May 29, 1956 B. T. R. REYMES-COLE 2,747,390

STOCKING AND METHOD OF MAKING THE SAME

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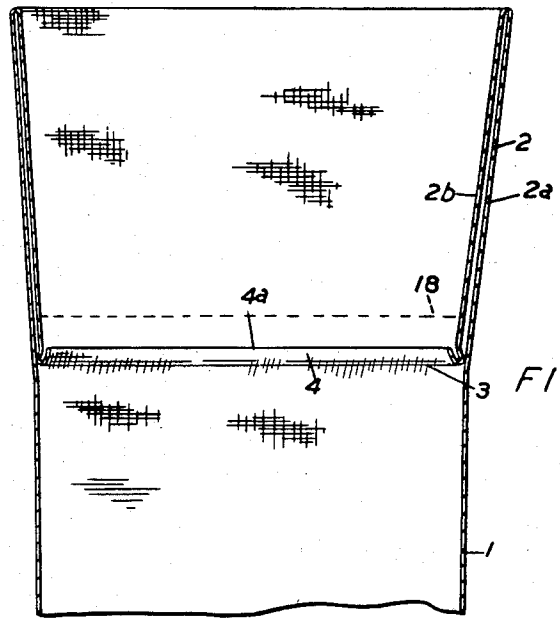


FIG. 1.

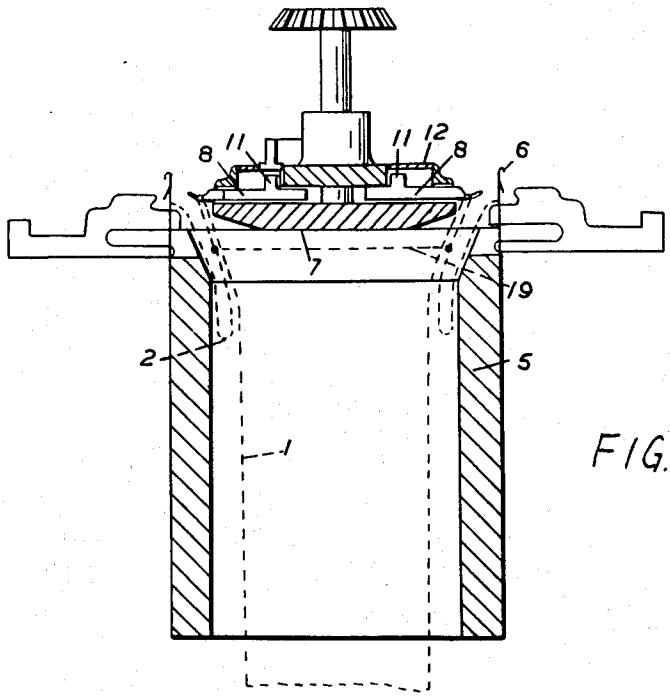


FIG. 2.

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FIG. 3.

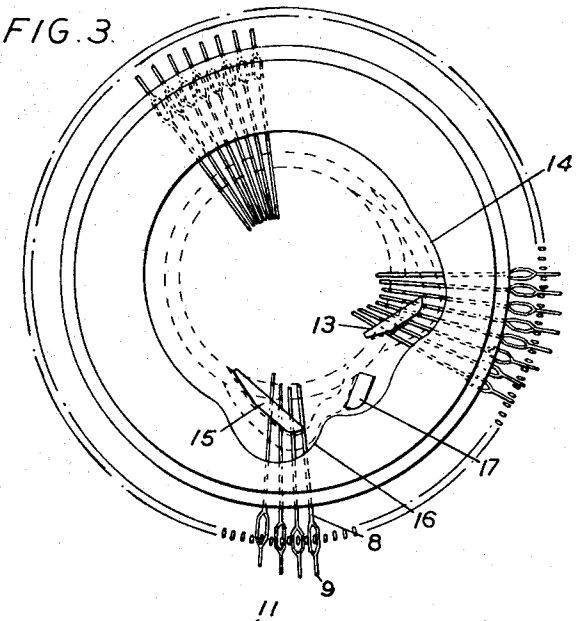


FIG. 4.

