

Sept. 28, 1943.

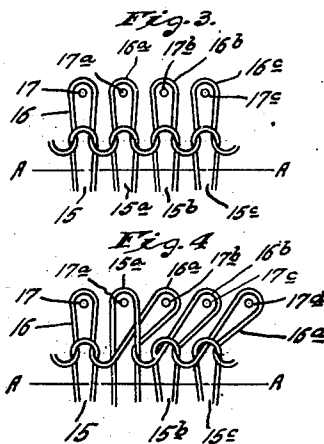
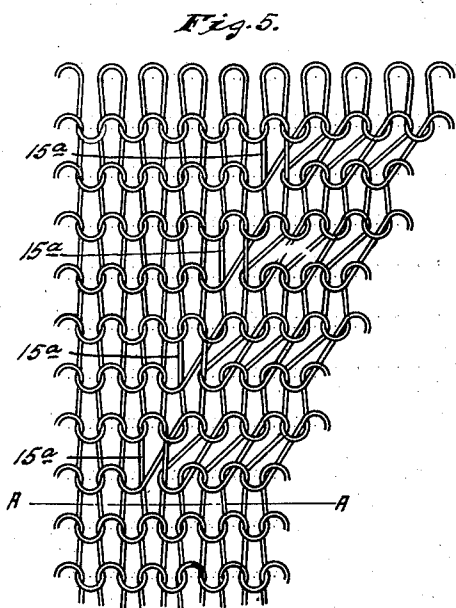
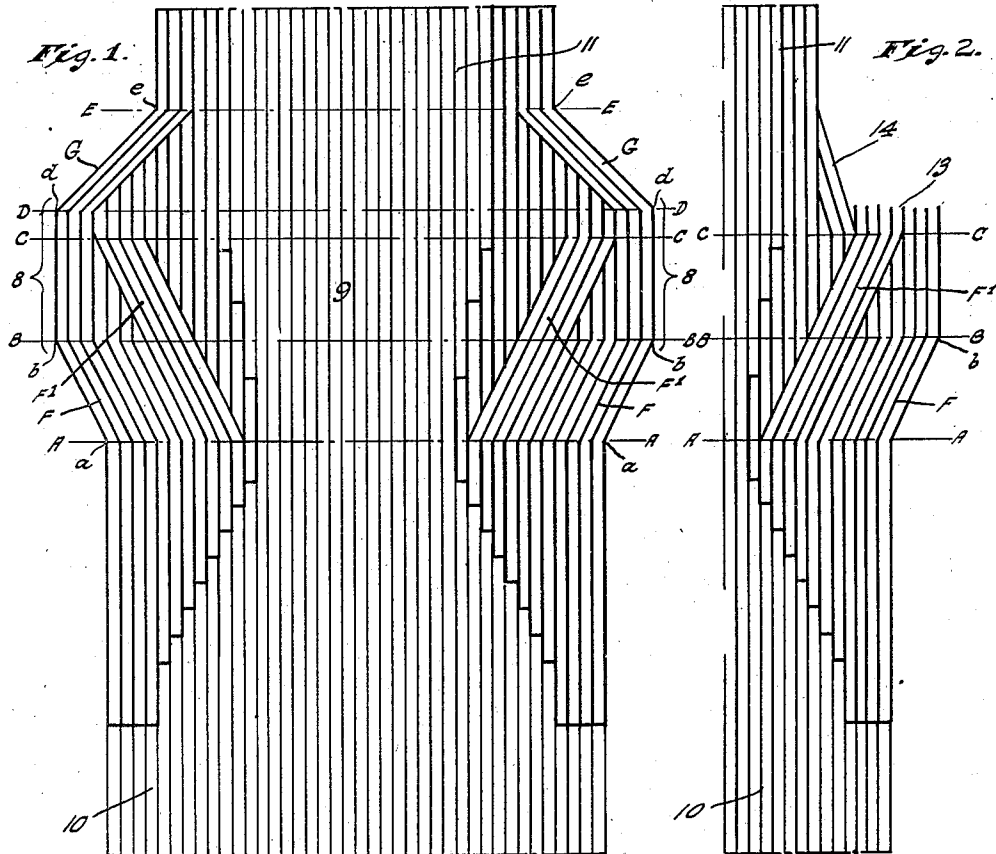
A. J. COBERT

2,330,683

STOCKING

Filed April 13, 1942

2 Sheets-Sheet 1



INVENTOR.
ARTHUR J. COBERT,
BY *Arthur J. Cobert*
ATTORNEYS.

