June 2, 1936. J. M. BOTTS 2,042,582

WELTLESS, FULL FASHIONED HOSIERY AND METHOD OF MANUFACTURE THEREFOR

Filed Aug. 21, 1931 2 Sheets-Sheet 1

Fig. 1.

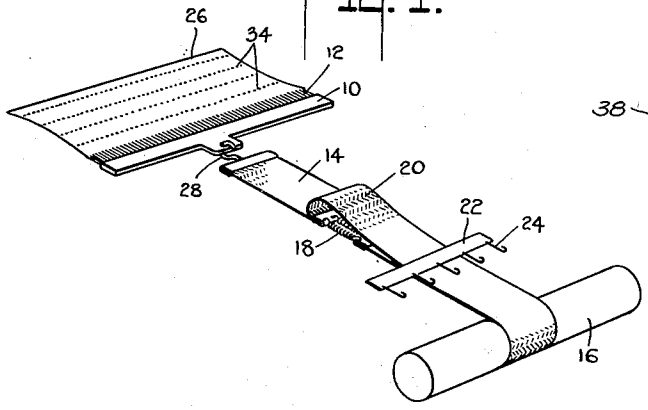


Fig. 2.

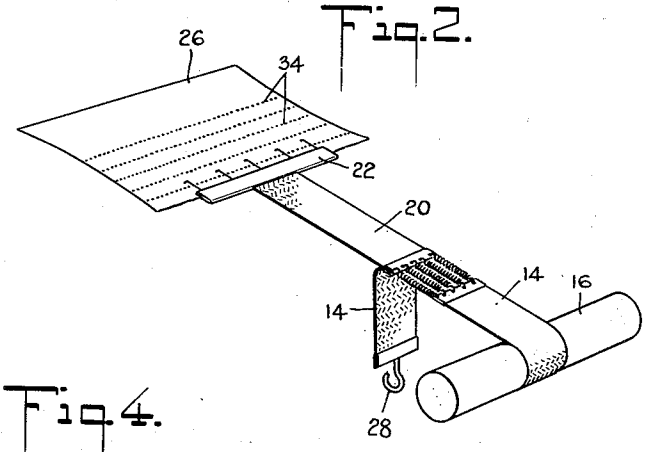


Fig. 3.

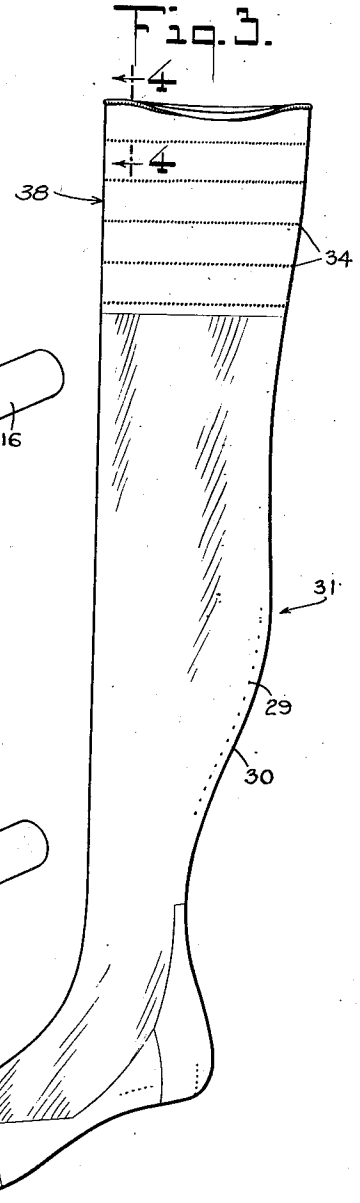


Fig. 4.

