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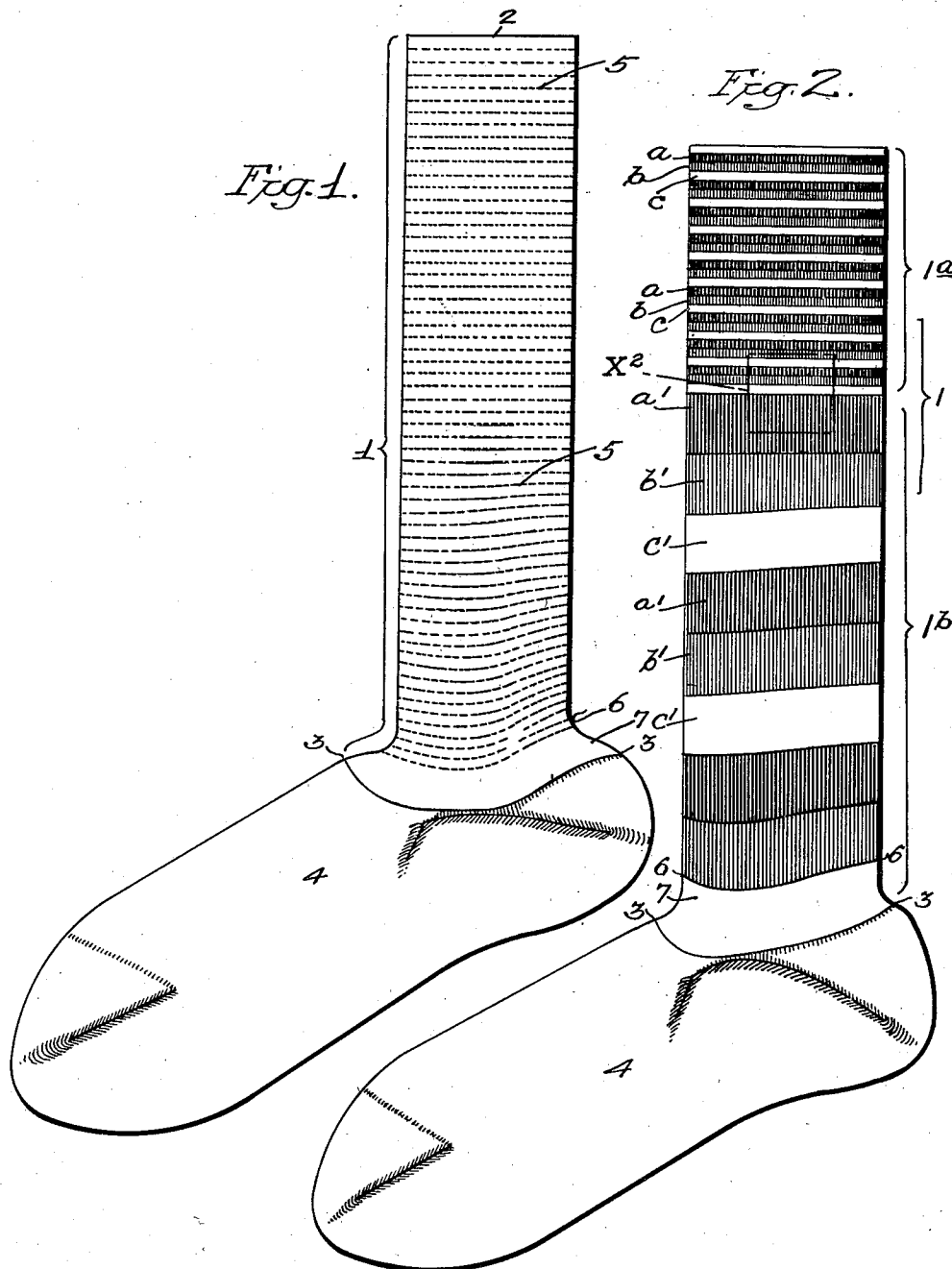
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2,188,241