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Fig. 6.

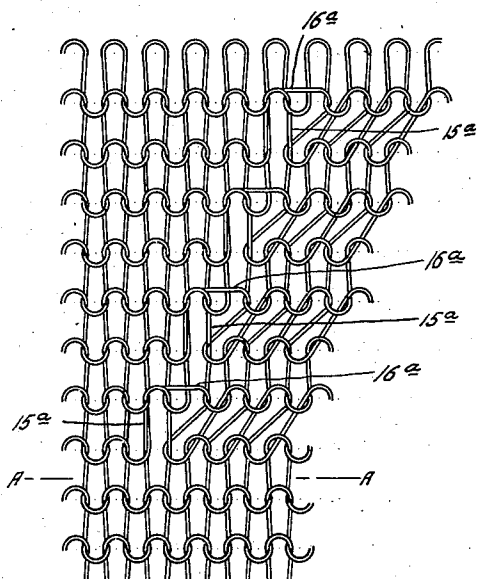


Fig. 7.

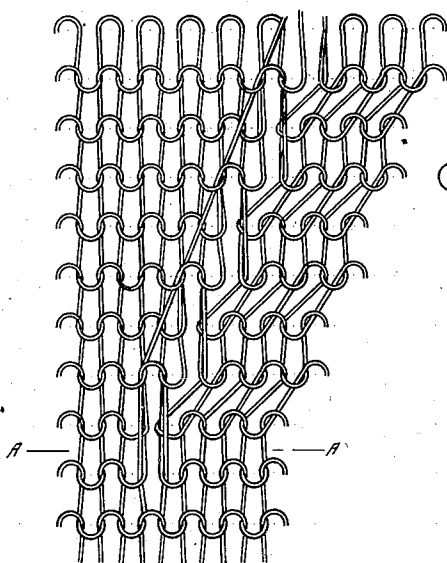
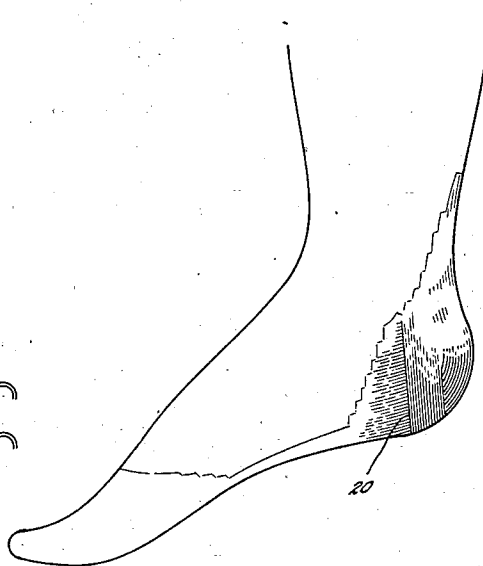


Fig. 8.



BY

INVENTOR.
ARTHUR J. COBERT,

Attorneys
ATTORNEYS.

UNITED STATES PATENT OFFICE

2,330,683

STOCKING

Arthur J. Cobert, Indianapolis, Ind., assignor to
Real Silk Hosiery Mills, Inc., Indianapolis, Ind.,
a corporation of Illinois

Application April 13, 1942, Serial No. 438,711

8 Claims. (Cl. 66—187)

This application is a continuation in part of my co-pending application Serial No. 375,897, filed January 25, 1941.

My invention relates to full-fashioned hosiery, and more particularly to a stocking-blank which can be completely knit on a single machine and which will possess a novel heel-forming portion. It has heretofore been proposed to form a complete stocking-blank, including leg and foot portions, and to widen the blank progressively in the vicinity of the heel by the outward transfer of stitches in marginal wales at each side of the blank. In a stocking thus formed, the outward transfer of the stitches in the marginal wales leaves an oblique open-mesh line along the inner edge of the area within which stitches have been transferred outwardly. Such an open-mesh line is relatively weak and therefore objectionable, and may also be regarded as detracting from the appearance of the stocking. In recognition of these disadvantages, especially the latter, it has been proposed to close the line of open meshes by a subsequent sewing or knitting operation; but such a subsequent operation is in itself a disadvantage because of the heavy corded appearance it produces, and also because of the increased difficulty and expense of manufacture.