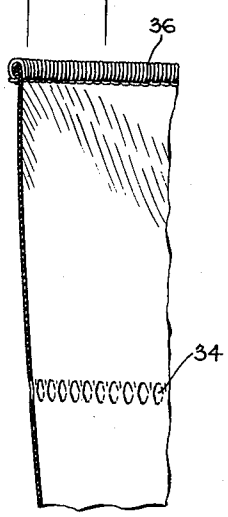
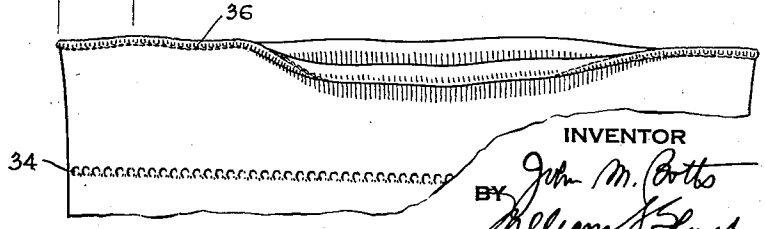


Fig. 5.



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Fig. 6.

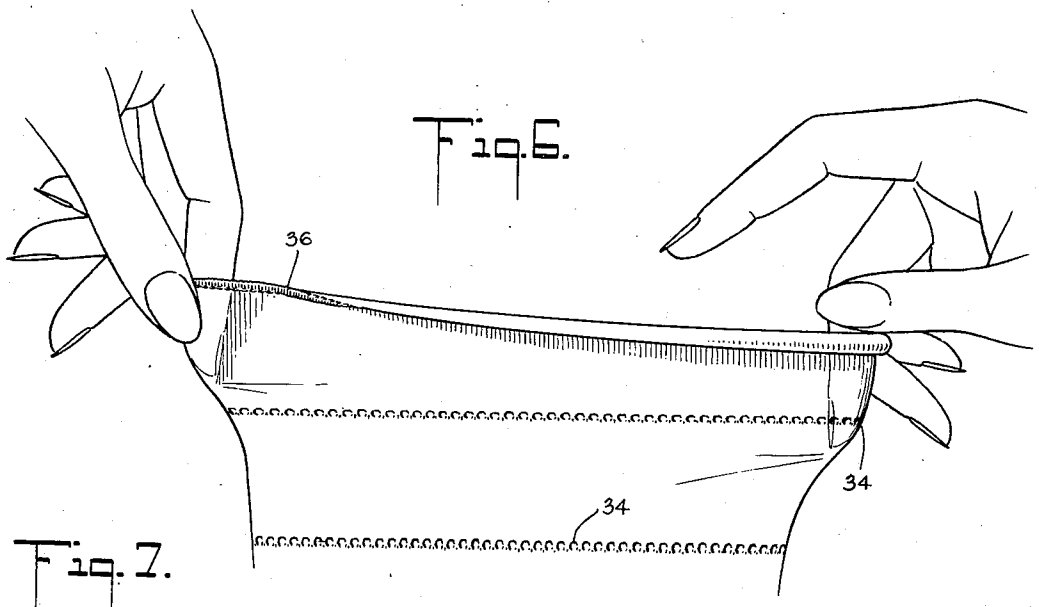


Fig. 7.

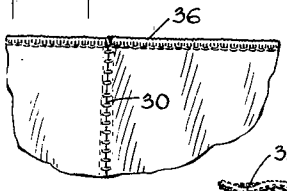


Fig. 8.

