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G. F. LANG

2,416,331

HOSIERY AND METHOD OF MAKING THE SAME

Filed Oct. 16, 1944

2 Sheets-Sheet 1

Fig. 2.

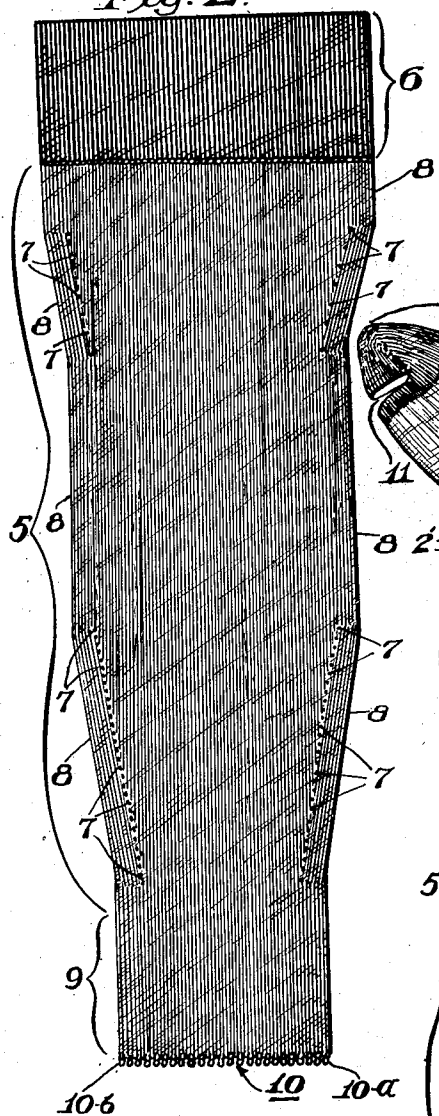


Fig. 1.

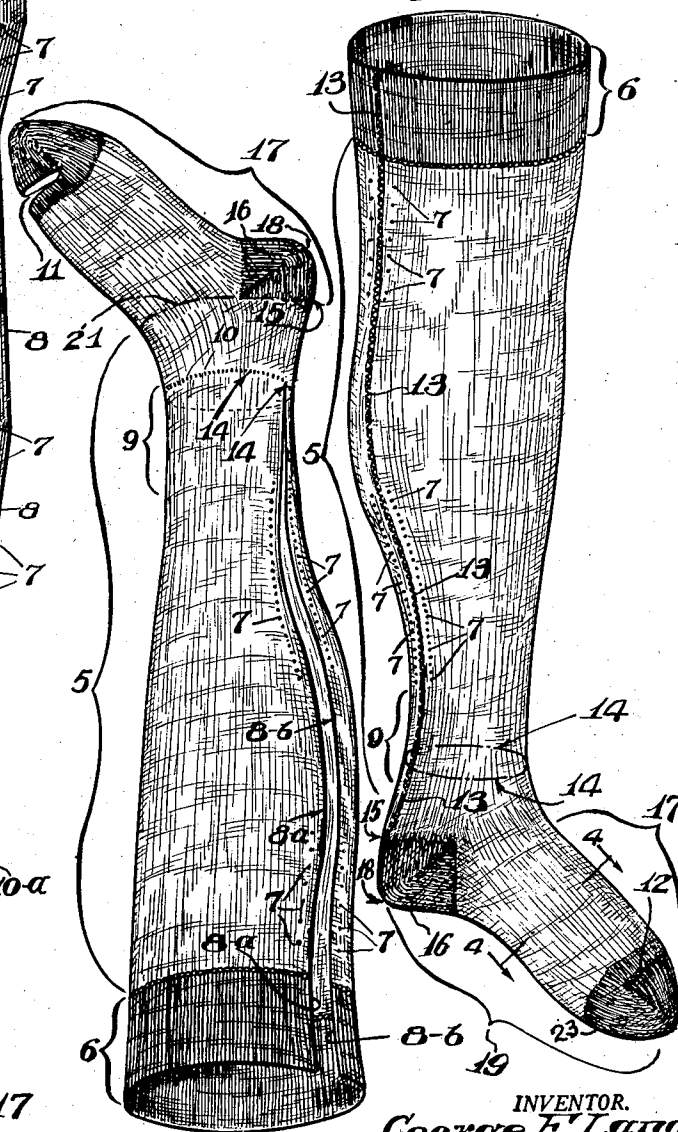


Fig. 3.