It is the principal object of my invention to form a stocking-blank in a single operation, to provide the widening required to form the heel by an outward transfer of stitches, and at the same time prevent the formation of the weak open-mesh line previously referred to.

Another object of my invention is to produce in a single machine, by a simple method, and at relatively low manufacturing cost, a complete stocking-blank which, when its marginal edges are joined, will form a stocking having a well-fitting heel of attractive appearance.

In the preferred form of my stocking, the leg portion of the stocking is knit in any desired manner, from and including the welt, down to the point where heel-widening is to begin. At that point stitches in a relatively large number or group of immediately adjacent marginal wales, at each side of the blank, are transferred outwardly and the travel of the yarn carrier or carriers correspondingly increased for a predetermined number of courses, or until the desired extent of widening has been produced. For a succeeding predetermined number of courses, the travel of the yarn carrier or carriers is maintained constant, but outward transference of stitches is continued in a relatively smaller subgroup of wales spaced inwardly from each mar-

ginal edge of the blank. Following this the blank is narrowed, by the inward transfer of the stitches in relatively smaller groups of converging marginal wales, to begin the formation of the foot.

As stitches in each course are transferred outwardly in the formation of the heel portion at each side of the blank, the needle upon which the innermost of the outwardly transferred stitches was originally formed is left vacant. Before the next course of stitches is formed, I cover that needle with a stitch which I pick up from a preceding course and transfer longitudinally of the blank on to the vacant needle, thus preventing the creation of any fabric-weakening openings in the mesh of the blank as the knitting of the blank proceeds. This method of preventing the formation of openings, which would otherwise be left by the outward transfer of stitches in a stocking-blank, is applicable to stockings other than the preferred type.

In the accompanying drawings:

Fig. 1 is a fragmental diagrammatic view of the preferred form of stocking-blank in the vicinity of the heel;

Fig. 2 is a similar view illustrating one side of a modified form of blank;

Figs. 3 and 4 are fragmental stitch diagrams illustrating successive steps in the method employed to prevent the formation of an opening which would otherwise be left by the outward transfer of stitches in widening the blank at the heel portion;

Fig. 5 is a fragmental stitch diagram showing a part of the widened portion of the blank with the cover stitch picked from the course preceding the one in which the lateral transfer is made in the manner illustrated in Figs. 3 and 4;

Fig. 6 is a view similar to Fig. 5 with the innermost laterally transferred stitch spread across two wales in the transfer course;

Fig. 7 is a view similar to Fig. 5, with two cover stitches picked respectively from the two courses preceding the transfer course; and

Fig. 8 is a fragmental elevation showing the foot of the stocking as it appears when worn.

In knitting the stocking illustrated in Fig. 1, the leg portion 10 of the blank is knit in any desired manner down to the course A—A, where the widening of the blank for the heel is to begin. Commencing at course A—A and continuing to course B—B, the blank is gradually widened by the outward transfer of relatively large numbers of immediately adjacent stitches in succeeding courses, forming wide primary groups F, F' of

divergent marginal oblique wales at the opposite sides respectively of the blank, the travel of the yarn carrier or carriers being increased in both lateral directions at a rate corresponding to the widening in opposite directions as effected by the outward stitch transfer.

From course B—B to course C—C the travel of the yarn carrier or carriers remains constant, but the outward transfer of stitches is continued in succeeding courses, with relatively smaller numbers of immediately adjacent stitches, to form sub-groups F¹, F¹ of divergent oblique wales spaced inwardly from the marginal edges of the blank.

Beginning with course C—C and continuing to course D—D there may be a few plain courses knit across the full width of the blank, which contain no transferred stitches.

Following the course D—D and continuing to course E—E, the blank is narrowed by the inward transfer of relatively small numbers of immediately adjacent stitches in succeeding courses, to form groups G, G of convergent marginal oblique wales preceding the formation of the foot portion II.

