

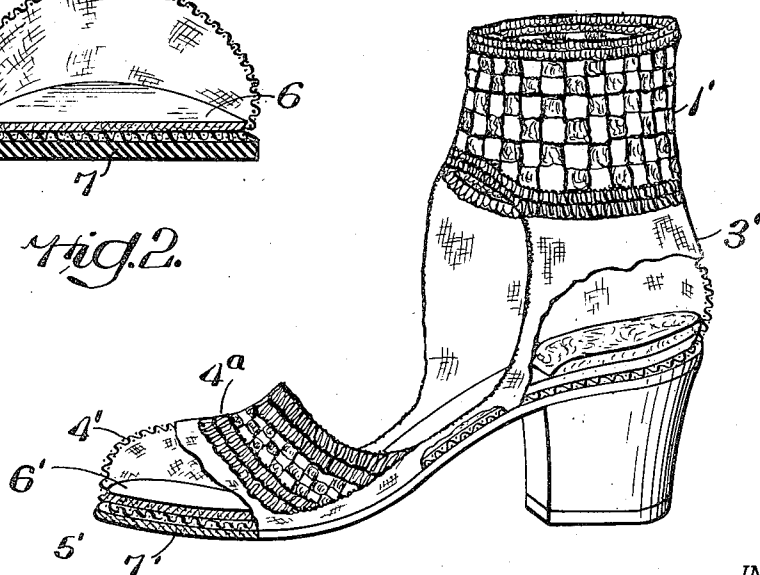
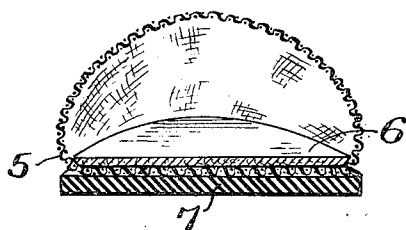
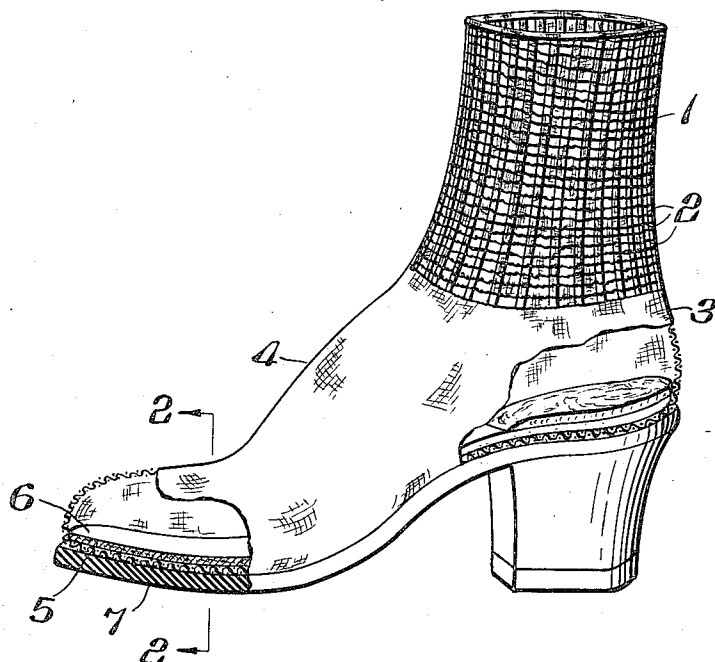
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METHOD OF MAKING SHOES

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2,314,098

METHOD OF MAKING SHOES

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1 Claim. (Cl. 12—142)

My invention is a shoe comprising a circular-knit fabric sock having a stretchable elastic welt and a reinforced sole devoid of ridge-forming seams permitting intimate attachment of inner and outer soles adhesively throughout the area of the sock sole. Portions of the sock may be stiffened to any desired degree by the inclusion in the fabric, as knit, of yarns containing or comprising synthetic filaments susceptible to thermal or solvent softening and stiffening. Such synthetic filaments are preferably heat treated or otherwise softened after the attachment of the inner and outer sole pieces to the sock-sole and are then solidified to impart a desired degree of stiffness to portions of the shoe upper.

In accordance with my invention, a seamless sock is knit upon a usual type of circular knitting machine with a reinforced sole, toe and heel composed of flexible but substantially inelastic absorbent yarns, such as cotton or wool. The sole is knit devoid of any ridge-forming seam so that an adhesive-coated moisture-resistant insole and tread may be applied to the sock-sole and firmly united thereto and to one another by pressure and heat, as, for instance, by the "compo" process. The absorbency, continuity, and freedom from ridges of the circular-knit seamless sole greatly facilitates the application of the insole and tread, and insures the permanent adhesion thereof so tightly to the sock-sole and to one another as to impede the ingress of any moisture or dampness between them.

The yarns knitted into the ankle portion of the sock, and if desired other portions thereof, preferably include or are composed of filaments of vinyon, nylon or cellulose acetate which may be stiffened by treatment with heat or solvents, and the top welt of the sock is composed of or contains elastic, stretchable yarns, such as natural or synthetic rubber, permitting such expansion and contraction of the circumference of the welt as will permit it to be slipped over the foot and ankle and to then firmly grip the leg to hold the upper in close engagement therewith and eliminate any need for an extraneous shoe vamp or top to maintain the shoe on the foot with the heel held firmly in place.