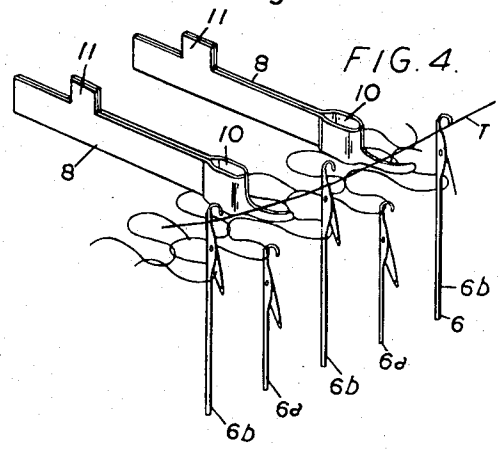
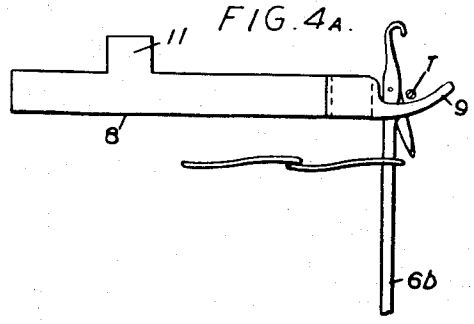


FIG. 4A.



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FIG. 5.

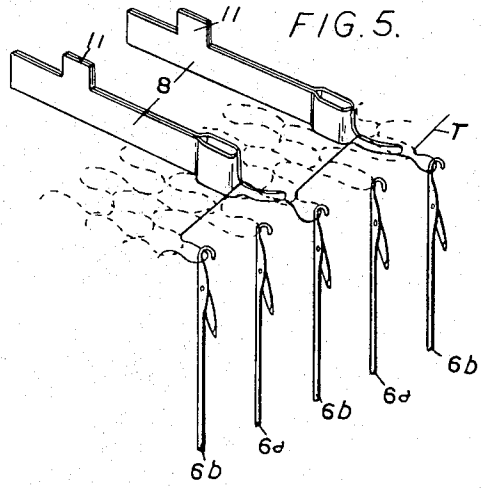


FIG. 6.

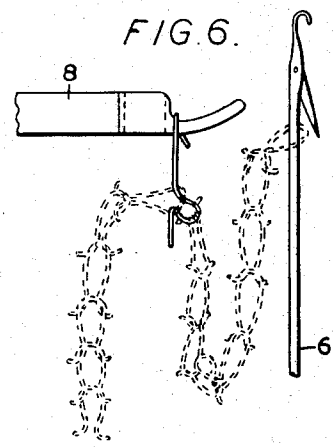
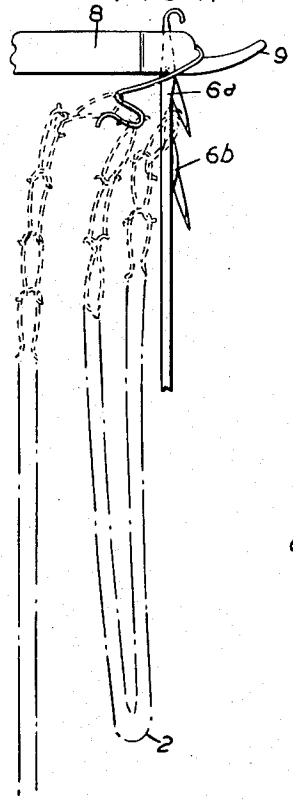


FIG. 7.



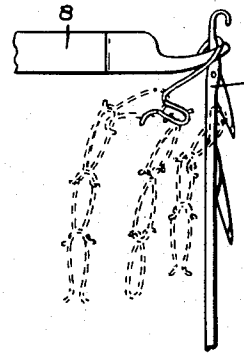
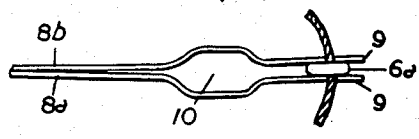


FIG. 8.

FIG. 9.



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STOCKING AND METHOD OF MAKING THE SAME

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Application March 9, 1955, Serial No. 493,196

7 Claims. (Cl. 66—173)

The present invention relates to an improvement in the manufacture of hosiery, and more particularly to an improved welt portion of an article of hosiery and method of knitting the same.

