

[54] **STOCKING WITH SOFT INNER THIGH AREA**

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[58] Field of Search.....66/172 R, 172 E, 66/173, 183, 178 A, 178 R, 192, 193; 2/226, 240, 241; 128/519, 524, 525, 530, 539, 165

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[57] **ABSTRACT**

A full length stocking of knitted fabric including an elastomer-containing yarn which exerts a compressive effect on that portion of the leg covered by the stocking boot. In contrast to a typical stocking of this type which has an attached garter band of elastic webbing encircling the upper thigh, a stocking is disclosed in which that portion of the garter band which covers the plexus of deep and superficial blood vessels in the inner thigh is replaced with a soft fabric such as that in the stocking boot.

**6 Claims, 9 Drawing Figures**

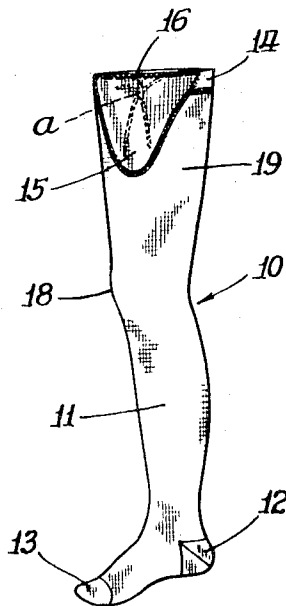




Fig. 4.

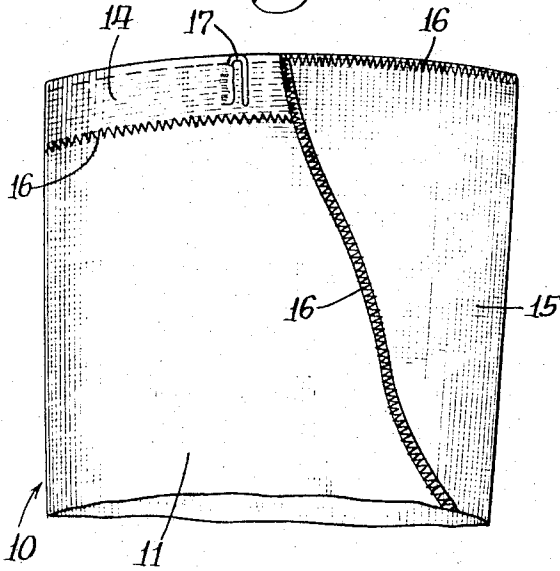


Fig. 5.

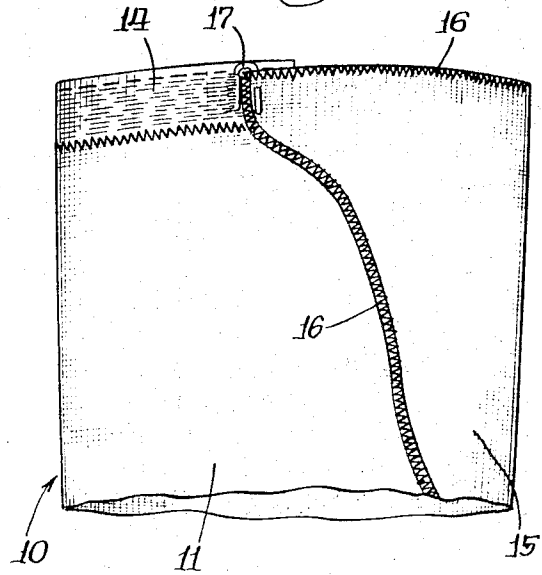


Fig. 7.

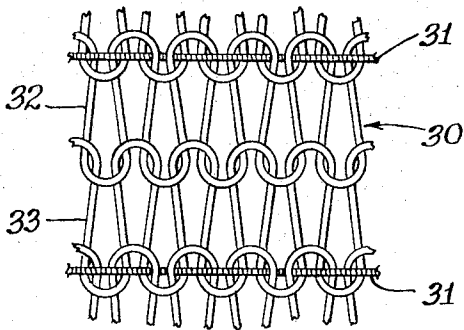


Fig. 8.

