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Engelhard

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[54] WARP KNIT FOOT COVERING

[75] Inventor: **Otto Engelhard,** Forest Hill, N.Y.

[73] Assignees: **Mark Tarnoff; Fleurette Tarnoff,** Erdenheim, Pa.

[22] Filed: **June 1, 1971**

[21] Appl. No.: **148,593**

[52] **U.S. Cl.** **66/195,** 66/185

[51] **Int. Cl.** **D04b 21/00**

[58] **Field of Search** 66/190, 192, 193, 66/195, 185, 169, 170, 171

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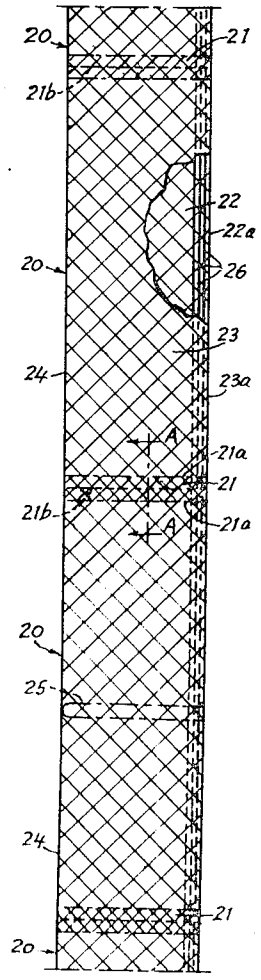
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Primary Examiner—Ronald Feldbaum
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[57] **ABSTRACT**

A continuous connected series of warp knit foot coverings formed of an endless length of relatively narrow warp knit fabric of wales and courses having relatively short alternate sections of single wall construction knit in continuation of relatively long intervening sections of double wall construction, the double wall fabric section being U-shaped in coursewise cross-section, the single wall fabric sections being adapted to be coursewise severed midway of their walewise length thereby to produce fully formed individual foot coverings of each of the double wall fabric sections and of the severed portions of the single wall fabric sections adjacent thereto. The walewise extending edges of the double wall fabric sections are selvaged and a plurality of walewise extending elastic yarns are incorporated in each wall of the double wall fabric sections adjacent to the edges thereof, the elastic yarns also being incorporated in the single wall fabric sections.

5 Claims, 21 Drawing Figures



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3 Sheets-Sheet 1

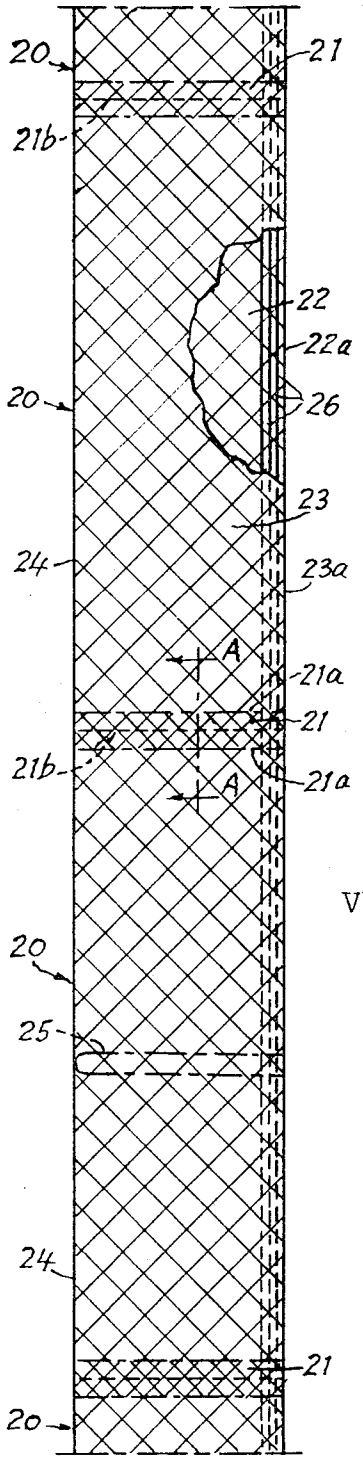


Fig. 1.