SELF-SUPPORTING STOCKING

Filed April 19, 1937

5 Sheets-Sheet 1



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5 Sheets-Sheet 2

Fig. 2a

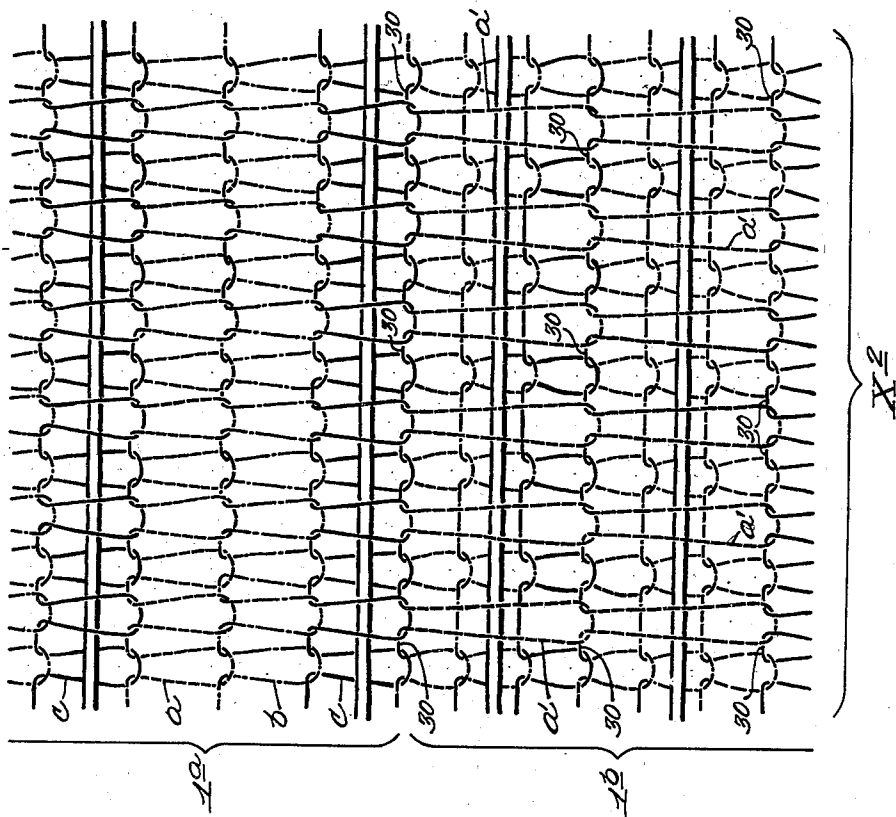
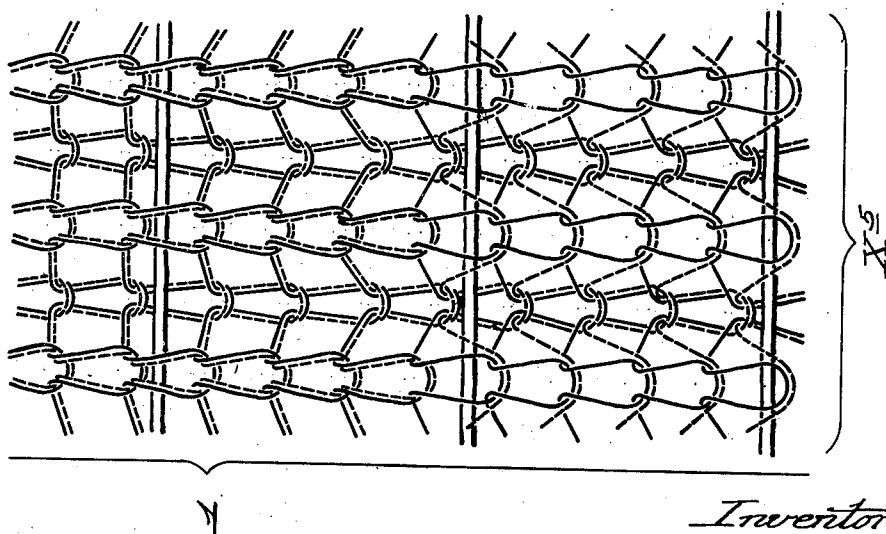