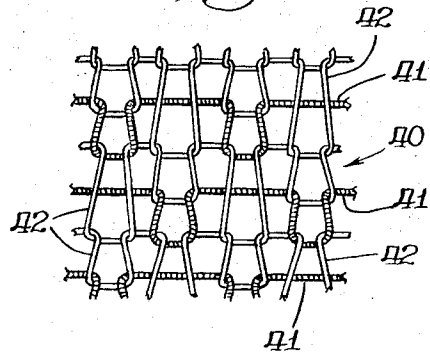
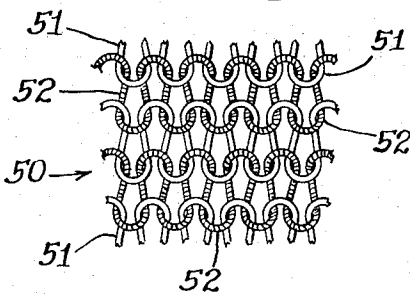


Fig. 9.



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## STOCKING WITH SOFT INNER THIGH AREA

## BACKGROUND OF THE INVENTION

Full length therapeutic stockings and so-called tired-leg stockings of the type including elastomer-containing yarns which exert a compressive effect on the leg portion covered by the stocking boot are well known. They have been constructed extending in lengths ranging from midthigh to the gluteal furrow in a great many constructions from a great variety of elastic fabrics. They have, for instance, been made from powernet fabric, such as is described in U.S. Pat. No. 2,960,855, for example, cut to shapes resembling when relaxed the blanks of full-fashioned non-elastomeric stockings, being somewhat narrowed from such blanks. These powernet blanks and similarly shaped knitted full-fashioned stocking blanks incorporating elastomeric yarns either in the knitted stitches or inlaid in non-elastomeric yarn stitches are generally seamed up the back with various loop, flatlock or overedge stitches to form finished stockings. Circular knit stockings of non-elastomeric yarn jersey stitches with elastomer yarn inlaid therein are disclosed in the Herbert Knohl U.S. Pat. No. RE 25,046 originally issued Dec. 6, 1960. Other circular knit constructions including jersey knit courses of elastomer-containing yarn alone and in combination with one or more course rounds of jersey stitches of non-elastomeric yarn are also well known, as are those with courses of jersey stitches and floats of elastomer-containing yarn alternating with jersey stitches of non-elastomeric yarn. Run-resistant elastic fabric stockings have also been proposed.

With regard to the compressive range of stockings presently marketed, the degree of compression exerted has been over a relatively large range. It is generally understood, however, that in a properly fitted stocking the pressure should be greater at the ankle than at the stocking top whether the stocking be possessed of the relatively reduced compression typical of therapeutic stockings used in hospitals for the prophylactic treatment of the thromboembolic disease or of so-called tired-leg stockings or of the relatively higher compression typical of stockings recommended and used in the treatment of varicosities. In most of these stockings the pressure has been gradually reduced from the ankle to the stocking top when the stocking is properly fitted. One stocking has appeared in the market, however, in which pressure exerted in the knee area has been reduced below that exerted on portions of the wearer's leg immediately adjacent the knee area. Full length stockings of the compressive type, regardless of the degree of compression exerted on the wearer's leg, have two problems. Because of extreme variation in the upper thigh dimensions of wearers even when other portions of the leg fall within a particular standard size range, full length stockings have been difficult to fit in the thigh area. As a result, manufacturers of non-custom stockings tend to make garments which will not bind the upper thighs of any significant proportion of wearers whose legs otherwise require a particular size stocking. The tendency, then, is to make an enlarged thigh stocking whether it is enlarged by modifying a knit full-fashioned blank or a cut powernet blank or is circular knit and enlarged by a wedge shaped insert. Such enlargement, however, sometimes causes the stocking to lose its self-support feature at the top. It is

common practice to make non-elastomeric stockings self supporting by attaching a thigh encircling garter band of elastic webbing whose leg-contacting inner surface is a non-slip material such as urethane elastomer. This band may be attached under the stocking fabric but in most instances is attached in edge abutting relationship to the stocking welt, increasing the stocking length by the width of the band.

Full length stockings which have to be supported by an encircling garter band have had one undesirable feature, however. The elastic band, which is quite stiff and bears against the leg with some pressure, tends to irritate the upper inner thigh and to constrict the deep and superficial blood vessel plexus there.

## SUMMARY OF THE INVENTION

A primary object of this invention is the provision of a self-supporting full length elastomeric yarn-containing stocking which is nonbinding over a wide range of upper thigh circumferences when worn and which has a soft and readily conformable elastomeric yarn-containing fabric area available for covering the blood vessels which are concentrated in the wearer's upper inner thigh.