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Fig. 5.

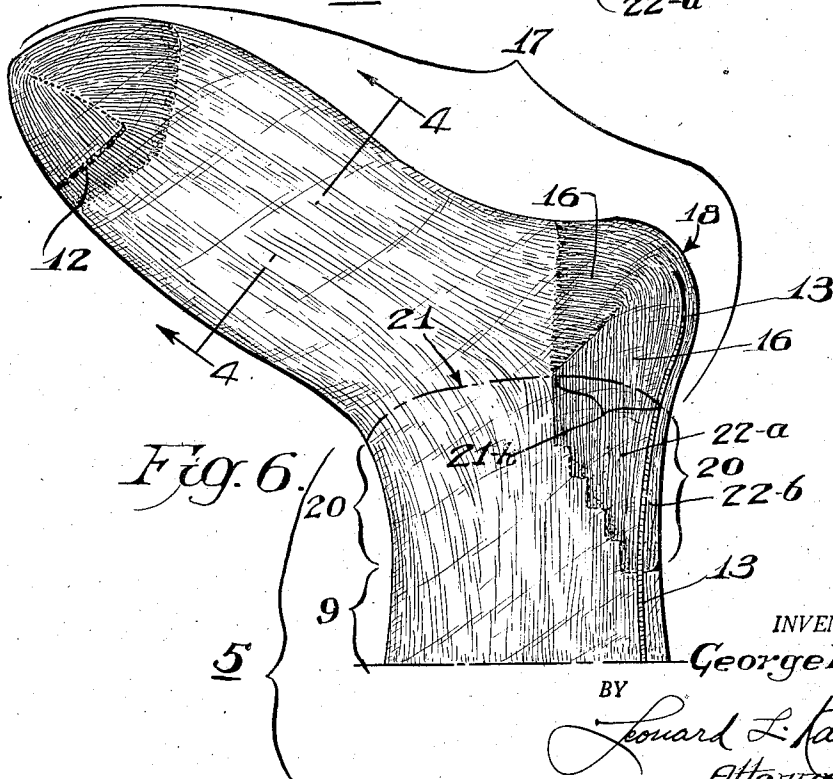
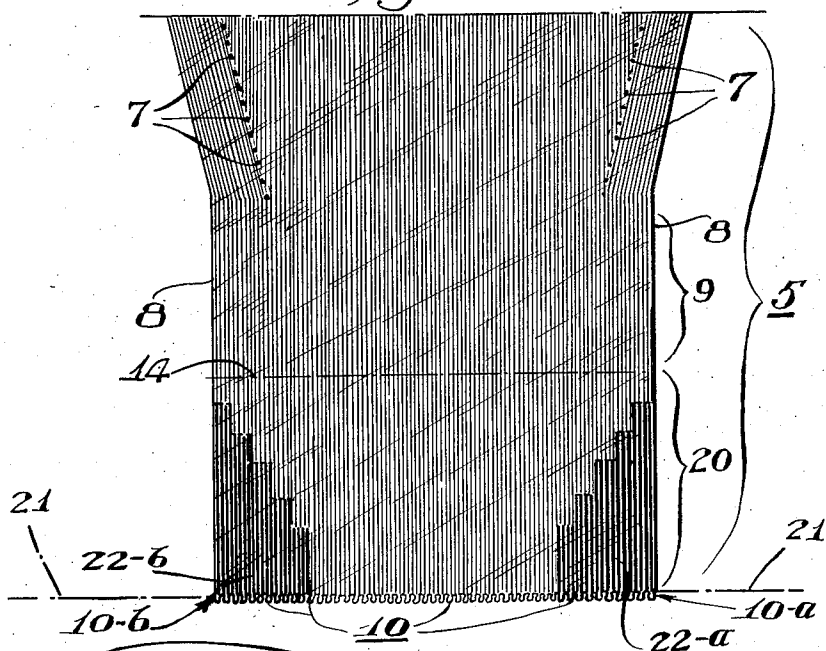