The invention is intended primarily as an improvement upon the knitted article and method of manufacture of the same which forms the subject matter of United States Letters Patent No. 2,703,970, dated March 15, 1955, to Bernard Thornton Reymes Reymes-Cole et al. for Knitting Machines, Methods of Knitting and Knitted Articles.

The pending application referred to relates inter alia to production of stockings or stocking blanks on knitting machines of the type having individually movable needles and yarn engaging devices (primarily sinkers and hereinafter referred to as such) alternating with the needles, which needles and sinkers are capable of relative loop drawing movement determining the stitch length; the reference to relative loop drawing movement determining the stitch length is to be construed as indicating that the needles, or the sinkers, or both, may be movable for the purpose of drawing loops of a predetermined length. This application provides, inter alia, a method for the production on a knitting machine of the type specified of a knitted stocking or blank that is shaped by insertion of additional wales as knitting proceeds up the back of the leg, which method comprises withholding from knitting activity spaced fashioning needles within a limited group of needles (e. g. at the back of the leg), knitting on the remaining needles, subsequently introducing the fashioning needles progressively into knitting activity to produce additional wales, and at all times controlling the relative loop drawing movements of the active needles and their sinkers in such manner that the fabric knitted by the needles of said group, both before and after the introduction of the fashioning needles, is substantially visually indistiguishable in the finished stocking from the other fabric of the leg. By the "finished stocking" this is meant the stocking after it has been subjected to the usual finishing processes (e. g. boarding) and in condition for wear. The sinkers associated with the fashioning needles (i. e. the sinker at the right hand side, or that at the left hand side, of each fashioning needle) may be withheld initially from activity and subsequently introduced with the fashioning needles. Alternatively the sinkers associated with the fashioning needles may be active throughout; particularly if the fashioning needles are arranged, when active, to draw somewhat longer loops than the other needles. Preferably every second or every third needle in the limited group of needles is a fashioning needle. Best results are achieved by imparting to certain spaced needles and their sinkers among the active needles, relative loop drawing movements that are the same as those imparted to the fashioning needles, when active, and their sinkers and that differ from those imparted to all other active needles and their sinkers. Preferably the spacing between such needles is the same as that between the fashioning needles.

It is known to provide a seamless stocking with an inturned welt but heretofore the usual practice adopted has been appropriate for use only when the stocking is knitted from the welt downwards.

An object of the present invention is to provide a method and mechanism whereby the stocking which is knitted up the leg is provided with an inturned welt.

The present invention provides an improvement upon the method of producing stockings set forth in the pending application Serial No. 95,336, now Patent No. 2,703,970, above referred to, which consists in the production of an integrally knitted inturned welt following leg courses of knitted fabric in accordance with the method which comprises the steps of moving the spaced needles to an inactive loop holding position, feeding thread to the remaining needles for an initial welt course, but operating welt instruments to receive and to hold thread loops or kinks of that course that would otherwise be received by the inactive needles, continuing to knit welt fabric while the welt instruments hold said loops or kinks, transferring said loops or kinks to the said spaced needles at the end of the welt, and knitting at least one further course on all needles.

Preferably, the said spaced needles are brought back into activity immediately after the initial welt course and continue in activity during the subsequent knitting of the welt.

According to a subsidiary feature of the invention the transfer of the loops or kinks at the end of the welt is effected in two stages, a first stage in which the loops or kinks of spaced instruments are transferred to the associated needles and a second stage in which the loops or kinks from the intervening instruments are transferred to their associated needles, and all needles knit at least one course between the two stages.

The foregoing and other features of the invention set out in the appended claims are incorporated in the method of manufacture, and in the article, which will now be described by way of example with reference to the accompanying drawings in which:

Figure 1 is a section through the welt and adjacent parts of the leg of the stocking according to this invention;

Figure 2 is a sectional view, to some extent diagrammatic, showing the relevant parts of the knitting machine and illustrates the manner in which the welt is formed;

Figure 3 is a plan showing the welting instruments in the dial and the cams for operating them;

Figure 4 is a perspective view showing the welting instruments and a few needles and illustrates the production of the first course of the welt, while Figure 4*a* is a side elevation of an instrument and needle showing their relative positions at this stage;

Figure 5 is a perspective view similar to Figure 4 showing the active needles drawing their kinks or loops of the first welt course over the instruments;

Figure 6 is a side elevation showing the first welt course hanging on the instruments and other welt courses being knitted by the needles;

Figures 7 and 8 are side elevations showing steps in the transfer of the first welt courses to the needles, while

Figure 9 is a plan view of a welting instrument and the associated needle at the stage shown in Figure 8.