A further object of the invention is the provision of a stocking meeting the primary object in which the soft and readily conformable elastomeric yarn-containing fabric area is so located that by slightly twisting the stocking, the area may be caused to cover the upper inner thigh of either the right or the left leg.

A still further object of the invention is the provision of means attached to the stocking top whereby the circumference of the stocking may be overlapped and fastened producing an effective circumference which properly fits when otherwise the stocking would be too large in the upper thigh for the particular leg being fitted.

The primary object of the invention is attained in circular knit garments by sewing a band of the usual garterlike elastic webbing in edge abutting relationship to the stocking top welt with the band ends sewn to and separated by a wedge, fastened point downward, into a slit in the stocking upper thigh, the wedge top and the band top being aligned and forming the stocking top. The wedge, which should be of a soft and readily conformable elastic fabric either in a single layer or a double layer, serves two functions. It reduces the binding in the upper thigh area when worn to a very small proportion of those who are otherwise fitted by a given size stocking, and it also constitutes the area which normally covers the deep and superficial blood vessel plexus in the upper inner thigh. The wedge may be centered in the area of the inner upper thigh but this placement necessitates the manufacture of right and left leg stockings. Optionally, the wedge may be inserted centered over the front or back fold line of the stocking from which position it may be rotated about a quarter turn to cover the inner thigh of either the right or left leg. The wedge sides are secured by sewing to the sides of the stocking slit and to the ends of the elastic webbing band by overedging or other appropriate stitching. A preferred wedge fabric is one in which elastomeric yarns are inlaid into jersey knit stitches with the elastomeric yarns extending circumferentially when the wedge is secured in place. Double fabric

wedges are preferred, with the top folded edge forming a roll-resistant stocking top in the wedge area. Doubled fabric preferably should be folded so that the normal outside surface is face to face and the normal inside surface forms the wedge's outer surface. Where a single thickness of fabric is utilized for the wedge, the top edge should be a soft selvage or it should be hemmed or overedged or sealed with a soft thermoplastic to make a ravel-resistant soft edge. A very effective wedge is in the form of an equilateral triangle about 6 inches plus the garter band width on each side.

Other variations may be made from circular knit stockings with finished or welted top edges and enlarged upper thigh portions by fastening to the inside of each a webbing band, corrugated slip-resistant surface exposed, and with a gap between the ends. The top edge of the band and stocking need not be but preferably are approximately aligned.

When an elastic blank is formed either by cutting from powernet or other suitable fabric or by full-fashioned knitting, the blank may be altered to include sufficient material in the upper thigh area to prevent binding. A projection above the top of the normal blank may be made in the area intended to cover the upper inner thigh or alternatively in the front center of the blank. If the top edge is to be double, the projection should be double the width of the garter band; if single, the edge should be finished and the width should be the same as the garter band width. In this embodiment the partial circumference of elastic webbing band may be sewn in edge to edge abutting relationship to the stocking top except in the area of the projection with the bare corrugated slip-resistant surface of the band inside. Thereafter the ends of the band and the adjacent ends of the projection either in single or doubled-over form are sewn together, preferably in abutting relationship. A modification of this cut and sew or full-fashioned method involves sewing the band slip-resistant surface exposed inside a normal stocking top with a gap between the ends thereof, or if a single width projection is present, folding down the projection and sewing the projection ends to the ends of the band.

The stockings of the invention may be made adjustable in the upper thigh area by fastening means which permit that portion of the stocking top not containing the band of elastic webbing to be folded over the band and secured in place by a hook which is secured to the band and is caused to pierce the folded-over fabric. One or more separated hooks may be used but preferably a hook on either side is provided. The fabric is of loose enough construction as to permit piercing by the hook without injury.

#### BRIEF DESCRIPTION OF THE DRAWINGS

FIGS. 1 and 2 illustrate respectively a typical stocking of the invention viewed from the inner leg side and the front.

FIG. 3 illustrates the top portion of a preferred form of circular knit stocking of the invention.

FIGS. 4 and 5 illustrate views of the top of a typical stocking before and after the upper thigh circumference has been adjusted.

FIGS. 6, 7, 8 and 9 illustrate typical elastic fabrics, including elastomeric yarns suitable for the boot portions of the stockings of the invention.