Fig. 6.

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UNITED STATES PATENT OFFICE

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HOSIERY AND METHOD OF MAKING
THE SAME

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5 Claims. (Cl. 66—184)

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The present invention relates to full-length women's hosiery and particularly to sheer hosiery for women's wear.

In the past, full-length hosiery for women's wear has been one of two well recognized types, namely, what has been known as "full fashioned" hosiery, on the one hand, and what has been known as "seamless" hosiery, on the other hand. The "full fashioned" hosiery, as is well known, has been made by knitting both body or "leg" portion as well as the foot portion (including heel and toe) in a flat condition either on the same flat-knitting machine or on two successive flat-knitting machines, that is, on machines in which the bank or row of knitting needles is in general a straight line, and thereafter "seaming" up the flat-knit leg and foot and generally also the flat-knit welt portion at the upper end of the leg portion by a seam running vertically along the back of the stocking where the two selvage-edges of the flat-knit stocking are brought together. This "seaming" operation is generally done on a sewing-machine type machine, and results in a bead-like seam which extends down the back of the welt, leg, ankle and heel and extends along the bottom of the heel and foot and sometimes also along the bottom of the toe-portion.

While the full fashioned type women's stocking has the very desirable feature of being well shaped in respect to the calf of the leg, which shaping is not as well achieved in "seamless" circular-knit stockings, yet such full fashioned hosiery has the disadvantage of having a seam in the tread zone of the foot or beneath the foot of the wearer; making for an uncomfortable feeling, and sometimes causing undesirable irritation.

The seamless hosiery, or what is generally known as circular-knit hosiery, has the advantage of having no seam along the bottom of the foot or in the tread-zone of the foot, but has the disadvantage of not being as well shaped in respect to the thigh, calf and ankle zones of the leg.

The object of the present invention is to so construct a full length hose, that, through it, full shape-conformance at the thigh, calf and ankle zones may be achieved, while, at the same time, eliminating the objectionable bead-like seam in the tread-zone of the foot, and also increasing the durability and strain-resistance of the hose.

With the above objects in view, the present invention contemplates a hose which, though integral in the fullest sense of that term (as that

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term may apply to the now conventional full-fashioned hosiery) is truly "fashioned" or shaped in the thigh, calf and ankle zones, is seamed in said zones, and is devoid of any seam in the tread-zone of the foot and is reinforced in the back by sewn stitches in continuation of the seam.

For the purpose of illustrating the present invention, there is shown in the accompanying drawings forms thereof which are at present preferred, although it is to be understood that the various instrumentalities of which the invention consists can be variously arranged and organized and that the invention is not limited to the precise arrangements and organizations of the instrumentalities as herein shown and described.

In the accompanying drawings, in which like reference characters indicate like parts,

Figure 1 represents a perspective view of one form of hose embodying the present invention.

Figure 2 is a more or less schematic or diagrammatic view of the flat-knit "fashioned" leg or "body" portion, which may also include the welt and which may also include some or all of the ankle portion (all in an open or flat condition), with the terminal course of free loops at the lower end thereof.

Figure 3 represents a perspective view of the "body" or "leg" portion of Figure 2, with the terminal course of free loops thereof at its lower end brought into a circle and facing upwardly as they would be facing when applied or transferred to a circle of needles of a circular-knitting machine, as in the method of the present invention, and showing also the foot as knitted onto said terminal course of free loops upon such circular-knitting machine.

