FIG. 1.

FIG. 2.

FIG. 3.

FIG. 4.

FIG. 5.

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TAKE-UP MEANS FOR KNITTING MACHINES

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TAKE-UP MEANS FOR KNITTING MACHINES

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1 This invention relates to knitting machines and has particular reference to take-up means involved in the production of stockings containing interlined welts.

Individual separate stockings may be knit starting with bare needles in accordance with the procedure and utilizing such instrumentalities as are disclosed in the patent to R. W. Scott, No. 1,982,958, dated October 29, 1929. In accordance with this procedure, which need not be repeated herein in detail, a non-ravelled selvage is first produced and thereupon loops are transferred to transfer elements which hold the initial courses during the knitting of a hem or welt, there being produced in the formation of this welt a sufficient number of courses to secure the desired length thereof. At the completion of the welt the loops which were held by the transfer elements are returned to the needles and knitting is resumed tying the welt loops into loops at the beginning of the leg so that a doubled or interlined welt is produced. The welt fold as it is being formed and thereafter has generally been carried away from the needles by gravity with initial assistance by a presser such as shown in said Scott patent. The foregoing method has been satisfactory but it has been recognized that more uniform and perfect stitches might be formed if tension was applied between the stitches being knitted and others previously knitted. Furthermore, more satisfactory results would be obtained if it is tension could be applied through a substantially length of the fabric. In the application of Alexander Belford and Fred A. Kuss, Serial No. 111,484, filed August 20, 1949, now Patent No. 2,574,009, there are provided suitable means for applying tension to the fabric through the use of take-up rolls which may be caused to stop or to advance at varying speeds as determined by control mechanism, thus to apply a uniform but variable tension to the fabric.

In accordance with the disclosure of said Belford and Kuss application the yarn is not taken entirely out of action between stockings but rather the regular yarn is changed in order that one or more courses of stitches may be knitted from a yarn having sufficient strength for knitting and providing a connection between successive stockings but frail enough to permit the various finished stockings to be torn apart or separated. Accordingly it is possible to feed the continuous string of stockings at all times to a take-up reel, remote from the point of knitting.

During the time that the welt or hem is being knitted such a remote take-up is incapable of exerting tension on the welt section of the fabric since the last course of fabric under the influence of the take-up will have been removed from the needles and held by the transfer elements. In accordance with said Belford and Kuss application there is provided a tube located inside of the needle cylinder and stationary with respect to a revolving cylinder (or rotating respect to a stationary cylinder), this tube having at the inside of its upper end one or more baffles having camming action on the welt to effect movement of the fabric as it is produced smoothly away from the needles and their cooperating sinkers in such a manner that neither distorted nor unsightly stitches will be produced.

In accordance with the present invention provision is made for more effectively lowering welts away from the needles during welt formation, this end being accomplished through the production of pulsating air flow engaging the welts desirably remote from the point of knitting so as to prevent any disturbance of the proper formation of stitches. Associated with the means for producing pulsating air as just described there is an interior tube arranged to provide a space into which the welt undergoing formation is lowered so that its motion is not impeded by the portion of a previous stocking which has been knitted. As will become apparent hereafter the invention is applicable not only to the knitting of stockings having interlined welts in a continuous series but also to the knitting of separate stockings in general accordance with the disclosure of said Scott patent.

The general objects of the invention indicated above and other objects particularly relating to details of construction and operation will become apparent from the following description read in conjunction with the accompanying drawings in which:

Figure 1 is a vertical section taken through the upper portions of a circular knitting machine to which the invention is applied; Figure 2 is a section taken on the plane indicated at 2—2 in Figure 1; Figure 3 is a fragmentary elevation showing in particular the fabric take-up rolls and their operating devices; Figure 4 is a fragmentary sectional view showing in particular a fin for aiding in taking up the welt; and Figure 5 is a plan view of the matter illustrated in Figure 4 showing in addition a presser of the general type illustrated in said Scott patent.
The figures show only those elements of a rotary cylinder circular knitting machine as are required for an understanding of the invention. It will, of course, be understood that this arrangement contains conventional elements well known to the art and, in particular, reference may be made to said Scott patent and to said Belford and Kuss application for a more complete showing and description of those elements particularly concerned with fabric formation. As will be apparent hereafter various features of the invention are applicable to machines of the stationary cylinder-rotary cam type, but for clarity and consistency of the description there will be hereafter referred to only a machine of the rotary cylinder type.