As a result of the foregoing, the stocking consists of the leg portion I of one transverse width, the foot portion II of a lesser transverse width, and an intermediate portion including a rectangular area b—d—d—b of greater transverse width than either the leg portion or foot portion and which is spaced therefrom, longitudinally of the stocking, by a pair of trapezoidal areas a—b—b—a and d—e—e—d, respectively, of progressively decreasing widths from the rectangular area to the leg and foot portions, respectively.

The intermediate portion includes a central instep portion 9 and a pair of heel portions 8, 3 at the opposite sides respectively thereof, said heel portions comprising the wide divergent primary groups F, F of the oblique wales which extend across the trapezoidal area a—b—b—a from the end a—a thereof to the end b—b of the rectangular area b—d—d—b, and the narrower complementary or sub-groups F¹, F¹, which extend across the rectangular section b—d—d—b from the end b—b thereof substantially to the end d—d of the second trapezoidal area d—e—e—d, and which, in the present instance terminate at the course C—C, although these complementary groups may continue to the course D—D if desired.

The inwardly converging groups of oblique wales G, G, extend across the trapezoidal area d—e—e—d from the end d—d thereof to the end e—e thereof where the intermediate portion of the blank joins with the foot portion II along the course E—E.

The walewise length of the rectangular area, from the course B—B to the course D—D, provides fullness in the heel of the finished stocking; and the carrying of the sub-groups of oblique wales F¹, F¹ substantially across the full length of the rectangular area, together with the running of the marginal edges b—d of the rectangular area b—d—d—b, parallel to each other, provides shape, fit, and neat conventional appearance to the heel of the finished stocking.

The conformation of the blank may be varied as desired by varying the rate at which transfer of stitches is effected and by varying the number of courses in which any predetermined rate of transfer is carried out. In stockings knit in the form illustrated in Fig. 1, the number of

courses intervening between courses A—A and B—B has varied from 80 to 90; the number from course B—B to course C—C has varied from 36 to 48; the number between courses C—C and D—D has varied from none to 20; and the number between courses D—D and E—E has varied between 20 and 48. The number of wales in which outward transfer of stitches is effected may approximate 55 to 65 between courses A—A and B—B, and 15 to 25 between courses B—B and C—C. Inward transfer of stitches beyond course D—D has been effected over about 20 wales. Preferably, outward transfer of stitches between courses A—A and C—C is effected at the rate of one needle in every other course, while inward transfer beyond course D—D is at the rate of two needles in every other course.

The characteristics set forth in the immediately preceding paragraph are included solely by way of illustration, and not by way of limitation. However, it may be noted that I regard widening of the heel by the outward transfer of stitches at the rate of one needle in every other course as preferable to the widening of the heel at other rates. In a stocking such as that illustrated in Fig. 1 where, at each side of the blank there is a continuous selvage edge extending from the leg throughout the heel and into the foot portion of the stocking, the natural or inherent angle between the foot and the leg of the stocking formed when the blank is seamed is determined largely by the rate of transfer between the courses A—A and B—B. I find that transferring stitches in marginal wales between those courses at the preferred rate of one needle in every other course results in a stocking in which the natural or inherent angle between the leg and foot portions is approximately 120°, which is close to the angle existing between the foot and leg both when the stocking is boarded and when it is worn. Accordingly, when the heel portion of the blank is widened at the preferred rate, there is a minimum of stitch-distortion and wrinkling when the stocking is worn.

As indicated by the heavier wale-lines in Fig. 1, the marginal portions of the blank, in the vicinity of the heel, may be reinforced in the conventional manner. After completion of the blank, the side edges are seamed together and the toe closed in conventional manner to form the finished stocking.

In boarding the stocking for finishing, and under conditions of wear, the wales of the foot portion join the wales of the heel portion along a line formed by the innermost oblique wales in the widened portion of the blank. The outward transfer of stitches between the courses A—A and C—C would, unless steps were taken to prevent it, leave an oblique row of openings in the blank along a line adjacent the innermost transferred stitches, which would weaken the hose at the places where the strains attending the forward thrust of the toe, in boarding and in wear, are transmitted to the forward edges of the heel pocket as defined by the lines of the innermost outwardly transferred stitches. To prevent the formation of such openings, and to strengthen the hose along these lines, I may knit the blank in the manner illustrated in Figs. 3, 4, and 5. Fig. 3 illustrates a few stitches 15, 15a, 15b, and 15c in the last plain-knit course A—A of the leg portion of the blank, and illustrates also stitches 16, 16a, 16b, and 16c of the next succeeding course, the latter stitches being formed upon needles 17, 17a, 17b and 17c, respectively. In

effecting the blank-widening at the heel, the stitch 16a and the stitches in the same course lying outwardly beyond it are transferred outwardly for one needle.