Figure 4 represents a section (schematically shown) on line 4—4 of Figure 1 or on line 4—4 of Figure 6.

Figure 5 represents a fragmentary portion of the lower end-portion of the flat-knit "leg" similar to that of Figure 2, illustrating a modified embodiment of my present invention, in which the flat-knitting is carried down further, namely, to the upper edge of the heel, and includes flat-knit "high splice" portions.

Figure 6 represents a fragmentary view, similar to that shown in Figure 3, in which the flat-knit "leg," including the flat-knit "high splice" portions, is joined directly to the circular-knitted heel portion.

By the method of the present invention, the "leg" portion designated generally by the numer-

al 5 (which may or may not also include the welt portion 6) is knitted, in a flat condition, upon any conventional (or other) "full-fashioned" flat-knitting machine, with the flat form shaped or fashioned by varying the number of needles included in the successive knitted courses, or by "dropping" out needles, as shown by what are commonly known as "narrowing marks" 7 along lines spaced more or less inwardly from the selve-edges 8—a and 8—b of the flat-knit form shown in Figure 2; thereby varying the number of wales in successive courses. It is to be understood, of course, that Figure 2 is merely a diagrammatic representation and is not intended to be "to scale," and that the rows of "narrowing marks" 7 are shown somewhat enlarged merely for purposes of more ready illustration.

Some (more or less) of the ankle-zone or of the generally uniform-circumferenced zone 9, that is, the zone where there is generally no change in the number of needles or wales or in the width of the flat-knit portion, may also be knitted flat (on the flat-knitted machine), in direct continuation of or as a part of the lowermost "narrowed" portion of the "leg" or "body" portion 5. Thus, the flat-knitting may be stopped off directly (or within a course or two) after the last narrowing point 7 nearest the bottom of the stocking, or any number of courses of the uniform-width portion 9 may be knitted right along in the flat-knitting operation, and the flat-knitting stopped off at a point which includes some or all of the portion 9, with or without including the portion 20. Thus, where the ankle-zone 9 is "plain," down to the heel 16, as in the embodiment shown in Figures 1 and 3, the flat-knitting may be stopped off at the line 14, while where a "high-splice" type back is desired in the ankle-zone 9, as in Figures 5 and 6, the flat-knitting is carried through to the line 21, and includes the two "high-splice" portions (22—a and 22—b) adjacent to the selve-edges (8—a and 8—b) of the flat-knit "leg" or "body" 5; in which "high-splice" embodiment of my present invention the flat-knit "leg" or "body" is then "pressed-off" at line 21, instead of at line 14 as in the plain form of Figures 1 and 3.

The terminal row or course of flat-knitted loops 10 (Figures 2 and 5) is then pressed-off and removed from the straight bank or row of knitting needles of the flat-knitting machine and transferred to the needle-circle of a circular-knitting machine of generally the same gauge, either by means of the conventional flat transfer bar, or may be picked off onto a circular transfer bar, or an articulated transfer bar in which the transfer-points or pins can be held in straight alignment while the terminal loops 10 (Figures 2 and 5) are being picked off the needles of the flat-knitting machine and then the transfer bar may be bent into a circle to correspond with the needle-circle of the circular knitting machine onto which the loops 10 are transferred from the transfer bar.

The flat-knitting is preferably brought down to a number of wales and terminal loops 10 more or less equal to the number of needles in the circle of the circular-knitting machine, so that when the flat-knit portion is transferred, the loops 10 will take up every (or generally every) needle of the circle of the circular-knitting machine, and the two terminal loops 10—a and 10—b of the course of free loops 10 will be adjacent to each other.

In the embodiment of my invention shown in

Figures 1 and 3, the balance of the generally uniform-circumferenced portion 9 is thereafter knitted circularly, down to the heel-line 21, and the foot 17 (including the heel 16 and toe 23) is then knitted upon such circular-knitting machine in direct continuation of the ankle-zone 9. The opening 11, left in the toe 23 by the circular-knitting machine is "looped" together along the seam-line 12.