Referring to the drawings in greater detail, FIGS. 1 and 2 illustrate respectively the inner leg side and front view of a typical circular knit stocking 10 of the invention as worn, with a boot 11, a knee 18, a thigh 19 and a soft, readily conformable upper thigh insert 15, all made of knitted elastic fabric. The reciprocated heel 12 and the toe 13 are of typical heel and toe construction made from typical yarns preferably of stretch nylon. A partial round of elastic retention band 14 made with a corrugated slip-resistant inner surface of urethane elastomer is sewn to the upper narrow welt of the stocking proper projecting above the stocking welt so that its top forms a continuous line with the top of insert 15. The insert is overedged around its top edge and around its juncture with the slit stocking thigh 19 and with band 14 by stitching 16. The insert 15 preferably is symmetrical about the front or rear center line of the stocking so that it may be twisted in proper position to locate the insert 15 over the juncture "a" at the inner thigh, of the femoral, great saphenous, and superficial lateral cutaneous, pudendal and iliac veins. This plexus occurs approximately mid-way between the front of the thigh and the mid-inner thigh as depicted in FIG. 1.

FIG. 3 illustrates a preferred construction in which the insert wedge 15a is of doubled fabric. The fold line 15b constitutes a portion of the top edge of the stocking. The fold is preferably made with the normal fabric face folded in face to face contact.

FIGS. 2, 4 and 5 illustrate the stocking of FIG. 1 with a hook 17 which is shown sewn to a portion of the band 14 adjacent the insert 15. The hook shown disengaged in FIGS. 2 and 4 is shown in FIG. 5 engaging a folded-over portion of the top margin of the insert 15. This feature, which may be incorporated on either or both sides of the insert 15, makes the upper thigh stocking portion adjustable in circumference.

FIG. 6 shows a typical fabric 20 suitable for the stockings of the invention, in which covered elastomeric yarns 21 are formed into courses of knitted jersey stitches alternating with floats, the floats being across different wales in adjacent rounds. Yarns 22, which may be stretch synthetic yarns or usual nonstretch stocking yarns such as nylon, silk, cotton, rayon, polypropylene and the like, are formed into jersey courses. The elastomeric yarn 23 is shown inlaid into one of the jersey courses of yarn 22.

FIG. 7 is the preferred typical fabric 30 suitable for the stockings of the invention. The yarns 32 are preferably of Z-twist stretch nylon, while yarns 33 are preferably of S-twist stretch nylon but may be any non-elastomeric yarn. A covered elastomeric yarn 31 is inlaid preferably into every other course as shown but optionally in every course of jersey stitches.

FIG. 8 is another typical fabric 40 of the invention, in which covered elastomeric yarns 41 are formed into knitted jersey stitches alternating with floats, the floats being across different wales in adjacent rounds. Yarns 42, preferably non-elastomeric stocking yarns such as synthetic or natural yarns including stretch synthetic yarns, are formed into course rounds of jersey stitches.

FIG. 9 is another typical fabric 50, suitable for the stockings of this invention. The jersey knit fabric has alternating rows of stitches of synthetic or natural yarns 51 and covered elastomeric yarns 52.

## EXAMPLE 1 MEDIUM SIZE

Using 10 filament stretch nylon 30/2 yarn, made up and knitted an automatic welt having a fully stretched circumference of 39 inches in the usual manner using a 401 needle Scott & Williams AMF 3 ¼ inches stocking knitting machine. Immediately after the transfer, exchanged yarns to 70/1, 17 filament Z-twist nylon 66 yarn on one feed and 70/1, 17 filament S-twist nylon 66 yarn on the other feed. Frame circumference fully stretched measured 42 inches. This frame was maintained to a point approximately at the upper calf, at which time the frame was reduced abruptly because of machine limitations but preferably within five to 10 courses to 32 inches fully stretched. This frame was maintained for approximately 120 course. The frame thereafter was gradually reduced at a constant rate by reducing stitch size until at the ankle the frame circumference measured 28 inches fully stretched. Thereafter, for 150 course rounds the frame remained at 28 inches circumference fully stretched. Thereafter the frame was gradually increased to the midpoint of the instep, at which point the frame measured 32 inches in circumference fully stretched. Thereafter a reciprocated heel was knitted in the usual manner. After completion of the heel, circular motion was resumed, the stitch being gradually reduced to a point between the heel and the toe to a circumference of 28 inches fully stretched. This circumference was maintained to the ring toe. Thereafter the ring toe including run-resist courses were knitted in the usual manner. Thereafter a reciprocated toe was knitted in the usual manner.