Fig. 4 illustrates the stitches 16a, 16b, and 16c after having been transferred outwardly to the needles 17b, 17c, and 17d, respectively. Such a transfer would leave no stitch upon the needle 17a; and if the succeeding course was then knit in the usual manner, an opening would occur in the mesh at the site of the needle 17a. To prevent this, before the next course of stitches is formed, the stitch 15a in the course A—A is picked up, transferred forwardly, i. e. longitudinally of the blank in the direction of knitting, and placed upon the needle 17a, as clearly shown in Fig. 4. After this has been done, the next course of stitches is formed in the usual manner. This operation is repeated at every course in which stitches are transferred outwardly, thus preventing the formation of an oblique row of openings in the finished blank. Fig. 5 illustrates a plurality of courses following the course A—A. From Fig. 5 it will be apparent that each outward transfer of stitches is accompanied by a forward transfer of the stitch 15a in the immediately preceding course and that the successive forward transfers occur in immediately adjacent stitch wales, which combine to produce an extremely strong close structure in each of the innermost of the oblique wales where the foot joins with the front of the heel.

In Fig. 6 I have shown each innermost outwardly transferred stitch as having been spread laterally in the transfer course and interknit with two stitches in two adjacent wales respectively of the course immediately following the transfer course.

In Fig. 7 I have shown two longitudinally transferred stitches as having been picked up respectively from the first and second courses immediately preceding a lateral transfer course, and the innermost of the outwardly transferred stitches in the transfer course as being also spread laterally. Where the lateral transfer is effected in alternate courses with the innermost stitches in successive transferred courses located in adjacent wales, the stitch longitudinally transferred from the second course immediately preceding a laterally transferred course will be the laterally-spread, innermost transferred stitch in such lateral course, so that this stitch will extend not only across two wales but also across three courses, as will be clear from Fig. 7. However, if one or more needle wales intervene between the innermost transferred stitches in successive laterally transferred courses, or if more than one course intervenes between successive outwardly transferred courses, the stitch transferred from the second course preceding a laterally transferred course will not be spread laterally.

In each instance, Figs. 5, 6, and 7, the longitudinal transfer covers the hole which would normally be present at the point of lateral outward stitch transfer. In addition to covering or preventing such holes, the forward or longitudinal transfer and the lateral transfer of stitches strengthens the line of juncture of the foot sole wales with the edges of the heel portions, by distributing the strains over two succeeding courses and two adjacent wales, at each point of transfer. In this manner a closed strong line of juncture is formed where the foot sole wales are

joined with innermost wales of the heel portions of the blank.

Of the three forms of longitudinal transfer respectively illustrated in Figs. 5, 6, and 7, I prefer that of Fig. 6, as it is most easily effected in manufacture. In quantity production employing the form of transfer illustrated in Fig. 6, it may occasionally happen that a machine will produce a longitudinal transfer of one or the other of the types illustrated in Figs. 5 and 7. This, however, does no harm; as all three types of transfer have substantially equal effectiveness.

It will be noted that in the stocking blank illustrated in Fig. 1 the marginal edge of the blank, throughout its entire extent, is a selvage edge. While I prefer this form of blank, the above-described process of heel-widening, by outward transfer accompanied by the forward transfer of stitches to close openings which would otherwise be left, may be employed in other types of blanks. Thus, I have illustrated in Fig. 2 a blank which is knit like that of Fig. 1 to course C—C. Following this course C—C, the blank proper is abruptly narrowed to form a foot portion 14, the marginal wales in which, at least for a number of courses, are transferred inwardly to effect the customary sole-narrowing. Outwardly beyond the foot-portion 10, knitting may be continued for a few courses from a separate thread or threads to form a ravel tab 13. Between the courses A—A and C—C the same expedient as illustrated in Figs. 3, 4, and 5 is employed to prevent the formation of openings adjacent the innermost of the outwardly transferred stitches.

