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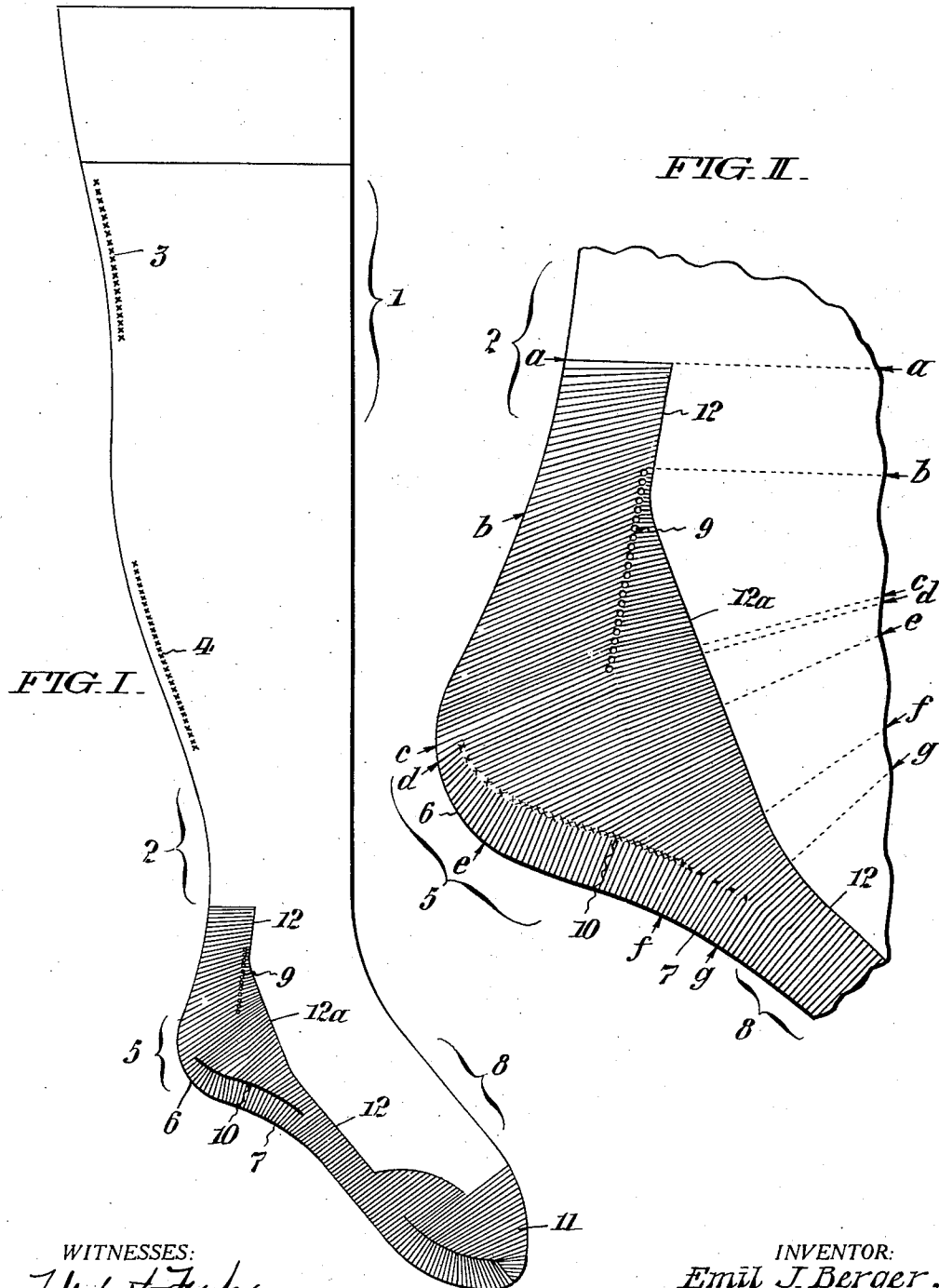
E. J. BERGER

2,154,602

METHOD OF PRODUCING FULL-FASHIONED STOCKINGS

Filed July 30, 1937

2 Sheets-Sheet 1



WITNESSES:

Richard Fuchs
William Bee, Jr.

INVENTOR:

INVENTOR:
Emil J. Berger,
BY Tracy & Paul
ATTORNEYS.

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E. J. BERGER

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2 Sheets-Sheet 2

FIG. III.