Fig. 5a



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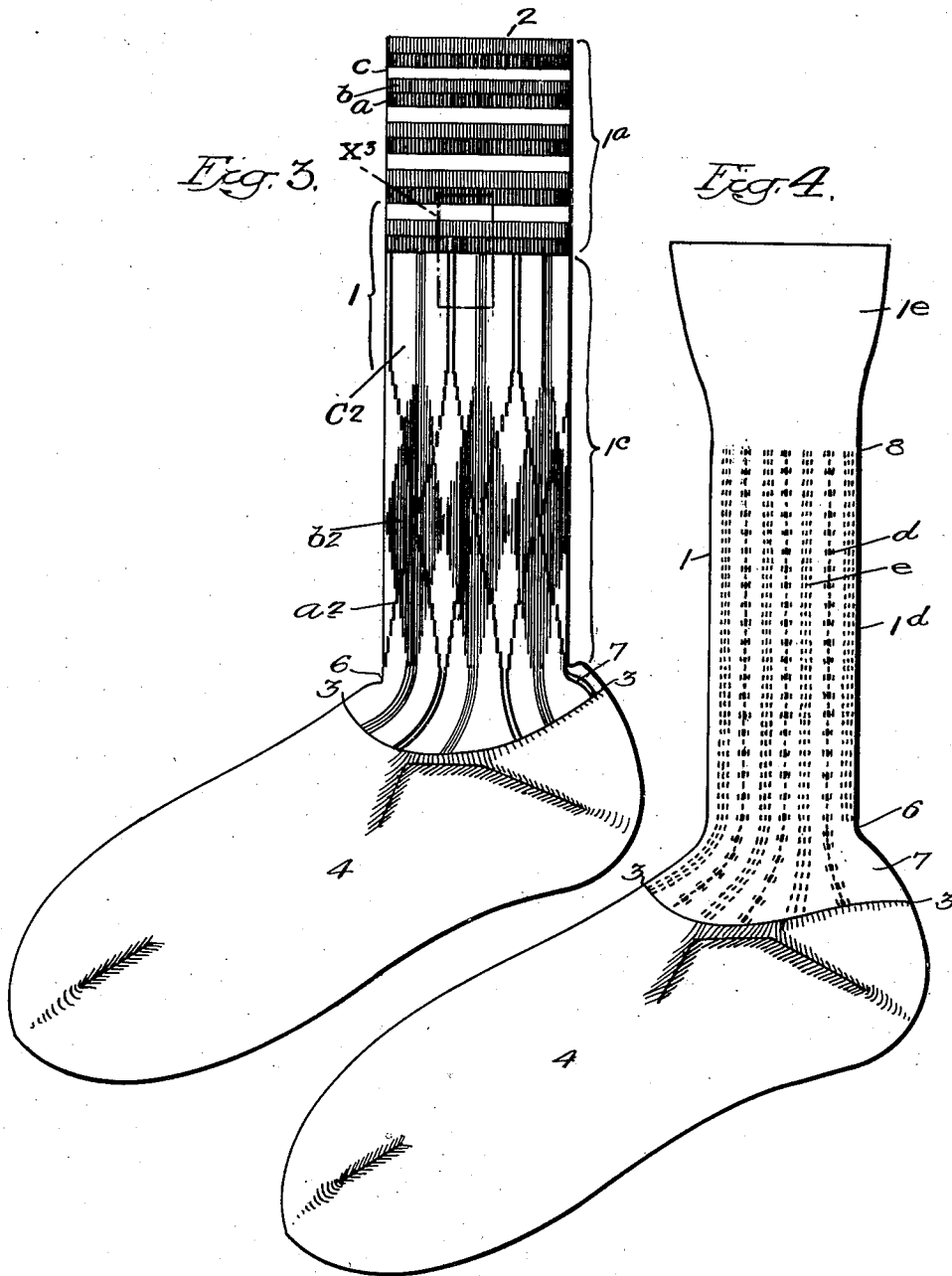
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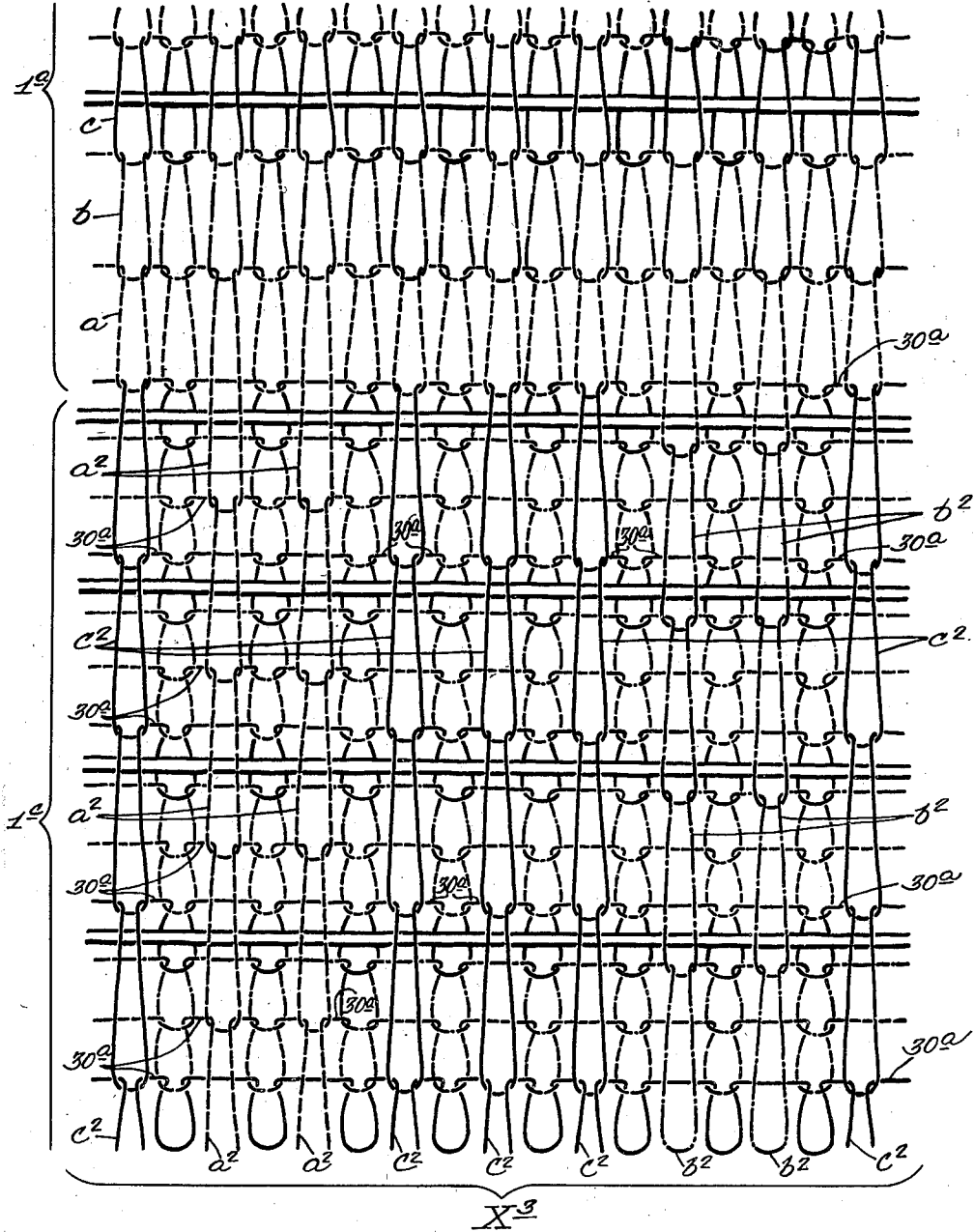