After the nylon frame was properly knitting, the elastomeric yarn was incorporated as follows: Immediately following completion of the top welt, the inlay feed was activated and a single covered elastomeric yarn having a 280 denier spandex core and a covering of 70/1, 34 filament stretch nylon 66 was inlaid in the course of jersey stitches knitted-off on the center feed. The elastomer should be metered in at a rate sufficient to produce a fabric having a fully stretched circumference of 38 inches. Knitting the frame including the inlaid elastomeric yarn continued at that stretched circumference to a point just above the calf, at which point the amount of metered elastomeric yarn was gradually reduced to the point at the upper calf where the circumference was 27 inches fully stretched. The elastic yarn metering rate was maintained constant for about 100 nylon courses. Thereafter the elastomeric yarn was gradually increased per round to the midpoint of the instep, at which point the stocking had a fully stretched circumference of 26 inches. At that point the elastomeric yarn was taken out and the reciprocated heel knitted. After completion of the heel, the elastomeric yarn was reintroduced in the usual manner and gradually decreased in amount per round to a point between the heel and toe, at which point the stocking foot fully stretched measured 22 inches in circumference. The elastomeric yarn was fed at this latter rate constantly for 60 course rounds, after which the elastomeric yarn rate was gradually increased to the ring toe, at which point the elastomeric yarn was taken out and the ring toe including run-resist courses were knitted in the usual manner. Thereafter a reciprocated toe was knitted and the toe

opening in the sole under the base of the toes was stitched closed.

The finished stocking was preboarded at 220° F. to 230° F. for 45 seconds; the total steam treatment and drying cycle lasted approximately 2 ½ minutes; the total time, including build-up, was about 3 minutes. (Temperatures above 240° F. are to be avoided if the most desirable products are to be obtained.) Thereafter a 1-inch wide band of typical elastic webbing of the type used for stocking garter tops was wrapped around the stocking, the corrugated slip-resistant urethane elastomer side of the band outward. The ends of the band abutted at the front fold of the stocking but were not fastened together. The top of the stocking and the top of the band were sewn together in this position by overedge stitches. The band was then folded upward so that it stood up from the stocking top, with the corrugated side in. A fastening hook, similar to those illustrated in FIGS. 2, 4 and 5, was then sewn as illustrated to each side of the band about 1 ½ inches from the band ends. (The distance may be anywhere from three-fourths inch to 2 inches.) The stocking was then slit between the band ends along the front fold for about 6 inches. A diamond shaped piece of the same fabric as the stocking boot and about 6 inches across and 13 inches long, with the inlaid elastomeric yarn running transversely, was folded to make substantially equilateral triangle of doubled fabric. This triangular double-fabric wedge was inserted into the slit in the stocking, point downward, with its folded edge in alignment with the top of the band, and was overedge stitched, as is illustrated in FIG. 3, to the sides of the slit in the stocking and to the ends of the band of elastic webbing to complete the stocking.

## DESCRIPTION OF THE PREFERRED EMBODIMENT

The stocking described in Example 1 is the preferred embodiment but for some purposes other yarns than those used may be preferred by others.

We claim:

1. A full length stocking having a circumferentially elastic boot portion including elastomeric filament containing elastic yarn, a narrow elastic band formed of non-slip elastomeric webbing material attached to the top of said stocking extending around a major portion only of the circumference of said top, the ends of said band being separated by an area of soft conformable circumferentially elastic fabric which extends from the top of the stocking downwardly for a substantial distance below the band for covering the plexus of deep and superficial blood vessels in the upper inner thigh of a wearer.

2. The stocking of claim 1 wherein the area separating the band of elastic webbing is in the form of a wedge shaped insert sewn into a downward slit in the stocking thigh portion.

3. The stocking of claim 2 wherein the insert is of doubled fabric.

4. The stocking of claim 1 wherein the elastic fabric area separating the ends of the band of elastic webbing is of jersey stitches of non-elastomeric yarn with elastomeric filament containing yarn inlaid in the jersey stitches.

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5. The stocking of claim 4 wherein the boot fabric is of courses of knitted jersey stitches of non-elastomeric yarn into some of which elastomeric filament containing yarn is inlaid.

6. The stocking of claim 4 wherein the boot fabric comprises courses of jersey knit stitches of non-

5 elastomeric yarn alternating with courses of jersey knit stitches of covered elastomeric yarn alternating with floats thereof, next adjacent courses of elastomeric yarn having the floats thereof across different wales of said fabric.

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