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SEAMLESS HOSE AND METHOD OF MAKING

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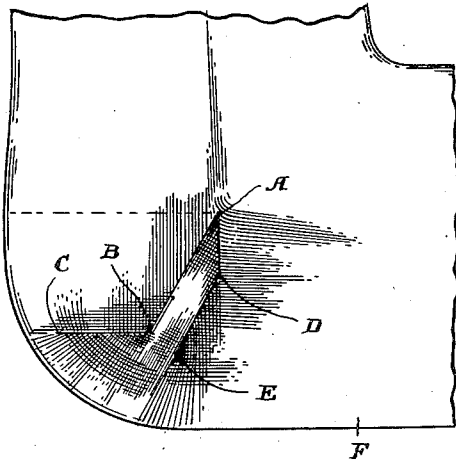


Fig. 2.

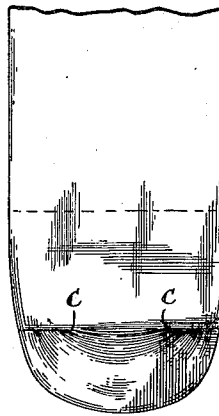


Fig. 3.

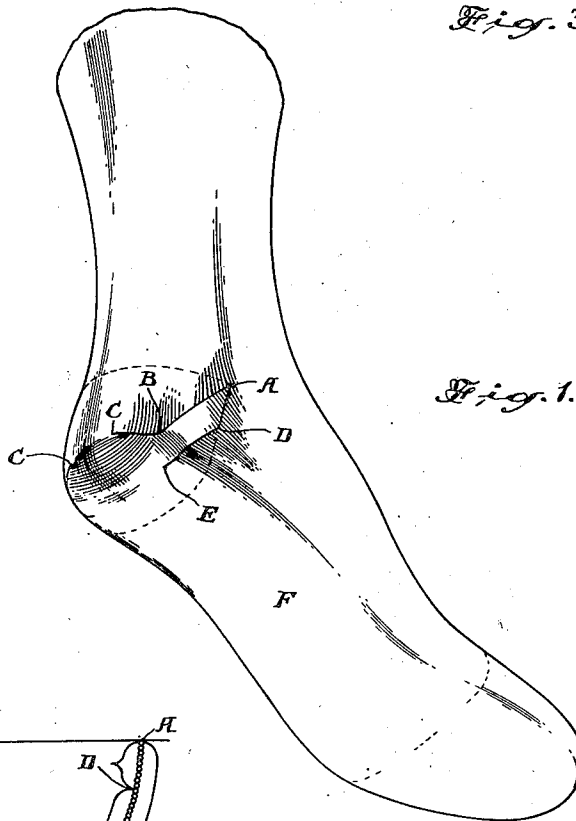


Fig. 1.

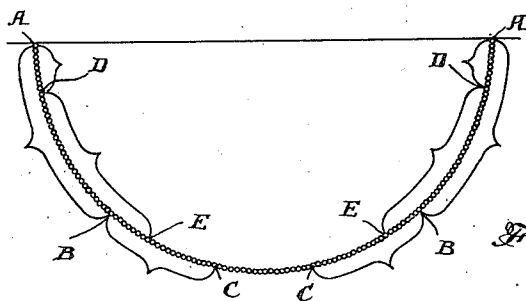


Fig. 4.

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## UNITED STATES PATENT OFFICE

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## SEAMLESS HOSE AND METHOD OF MAKING

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The principal objects of the invention are, to devise a knitted fabric in the heel of a stocking which will conform to the shape of the foot without distortion and which will present a different appearance from that of the ordinary diagonal suture heel.

A further object is to provide a heel of greater length in relation to the leg of the stocking than its width lengthwise of the foot, and to eliminate wrinkles and puckers, and further to enhance the appearance of the heel and to provide a stocking, the heel of which lies flat.

The principal feature of the invention consists in the novel manner of knitting the heel portion of the stocking whereby the direction of the wales are altered to conform to the bend of the heel with the least amount of opposing stress, and whereby sutures are formed to shape the fabric to the configuration of the heel of the wearer.

In the manufacture of hosiery it is the usual practice to form the heel of the stocking by first narrowing and then widening the fabric by the use of a number of fashioning needles which produce a pocket with a diagonal suture at each side. Such heel pockets are of a square formation and the inner ends of the sutures form dog ears or puckers and steam pressing and stretching is resorted to to draw the pucker into a mere semblance to the natural shape of the human foot.