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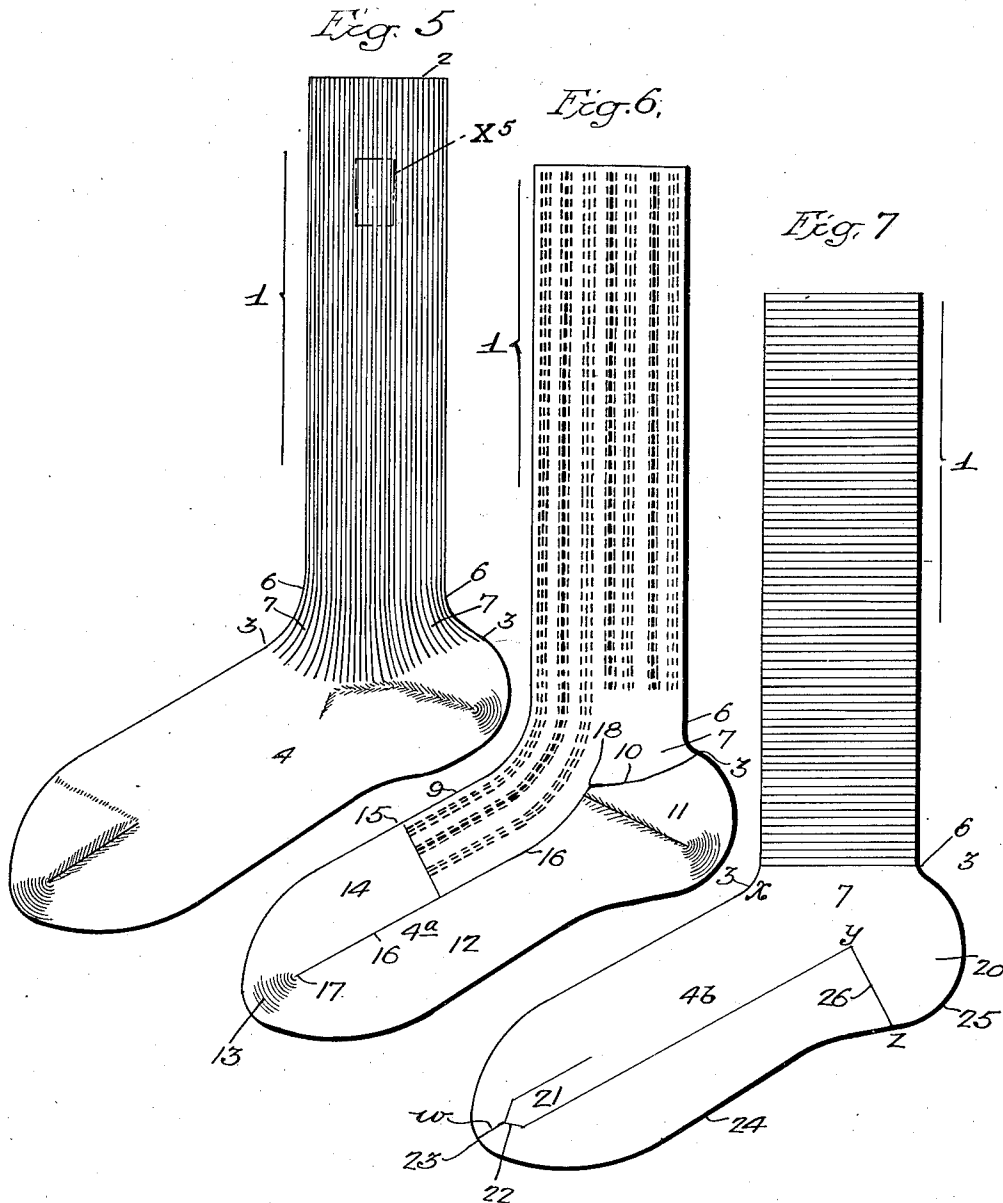
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SELF-SUPPORTING STOCKING