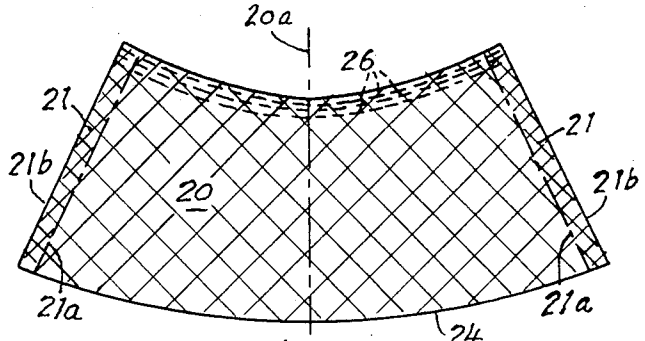


Fig. 2.

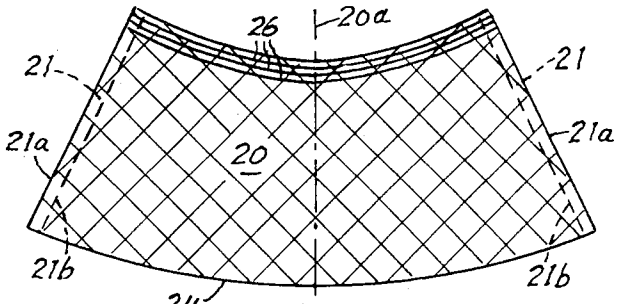


Fig. 3.

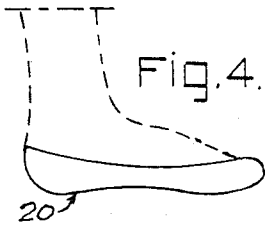


Fig. 4.

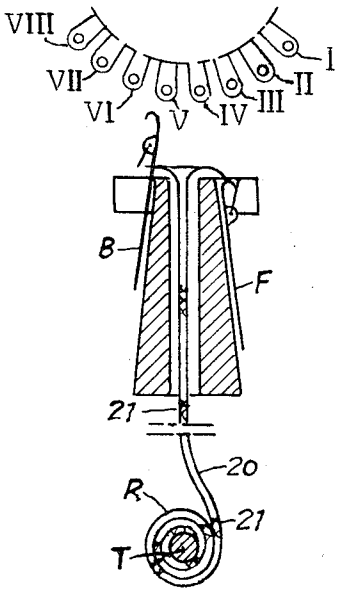


Fig. 6.

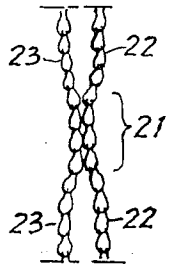


Fig. 5.

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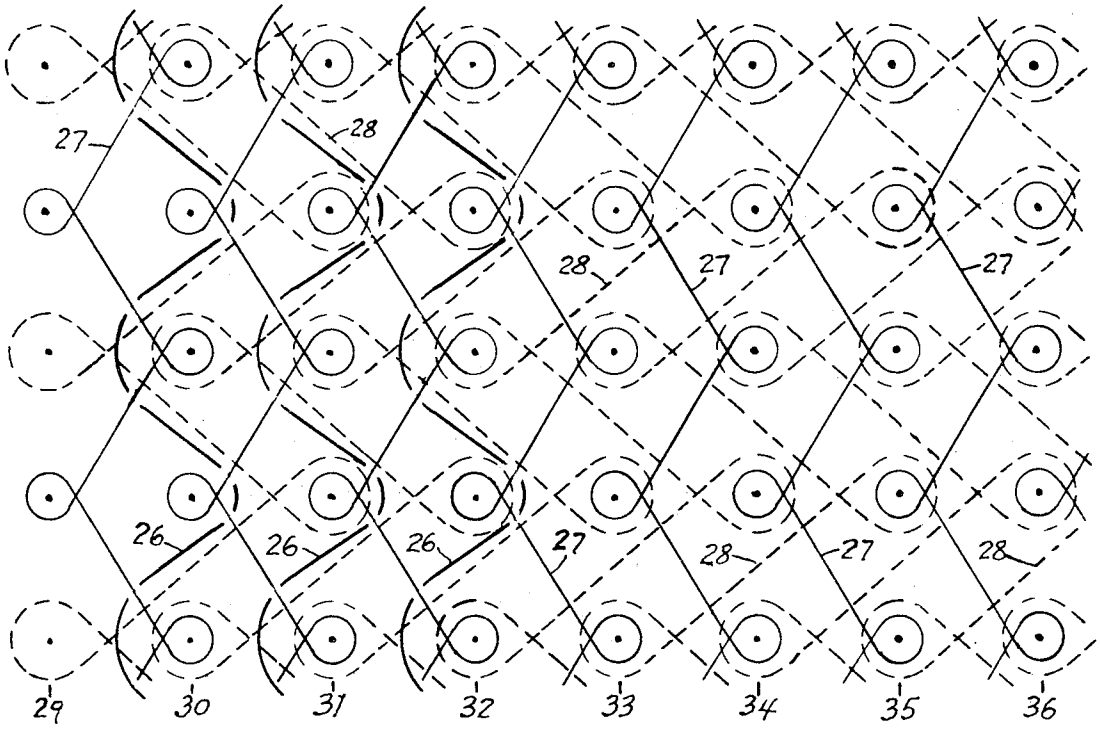