It is well known that the sutures formed in the fashioning of the stocking are non-yielding and the ordinary diagonal location of the sutures greatly restricts the longitudinal stretch of the fabric at the heel where it is extremely desirable that the maximum resiliency should be obtainable.

In the accompanying drawings, Figure 1 is a perspective view from the underside and heel end of a foot showing a stocking with the heel knitted in accordance with my improved method.

Figure 2 is a side elevational view of the heel portion of my improved stocking.

Figure 3 is a back view.

Figure 4 is a diagrammatic view illustrating the manner of manipulation of the nee-

dles on a cylinder knitting machine to accomplish the result shown.

In the manufacture of my improved stocking heel, the knitting of the leg of the stocking is carried to the point A on the full complement of needles, and from that point approximately one-half the needles are left out of action and knitting is continued on the remaining half of the needles and one needle is picked up out of action at the end of each course until from thirty-five to forty needles between the points A and B are removed from action, thus progressively narrowing the fabric forming same with the tapered edges A—B.

From the point B to C from twenty to twenty-five needles are picked up out of action all at once abruptly narrowing the fabric, that is to say, reducing the width of the fabric in one course by the dropping of a multiplicity of stitches and knitting is continued on the remaining needles across the back of the heel between the points C—C on either side of the heel, which forms a very narrow width at the back of the heel.

In continuing the knitting from the point C the needles taken out of action are picked down one at a time, or two down and one up as may be desired, progressively widening the fabric, forming the same with tapered edges C—B until the complement of needles between the points C and B have been returned into action, then the full complement of needles between the points B and A are picked down all at once thereby abruptly widening the fabric, that is, increasing the width of the fabric in one course by a multiplicity of stitches and the longest course is knitted directly to the tapering edges B—A of the first mentioned progressively narrowed heel portion.

It will be seen that in knitting beyond the point A, the wales run lengthwise down the leg of the stocking to the diagonal and transverse suture lines A—B and B—C. The picking down into action of the needles from C to B changes the direction of the courses to substantially the alignment of the suture line A—B and these courses are continued

by the instantaneous dropping into action of the needles between the points B—A so that approximately one half of the full complement of needles are now in operation from the points A to A, the fabric being widened abruptly by an increase in the number of stitches to extend from B to A when the complete half complement of needles will be in use. This forms the wales in the insert portion at an angle of approximately 135° to the leg wales.

Immediately all of the half complement of needles used in knitting the heel have been returned to action as stated, from A to A, the needles are picked up out of action, preferably one at a time progressively narrowing the fabric for about ten courses between the points A and D forming a gusset with narrowed ends. Then about thirty-five needles are picked up out of action all at once between the points D and E again abruptly narrowing the fabric, reducing the number of stitches in the fabric by a multiplicity of stitches in one course. All the needles thus removed from action from D to E are then progressively returned into action preferably two at a time at the end of each course progressively widening the fabric and knitting same to the last course of the gusset extending from E to D. If it be desired to lengthen the sole of the foot, picking down the needles from E to D may be effected one at a time and this will increase the number of courses and lengthen the bottom of the foot. When the needles have been progressively returned to points D from E the remainder of the half complement of needles from D to A is returned instantaneously forming an abruptly widened fabric which is knit directly to tapered ends D—A of the insert portion.

The full complement of needles is then in action and the foot portion F is knitted in the usual manner.

It will be noted that the wales of the portion knitted in from the points E to the points D are in substantially right angular relation to the wales extending down the leg to the suture formed between the points A—B—C but the wales in the intervening portion of the fabric extend in an intermediate angle, thus giving to the heel structure great elasticity and thereby eliminating the non-yielding feature of the single diagonal suture.

It will be further noted that the angularity of the courses in the portion between the sutures A—B—C and E—D, being midway between the horizontal as in the leg section, and in the vertical, as in the foot section, is so disposed as to give the greatest fashioning effect to the heel and also the greatest measure of elasticity, and the longitudinal strain of the leg portion in the action of walking will not be pulling dead against a

suture forming a dividing line between the vertical and the horizontal, but will pull against the flexible and resilient knitted structure in between.

A yarn change may be made wherever desired in the construction of the heel, but it is preferable to make the change in alignment with the points A—D so as to retain the square heel appearance.

As previously described the heel structure set forth is of greater vertical length than horizontal, which is in proper relationship to the natural proportions of the foot.

In the above description the steps of knitting have been described as progressing from the leg portion but these steps may be reversed if it be desired to first knit the foot portion.