In forming a stocking from the blank of Fig. 2, the selvage edges at the opposite margins of the blank are joined together by sewing, while the stitches in course C—C along the lateral extent of the ravel tabs 13 are joined to the corresponding stitches at the opposite side of the blank as by looping.

As previously noted, widening of the stocking blank to form a heel portion by outward transfer of stitches unaccompanied by longitudinal transfer would result in a line of openings in the fabric, because of the fact that an interior needle near each edge of the blank would be left vacant by the outward transfer. In such a stocking, there would be at each side of each of such openings a sinker stitch interlooped with only a single stitch in the preceding course; and, when the stocking was boarded or worn, this single interlooping of two sinker stitches on opposite sides of each of the openings would result in a concentration of stresses tending to promote breakage of the yarn. In any stocking embodying the longitudinal transfer of stitches in any manner indicated in Figs. 5, 6, and 7, however, the sinker stitches which would otherwise be looped with but a single stitch in the preceding course are both interlooped with the longitudinally transferred stitch 15a, thus eliminating the concentration of stresses which would occur in the absence of the longitudinally transferred stitch. An additional advantage of the longitudinally transferred stitch will be apparent from Fig. 8, which shows the finished stocking on the foot of the wearer. From this figure, it will be apparent that the wales in the foot portion of the stocking ahead of the line 20 of longitudinally transferred stitches extend in a direction generally normal to the wales in the heel portion of the stocking in rear of the line 20. As a result, the forward thrust of the toe when the finished stocking is boarded

or worn will create tensile stresses extending along the wales in the foot portion of the stocking and along the courses in the heel portion of the stocking. In the preferred method of longitudinal transfer illustrated in Fig. 6 the terminal stitch in each needle wale in front of the line 20 is interlooped with stitches in two courses of the heel portion of the stocking lying in rear of the line 20. Thus, at the line 20, the stress in each of such wales is distributed between two of such courses, which tends to equalize stresses and to prevent such stress-concentration as would tend to cause breakage of the yarn. The same advantage is possessed by the stitch formation of Fig. 7; but in this instance the needle stitch lying immediately ahead of the line 20 is interlooped with the stitches of three succeeding courses in rear of the line 20, thus producing an even greater equalization of stresses.

The picking up of the stitches 15a and their transfer forwardly to needles left vacant by the lateral transfer of stitches in succeeding courses may be performed in any desired manner, but I prefer to employ the mechanism set forth and described in my co-pending application Serial No. 380,181, filed February 24, 1941.

I claim as my invention:

1. A flat knit hosiery blank composed of longitudinal stitch wales and transverse stitch courses and comprising a leg portion, a foot portion, and an intermediate portion, said intermediate portion including a central instep portion and heel portions at opposite sides respectively thereof, said intermediate portion being formed of a transverse rectangular area of greater width than said leg and foot portions and composed of a multiplicity of courses of equal lengths with the ends of said courses collectively forming parallel side edges of said rectangular area, a trapezoidal area between the leg portion and said rectangular area, a second trapezoidal area between said foot portion and said rectangular area, said trapezoidal areas each being composed of a multiplicity of courses of lengths progressively decreasing from said rectangular area to said leg and foot portions with the ends of the successive courses collectively forming divergent and convergent angular marginal side edges of said trapezoidal areas, respectively, said heel portions comprising divergent marginal groups of oblique wales extending from the opposite sides respectively of said leg portion through the first said trapezoidal area to said rectangular area in parallel relation to the divergent side edges of the first said trapezoidal area, and internal sub-groups of said oblique wales continuing through said rectangular area adjacent said instep portion substantially to the second of said trapezoidal areas in inwardly spaced angular relation to the opposite parallel side edges of said rectangular area, said rectangular area including longitudinal marginal wales parallel to its said parallel side edges forming continuations of the first said groups of divergent wales between said side edges of said rectangular area and the outermost oblique wales of said sub-groups.