The needle cylinder illustrated at 2 is slotted to carry needles 4 with which cooperate conventional sinkers 6. A rotary dial 8 carries transfer elements 10 of the type described in said Scott patent. Relative movements of conventional character are imparted to these various instrumentalities in conventional fashion. The dial 2 which carries the transfer elements 10 is provided with a series of openings 14 which during rotation of the dial 2 are successively brought beneath the lower end of a tube 16 passing through the dial 2 and are connected by a tube 18 to a source of compressed air. This compressed air may be continuously flowing or may be caused to flow during only certain portions of the knitting cycle, as for example during the formation of the welt, by means which are conventional and are not herein shown. While the air is flowing the rotation of the dial 2 to bring the holes 14 successively beneath the tube 16 results in the production below the dial 2 of intermittent puffs of air which have a take-up function hereafter described. The tube 16 is desirably located approximately opposite the point at which stitches are formed from yarn fed by one or a series of yarn fingers 18 which are subject to control by the usual clappers 22 controlled by the main cam drum of the machine. By reason of this location of the tube 16 the introduced air produces no disturbance in the uniformity of formation of the stitches, functioning solely for take-up purposes.

Located within the needle cylinder is a tube 24 which is held at its lower end by the upper end of a non-rotating cylinder of conventional type such as illustrated in the Belford and Kuss application, which cylinder is adapted to have axial movements imparted thereto for the control of corresponding axial movements of the needle cylinder.

The upper end 30 of the tube 24 is flared outwardly forming substantially a smooth continuation of the inner surface of the needle cylinder assembly. Spacers 28 and screws 29 support the tube 24 in the sleeve 27 or cylinder 31 arranged concentrically with the tube 24 and provided with an upper rounded end 33 against which the fabric may move. An annular space 35 is formed between the tubes 24 and 31 for the reception of the welt as hereafter described. As described in said Belford and Kuss application the lower portion of the welt 30 is provided a take-up assembly indicated generally at 32 having upper and lower bearings (not shown) in the machine frame. The assembly includes a fabric receptacle indicated at 33. Drive of this assembly is effected by gearing from the vertical shaft 44 which is geared to the needle cylinder. The arrangement is such that the take-up assembly rotates in unison with the needle cylinder. A guide 50 forming part of the assembly is so arranged that this guide at its lower end a crosshead 54 on which are pivoted paws 56 and 60 urged into engagement with ratchet wheels 62 and 64 by a spring 61. A spring 58 urges the slide 52 upwardly. The ratchet wheels 62 and 64 are carried by the crosshead 54 which is urged together by a spring arrangement indicated at 72. These rollers may be surfaced in various fashions to secure proper take-up of the particular fabric being knit; for example, one of the rollers may be covered with smooth fabric and the other with corduroy, pile fabric or the like, or one of the rollers may be cloth surfaced and the other formed of corrugated wood, or other arrangements may be used, such as a pair of metallic rollers. A detent 70 prevents reverse movement of one of the ratchets; this generally sufficient to insure maintenance of tension through, if desired, detents may be associated with both ratchets.

A cam 74 is carried by a lever 76, pivoted to the frame at 78 and adapted to be actuated upon by suitablecams on the main cam drum serving to control other movements of the machine in various conditions of operation of the take-up. The operation of this type of take-up is described in detail in said Belford and Kuss application and need not be described herein.

Reference may now be made particularly to Figures 4 and 5. In the inside of the upper end of the tube 24 there is secured a fin 80 extending inwardly and provided with an inner smooth edge. This edge of the fin at 90 merges horizontally and smoothly with the upper end of the tube. Its lower end at 92 also merges into the surface of the tube in smooth fashion, this merger preventing catching of the fabric on the fin during reciprocation. A presser 94 which corresponds to the presser P of said Scott patent and which may be similarly controlled, has a position such as indicated in Figure 5 showing the level of the top of the tube. As an indication of the position of the fin 80 there is indicated at 96 the approximate circumferential location of the center of the sinker cam and at 98 the approximate circumferential location of the lowest point of the stitch cam. It has been found that the fin operates most effectively if it is held at an angle of approximately 42° with respect to a horizontal plane and extends inwardly from ¾ to ¾ inch from the inner cylinder wall of the tube 24.