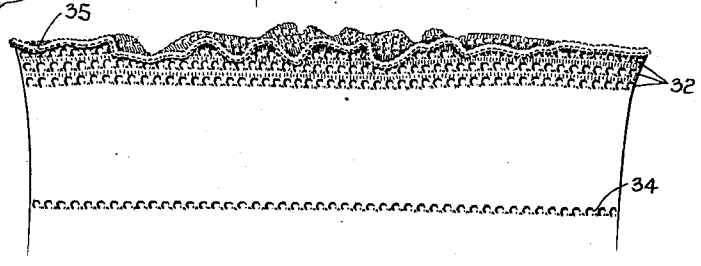
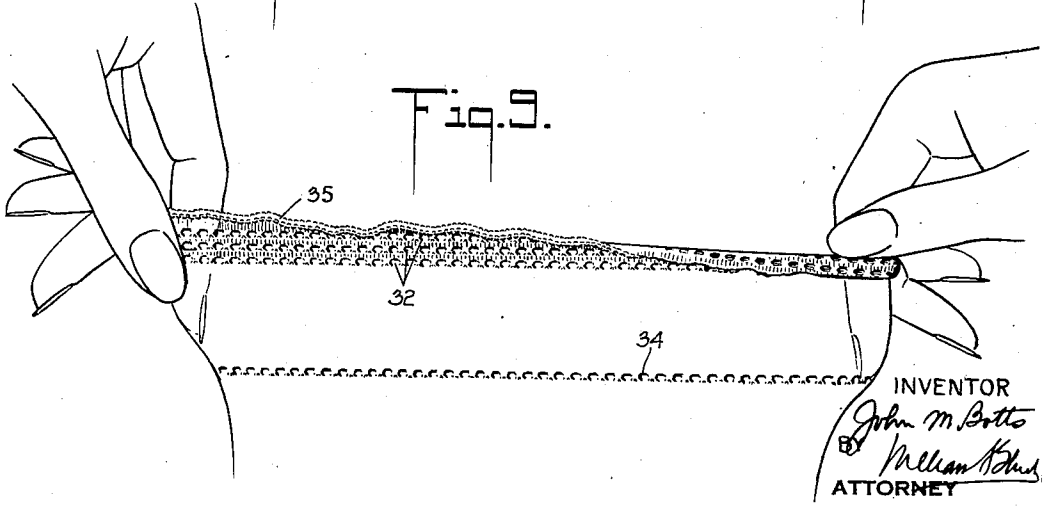


Fig. 9.



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UNITED STATES PATENT OFFICE

2,042,582

WELTLESS, FULL-FASHIONED HOSIERY AND METHOD OF MANUFACTURE THEREFOR

John M. Botts, Jenkintown, Pa.

Application August 21, 1931, Serial No. 558,518

3 Claims. (Cl. 66—147)

This invention relates to weltless, full-fashioned hosiery, and to a method of manufacture therefor.

Generally, full-fashioned hosiery, as known in the art, is produced from a fabric the knitting of which involves dropping stitches in certain portions of the fabric body; there finally results a contour favorably conforming to the shaping of a leg. In the knitting of such stockings, a section is first formed with a welt bar as a base; then the stitches, which were formed first upon the welt bar, are transferred from the needles of the bar to the needles of the machine, and the knitting continued while the fabric is placed in tension to remove portions being knitted from the needles as the operation continues.

This type of manufacture produces, at the upper free edge of the stocking, a fabric of double thickness. The double layer of fabric at this point is not conducive to comfort, since, among other things, that section of the stocking is intended to encompass the thigh and, therefore, must be capable of extension to greater girth than other portions of the stocking, while, in fact, because of the greater thickness, the elasticity of this section of the stocking is reduced below that of the rest of the stocking; there is also the factor that an increased amount of material is required for this portion of the stocking. The procedure in manufacture requires complete stopping of very expensive machinery during the process for a considerable portion of a working day to effect the transfer of stitches from the welt bar to the needles.

It is an object of the invention to provide a method of manufacture for full-fashioned hosiery which will result in the production of a stocking of single thickness throughout, which will be of greater elasticity at the upper edge than at the other portions, and which, if desired, may have produced at the extreme edges and also at other portions thereof, ornamental effects not possible with the ordinary folded welt stocking.

It is an object of the invention to provide a method of manufacturing stockings, wherein, after the first stitches have been formed, no cessation of the operation is necessary, it being possible to knit the strip continuously without interruption. For this purpose, the needles of the bar, upon which the first stitches are formed, are separated from such stitches, and the fabric is then retained in tension while the knitting of the remaining courses continues thereafter without interruption.