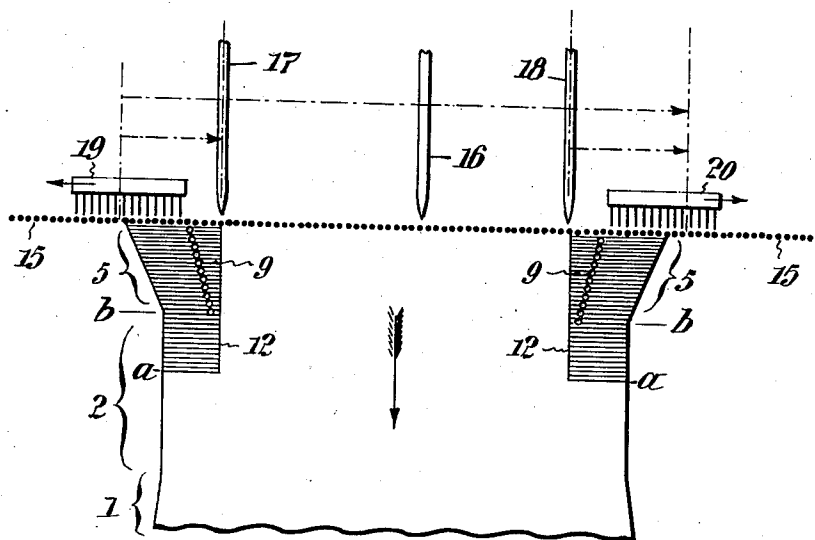
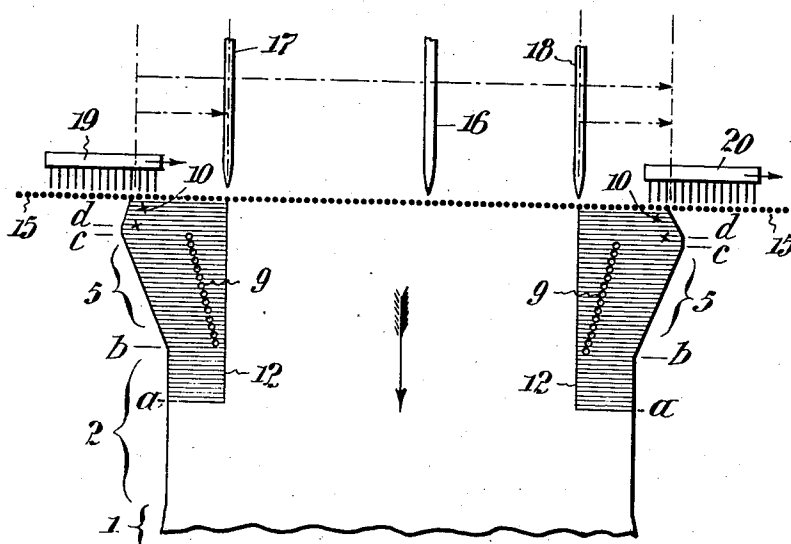


FIG. IV.



WITNESSES:

Hubert Fuchs
William Bree, Jr.

INVENTOR:

Emil J. Berger,
BY Tracy Paul
ATTORNEYS.

UNITED STATES PATENT OFFICE

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METHOD OF PRODUCING FULL-FASHIONED STOCKINGS

Emil J. Berger, Hatfield, Pa., assignor to Dextdale Hosiery Mills, Lansdale, Pa., a corporation of Pennsylvania

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4 Claims. (Cl. 66—89)

This invention relates to full fashioned stockings and to methods of producing them; and it has reference more particularly to fashioned stockings knitted in one operation on a single machine as distinguished from those whereof the leg blanks are knitted on one machine and transferred to another machine for addition of the feet. A full fashioned stocking blank ordinarily produced under either of the above methods has square heel tabs with straight edges in direct continuation with the rear edges of the ankle. As a consequence, the finished stocking fails to accurately fit the foot of the wearer, being tight across the instep and too full at the ankle.

The chief aim of my invention is to overcome this deficiency, which objective I attain as herein-after more fully set forth by reducing the width of the ankle portion of the stocking blank to a greater extent than usual; then resorting to progressive widening for a time to form heel projections which extend outward beyond the side edges of the ankle portion at opposite sides of the blank, and then to progressive narrowing for a time to round the bottoms of said projections and to predetermine smooth mergence of their edges into the side edges of the stocking foot portion, so that the completed stocking conforms accurately to the human foot. The widening I effect by periodically transferring groups of end loops of the fabric outward from needles on which they are formed to adjacent needles with the aid of the usual transfer point combs of the producing machine, and by concurrently and periodically increasing the throw of the main yarn carrier by a somewhat larger amount each time. As a result of this procedure, the edges of the upper portions of the heel projections are caused to slope outwardly relative to the edges of the ankle portion with incidental formation of lines of open meshes which extend substantially vertically of the blank within the heel areas. The narrowing I accomplish by periodically transferring lesser numbers of end loops inward variably, likewise by means of the transfer point combs, to produce the desired rounding at the bottoms of the heel projections and to determine smooth mergence of their edges, through reverse curvatures, into the side edges of the foot portion of the stocking blank, with incidental formation of fashioning sutures which lie within the heel areas closer to the edges of the blank than the lines of open meshes and which extend well into the foot portion; and then I complete the foot portion without removing the blank from the machine.