2. A flat knit hosiery blank composed of longitudinal stitch wales and transverse stitch courses and comprising a leg portion, a foot portion, and an intermediate portion, said intermediate portion including a central instep portion and heel portions at opposite sides respectively thereof, said intermediate portion being formed of a transverse rectangular area of greater width than said adjoining leg and foot portions and composed

of a multiplicity of courses of equal lengths with the ends of said courses collectively forming parallel side edges of said rectangular area, a trapezoidal area between the leg portion and said rectangular area, a second trapezoidal area between said foot portion and said rectangular area, said trapezoidal areas each being composed of a multiplicity of courses of lengths progressively decreasing from said rectangular area to said leg and foot portions with the ends of the successive courses collectively forming divergent and convergent angular marginal side edges of said trapezoidal areas, respectively, said heel portions comprising divergent marginal groups of oblique wales extending from the opposite sides respectively of said leg portion through the first said trapezoidal area to said rectangular area in parallel relation to the divergent side edges of the first said trapezoidal area, and internal sub-groups of said oblique wales continuing through said rectangular area adjacent said instep portion substantially to the second of said trapezoidal areas in inwardly spaced angular relation to the opposite parallel side edges of said rectangular area, said rectangular area including longitudinal marginal wales parallel to its said parallel side edges forming continuations of the first said groups of divergent wales between said side edges of said rectangular area and the outermost oblique wales of said sub-groups, said second trapezoidal area including marginal groups of oblique wales converging from the outer parallel side edges of said rectangular area to the outer side edges of said foot portion and constituting continuations of the longitudinal marginal wales paralleling the side edges of said rectangular area and lying outside the outermost oblique wales of said sub-groups.

3. A flat knit hosiery blank according to claim 1, characterized by the divergent oblique wales being formed of outwardly transferred stitches in alternate courses, and by the innermost oblique wales being formed in part by longitudinally transferred stitches originating in the intermediate courses preceding the outward transfer courses and interknit with stitches in the intermediate courses following the outward transfer courses in the longitudinal wales of origin of the longitudinally transferred stitches.

4. A flat knit hosiery blank according to claim 1, characterized by the divergent oblique wales being formed of outwardly transferred stitches in alternate courses, and by the innermost oblique wales being formed in part of stitches in successive laterally adjacent longitudinal wales transferred longitudinally in their respective wales of origin from courses preceding the respective courses containing the outwardly transferred stitches and interknit with stitches in courses following the respective courses containing said outwardly transferred stitches.

5. A flat knit hosiery blank according to claim 1, characterized by the divergent oblique wales being formed of outwardly transferred stitches in alternate courses, and by the innermost oblique wales being formed in part of stitches in successive laterally adjacent longitudinal wales transferred longitudinally in their respective wales of origin from courses preceding the respective courses containing the outwardly transferred stitches and interknit with stitches in courses following the respective courses containing said outwardly transferred stitches, and in part by the innermost of said outwardly transferred stitches being spread laterally in said

transfer courses over their respective wales of origin and wales next adjacent thereto.

6. In a stocking formed from a flat-knit hosiery blank having a leg-forming portions, a foot-forming portion, and a widened portion intervening between said other two portions and adapted to form the heel and instep of the finished stocking, all said portions being integrally knit, said intervening portion comprising an upper part joining said leg-forming portion and of gradually increasing width toward the foot-forming portion, said upper part comprising transfer courses in which groups of stitches adjacent the margins of the blank are transferred outwardly, the course knit immediately preceding each of said transfer courses including a connecting stitch which is interlooped with the innermost stitch in the transferred group and which extends longitudinally of the blank across the transfer course and is interlooped with a stitch of the course knit immediately subsequent to the transfer course,

the marginal edges of said blank being united to form a stocking in which the outwardly transferred portions of said transferred courses are included in the heel and at the sides thereof are generally parallel to alternating needle wales and sinker wales extending forwardly along the sides of the foot, each of said needle wales being interconnected through the medium of an associated connecting stitch with two adjacent courses of said heel.

7. A flat knit hosiery blank according to claim 6, in which the innermost stitch of each of said transferred groups is spread laterally of the blank to span both the wale in which it originated and the wale to which it is transferred.

8. A flat knit hosiery blank according to claim 2 in which each wale of said divergent marginal groups of oblique wales consists of stitches transferred outwardly of the blank at the rate of one needle for each two courses.

ARTHUR J. COBERT.