The vinyon, nylon or acetate yarns are soft and flexible when knitted into the sock and hence in no way impede the insertion of the insole into the open top of the sock and into position to stretch the sock-sole. Only the parts of the sock where stiffness is desired are subjected to the heat treatment or solvent treatment which softens and then stiffens the synthetic yarns. For

instance, after the insole and tread are attached to the sock-sole, the sock may be placed on a form having a steam, gas or electrically heated portion in contact only with the heel and ankle portion between the sole and welt so as to effect the stiffening of this portion without impairing the flexibility and softness of the instep, toe and sole portions or the elasticity of the welt. If desired, a portion of the sock adjacent the toe may be omitted or eliminated to provide an open instep and the toe portion provided with a stretchable elastic welt to position and hold the forepart of the shoe.

The characteristic features and advantages of my method and product will further appear from the following description and the accompanying drawing in illustration thereof:

In the drawing, Fig. 1 is a perspective view of the shoe embodying my invention, with parts broken away to show the interior construction; Fig. 2 is a transverse sectional view taken on the line 2—2 of Fig. 1; and Fig. 3 is a perspective view of a modified form of shoe embodying my invention with parts broken away to show the interior construction.

In the embodiment of my invention illustrated in Figs. 1 and 2, a seamless sock is knit on a conventional type of circular knitting machine with a top welt 1 of ribbed fabric having stretchable elastic threads 2 knit circumferentially therein in any usual manner to form a stretchable elastic welt, as for instance in the manner illustrated in Letters Patent Nos. 630,110, 1,883,303, 1,929,006, or any of the other known methods of incorporating in a welt knit fabric stretchable elastic threads composed of wrapped cores of extruded or cut rubber or rubber substitutes of which the stretchable elastic yarns used in my invention are composed.

The sock-foot, including the ankle and heel portion 3 instep 4 and sole 5, is preferably knit with a plain or jersey stitch and the yarns from which such parts are knit preferably include or comprise fibres of nylon, vinyon or acetate which may be softened by the action of heat or solvents and then stiffened by cooling or solidification. The sole 5 is preferably knit from absorbent yarns, such as cotton or wool, and is devoid of seams or ridges.

An insole 6, having its bottom coated with a quick-hardening compo cement, is inserted in the sock so that the sole 5 of the latter is stretched taut by the insole, and a tread or outsole 7, likewise coated with compo cement, is applied externally to the taut sole 5. Pressure, and, if nec-

essary, heat are applied to the insole and outsole during the hardening of the cement, so that the cement coatings on the insole and outsole mingle through the interstices in the sock-sole fabric and the porosity of the yarn therein, and the insole, sock-sole and outsole are firmly bonded together by the drying of the cement so as to impede any ingress of moisture or dampness to the sock-sole.

When the bonding of the soles is completed, the synthetic filaments in the portions of the upper to be stiffened are subjected to a thermal or solvent action to first soften and then stiffen such filaments, preferably while the shoe is expanded on a suitable form provided with means for selectively applying heat or solvent to the area to be stiffened.

In the embodiment of my invention illustrated in Fig. 3, a sock foot, devoid of an instep section, is knitted upon a circular knitting machine so as to form an ankle and heel portion 3', a toe 4' and a sole 5' devoid of seams or ridges. A strip of all-way stretch fabric, such as illustrated for example in Letters Patent No. 2,036,702 or 2,190,560, is stitched to the top of the ankle and heel section 3' and seamed, to form an annular stretchable elastic welt 1' which closely grips the ankle of the wearer and holds up the fabric comprised in the ankle and heel section 3' without any extraneous vamp or upper. A strip of similar elastic fabric 4a is seamed to the toe piece 4' and to opposite edges of the sole 5' adja-

cent to the toe piece to provide a stretchable elastic toe welt which firmly holds the forepart of the shoe on the wearer. The heel portion 3' is preferably knitted from yarns composed of or including synthetic fibres, such as above described, which are soft and pliable when knitted but which may be softened and stiffened by thermal or solvent treatment, as above described, after the insole 6' and tread or outsole 7' have been attached to the sock-sole 5' as above described. The sock-sole 5', like the sock-sole 5, is preferably plain knitted from absorbent yarns and is free of seams or ridges so as to facilitate the application and attachment of the soles 6' and 7' and the unification of the cement coatings thereon into a composite cement layer in which the sock-sole is embedded uniformly throughout its area.

By my improvements a comfortable and relatively durable and attractive shoe may be produced at a minimum cost by relatively unskilled workers and without any need for the expensive shoe-making machinery ordinarily deemed necessary for economical shoe manufacture.

Having described my invention, I claim:

The method of making a shoe which comprises providing a knitted sock-foot with a sole devoid of seams, inserting in said sock an adhesively coated insole and stretching said sock-sole thereon, applying to said stretched sock-sole an adhesively coated tread, and squeezing said tread and soles together.

RAYMOND McDONALD.