It is an object of the invention to provide a method of manufacturing stockings in which the fabric produced is of single thickness throughout, and the free edges of the stocking, disposed at the extremity of that portion formerly known as the welt, are bound, either by a sewed stitch or, in a preferred case, by a knitted interlooped stitch, to prevent unravelling of the free loops at these edges. This results, among other things, in making this portion of the stocking of greater elasticity than the remainder, and also to make possible, both by inherent properties of the material as applied in the manufacture and additionally by the application of designs, the creation of ornamental effects not possible in the ordinary welt-topped hosiery.

It is another object of the invention to provide a full-fashioned stocking, in which that portion commonly known as the welt consists of but a single layer, the upper free edges of this portion being bound against unravelling by an interlooped knitted stitch, or even by a sewed stitch, so that the extent of this edge may be made greater than that of the body material.

Other objects of this invention will be set forth hereinafter, or will be apparent from the description and the drawings, in which are illustrated a number of embodiments of articles and apparatus exemplifying the invention.

The invention, however, is not intended to be restricted to particular constructions and arrangements, nor to particular applications, nor to specific methods of operation, nor to the various steps or details thereof, herein shown and described, as the same may be modified in various particulars or be applied in many varied relations without departing from the spirit and scope of the invention.

For the attainment of these objects and of such other objects as may hereinafter appear or be pointed out, I have illustrated some practical embodiments of my invention in the drawings wherein:—

Fig. 1 is a view in perspective of portions of apparatus used for knitting stockings according to an embodiment of the invention;

Fig. 2 is a view similar to Fig. 1, showing the apparatus in another position;

Fig. 3 is an elevational view of a stocking embodying features of the invention;

Fig. 4 is a section on the line 4—4 of Fig. 3, through one portion of the stocking, illustrating the manner in which the top edge is bound by overcast stitching;

Fig 5 is a view in elevation of a portion of a

stocking top, made as shown in Fig. 4, and illustrating the natural tendency of such top;

Fig. 6 is a view, similar to Fig. 5, illustrating the action of the stocking top of Fig. 4 when placed in tension;

Fig. 7 is a detail elevational view at the vertical seam of a portion of a stocking such as shown in Figs. 4 to 6;

Fig. 8 is an elevational view of a stocking top, embodying the invention in modified form; and

Fig. 9 is a view, similar to Fig. 8, illustrating the action of the material at the stocking top of Fig. 8 when the material is placed in tension.

When knitting a fabric strip for stockings in accordance with the invention herein, a flat-bed machine is used, the initial stitches being formed upon a bar **10**, similar in construction to the well-known welt bar, the needles **12** of bar **10** being disposed to receive the thread in the manner of the welt bar. After the first stitches have been formed on these needles, the strap **14** is hooked to the bar, and, by means of a roller **16**, the material being formed is placed in tension. The usual springs **18** are provided to take up the slack of the strap, and also to compensate for any excessive strains that may be applied as the roller revolves.

As is well known, the bar **10** must be of considerable body and, therefore, weight in order that the needles **12** may be assembled therewith. Due to its weight, it is practically undesirable to continue knitting beyond a few courses with this bar in position. In the ordinary method of knitting, after a number of courses have been knitted with the bar, the loops are transferred from needles **12** to the needles of the knitting machine (not shown), and then tension is applied directly to the fabric by strap **14** engaging a rod positioned within the folded back courses.

In the application of the invention herein, the bar **10** is eliminated as soon after the formation of the initial stitches as possible. For this purpose, there is secured to strap **14**, at any desired point, but preferably in advance of springs **18**, an auxiliary strap **20**, at the free end of which is disposed a rod **22** carrying a few hooks **24**. The extent of the rod is made sufficient to dispose the hooks sufficiently separated to support the entire strip **26** of the fabric being formed; the strap **20** is of a length sufficient to dispose the hooks immediately over the fabric strip and appreciably in advance of the needles of bar **10**.