What I claim as my invention is:—

1. A method of making hosiery, consisting in knitting the leg portion to the commencement of the heel, then narrowing the heel for a predetermined number of needles, then lifting a plurality of needles out of action simultaneously, then widening the fabric and knitting a gusset along the narrowed portion of the heel, then knitting in a widening foot portion to the gusset, and finally continuing the foot in the use of the full circle of the needles.

2. A method of making hosiery consisting in knitting the leg portion to the commencement of the heel, then progressively narrowing the heel for a predetermined number of courses, then knitting a shortened course to the last knit course centrally of its length, then knitting progressively longer courses to said shortened course forming a gusset, then knitting a lengthened course to extend along the tapered side of the narrowed heel portion, then knitting progressively shorter courses to the last knit lengthened course narrowing the fabric, then widening the fabric, and finally knitting in the full complement of stitches.

3. A method of making hosiery, consisting in knitting the leg portion with the full complement of needles, then commencing the heel portion on half the complement of needles and progressively removing needles from action to form a tapering heel section, then simultaneously removing a plurality of needles from action, then progressively returning the needles to action that were removed simultaneously, then simultaneously returning the needles to action progressively removed from action in the tapering of the heel, then progressively reducing the number of needles in action tapering the ends, then simultaneously removing a plurality of needles from action, then progressively returning the needles to action simultaneously removed, then continuing the knitting of the hose with the full complement of needles.

4. A method of making hosiery, consisting in first knitting the leg of the hose with the full complement of needles, then removing half the complement from action, then gradually removing needles one at a time at the ends of each course for a predetermined number of courses, then simultaneously lifting out of action a predetermined number of needles on each side leaving only a few needles in action, then progressively returning into action the needles simultaneously removed, then simultaneously returning into action the needles progressively removed then continuing the knitting progressively removing needles from the courses till a predetermined number have been removed from action, then simultaneously lifting out of action a predetermined number of needles, then progressively returning into action the needles simultaneously removed from action, and finally returning all the needles into action to knit the foot.

5. A method of making hosiery consisting in knitting the leg portion to the commencement of the heel, then continuing the knitting with substantially half the complement of needles progressively narrowing the heel for a predetermined number of courses by removing about 35 to 40 needles from action progressively at each end of the courses, then abruptly narrowing the fabric a plurality of wales by simultaneously removing from operation about 20 to 25 needles at each end, then progressively widening the fabric for a number of courses corresponding with the number of wales abruptly narrowed by progressively returning to operation at each end the 20 to 25 needles that were previously removed simultaneously from operation, then abruptly widening the fabric by returning to operation the remaining needles of the half complement on which the heel was started, then progressively narrowing the fabric for approximately ten courses, then abruptly narrowing the fabric a number of wales by removing from operation about 35 needles at each end, then progressively widening the fabric to the commencement of the last abruptly narrowed portion by returning at each end said latter 35 needles one or two at a time, then knitting in the full circle fabric with the full complement of needles.

6. An improved hose having the longest course of stitches of a tapered insert portion knitted along the tapered edge of a progressively narrowed heel portion and having the tapered edge of a progressively widened portion knitted directly to the last course of knitting of said progressively narrowed heel portion.

7. An improved hose having the longest course of knitting of a tapered insert portion knitted along the tapered edge of a progressively narrowed heel portion and having the tapered edge of a progressively widened por-

tion knitted directly to the last course of knitting of said progressively narrowed heel portion, the taper of said insert being at one end thereof and extending from the longest course therein and knitted directly to the first course of an abruptly widened portion of the foot and having its narrowest course knitted directly to a progressively widened portion of the foot.

8. An improved hose having the tapered edge of a progressively narrowed heel portion directly connected with an insert portion and having progressively widened portions respectively at the front and rear of said insert portion connected directly and respectively with the last course of knitting of said insert portion and said progressively narrowed heel portion.

9. Hosiery having the back of the heel formed with a progressively narrowed portion terminating in an abruptly shortened course of knitting, an insert having progressively widened and abruptly widened portions knitted to the narrowed back, said insert being progressively narrowed presenting tapered ends, and forward sections having a progressively widened portion knitted to the last course of knitting of the insert and abruptly widened portions knitted to the tapered ends of the insert.

10. Hosiery having a portion of the heel progressively narrowed for a number of courses, then abruptly narrowed in one course, a portion progressively widened for a number of courses to connect with the last course of knitting of the progressively narrowed portion, a portion knitted to the last course of said progressively widened portion and to the tapered edge of the progressively narrowed portion and having one end thereof progressively narrowed, and a progressively widened portion knitted between the last course of the latter portion and the foot of the hose.

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