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H. B. SNADER

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HOSIERY WITH ELASTIC SEAM

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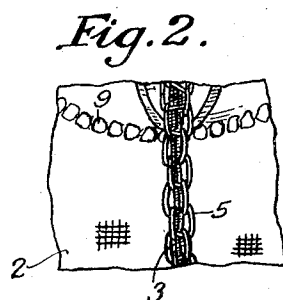
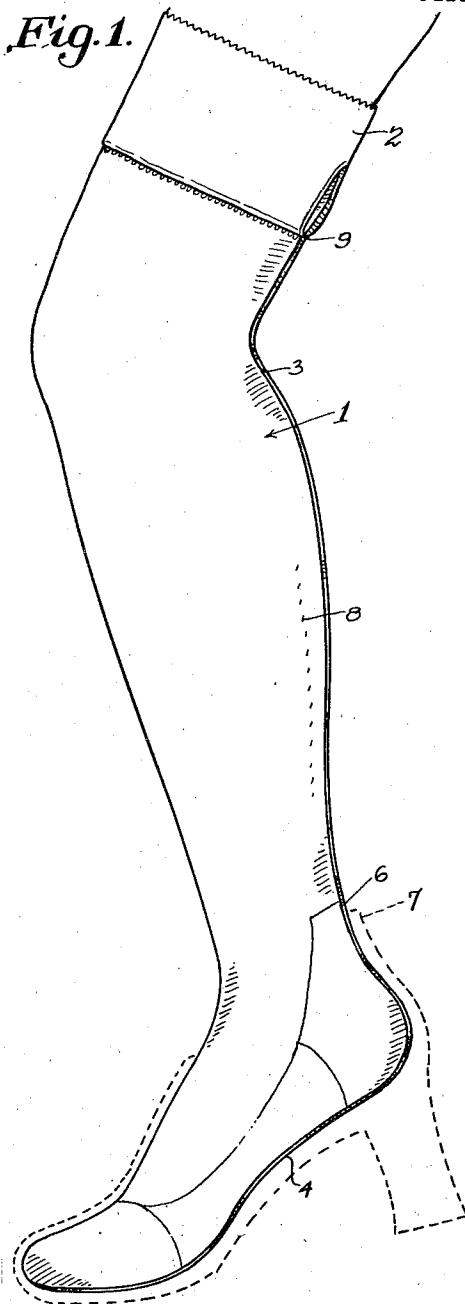


*Fig. 5.*

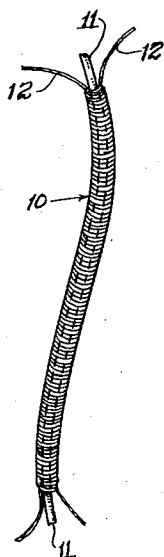


*Fig. 3.*

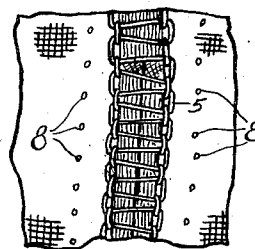
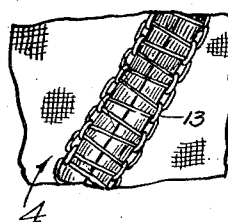


*Fig. 4.*



Inventor

HOWARD B. SNADER

By *Mason Fenwick Lawrence*  
Attorneys

## UNITED STATES PATENT OFFICE

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## HOSIERY WITH ELASTIC SEAM

Howard B. Snader, Reading, Pa., assignor to  
Vanity Fair Silk Mills, Reading Pa., a corporation of Pennsylvania

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## 1 Claim. (Cl. 2—239)

This invention relates to hosiery, and particularly to that type of stocking having a seam running longitudinally of the back of the leg and along the sole, whether the seam be real or mock.

The stocking as ordinarily made, is of knit fabric, inherently elastic within narrow limits in both directions, and designed to be elastically distended in fitting relation to the foot and leg of the wearer.

The seam as ordinarily constructed is an impediment to the exercise by the fabric of its capacity to stretch, and thus destructive strains are imposed upon the fabric, particularly in several specific regions as will hereinafter appear. The relative rigidity of the seam is due to the fact of the layers of fabric, which are brought together in the seam, being sewn with a thread which is only slightly elongatable, such as silk, rayon or cotton, so that the seam stands up cord-like relative to the surface of the fabric, resisting the yield of the fabric to the various stretching stresses to which the stocking is subjected.

The object of the present invention is to provide a stocking, the seam of which is united by means of a thread many times as elastic as any thread heretofore used for the purpose, and which imparts to the seam entirely new characteristics, so that it flattens substantially into the plane of the fabric when stretched transversely, and is much more elongatable than the ordinary seam, its co-efficient of elasticity, being even greater than that of the fabric which it unites, so that the seam being more yielding than the fabric itself, imposes no restraint to the stretch of the fabric in any direction and consequently, is not only not contributory to any stresses which the fabric has to bear, but relieves such stresses through its superior yielding capacity.