At the commencement of the operation, rod **22** and its hooks, are supported, as shown in Fig. 1, so as not to interfere with bar **10**, and the fabric being formed thereon. However, after a number of courses have been knitted, strap **20** is thrown toward the fabric, and hooks **24** engaged in the fabric itself, as shown in Fig. 2. In this relation, the hooks now apply the tensional force directly to the fabric; hook **28**, engaging bar **10**, may be released, and the initial loops separated from needles **12**. The knitting operation thus may be continued without interruption, as tension is continuously applied to strip **26** and there is no necessity to bring the operation to a halt in order to remove the loops from needles **12**. When hook **28** arrives at roller **16**, strap **20** will be positioned above and substantially covering it, protecting the fabric from engagement therewith and guarding it against tears that might result from such possible engagement.

After strip **26** has been knitted, with portions thereof "narrowed" as indicated at **29**, in the usual manner, to produce full-fashioned effects, the strip is folded and seam **30** sewed to form the stocking **31**. In the preferred embodiment of the invention, the sewing of this seam is effected by starting from the top, and going downwardly. By such procedure, the bunching, ordinarily produced at the top, is eliminated.

In order to bind the free loops at the top edge of the stockings, a number of different methods are contemplated. In the preferred method, the knitting is commenced with a cheap thread, commonly known as ravel-off. After a number of courses have been knitted with this thread, there may be produced, by the thread with which the stocking is finally to be knitted, and which will be known herein as finish thread, one or more courses of picot stitches **32**. The knitting may then be continued in the customary manner, either with the production of additional courses **34** of picot stitches, or with their omission.

After the full leg and the rest of the stocking have been formed, the strip is separated from the machine, the ravel-off thread unravelled down to, or within a course or more of, the first course of picot stitches, and then, by well-known apparatus, the free stitches of finish thread are bound by interknitting thread therewith. There results a bunching of loops **35** on this edge, the character of which is such that the stocking at this point is capable of extension far beyond that of the body itself.

This construction favors the use of stockings of this character for abnormal conditions, as, for instance, for thighs of more than average girth, as well as for normal conditions, since the elasticity of the stocking top will compensate for these many conditions. It, therefore, makes possible the provision of standard sizes for substantially all possible users within a wide variety of thigh girths.

The location of the interlooped stitches together with the picot stitches at the upper extremity of the stocking, produce ornamental effects, such as are apparent in Figs. 8 and 9, not possible with the ordinary double welt stocking. The appearance of the stocking top in Fig. 8 is one actually observed, and appears to arise from the tensile effect of the interlooped thread binding the edges. This tensile effect results in the formation of a top edge having a substantially scalloped appearance. It is also possible to derive many of these results without the use of picot stitches at all; for instance, the binding of the edges is not dependent upon the use of the picot stitches, although the increased elasticity of the top edge is furthered by the association of courses of picot stitches with the interlooped binding stitch, or the sewed binding stitch to be described.

In Figs. 4 and 5, there has been illustrated the use of another method of binding the free stitches against unravelling. In this case, overcast stitching **36** is utilized. These stitches may be formed by sewing machines, the character of which is well known in the art. These stitches, to a marked extent, are elastic, and permit the extension of the top beyond that of the body itself.

One of the inherent characteristics of stocking tops, formed in accordance with the invention, is the tendency of the free edges to curl outwardly and downwardly, a peculiarity which has been observed in the many forms of stockings made according to the methods described. This feature of the invention has been illustrated in Figs. 3, 5, 6, 8 and 9, the illustrations of Figs. 6 and 9

indicating that this tendency is accentuated when the stocking top is placed in tension, as occurs, of course, when the stocking is placed upon the leg. A natural result, therefore, is that a round, and not a raw, edge will be presented to the flesh at any time during the use of the stocking. The natural rolling of the stocking may be continued, where such is desired, without the bunching of material that occurs with the double welt type.