In connection with a stocking having the above attributes, it is a further object of my invention to provide reinforced areas within which the lines of open meshes and narrowing sutures of the heel are included, and at the same time determine a cradle foot contour in said reinforcements.

Other objects and attendant advantages will appear from the following detailed description of the attached drawings wherein Fig. I is a side elevation of my improved stocking.

Fig. II is an enlarged fragmentary view of the heel portion of the stocking.

Figs. III and IV are diagrammatic views showing successive steps in the production of my new stocking in one operation on a flat knitting machine.

As pictured in Fig. I, the stocking has a leg portion 1, which is tapered downwardly from the top by progressive stages to the region of the ankle 2 and which has lines of fashioning marks appearing at 3 and 4. The widened upper part of the heel 5, it will be observed extends outwardly beyond the normal back line of the ankle 2 while the bottom of the heel is rounded as at 6 and merges smoothly as at 7 through a reverse curve into the bottom of the foot portion 8. Due to being fashioned in the manner presently explained in greater detail, a series of open meshes 9 and a suture line 10 is formed at each side of the stocking within the heel area. The open meshes extend along straight lines at a slight angle to the vertical and are in turn disposed at a slight angle relative to the back of the heel. The sutures 10 on the other hand, are closer to the back edge of the stocking and extend well into the foot portion. The stocking is, moreover, reinforced at each side as indicated by the conventional shading, said reinforcement extending from the point in the ankle 2 well above the uppermost of the open meshes 9 downward through the heel portion 5, along the bottom of the foot portion 8 and across the toe 11, the inner limiting or boundary line 12 of said reinforcement defining a cradle foot effect. It is to be further noted that the reinforcement at each side of the stocking extends inward beyond the line of open meshes 9 and the lines of fashioning marks at 10 so that these lines lie wholly within the shaded areas.

To produce the stocking, I employ a suitable knitting machine such as diagrammatically shown in Figs. III and IV, comprising a series of needles 13; a main yarn carrier 14; a pair of reinforcing yarn carriers 15 and 16; and a pair of

transfer point combs 19 and 20. The leg portion 1 of the stocking, I knit in the usual way down to the line *a-a* in the ankle except for continuing the narrowing for a somewhat longer period than usual to predetermine an ankle of correspondingly smaller girth. Upon reaching the line *a-a* (Figs. II and III) the reinforcing yarn carriers 17 and 18 are brought into action to produce the high heel reinforcements at opposite sides of the blank down to a course *b-b*, the throw of said carriers being maintained uniform during this time with the reinforcements terminating in lines 12, 12. Upon reaching the course *b-b*, the transfer point combs 19 and 20 are shifted inwardly so that their innermost points register with the needles at least two wales outwardly from the inner lines 12 of the reinforcement in readiness for the widening phase of the knitting to form the heel projections. During the latter operation, the combs 19 and 20 are moved outwardly periodically, for example a distance of one needle in every second course of the knitting as instanced at the right hand of Fig. III, and the loops of the fabric on the end groups of the needles covered by said points, transferred outwardly to adjacent needles with the resultant formation of the lines of open meshes 9. Concurrently with the shifts of the point combs 19 and 20 as just explained, the outward throw of both the main yarn carrier 16 and the reinforcing yarn carriers 17 and 18 is increased each time by a distance of several needles, for example two, so that the edges of the upper portion of the heel projections are caused to slope outwardly and downwardly with respect to the outer edges of the ankle portion 2 at an inclination to the lines of open meshes 9. The widening is continued until a line *c-c* is reached, when preferably a few courses are knit without the use of the point combs and without change in the outward throw of the yarn carriers 16-18, to a line *d-d* before the narrowing phase of the heel knitting is begun. The point combs 19 and 20 are next shifted outward so that their innermost points are distanced inward from the edges of the heel projections by several needles in readiness for the narrowing operation to round the bottoms of the heel projections. To effect the narrowing, the outward throw of the main and reinforcing yarn carrier 16-18 is reduced at variant intervals during the knitting, concurrently with variant inward shifting of the point combs 19 and 20 to transfer the loops on the covered needles to adjacent needles, with incidental formation of the lines of narrowing marks 10. Between the courses *d-d* and *e-e*, there may be for example twelve narrowings, one for every fourth course; between the courses *e-e* and *f-f* twenty narrowings, one at every second course; and between the courses *f-f* and *g-g* eight narrowings, one every fourth or sixth course. As a result, the heel projections are shaped to conform accurately to the human foot with their bottom edges sharply but smoothly rounded and merging through curvatures of greater radii into the side edges of the foot portion as already pointed out. The foot portion 8 of the stocking may be formed as illustrated with the reinforcement extending across the toe 11. During the knitting of the lower part of the ankle 2, the heel projections and the greater part of the foot, the inner limit of throw of the reinforcing yarn carriers 17 and 18 is kept fixed as will be noted from Figs. III and IV. However, due to the fashioning of the heel projections in the manner above ex-

plained, there is obtained a cradle effect as shown in Fig. I wherein the segments 12*a* of the inner lines 12 of the reinforcements are sloped diagonally of the heel.