Another object of the invention is the provision in hosiery of a seam sewn together with a composite thread comprising a rubber strand core in a spiral thread covering.

A further object of the invention is the sewing together of the seam as above described with a helically wound thread, and maintained in helical form throughout the stitching by being carried upon a mandrel constituted by a fine rubber filament, the elastic property of the helical thread compensating for the deterioration in the elasticity of the rubber filament as the latter ages.

Other objects of the invention will appear as

the following description of a preferred and practical embodiment thereof proceeds.

In the drawing which accompanies and forms a part of the following specification and throughout the several figures of which the same characters of reference have been used to denote identical parts:

Figure 1 is a side elevation of a stocking embodying the principles of the present invention, shown in relation to a shoe;

Figure 2 is a back view of the upper part of the stocking showing the seam on an enlarged scale;

Figure 3 is a similar view of the intermediate part of the stocking;

Figure 4 is a similar view of part of the wall of the stocking; and

Figure 5 is a detail in elevation showing a fragment of the elastic thread.

Referring now in detail to the several figures, the numeral 1 represents in general a stocking of the full fashioned type, made of knit material such as silk or rayon, having the top 2, of double thickness as usual, and knit integrally with the fabric at the lower edge. The fabric blank is united by a seam 3 which extends longitudinally down the back of the stocking along the median line and along the middle of the sole of the foot as at 4. This seam is made by bringing the edges of the material together under a sewing machine and stitching them with an over-seam chain stitch shown at 5 which is commonly considered an elastic chain in view of the fact that it can stretch to the aggregate extent permitted by the elongation of the open meshes, although this term is a misnomer insofar as the present invention is concerned, for the extent of the elasticity in the ordinary chain stitch is insufficient to perform the purposes of the present invention, and in fact the ordinary chain stitch is elastic in one direction only, being practically non-stretchable in a transverse direction.

The seam 3 in its normal state of repose has the form of a ridge or cord standing up from the fabric of the stocking on the inside of the hose. In Figure 1 the stocking is shown inside out so that the seam 3 appears on the outside.

Although the knit material of the stocking is inherently adequately elastic to meet the requirement of fit, and the various stresses which the flexion of the leg and foot impose upon the stocking, its freedom to stretch is restricted by the presence of the seam which as stated, is only slightly elongatable in a longi-

tudinal direction and practically non-stretchable in a transverse direction. The presence of the seam therefore creates several disadvantages, among which are the following:

- 5 For example, if the stocking is slightly too short for the foot, the limited elongatability of the seam prevents the foot of the stocking from stretching lengthwise, even though the elasticity of the fabric itself is sufficient for this purpose.
- 10 In consequence, the toes press against the front of the foot of the stocking and soon start a runner, or wear through. Furthermore, the presence of the seam as a relatively rigid cord presses uncomfortably against the sole of the foot.

Referring to the region designated by the reference character 6 at which the counter 7 of the shoe engages the stocking, the relatively rigid rib which the seam assumes at this point does not yield to the shape of the counter so as to move therewith as the ankle flexes, but moves relative to the edge of the counter creating a rubbing by the shoe which soon wears a hole in the stocking.

- 20 In a full fashioned stocking in which the narrowing below the calf is produced by the withdrawal of a certain number of needles during the knitting so that certain meshes must bear the stress of double the number of loops in the knitting, certain marks 8 are visible, known as "fashion marks", these being the points which are normally excessively stressed due to the character of the knitting as above explained.

Through the variations in the shapes of different legs, the swell of the calf frequently distends that part of the stocking in the zone of the "fashion marks" which may stress the loops of the knitting beyond their elastic limit, causing breakage of a thread and the starting of a runner. Possibly the most frequent source of destruction of a stocking is at this region.

Another point at which the presence of the seam as ordinarily constructed is peculiarly disadvantageous is at the line of juncture between the stocking top and welt indicated at 9. The top of the stocking is double, both layers being knit into the fabric of the stocking at the said line of juncture. This makes the top just about one-half as resilient as the remainder of the stocking so that in the longitudinal stretching of the stocking, a preponderance of the stress of stretching is concentrated at the circumferential line of juncture so that the fabric along this line is a potential source of weakness.

The garter is usually, and properly attached to the top of the stocking at the rear in the seam 3. The object of this preferred location for the garter is as everyone knows to maintain the seam straight along the rear of the leg instead of permitting it to shift around to a crooked position as would happen if the garter were attached at another circumferential point of the stocking. The pull of the garter longitudinally of the seam is normally far in excess of the elastic modulus of the seam so that the entire strain of the garter is resisted inelastically by the seam, which strain is frequently, and eventually more than the seam can bear at its weakest point, which point is at the line of juncture between the stocking top and welt. Therefore, the fabric breaks at and adjacent this line of juncture, running the stocking.

The present invention as has been stated, makes the seam more elastic than the fabric itself, and freely stretchable in all directions.