It is noted, also, that, due to the construction of the stocking, the many methods of repairing the fabric where "runs" have occurred is not limited by a welt, since none such exists in the stocking. Where "runs" commence in, or extend into, the extreme top portion of the stocking, the repair may be continued without a halt from the body up into that portion of the stocking.

In order to produce the illusion of a separate welt the upper section **38** of the stocking may, if desired, be knitted with heavy weight thread, while the body may be knitted with a light weight thread. In this manner, the stocking finally produced has all the qualities of a single layer, and yet has the appearance of a double welt, stocking.

In some cases, it may be desired to produce a stocking which, in finished state, does not have the curling or rolling tendencies indicated; for that purpose, the stocking, when finished, may be worked on a board, as, for instance, by wetting and stretching. For stockings having these characteristics, those made in accordance with another embodiment of the invention are especially adapted.

Some forms of knitting displaying picot effects are produced by a stitch which may not be unravelled in one direction. Therefore, by knitting stockings with a course or more of such stitches, and subsequently unravelling down to the first course of picot stitches, the thread will be secured automatically against unravelling.

Another method of securing the free thread end against unravelling arises from seaming the stocking downwardly, rather than upwardly. In this way, the seam itself is firmly knotted at the top. If unravelling of a course of the knitted stitches be commenced, it must terminate at one of the selvage edges secured to form the seam. In one application of the invention in which ravel-off is used for the initial stitches, the strip has been completely knitted and before any further steps are taken, the vertical seam may be closed by sewing downwardly, as indicated herein, commencing at such point as is predetermined as the top edge of the stocking. The stocking, as a unit, may then be put through such processing as desired, such, for instance, as dyeing, stretching, and like steps, in some of which the extra extent of the ravel-off may be used to advantage. All these steps having been completed, there may then be effected the unravelling of the ravel-off down to the position at which the first stitch of the seam was made, an automatic locking of the thread against unravelling resulting. In conjunction with such locking may be applied the knitting of picot stitches either of the locking or non-locking character.

Another application of the use of ravel-off in knitting stockings of this character lies in interknitting, with the last course of the ravel-off thread, a single course from an independent thread, the ends of which thread are left freely extending beyond the extent of the fabric, so that they may be grasped by the fingers, if desired. Then, the finish silk is interknitted with this course to complete the entire fabric. After the fabric has been separated from the machine, one of the free ends is grasped and the thread carefully pulled out of the fabric, whereupon the knitted ravel-off and the knitted finish thread will separate sharply and leave the top edge of the finish fabric cleanly defined. As another feature of such manner of procedure, there would be produced, as the first course of stitches for the finish thread, a course of picot stitches of the self-locking type, so that such top edge would be non-ravelling.

Many other changes could be effected in the particular apparatus and the articles of manufacture designed, and in the methods of operation set forth, and in the specific details thereof, without substantially departing from the invention intended to be defined in the claims, the specific description hereinabove being merely to illustrate operative embodiments carrying out the spirit of the invention.

Having thus described my invention and illustrated its use, what I claim as new and desire to secure by Letters Patent is—

1. The method of knitting stockings on a flat-bed machine, which includes the steps of: forming a plurality of stitches on a needle bar, applying tension to the bar, continuously forming stitches thereafter, subjecting the fabric to tension independently of the bar, and separating the bar from the fabric.

2. The method of knitting stockings on a flat-bed machine, which includes the steps of: forming a plurality of stitches on a needle bar, applying tension to the bar, continuously forming stitches thereafter, subjecting the fabric to tension independently of the bar, and separating the bar from the fabric, all while the knitting operation continues without interruption.

3. Apparatus for knitting stockings including: a tension belt having means for separable connection to the welt bar of a flat-bed machine, and means secured to the belt for engaging the fabric knitted by the machine independently of the bar.

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