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5 Sheets-Sheet 5



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UNITED STATES PATENT OFFICE

2,188,241

SELF-SUPPORTING STOCKING

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Application April 19, 1937, Serial No. 137,855

2 Claims. (Cl. 66—178)

This invention relates to men's socks of the so-called self-supporting type, i. e., socks which allegedly require no extraneous supporter to maintain the sock in smooth close-fitting contact with the man's leg.

Self-supporting socks heretofore have been made with elastic threads laid in or knit into the normal ribbed top of the sock, in immediately succeeding stitch courses adjacent the welt edge of the sock or in predetermined relatively spaced courses in the top.

The normal ribbed top of a man's sock embraces the downwardly tapering portion of the man's leg, i. e., the portion of the leg lying between the thickest part of the calf of the leg and the ankle, with the bottom edge of the ribbed top lying approximately midway between the two. The foot and ankle, or leg portion of the sock below the lower edge of the ribbed top is usually composed of plain fabric.

Self-supporting socks heretofore have been built upon the theory that if the ribbed top of the sock is caused to embrace the leg snugly the whole of the sock will stay up and cause the leg and/or ankle portions to retain a neat snug fitting appearance.

In practice it has been found that, due to the taper of the leg, the elastic top slides down and causes the lower inelastic leg portion of the sock to wrinkle horribly around the ankle.

The sock forming the subject matter of the present case is built on an entirely different principle, based on the theory that, if the leg portion of the sock at and adjacent the ankle is caused to embrace the lower part of the taper of the leg snugly, the top of the sock, embracing the larger upper part of the taper of the leg, cannot slide down and the whole of the sock, from the foot to the welt edge of the top, will stay put and present a neat close-fitting appearance.

In accordance with this principle, the whole of the lower leg portion and in some instances the top of the sock, from the foot upwardly a substantial distance toward or entirely up to the top edge or welt, is provided with elastic strands incorporated in the fabric at relatively spaced courses of stitches of which the fabric of the sock is composed.

In the accompanying drawings:

Figs. 1 to 7 inclusive diagrammatically illustrate socks which respectively embody the full elastic feature of the present invention, with the elastic extending from the foot to the welt edge of the sock in predetermined relatively

spaced courses of stitches of which the socks are respectively composed.

Figs. 2a, 3a, and 5a respectively illustrate enlarged stitch diagrams of the areas X2, X3, and X5 of the fabrics of which the socks shown in Figs. 2, 3 and 5 respectively are composed.