Fig.7.

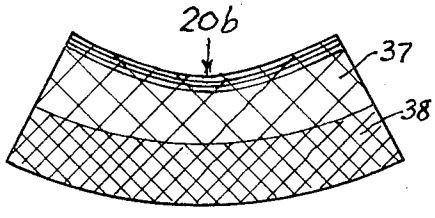


Fig.14.

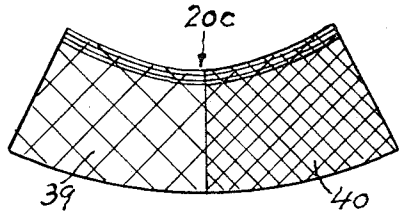


Fig.15.

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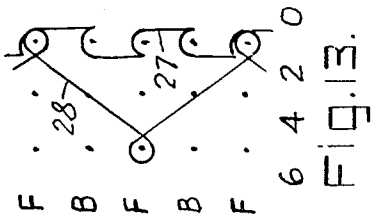


Fig. 13.

III	2/0	2/2	4/6 4/4
II	0/2	2/0	0/2 2/0

Fig. 13A

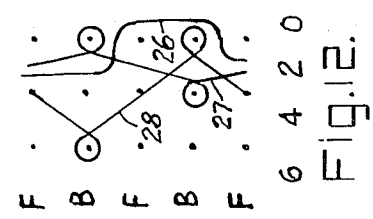


Fig. 12.

VI	2/2	0/0	0/0 2/2
V	2/2	2/4	2/2 2/0
IV	2/2	2/0	2/2 4/6

Fig. 12A

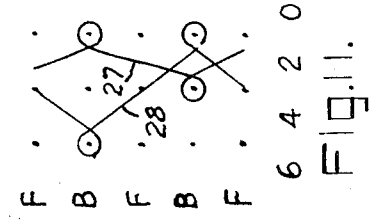


Fig. 11.

V	2/2	2/4	2/2 2/0
IV	2/2	2/0	2/2 4/6

Fig. 11A

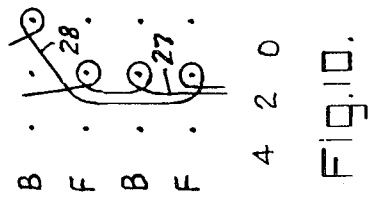


Fig. 10.

VIII	4/2	4/4	4/4 2/0
VII	4/4	4/2	4/2 4/4

Fig. 10A

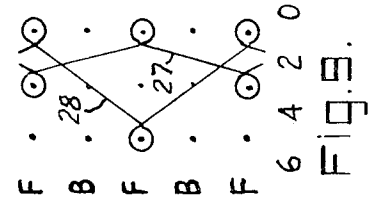


Fig. 9.

III	2/0	2/2	4/6 4/4
II	2/4	2/2	2/0 2/2

Fig. 9A

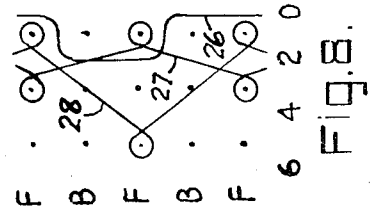


Fig. 8.