It comprises substituting for the ordinary silk, rayon or cotton thread generally employed for stitching the seam, a composite thread consisting of a fine rubber filament covered with a spiral thread winding of any suitable fiber such as silk, rayon or cotton. The nature of the stitch may be the same as is ordinarily employed, the novel advantages resulting from the use of the composite elastic thread. The use of this thread is not merely the substitution of one equivalent for another, for in the known seam, the small available elasticity is due to the nature of the stitch itself and not to the material of the thread, while in the present invention, the stitch being the same, the supplemental elasticity due to the employment of the elastic thread is entirely in addition to the limited elasticity inherent in the stitch.

By contrast with the ordinary seam which stands up as a ridge or cord at all times and at all points, the seam constructed according to the present invention is freely amenable to all variations of tension, at all points, and when tensioned it readily spreads transversely so as to flatten out substantially in the plane of the fabric of the stocking. It is also freely stretchable longitudinally far beyond the elastic coefficient of the adjacent fabric so that the seam itself is never the cause of imposing excessive stresses upon the fabric.

The elastic thread 10 is shown in detail in Figure 5 and comprises a fine strand 11 of latex rubber or the like, preferably made by a process of extruding with which the present invention is not particularly concerned, but which produces a much finer gage strand than can be made by any known process of cutting. This strand is preferably double wrapped by silk, rayon or cotton threads 12 wound helically. The thread depends for its elastic qualities not only upon the elasticity of the rubber, but also in view of the elasticity of the covering. The principle by which the elasticity of the covering is enhanced beyond that of a straight thread is the same as that employed in a spiral spring. By virtue of its helices, the spiral spring is more resilient than a straight rod of the same gage. So is the helically wound covering of the elastic thread more resilient than would be a straight thread. The elasticity of the composite thread therefore depends not only upon the stretchability of the rubber, but upon the helical nature of the cover, and as the rubber begins to lose its elasticity through aging, this loss is compensated by the elasticity of the helical covering.

It would be impossible to stitch the seam with a helically wound thread, the helices of which are unsupported, but by introducing the helical thread as the covering of the rubber filament, the latter serves as a flexible mandrel by means of which the helical thread is laid in position in the formation of the stitches without disturbing or dis-arranging its helices.

Comparing the advantages of the new seam with the ordinary relatively rigid seam, it will be understood, referring to the region 6 that the seam flattens transversely under distention by the ankle, so as to lie in the plane of the fabric and therefore to be free to conform to the shape of the interior of the counter 7 of the shoe, so that it clings to the counter and moves with the shoe, avoiding relative rubbing between the shoe and the stocking and preventing undue wear at this point.

It also stretches transversely with the foot in

the region of the sole as shown at 13 in Figure 4, so as to present a perfectly flat and comfortable surface to the sole of the foot. In the region of the "fashion marks" 8 it also stretches freely transversely, not only avoiding the imposition of any stress due to the seam, upon said "fashion marks", but in effect, relieving said "fashion marks" from some of the normal strain, since the seam stretches more freely than the fabric itself.

At the point 9, where the seam intersects the line of juncture between the stocking top and welt, no strain is communicated by the seam to the adjacent fabric since the elasticity of the seam exceeds that of the adjacent fabric and the pull of the garter is therefore uniformly distributed through substantial areas of the fabric instead of being concentrated at any particular point or points.

In addition to these specific virtues the elastic seam, constructed according to my invention and being more elastic than the fabric itself, supplements the yielding quality of the fabric in accommodating itself to the distention by the leg, causing it to fit the leg more neatly and with a more uniformly distributed cling so that any tendency of the stocking to slip or twist and thereby bring the seam out of longitudinal alignment with the back of the leg, is obviated. Due to the added modulus of elasticity which the seam imparts to the entire stocking, it will yield more freely to the accidental pulls and other causes which ordinarily produce runners, thus prolonging the life of the stocking.

It is obvious of course that the same advantages accrue to the adoption of my invention in the mock seam frequently put into a tubular stocking, excepting, of course, that since there are no real "fashion marks" in the tubular hose, the specific advantage of relieving the "fashion marks" which already over-tensioned, from the additional strain of the seam, may not be present.

While I have in the above description disclosed what I believe to be a preferred and practical form of the invention, it is to be understood that the specific details as shown and described are merely exemplary and not to be construed as limiting the scope of the invention as defined in the appended claim.

What I claim is:

Knit stocking having portions of the knit fabric brought together and stitched to form a seam lying along at least a portion of an imaginary line extending longitudinally along the rear of the stocking and the middle of the sole, said stocking being capable of distending circumferentially by expanding the stitching of the seam, the stitching being of rubber yarn having a greater co-efficient of elasticity than that of the fabric of the stocking, whereby the stress created in the stocking fabric by distention is referred to the stitching without stretching the adjacent portions of the fabric.

HOWARD B. SNADER.