In Fig. 1 the full elastic leg including the normal ankle and top portions of a man's sock is illustrated at 1. The leg portion 1, in the present instance, is composed of regular one and one ribbed fabric from the welt course 2 to a juncture course 3, where the ribbed fabric of the leg 1 joins with plain fabric of the foot 4.

In order to be able to extend the ribbed fabric down into the foot of the sock a sufficient distance to hide the line of juncture of the ribbed and plain fabric below the upper edge of a man's low shoe, the foot of the stocking is made in accordance with the principles set forth in the prior U. S. patent to Emil A. Hirner, No. 1,154,116, dated September 21, 1915, and which is commonly known in the art as the "Hirner" foot.

In the present case the full elastic ribbed leg 1 is knit in the usual manner with an elastic strand 5 incorporated in every fourth course, for example from the welt edge 2 to a course 6 which is spaced from the juncture line 3 by approximately fifteen courses.

The opposite ends of the rubber strand 5 are anchored in the courses 2 and 6 respectively as, for example, by knitting said end in on a plurality of needles, for example, ten needles, either cylinder or dial or both, while the strand 5 intermediate said anchored ends is preferably laid in the fabric between the front or cylinder wales and the back or dial wales of the fabric, as disclosed, for example, in my copending application Serial No. 83,344, filed June 3, 1936, now Patent No. 2,089,880, wherein the elastic ribbed fabric is produced on a multiple feed circular knitting machine.

The stopping of the elastic strand 5 at a place spaced a number of courses away from the juncture line 3 provides a band 7 of relatively flaccid fabric in which is formed a loose or transfer course employed for transferring the full elastic ribbed leg 1 onto the needles of a plain fabric footer, by which the "Hirner" foot 4 is applied to the full elastic leg 1. As the formation of the "Hirner" foot is fully disclosed in the above noted Hirner patent a description of its construction here is deemed unnecessary.

The leg portion 1 of the sock shown in Fig. 1, as noted above, is preferably made on a four feed circular knitting machine with a rubber

laying-in attachment between two of the feeds or adjacent one of the feeds whereby the rubber is laid in the course produced by the knitting cams attending the one feed throughout the knitting of the full elastic leg 1. However, the leg 1 may be knit on a single feed machine and the rubber laid in every second, third, fourth or fifth course, etc., as desired, or the rubber strand 5 may be fed to the needles of a single feed machine by one of a plurality of fingers employed for yarn changing at said single feed, whereby the elastic yarn may be knit into a full course and held out for a plurality of succeeding courses.

Fig. 2 illustrates a full elastic leg 1 made on a three feed circular machine. In the upper portion 1a of the leg, which normally would be the ribbed top of an ordinary sock, each feed knits single course a, b, c, respectively in recurring order with a rubber strand incorporated in the courses produced by one of the feeds (see Fig. 2a). In the lower part 1b of the full elastic leg 1, the needles of the machine are manipulated in a manner whereby one of said feeds lays its thread to both cylinder and dial needles for one course whereupon the cylinder needles are held out of action and retain their stitches of said course while the other two feeds feed their respective threads to the dial needles only in the next two courses respectively, after which the cylinder needles are restored to action to knit a full course of the thread from the first said feed. This operation is repeated a predetermined number of times which produces a broad band a¹ on the outside of the stocking composed of the thread from the first feed, with the threads from the second and third feeds buried below the wide band a¹ and appearing only on the inner face of the sock in the a, b, c order shown in the top 1a.

The needles are then operated in the same manner as noted above, to bring the thread from the second feed to the front or outside and to bury the threads from the first and third feeds on the back or inside in dial courses only, making a wide band b¹ on the face composed of the thread of the second feed.

The needles are then actuated in a like manner to form a face band c¹ of the thread from the third feed while the threads from the first and second feeds knit on the dial needles.

As a result of this construction the elastic strand 5 in the upper part 1a of the full elastic leg 1 is held in the single course of stitches formed by the thread from the feed at which the rubber is laid in the fabric. That is the elastic strand is held against walewise movement in the fabric by reason of the portions of the knitting threads of the successively interknit courses passing back and forth from the cylinder wales to the dial wales, above and below the elastic strand. In the lower part 1b of the full elastic leg 1 of Fig. 2, where the thread of one feed crosses from the cylinder to the dial wales at only every third course, as illustrated at 30, 30 in Fig. 2a, while the threads from the other two feeds stay in the plane of the dial wales exclusively, the elastic strand is held in a pocket three courses in width, in the bands a¹, b¹, c¹, and is thereby permitted some movement walewise of the fabric. This allows the rubber strands to adjust themselves under conditions of use of the sock and causes the outer surface of the sock to remain smooth on the leg without showing slight undulations caused by the tension of the rubber strand pressing the fabric into the flesh of the wearer. These undulations,

however, are formed by the dial fabric produced by the thread from the two feeds which are fed exclusively to the dial needles while the thread of the third feed is being held on the cylinder needles and produces cylinder fabric which is tied to the dial fabric of the other two feeds at the courses where the one feed feeds its thread to both dial and cylinder needles.