III	2/0	2/2	4/6 4/4
II	2/4	2/2	2/0 2/2
I	0/0	0/0	2/2 2/2

Fig. 8A

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WARP KNIT FOOT COVERING

The present invention relates generally to the art of knitting and more particularly to warp knit foot coverings of the type which provide a covering for the toes, the back of the heel, the sole and a portion of the sides of the foot of the wearer of the foot covering.

The principal object of the present invention is to provide warp knit foot coverings of the type above set forth wherein the foot coverings are formed as a continuous connected series thereof and wherein fully formed individual ones of the foot coverings are provided when the foot coverings of the series thereof are separated by severing the connection between adjacent ones of the series of foot coverings.

It is also an object of the present invention to provide severed individual warp knit foot coverings of the type above set forth which comprise a rectangularly shaped first warp knit section of fabric of wales and courses of which the walewise extending edges are selvaged, wherein the first fabric section if formed in folded over condition along central wales during the knitting thereof thereby to provide a pair of rectangularly shaped similar smaller second sections of fabric, wherein the end portions of the second fabric sections are coursewise joined during the knitting thereof, and wherein the terminus of the joined end sections are severed.

With the above and other objects of the invention in view, as will be apparant from the following detailed description of preferred embodiments thereof to be read in connection with the accompanying drawings, the invention resides in the warp knit foot coverings as made in a continuous connected series thereof and in the individual foot coverings formed by severing the connection between adjacent ones of the series thereof, as set forth in the accompanying specification and in the appended claims.

In the drawings:

FIG. 1 shows a number of the warp knit foot coverings of the present invention as they appear in a portion of a continuous connected series of the foot coverings with the fabric forming the foot coverings in extended condition,

FIG. 2 shows a single one of the foot coverings of the present invention as formed by cutting the fabric of FIG. 1 at designated intervals,

FIG. 3 shows the foot covering of FIG. 2 as turned inside out,

FIG. 4 shows the foot covering of the present invention upon the foot of a wearer thereof,

FIG. 5 is a schematic showing of a section of the fabric as taken along line A—A of FIG. 1,

FIG. 6 is a schematic showing of the needle bars and thread guide bars of the machine upon which the fabric of FIG. 1 is made,

FIG. 7 is a schematic stitch diagram of a portion of the fabric of a foot covering showing the stitch arrangement used therein and including elastic yarns incorporated unknit in the fabric curing the knitting thereof,

FIGS. 8 through 13 are notations of the stitches used in the several portions of the fabric of the foot covering,

FIGS. 8A through 13A are notations of the thread guide bar movements of the machine which are used in the formation of the stitches shown in FIGS. 8 through 13, respectively, and

FIGS. 14 and 15 show modified forms of the present foot covering.

In the present invention the individual foot coverings are made in the form of a continuous connected series thereof. Such a connected series of foot coverings is shown in FIG. 1 wherein the fabric forming the connected series of foot coverings is in the stretched condition it assumes as it extends from the machine knitting the same to the take-up of the machine. Each of the individual connected foot coverings is indicated at **20.**

The fabric of the foot coverings is preferably of warp knit construction and is preferably made upon a two needle bar Raschel machine having eight yarn guide bars, as schematically shown in FIG. **6.** In this machine the yarn guide bars are numbered I through VIII and the needle bars, which reciprocate alternately, are indicated at B for the back needle bar, and at F, for the front needle bar. The fabric made upon the machine extends from the needles thereof to a conventional take-up roller T upon which the fabric is wound to form a roll R thereof.