In Fig. 1 the leg of the stocking (according to the aforesaid co-pending application) is shown at **1** and the welt at **2**. This welt **2** consists of outer layer **2***a* which is knitted immediately after the leg **1** and an inner layer **2***b* knitted after the outer layer. The two layers **2***a*, **2***b*, are joined together along the line **3**, and are integral with the narrow band of fabric **4** at the interior of the welt. This band of fabric **4** consists of a few courses (for example, four in number) knitted immediately the two parts of the welt have been joined. It has a raw edge **4***a* (e. g. at which the fabric is pressed off the needles). It is found that the

fabric will not run back from this raw edge under normal usage because it is not submitted to any strain. However, if desired, precautions may be taken to prevent the band **4** from unravelling, for example it may be knitted of run-resistant fabric.

One suitable form of run-resistant fabric consists of alternate courses of long and short loops. Another comprises at least one course in which tuck stitches are produced on every second needle. Alternatively the band **4** may be knitted of a yarn which, like wool or cotton, is of a comparatively rough nature (as compared with silk, artificial silk or nylon) such that the fabric does not exhibit any pronounced tendency to unravel. As a further alternative an adhesive may be applied to the fabric or to the yarn of which it is knitted, tending to stick adjacent parts of the yarn together and to prevent unravelling. For example, the yarn may be treated with a mixture of rubber adhesive compound and oleic acid, the respective proportions of the ingredients being 50 and 100. The yarn may be run through this solution on its way to the needles. Instead of treating the yarn or fabric with an adhesive, the fabric may be knitted of a thermoplastic yarn, heat being subsequently applied to the band to cause contacting parts of the yarn to fuse together.

In a still further alternative one or more courses of the band **4** may be knitted of elastic thread, while in still further alternative the joint **3** may be stitched or overlocked. A still further alternative is described later in this specification.

In order to carry the present invention into effect the knitting machine (being a machine according to the aforesaid application) has in addition to the conventional cylinder **5** equipped with needles **6**, a dial **7** equipped with welting instruments **8** of known kind that are capable of receiving and retaining thread loops or thread kinks and of transferring these loops or kinks to the needles. Each instrument **8** consists of two blades **8***a*, **8***b* formed right and left handedly (at least one of them being provided with an upturned hook **9** at its outer end), and an eye **10** between them. These instruments are provided with butts **11** and are slidable in tricks in dial **7**, being operated by cams in the dial cap **12**. It will be understood by one skilled in the art that certain of the dial cams (and notably the cams **13**, **14** and **17** hereinafter referred to) are bolt cams which are only lowered to operative position when it is required to start and finish the welt, the welting instruments being held retracted at all other times.

At the commencement of the welt each of spaced needles **6***a* (e. g. every second or third one) is temporarily lowered to an inactive position in which it retains in its hook the loop which is knitted in the last course of the stocking leg **1**. Now the welting instrument **8** associated with each such needle **6***a* is projected outwards across the needle line by means of a bolt cam **13** in the dial cap **12**, so that when thread T is fed to the intervening active needles **6***b* for the next course of knitting these active needles draw their loops of the next course over the hooks **9** of the projected instruments. The instruments are then retracted by cam **14** so that they retain the connecting loops or kinks of this initial course and the temporarily inactive needles **6***a* are raised to knitting activity to continue with the other needles **6***b* the production of the welt.

The outer and inner layers **2***a*, **2***b* of the welt **2** are thus knitted on all needles, with the thread kinks of the initial welt course still retained on the welt instruments as shown in Figure 6, and as the welt knitting proceeds the fabric of the welt rolls down in a bight between the interior of the needle cylinder **5** and the leg **1** of the stocking, as shown in Figure 2.