Fig. 3 illustrates a full elastic leg 1 wherein the top 1a is of the same character as the top 1a of Fig. 2 but wherein the bottom portion 1c is produced in pattern by trick wheel or similar selection of the cylinder needles to knit the threads from the three feeds selectively on the outer face of the fabric while the threads from the three feeds knit on the dial needles in succeeding courses respectively.

For example, the feed which produces the courses c, c in the top 1a also produces the background c² in the lower portion 1c; the thread from the feed which produces the courses b, b in the top 1a also produces a solid design figure b² in the lower portion 1c; and the feed which produces the courses a, a in the top 1a also produces a line design figure a² in the bottom portion 1c.

At each feed a predetermined number of the cylinder needles are selectively manipulated to take thread to take one of the three threads from the three feeds and to knit the thread into stitches on the outer face of the fabric. The complete outer face of the fabric, therefore, is a composite structure produced by a combination of the three threads respectively drawn from the three feeds. Each thread is also knit on the dial needles to form a complete inner face of the fabric; and the elastic strands 5 are laid in the fabric between said inner and outer faces and limited as to movement walewise of the fabric by the threads from the three feeds crossing from the outer to the inner face and vice versa, as illustrated at 30a in Fig. 3a.

Fig. 4 illustrates a sock wherein the elastic strands 5 extend through the fabric of the lower part 1d of the elastic leg 1 from the course 6, adjacent the juncture line 3 with the flaccid section 7 therebetween to a course 8 which corresponds to the juncture line of the top 1a and bottom 1c of the sock shown in Fig. 3; and the upper part 1e in this instance is devoid of rubber and is of a more or less flaccid character similar to the flaccid section 7.

In this case the leg 1 is knitted of one or more threads drawn from one or more feeds respectively with needle-wrapping mechanism at one, each or any desired number of the feeds to produce vertical line designs d and e on the outer face of the fabric by separate threads wrapped selectively around predetermined cylinder needles at desired feeds.

In this instance the inherent elasticity of the ribbed top 1e causes it to cling to the upper larger portion of the taper of the leg while the natural elasticity of the lower leg portion 1d augmented by the rubber strands 5 causes the lower part 1d of the leg 1 to adhere snugly to the lower portion of the taper of the wearer's leg which illustrates the fundamental principle upon which the present case is predicated, i. e., if the lower portion of the leg of a sock is kept from sliding down on the taper of the leg the upper part cannot slide down and thus the whole sock will present a neat-fitting appearance.

The sock shown in Fig. 5 includes a full elastic leg 1 which includes the elastic strands 5, the same as in Figs. 1, 2 and 3 and in the lower part

of Fig. 4. In this instance (Fig. 5) the full elastic leg 1 is composed of what is known as "accordion" fabric, i. e., the outer surface composed of the cylinder wales of the ribbed fabric presents one color while the intermediate dial wales presents another color or a different shade of the color presented by the cylinder wales.

The fabric of the full elastic leg 1 of Fig. 5 is produced by feeding one thread into the hooks of both cylinder and dial needles and another thread into the hooks of the dial needles and below the latches of the cylinder needles, whereby the second thread is knit only on the dial needles and lies behind the stitches of the cylinder needle wales and in front of the stitches of the dial needle wales which are thus formed of the first and second threads conjunctly, as shown in Fig. 5a. This fabric may be made on a single feed machine with a double thread guide or on a two feed machine with each feed laying a single thread to the needles as noted above, or the fabric may be made on a four feed machine with alternate feeds laying front threads to the cylinder needles and the intermediate feeds laying back threads to the dial needles or with a double thread guide at each feed and a rubber-laying feed disposed adjacent one of the thread feeds, in which latter case the rubber strand 5 would be laid in every fourth course of stitches.