At designated intervals the fabric of FIG. **1** is knit in the form of a relatively short transversely extending band of single wall flat construction, as indicated at **21** between lines **21***a*, **21***a*, while the fabric between bands **21** is knit in the form of a relatively long transversely extending band of double wall construction, as indicated at **22** and **23,** and which is U-shaped in cross-section. The spaced walls **22, 23** and the single wall **21,** which is formed by joining the spaced walls together, appears in FIG. **5.** The fabric walls **22** and **23,** of generally rectangular configuration, have selvages **22***a* and **23***a*, respectively, at the open sides of their U-shape while at their closed sides the walls are joined as at **24.** The cross-sectional U-shape of the walls **22, 23** is indicated schematically by the dot dash line **25** in FIG. **1.**

Adjacent each selvage **22***a* and **23***a*, the walls **22, 23** are provided with a plurality of relatively closely spaced walewise extending elastic yarns **26** of suitable denier which are incorporated in the fabric during the knitting thereof. The elastic yarns **26** are also incorporated in bands **21.** While only three elastic yarns are shown in each wall of the foot covering, it will be understood that any desired number and spacing thereof may be used. The elastic yarns **26** are barely visible on the outer non-adjacent sides of the walls **22, 23** of FIG. **1** and are in raised rib-like condition on the adjacent inner sides of the fabric walls.

The individual foot coverings **20** of the present invention are each completely formed by simply severing the spaced bands of flat fabric **21** along the designated coursewise extending lines **21***b* which are midway of the bands **21.** Each foot covering is formed of a pocket defined by the walls **22, 23** which are joined at **24** and at each end by the severed portions of the adjacent bands **21.** Each foot covering assumes the curved shape shown in FIG. **2** due to the contraction of the elastic yarns **26** to their relaxed condition, these yarns having been tensioned when incorporated in the fabric. It will be noted that the foot covering is symmetrical about a vertical center line **20***a*. Since the fabric of band **21** is of warp knit construction, the cut ends thereof along lines **21***b* will not ravel or run back.

While the foot covering may be worn in its condition of FIG. **2,** it may also be turned inside out, as in FIG. **3,** before it is worn. When turned inside out the covering presents a neater appearance with the cut portions

of bands 21 hidden from view. In the condition of FIG. 3, the elastic ribs 26 are on the outside where they will not be in direct contact with and will consequently not irritate the foot of the wearer of the covering. The cut ends of the bands 21 on the inside of the covering do not bother the wearer.

While the covering may be knit of any suitable yarn, it is preferred that stretch yarns be used so that the body of the covering of a single size may be suitably stretched to snugly fit over the foot of any wearer thereof. The elastic yarns 26 will cause the selvaged portions of walls 22, 23 to cling tightly to the sides of the foot of the wearer. As shown in FIG. 4 this type of foot covering is of such dimensions as to cover the toes, the lower part of the heel, the bottom and part of the sides of the foot, whereby the covering is particularly useful when worn by women inside of low cut shoes.

The fabric of the foot covering may be of any desired warp knit construction and one type thereof is shown in FIG. 7 wherein a series of individual yarns 27 are each knit in alternate ones of adjacent wales in alternate courses and wherein a series of individual yarns 28 are each knit in alternate ones of spaced wales in alternate courses. The fabric of yarns 27, 28 shown in eight wales 29 through 36 of FIG. 7 is representative of the base fabric of the foot covering. The elastic yarns 26 are shown incorporated unknit in wales 30, 31 and 32 of this base fabric and this is representative of the incorporation of the elastic yarns in both walls 22, 23 adjacent their selvages 22*a*, 23*a*.

The stitch notation of wales 30, 31 and 32 adjacent selvage 22*a* is shown in FIG. 8 while the notation of the guide bar movements therefor is shown in FIG. 8A. A cycle of the machine comprises a reciprocation of each needle bar F and B thereof. It will be seen that yarns 27 and 28 of the guide bars II and III are fed to and are knit only on the front needle bar F during a first half of each cycle while at the same time elastic yarns 26 of guide bar I are positioned between the needles of the front bar F to be incorporated unknit by the stitches of yarns 27,28.

The stitch notation of the remaining portion of wall 22, as represented by wales 33 through 36 of FIG. 7, is shown in FIG. 9 while the guide bar notation therefor is shown in FIG. 9A. It will be seen that this also is knit of yarns 27, 28 from guide bars II, III upon only the front bank of needles F during the first half of each cycle and is similar to FIGS. 8 and 8A except for the elastic yarns 26.