The selve-edges 8—a and 8—b of the leg 5 are seamed up, as is also the welt 6, to form a back seam 13. The welt 6 may be flat-knit, along with the body, and seamed together by the seam 13, or it may be circular-knit (separately) and then "looped" onto the top course of the seamed body 5.

In the embodiment shown in Figures 1 and 3, the back-seam 13 is preferably also extended somewhat below the juncture-line 14, into proximity of the top of the heel 16, namely, into proximity of the point 15, or down the back of the heel 16 to approximately the point 18, so as to give continuity to threads of the back-seam 13, across the juncture between the last flat-knit course and the first circular-knit course, and so to reinforce the back of the hose against pull from above. The seam 13 (in Figures 1 and 3) from the point 14 to the point 15 (or to the point 18, to whichever point it is extended), will, of course, be a mock seam, but will serve not only to carry the seam through to the heel 16 (or even down to the point 18 of the back of the heel), but will also serve to increase durability of the composite hose because the seaming threads will not be stopped at a point where the true seam joining edges 8—a and 8—b ends, but will extend substantially below the point where the true seam ends, and will also create thickened or bead-like line of reinforcement down the back from 14 to 15 (or 18) to absorb and distribute the pull transmitted downwardly from the back of the leg.

While in the drawings, as, for instance, at 14 in Figures 1 and 3, and at 21 in Figure 6, a circle has been shown to indicate the juncture between the last flat-knit course or the terminal row of flat-knit loops 10 and the first course of circular-knit loops, such a circle is not actually visible in the finished product, because the same yarn, gauge and tension is used on both machines.

In the embodiment of my invention shown in Figures 5 and 6, the terminal-course of loops 10 (pressed off on the flat-knitting machine) being at the lower line 21, receive, as the first course of circular-knitted loops (on the circular-knitting machine, after transfer thereto) the circular-knitted course which includes also the first course of the heel 16 (in that portion of the line 21 which is designated by the reference 21—h), and the foot 17, including the heel 16 and the toe 23, are then circular-knitted onto said terminal-course of loops 10, at the juncture-line 21, which, in this embodiment of my invention, is also the "heel-line" of the hose. The opening 11 in the toe 23 is similarly "looped" together along a seam-line like the seam line 12 in Figure 1. In the embodiment of my invention shown in Figures 5 and 6, the same yarn is used in the high-splice portions 22—a and 22—b (in the flat-knitting operation) as is used in the heel portion 16 (of the circular-knitting operation), so that, in this embodiment of the present invention, there will be no appreciable line visible along the line indicated (for purposes of illustration in the drawings) at 21 nor at 21—h, and the

upper half of the heel 16 will appear integral with the high-splice portions 22—*a* and 22—*b*.

In the practice of my above-described method, I may use any full-fashioned spring-beard needle "legger" knitting machine, as for instance the "Reading" full-fashioned legger, or "Karl Lieberknecht" full-fashioned legger, or the "Schubert & Salzer" full-fashioned legger, or the like, for the flat-knitting operation to produce the first stage or phase represented generally in Figure 2, and may use any suitable spring-beard needle type or latch-needle type circular and foot-knitting machine, such as, for example, the "Scott & Williams" seamless hosiery machine or the "Wildman" seamless hosiery machine or the "Hemphill" seamless hosiery machine, for the second stage or phase of my method, to form the foot 17 in direct continuation of the "leg" or "body" of Figure 2 or of Figure 5.

The flat-knitting of the "leg" or "body" of Figure 2 may be 42, 45, 48, 51, 54 or 57 gauge; that is with 28, 30, 32, 34, 36 or 38 needles-per-inch, respectively.