When sufficient fabric has been produced to form the welt **2** those spaced needles **6***a* which were temporarily inactive at the start of the welt are again lowered and the associated welt instruments are gain projected by a cam **15**. The extent to which they are projected by cam **15** is greater than that to which they were initially projected by

cam **13** and is sufficient to cause their eyes **10** to be temporarily disposed above the lowered needles. This is shown in Fig. 3. These lowered needles **6***a* are then raised so that they enter the eyes **10** and necessarily transfix the thread kinks of the initial welt course which are held on the instruments **8**. The instruments are then retracted by cams **16** and **17** so that the hook part **9** of each blade **8***a*, **8***b*, withdraws past the needle as shown in Figs. 8 and 9, leaving the kinks of the initial welt course on these needles. Thereafter all needles continue to knit and as soon as the needle loops of the first resumed course have been drawn by the spaced needles **6***a* through the thread kinks of the initial welt course just transferred to them, the welt is completely turned. Thereafter all the needles continue to knit the band **4** until the fabric is pressed off from them, or until a drawthread is inserted and the knitting of a further stocking is commenced.

It may be desirable to perform the transferring or welt turning operation in two steps. In the first step the even instruments **8** transfer their kinks to the associated needles, at the point indicated by the line **18** in Fig. 1;—that is to say while at least one and preferably a plurality of courses of the inner layer **2***b* of the welt still require to be knitted. These remaining few courses will then be knitted on all needles while the odd transfer instruments still retain their thread kinks of the initial welt course. At the second stage the odd transfer instruments are operated to transfer their kinks to the associated needles at the point indicated by the line **3** in Fig. 1.

If desired elastic thread may be introduced locally into the welt a few courses after commencement of the welt as indicated at **19** in Fig. 2. This elastic thread may be laid in or knitted for one or more courses.

I claim:

1. The method of knitting an article of hosiery including leg courses and a welt portion knitted integrally thereto on a circular knitting needle series having needles shiftable to inoperative position spaced between other needles including a group of such spaced needles shiftable from said inoperative position to add fashioning wales, and on cooperating welting instruments, which comprises the steps of moving all of said spaced needles to an inactive loop holding position, feeding thread to the remaining needles for an initial welt course, and operating the welting instruments to receive and to hold the thread kinks of said initial welt course that otherwise would be received by said inactive needles, returning all of said spaced inactivated needles into activity immediately following the initial welt course and during the subsequent knitting of the welt, transferring kinks from spaced welting instruments disposed between other welting instruments to the associated needles, causing all of the needles to knit at least one course, and thereafter causing said other welting instruments to transfer their kinks to the associated needles.

2. The method of knitting an article of hosiery including leg courses and a welt portion knitted integrally thereto on a circular knitting needle series with needles shiftable to inoperative position spaced between other needles including a group of such spaced needles shiftable from said inoperative position to add fashioning wales, and on cooperating welting instruments, which comprises the steps of moving all of said spaced needles to an inactive loop holding position, feeding thread to the remaining needles for an initial welt course, and operating the welting instruments to receive and to hold the thread kinks of said initial welt course that otherwise would be received by said inactive needles, continuing to knit welt fabric while the welt instruments hold said kinks, transferring said kinks to spaced needles at the end of the welt, and knitting a plurality of courses having non-run characteristics following said loop transfer to the needles.

3. A circular knitted stocking blank which comprises a knitted leg fabric having fashioning wales spaced between

other wales added to produce a fashioned fabric, and an inturned welt having a plurality of welt courses including an initial welt course with spaced loops thereof withheld from the knitting of the next succeeding welt course, and a plurality of terminal welt courses, said spaced loops being knitted inwardly of the circular fabric into the first of said terminal welt courses to close the welt, said terminal welt courses being knitted and arranged to provide a terminal band of welt fabric having non-run characteristics.

4. The stocking blank of claim 3 in which the terminal band of welt fabric having non-run characteristics includes alternate courses of long and short stitches.

5. The stocking blank of claim 3 in which the terminal band of welt fabric having non-run characteristics includes a rough spun yarn.

6. The stocking blank of claim 3 in which the terminal band of welt fabric having non-run characteristics includes a thermoplastic yarn.

7. A circular knitted stocking blank which comprises a knitted leg fabric and an inturned welt knitted from the leg fabric having a plurality of welt courses forming continuations of all the wales in the leg fabric including an initial welt course with alternate loops thereof withheld from the knitting of the next succeeding welt course, a plurality of terminal welt courses, a portion of said alternate loops spaced individually between other alternate loops being knitted inwardly of the circular fabric into the first of said terminal welt courses, and the remainder of said alternate loops being knitted inwardly of the circular fabric into a following terminal welt course to close the welt.

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