The stitch arrangement of portion 24 which connects the walls 22, 23 is similar to that of the walls themselves and appears in FIG. 10 while its guide bar notation is in FIG. 10A. It will be seen that yarns 27, 27 from guide bars VII and VIII are knit on the needles of both front and back bars F and B. This arrangement of FIGS. 10 and 10A results in the stitches of connecting wales 24 being of similar appearance to those of the fabric of walls 22, 23.

The fabric of wall 23 is similar to that of wall 22 and its stitch notation appears in FIG. 11 while its guide bar notation is shown in FIG. 11A. It will be seen that yarns 27, 28 from guide bars IV and V are herein knit only upon the needles of the back needle bar B during the second half of each knitting cycle.

The fabric containing elastic yarns 26 adjacent selvage 23*a* is similar to the fabric adjacent selvage 22*a* and its stitch diagram appears in FIG. 12 while its guide bar notation is shown in FIG. 12A. It will be seen that this differs only in that the yarns 27, 28 from guide bars IV and V are knit only upon the needles of back needle bar B during the second half of each knitting cycle and the elastic yarns 26 are fed from guide bar VI between needles of the back bar B.

The single wall flat fabric bands 21 are formed as a result of a variation in the movement of guide bar II to vary the feeding of yarns 27 and the knitting thereof while the remaining guide bars continue to feed their yarns for knitting without variation. As appears in FIGS. 13 and 13A, the yarns 27 from guide bar II are each fed to and knit upon a single needle of each of the needle bars B and F in each knitting cycle. Thus, yarns 27 are knit first on the needles of one needle bank, then on the needles of the other needle bank, and so on, so that the fabric walls 22, 23 are joined together by consecutive stitches of yarns 27 on needle banks F and B thereby to form the transversely extending bands of single wall flat fabric areas 21.

It may be noted that severing the bands 21 along lines 21*b* results in completely formed individual foot coverings each of which comprises a folded over rectangularly shaped section of warp knit fabric integrally joined together along three of its four sides thereby to form a foot receiving pocket therein and which is provided with elastic selvages along the edges of its remaining non-joined sides.

The type of warp knit fabric as well as the yarns used in the foot covering may vary as desired. In FIG. 14 a foot covering 20*b* is shown wherein the upper half of the covering is of openwork net construction 37 while the lower half of the covering is of solid fabric 38. The yarn used to make the solid fabric may provide a cushion sole for the foot covering. In FIG. 15 a foot covering 20c is shown wherein approximately one half of the covering is of relatively openwork net construction 39, which may be the heel side of the covering, while the other half or toe side of the covering is of solid fabric 40.

I claim:

1. One piece integrally knitted foot cover of warp knit fabric having wales and courses formed of a plurality of warp yarns and comprising a relatively short first warp knit fabric section of single wall construction formed of said plurality of yarns, a relatively long second warp knit fabric section of U-shaped double wall construction formed of said plurality of yarns in continuation of said first fabric section, said U-shape extending coursewise and said second fabric section having a walewise extending opening therein between the opposed sides of the U-shape thereof, and a relatively short third warp knit fabric section of single wall construction formed of said plurality of yarns in continuation of said double wall construction of said second fabric section, said first and third fabric sections being similar and serving to join together the walls of said second fabric section at the ends thereof thereby to form oppositely disposed walls, ends and a closed bottom of said foot cover, the fabric of said bottom and of said sidewalls being of continuous and of similar seamless stitch formation, said sidewalls, ends and bottom enclosing a foot receiving pocket in said foot cover and wherein access to said pocket is provided through said opening between said opposed sidewalls.

2. Foot cover as in claim 1 wherein said sidewalls have additional walewise extending yarns integrally in-

corporated in the fabric thereof along the edges of said opening.

3. Foot cover as in claim 2 wherein said additional yarns are elastic yarns in relaxed condition, said elastic yarns causing said opening as well as fabric adjacent thereto to be yieldably walewise contracted, and wherein said opening and said adjacent fabric are walewise expandable when said foot cover is placed upon the foot of the wearer thereof.

4. Foot cover as in claim 2 wherein said additional yarns are also incorporated in said first and third fabric sections.

5. Foot cover as in claim 3 wherein said elastic yarns are also incorporated in said first and third fabric sections.

* * * * *