The circular or seamless machine onto which the terminal-course of free loops 10 is transferred is provided with substantially the same number of needles as the number of needles which were operative or active in the terminal-course 10 on the flat-knitting machine, and with substantially the same spacing per inch. Thus, for example, in knitting the "leg" or "body" as shown in Figure 2, or as shown in Figure 5, in 51 gauge, and starting with a 14-inch "head" and terminating in a 9-inch width in the terminal-course 10, the seamless circular machine should have 306 needles in its cylinder and of generally the same spacing per inch, so that the circumference of the needle circle or the effective circumference of the cylinder will be 9 inches with 306 needles uniformly spaced around such circumference (the "diameter" being approximately 9" divided by 3.1416). As another illustration I may use an approximately "3-inch" cylindrical circular and foot-knitting spring-beard or latch-needle machine, with 276 or 280 needles, for the second stage of my method; for 48 to 54 gauge.

Thus, the number of needles in the cylinder of the seamless circular-knitting machine will be more or less equal to the number of courses in the terminal-course 10, and the "diameter" will be the width of the needle bank in the terminal-course 10 divided by 3.1416.

For a seaming operation at 13, I may use any suitable 2-thread (or "2-end") or any suitable 3-thread (or "3-end") seaming machine, such as the 2-end Union Special (No. 41,200) hosiery seamer or the 3-end Union Special (No. 41,300) hosiery seamer.

By my invention, a truly full-fashioned full-length hose, and particularly sheer full-fashioned hose of silk, rayon, nylon or similar filaments may be formed which will have no "seam" nor any thickening or enlargement or bead-like line at the bottom of the foot or in the tread-zone 19 of the foot 17, and which, at the same time will be fully reinforced along the back vertical median line.

The present invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof, and it is therefore desired that the present embodiments be considered in all respects as illustrative and not restrictive, reference being had to the ap-

ended claims rather than to the foregoing description to indicate the scope of the invention.

Having thus described my invention, what I claim as new and desire to protect by Letters Patent is:

1. The method of making sheer full-fashioned hosiery which includes flat-knitting the leg portion or "body" of the stocking including the welt on spring-beard knitting-needles, with opposed selvage edges extending generally wale-wise and varying the number of wales in successive courses to vary the width of the flat-knit body and terminating same in a course of free loops with a number of wales or loops in said terminal-course generally that of the more or less uniform-circumferenced portion at and immediately above the ankle zone, removing said terminal-course of free loops from the straight row of knitting needles of the flat-knitting machine and disposing them generally in a circle and transferring them to a circular-knitting machine of generally the same gauge as that of the flat-knitting machine upon which the leg was flat-knit and adapted to knit circularly and to knit heel, foot and toe portions, and circularly knitting successive courses in direct continuation of the aforesaid flat-knit terminal-course of free loops and knitting the heel portion, knitting the foot portion circularly and without any wale-wise seam and knitting the toe, all in continuation of each other and generally integral with each other, and seaming together the opposed selvage-edges of said body including the welt, and extending the said seaming stitches wale-wise across the juncture between the last flat-knit course and the first circular-knit course.

2. Full-fashioned composite sheer hosiery for women's wear, including flat-knit shaped leg portion having gradually varying number of wales in the different zones of the leg and being of corresponding varying widths in different portions of the leg, said flat-knit leg portion extending downwardly to the zone of the leg which is more or less of uniform circumference, and circular knit seamless foot joined to the bottom of said flat-knit leg portion with the last flat-knit course of the leg portion and the first circular-knit course of the foot portion being directly inter-knitted with each other by the first circular-knit course and forming a continuity without appreciably visible juncture line, and a seam uniting the opposed edges of said flat-knit leg portion generally at the rear of the hose and extending across the juncture of the flat-knit leg portion and the circular-knit foot portion.

