ravel stop. This construction is diagrammatically represented at 15 in Fig. 1.

In case a supplemental fabric is to be attached to the stocking, a ravel stop stitch formation such as illustrated in Fig. 4 may, besides performing its ordinary function, also be used to connect the same to the stocking at any desired point. Such an arrangement is shown in Figs. 6 and 7, which show a stocking comprising a welt portion 20 and

a leg portion 21. An additional band of fabric 22, such as may serve to receive a garter, is provided. The latter may be attached to the stocking by a ravel stop 23 constructed according to the present invention at any desired point. In the drawings the same is shown applied near the line of joinder of the welt and leg fabric.

It will be understood that the essential feature of my invention is the production of a ravel stop by means of an independent stitch formation which engages and locks a knitted loop in every needle and sinker wale along a line generally transverse of a stocking or other knitted articles. Such a construction is of great advantage not only because it can be rapidly put in at any point in the fabric and will positively prevent the passage of runs, but also because it may be readily produced at small cost by any of a variety of machines ordinarily present in knitting mills.

I claim:

1. The combination with a knitted stocking having an area of fabric to be protected comprising successive interknit courses of thread loops, of a ravel stop extending across the knitted wales of said area at an intermediate point in a generally coursewise direction adapted to prevent runs originating in the fabric on either side from passing through the successive courses and beyond the ravel stop, said ravel stop comprising a looping stitch formation constituted of independent thread in which the stitches interloop one with a stocking loop in every knitted wale along the ravel stop and interlock each of said loops with another stocking loop in another knitted wale and a different course, the stocking fabric at the ravel stop being in normal condition and lying flat, the stitch formation being constructed and arranged to engage the various knitted loops without distortion in the stocking fabric.

2. The combination with a knitted stocking having an area of fabric to be protected comprising successive interknit courses of thread loops, of a ravel stop extending across the knitted wales of said area at an intermediate point in a generally coursewise direction adapted to prevent runs originating in the fabric on either side from passing through the successive courses and beyond the ravel stop, said ravel stop comprising an independent looping stitch formation constituted of additional thread, loosely formed on one side of the fabric and having only collateral connection with the fabric so as not to distort the same or interfere therewith, the stitch formation being connected with the fabric only through looping portions of its stitches which pass through each a knitted loop in every stocking wale along the ravel stop and interlock each of said knitted loops, without binding of the fabric, with a knitted loop in another wale and in a different course.

3. The combination with a knitted stocking having an area of fabric to be protected comprising successive interknit courses of thread loops, of a ravel stop extending across the knitted wales of said area at an intermediate point adapted to prevent runs originating in the fabric on either side from passing through the successive courses and beyond the ravel stop, said ravel stop comprising an independent stitch formation constructed and arranged to include stitches which engage and lock a stocking loop in every wale along the ravel stop, the stitch formation being constituted of an independent thread formed into a series of successive loops each of which passes through and locks together a stocking loop in one knitted wale and a further stocking loop in an adjacent knitted wale and a different course, together with a second independent thread which extends along the ravel stop on one side of the fabric and interlocks with and maintains the successive fabric-locking loops of the first thread, the stocking fabric at the ravel stop being in normal condition and lying flat, the stitch formation being constructed and arranged to engage the various knitted loops without distortion in the stocking fabric.

4. A method of producing a ravel stop at an intermediate portion of a knitted fabric comprising successive interknit courses of thread loops, which consists in folding the fabric along a line transverse to the knitted wales and empaling the doubled fabric upon a series of pins with a loop in every fabric wale empaled upon a pin, a fabric loop in a wale on one side of the fold line being empaled upon a pin together with a fabric loop in an adjacent wale and a different course on the other side of the fold line, forming a loosely constituted series of stitches of independent thread along the line of pins and causing the stitches so formed each to pass through and interlock without binding the several fabric loops empaled on each of the pins.

5. The combination with a knitted stocking having an area of fabric to be protected comprising successive interknit courses of thread loops and in which area are two closely spaced courses of enlarged loops, of a ravel stop, constituted of independent thread extending along a line transversely to the knitted stocking wales, said ravel stop comprising a stitch formation engaging and locking a stocking loop in every knitted fabric wale along the line constructed and arranged to allow the fabric to lie flat and avoiding distortion in the fabric, the stitches of the formation engaging the fabric through the two courses of enlarged knitted loops and locking a loop in a wale in one of said courses with a loop in a different wale in the other of said courses.

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