While for convenience of explanation herein I have referred to but a single main yarn carrier 16, in practice I prefer to employ several of such carriers and to control them so that they feed their respective yarns to the needles in a predetermined repeating sequence after a well known manner for attainment of ringless fabric.

From the foregoing, it will be apparent that I have devised a new method whereby perfectly shaped stockings can be expeditiously and economically produced on a single knitting machine without interruption in the knitting except for the turning of the welts at the tops of the stockings. It will be realized, however, that it is also possible to produce the stocking of my invention after the manner ordinarily practiced in full fashioned stocking manufacture, that is to say, the leg portion down to the course *c-c* in Fig. II may be knitted on a legger, and the leg blank thereupon transferred to a footer for completion of the stocking foot.

Having thus described my invention, I claim:

1. The method of producing a full fashioned stocking blank in one operation on a knitting machine having a series of needles, a reciprocating yarn carrier and a pair of laterally shiftable loop transferring point combs, which comprises knitting the leg as a narrowed web down to the ankle; thereupon forming laterally-extending heel projections at opposite edges of the blank by periodically increasing the throw of the yarn carrier and at the same time outwardly transferring groups of end loops at opposite sides of the blank from the needles on which they were formed to adjacent needles; thereupon shaping the bottoms of the heel projections by decreasing the traverse of the yarn carrier and concurrently transferring end groups of the loops inward of opposite side edges of the blank, first at relatively infrequent intervals for a time, and then at more frequent intervals for a time; and thereafter knitting the stocking foot in direct continuation.

2. The method of producing a full fashioned stocking blank in one operation on a knitting machine having a series of needles, a reciprocating yarn carrier and a pair of laterally shiftable loop transferring point combs, which comprises knitting the leg as a narrowed web down to the ankle; thereupon forming laterally-extending heel projections at opposite edges of the blank by periodically increasing the throw of the yarn carrier and at the same time outwardly transferring groups of end loops at opposite sides of the blank from the needles on which they were formed to adjacent needles; thereupon shaping the bottoms of the heel projections by decreasing the traverse of the yarn carrier and concurrently transferring end groups of the loops inward of opposite side edges of the blank first at relatively infrequent intervals for a time, then at more frequent intervals for a time, and then again at less frequent intervals for a time; and thereafter knitting the stocking foot in direct continuation.

3. The method of producing a full fashioned stocking blank in one operation on a knitting machine having a series of needles, a reciprocating main yarn carrier, a pair of reinforcing yarn carriers and a pair of laterally shiftable loop transferring point combs, which comprises

knitting the leg as a narrowed web down to the ankle; thereupon forming laterally-extending heel projections at opposite edges of the blank by periodically increasing the throw of the main yarn carrier, and at the same time outwardly transferring groups of end loops at opposite sides of the blank from the needles on which they were formed to adjacent needles; thereupon shaping the bottoms of the heel projections by decreasing the traverse of the main yarn carrier and the outward throw of the reinforcing yarn carriers and concurrently transferring end groups of the loops inward of opposite side edges of the blank first at relatively infrequent intervals for a time, and then at more frequent intervals for a time; and thereafter knitting the stocking foot in direct continuation.

4. The method of producing a full fashioned stocking blank in one operation on a knitting machine having a series of needles, a reciprocating main yarn carrier, a pair of reinforcing

yarn carriers and a pair of laterally shiftable loop transferring point combs, which comprises knitting the leg as a narrowed web down to the ankle; thereupon forming laterally-extending heel projections at opposite edges of the blank by periodically increasing the throw of the main yarn carrier and at the same time outwardly transferring groups of end loops at opposite sides of the blank from the needles on which they were formed to adjacent needles; thereupon shaping the bottoms of the heel projections by decreasing the traverse of the main yarn carrier and the outward throw of the reinforcing yarn carriers and concurrently transferring end groups of the loops inward of opposite side edges of the blank first at relatively infrequent intervals for a time, then at more frequent intervals for a time, and then again at less frequent intervals for a time; and thereafter knitting the stocking foot in direct continuation.

EMIL J. BERGER.