The operation of the machine may be considered starting from the beginning of formation of the welt. The previously knit stocking indicated at S in Figure 1 is held under tension between the take-up rolls 56 and 60 and the transfer or cylinder 31 on which the initial courses during the knitting of a welt 50 will be observed from Figure 1 the preceding stocking passes inwardly of the rolled or rounded edge of the tube 31 leaving a space in which the welt may descend during its formation. The inward movement of the fabric forming the welt 40 can be the machine there is provided a cam 74 immediately following the holding of loops on the transfer elements 10, the presser serving to force inwardly the loop of fabric which is then being produced. Inasmuch as the previously formed stocking is held inwardly by the upper edge of the tube
this action is not impeded. As the knitting of the welt progresses the fin 5 serves by frictional engagement with the welt 14 to aid in forcing the loop downwardly. The blasts of air penetrate the fabric which is held between the elements 10 and the top of the cylinder 31 as well as the section of the welt suspended below the elements 10, and this serves to effectively move downwardly the fabric hanging below the needles. The air currents seem to pass through the two layers just mentioned and exert a pulsating force on this fabric suspended from the needles and the pulsations by producing movement are particularly effective in insuring the proper downward movement of the welt into the annular space 35 which is of sufficient width and depth to receive the welt loop without impediment its movement. After the welt is completed and the held loops are transferred to the needles, the take-up rolls pull the previously formed stocking and thereby pull the welt out of the space 35 around the rolled edge 33 of sleeve 31 and downwardly inside this sleeve.

It will be evident from the above that the existence of tension on the previously formed stocking does not prevent the free and proper movement of the welt W during its formation.

While the invention is particularly applicable to the formation of stockings in a continuous string, it will be evident that by the removal of screws 29, spacers 23 and sleeve 31, it may also be applied to the knitting of stockings having wells even though the stockings are dropped off at the completion of their individual formations and new stockings are started on bare needles.

What is claimed is:
1. In a circular knitting machine, a needle cylinder, needles slidable in said cylinder, means associated with said needles for holding stitches during the formation of a turned welt, and means for directing pulsating air from a location inside the circle of held stitches to impinge upon and urge away from the needles a turned welt, the air directing means being located remote from the position at which the needles draw stitches.

2. In a circular knitting machine, a needle cylinder, needles slidable in said cylinder, means associated with said needles for holding stitches during the formation of a turned welt, and means directing pulsating air from a location inside the circle of held stitches to impinge upon and urge away from the needles a turned welt, the air directing means being located remote from the position at which the needles draw stitches.

3. In a circular knitting machine, a needle cylinder, cylinder, needles slidable in said cylinder, means associated with said needles for holding stitches during the formation of a turned welt, and means directing pulsating air from a location inside the circle of held stitches to impinge upon and urge away from the needles a turned welt, the air directing means being located remote from the position at which the needles draw stitches.

4. In a circular knitting machine, a needle cylinder, needles slidable in said cylinder, means associated with said needles for holding stitches during the formation of a turned welt, and means directing pulsating air from a location inside the circle of held stitches to impinge upon and urge away from the needles a turned welt, the air directing means being located remote from the position at which the needles draw stitches.

5. In a circular knitting machine, a needle cylinder, needles slidable in said cylinder, means associated with said needles for holding stitches during the formation of a turned welt, a cylinder located inside the needle cylinder, there being relative rotation between the needle cylinder and the last mentioned cylinder, and means directing air to impinge upon a turned welt and urge it downwardly within the last mentioned cylinder.

6. In a circular knitting machine, a needle cylinder, needles slidable in said cylinder, means associated with said needles for holding stitches during the formation of a turned welt, a cylinder located inside the needle cylinder, there being relative rotation between the needle cylinder and the last mentioned cylinder, and means directing pulsating air to impinge upon a turned welt and urge it downwardly within the last mentioned cylinder.

7. In a circular knitting machine, a needle cylinder, needles slidable in said cylinder, means associated with said needles for holding stitches during the formation of a turned welt, said means comprising a series of holding elements and a supporting dial, said supporting dial being provided with openings, and means directing air through said openings successively to provide pulses of air to impinge upon and urge away from the needles a turned welt.

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