The sock shown in Fig. 6 includes a full elastic leg 1 with rubber strands 5 running from the welt courses 2 to the flaccid section 7 therebetween and extending below the course 6 into the upper part 4a of the instep at 9. The sock is provided with an "English" foot in place of the Hirner foot shown in Figs. 1 to 5 inclusive. The "English" foot, in the present case, is produced by topping one-half of the stitches of course 3 onto one-half of the needles of the plain fabric footing machine, as along the line 10, and by reciprocating knitting producing the heel pocket 11, foot sole 12, toe pocket 13, and the upper forward end of the instep or top of the foot 14. The two abutting edges of the two parts of the upper portion of the foot 4a are then joined by looping, etc., along the line 15. The foot is then completed by joining the upper and lower portions of the foot 4a along the line 16 from the point 17 in the toe pocket to the point 18 at the heel pocket on both sides of the foot.

Fig. 7 shows a full elastic top 1 provided with a full fashioned foot 4b wherein the preformed leg down to the course 3 is knit on the regular ribber and subsequently provided, on the same machine or on a plain fabric machine, with heel tabs 20. The product is then applied along the line x, y, z, to the needles of a full fashioned footer, either of the circular type wherein reciprocating knitting is used or on a flat type machine, but which in either case give shape to the foot by transferring stitches adjacent each selva edge of the foot blank inwardly of said blank at predetermined courses which produces the usual full fashioned box toe 21. The foot blank is then folded and the edges from the point 22 to the point 23 along the line w looped together and the opposite edges of the blank from the point 23 along the sole of the foot to the point 2 joined by seaming in the usual manner followed in closing the feet of full fashioned stockings. The heel tabs 20, 20 may be joined on a median line between the two, from the point 2 to the point 3, under the bottom and up the back of the heel, along the edge 25, by looping or seaming

or partly by one and partly by the other of said methods as is usual in full fashioned hosiery.

If a flat full fashioned footer of the "Cotton" type is employed, it may be necessary to split the full elastic leg walewise at least adjacent the lower part thereof to apply the instep course and inner edges 26 of the heel tabs to the needle bar of the footer, in which case the elastic strand 5 in each course in which it is incorporated would be either knit into the entire course or laid in the course around the front and sides of the leg 1 and knit in around the back of the leg 1 at each side of the line on which the leg would be split, in order to hold the elastic strand in each course and to prevent the ends of the strand when cut by splitting of the lower part of the leg from pulling back into the fabric from the split.

From the foregoing description taken in conjunction with the illustrations referred to, it will be obvious that the principles of the present invention involving the incorporation of rubber strands in predetermined courses of the lower as well as the upper portion of the ankle or leg portion of a sock may be applied to single or multiple feed stockings with or without needle wrapping or trick wheel design and with well known Hirner, English or French full-fashioned feet.

The socks disclosed above are of the kind normally worn by men when dressed for business, social recreation, etc., i. e., the socks are of a normal weight and the elastic is of such character and tension as not to cause the wearer of the sock any consciousness of its presence around the limb or to produce any binding effect upon the limb. The socks of the present invention should not, therefore, be confused with surgical hosiery where strands of rubber are laid in each course of stitches of the fabric of which surgical hosiery is composed, for the purpose of binding in certain muscles, bones, ligaments, etc., against displacement by normal use of the limbs and for the purpose of definitely disclaiming any stockings of the surgical type the appended claims recite the stockings of the present case as being of a "dress" type which could be worn over a surgical ankle band, for example, to conceal the same and which normally presents an unsightly appearance.

The tension of the elastic in stockings made according to the present invention while sufficient to hold up the sock as noted above is not sufficient to serve any therapeutic or prophylactic purpose for physical ailments.

I claim:

1. A self-supporting dress sock comprising a foot portion, a leg portion composed of ribbed knit fabric, and an elastic strand incorporated in and extending transversely throughout at least the lower part of said leg portion adjacent said foot portion and upwardly for a substantial distance above said foot portion and at least said lower part of said leg portion being composed of at least two separate body yarns forming the inside and outside faces of said fabric with at least one of said yarns passing back and forth from one to the other of said faces and knit separately in stitches on said outer face and confining said elastic strand between said faces and against excessive movement longitudinally of said fabric.

2. A self-supporting dress sock comprising a foot portion, a leg portion composed of ribbed knit fabric, and an elastic strand incorporated in and extending transversely throughout at least the lower part of said leg portion adjacent said foot portion and upwardly for a substantial dis-

tance above said foot portion and at least said lower part of said leg portion being composed of at least two separate body yarns forming the inside and outside faces of said fabric with said
5 yarns passing back and forth from one to the other of said faces and selectively knit separately

in stitches on said outer face to form an appropriate design on said outer face of the fabric and confining said elastic strand between said faces and against excessive movement longitudinally of said fabric.

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