3. Full-fashioned composite sheer hosiery for women's wear, including flat-knit shaped leg portion having gradually varying number of wales in the different zones of the leg and being of corresponding varying widths in different portions of the leg, said flat-knit leg portion extending downwardly to the zone of the leg which is of more or less uniform circumference, and a circular-knit seamless foot joined to the bottom of said flat-knit leg portion with the last flat-knit course of the leg portion and the first circular-knit course of the foot portion having substantially the same number of wales therein and being directly inter-knitted with each other by the first circular-knit course, and a seam uniting the opposed edges of said flat-knit leg portion generally at the rear of the hose and extending across the juncture of the flat-knit leg portion and the circular-knit foot portion and the circular-knit foot portion down to and across the back

of the heel, to a terminal point in the vicinity of the tread-portion of the heel; the seaming thread so extending down the back of the heel forming a bead-like or slightly thickened line beneath said juncture in simulation of and in continuation of the seam above said juncture and serving to reinforce the juncture at the lower terminal of the actual seam and serving to provide a vertical line of reinforcement against vertical pull at the rear of the stocking.

4. The method of making sheer full-fashioned hosiery which includes flat-knitting the leg portion or "body" of the stocking with opposed selvedge edges extending generally wale-wise, and varying the number of wales in successive courses to vary the width of the flat-knit "body," thereby gradually reducing the width of said flat-knit "body" to a width generally equal to the circumference of the more or less uniform-circumferenced portion at and immediately above the ankle-zone, flat-knitting the portion of said "body" corresponding to said ankle-zone and incorporating a heavier yarn in gradually increasing number of wales immediately adjacent each of the two selvedge edges in successive courses of said narrowed ankle-zone portion of said "body," down to the heel-line of the hose, with the heavier yarn extending inwardly from each of the selvedge edges a total or combined number of wales in the last flat-knit course more or less the same as the number of wales in the first course in the subsequently circular-knit heel, pressing off said flat-knit "body" at said heel-line with a course of free loops, removing said terminal-course of free loops from the straight row of knitting needles of the flat-knitting machine and disposing them generally in a circle and transferring them to a circular-knitting seamless hosiery machine of generally the same gauge as that of the flat-knitting machine upon which said "body" was flat-knit and adapted to knit circularly and to knit a foot including heel and instep portions, and thereafter knitting heel and instep portions, and toe portions of foot, in direct continuation of the aforesaid flat-knit terminal-course of free loops without any appreciable line of demarcation where the last flat-knit course is interknitted with the first circular-knit course and without any wale-wise seam in the tread-zone of the foot, with the heel of the same weight yarn and of more or less the same number of wales as that covered by the heavier yarn in the terminal-course of the flat-knit

"body," seaming together the opposed selvedge edges of said "body," and extending the seaming stitches across the juncture-line between the last flat-knit course and the first circular-knit course.

5. Full-fashioned sheer composite hosiery for women's wear, including flat-knit shaped "body" portion having gradually varying number of wales in the different zones of the "body" and being of correspondingly varying widths in different portions of the "body," said flat-knit "body" portion extending downwardly to the heel-line, the lowermost portion of said "body" having a heavier thread incorporated in a gradually downwardly increasing number of wales adjacent to the selvedge edges thereof, so as to form gradually widening areas along said selvedge edges, near the bottom of said "body," which will be more wear-resistant, and a circular-knit seamless foot, including heel and toe, joined to the bottom of said flat-knit "body" portion with the last flat-knit course of the "body" portion and the first circular-knit course of the foot portion being directly inter-knitted with each other by the first circular-knit course and forming a continuity therewith without an appreciably visible juncture-line, said heel having a circumferential extent more or less the same as the circumferential extent of said heavier-yarned portions of the leg and being of generally the same yarn, and a seam uniting the opposed edges of said flat-knit "body" portion generally at the rear of the hose and extending downwardly across the juncture of the flat-knit "body" portion and the circular-knit foot portion, forming a mock seam at the back of the heel in direct continuation of the true seam at the back of the "body" portion and constituting a reinforcement of the aforesaid juncture.

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