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METHOD OF FORMING FLAT KNIT MATERIAL

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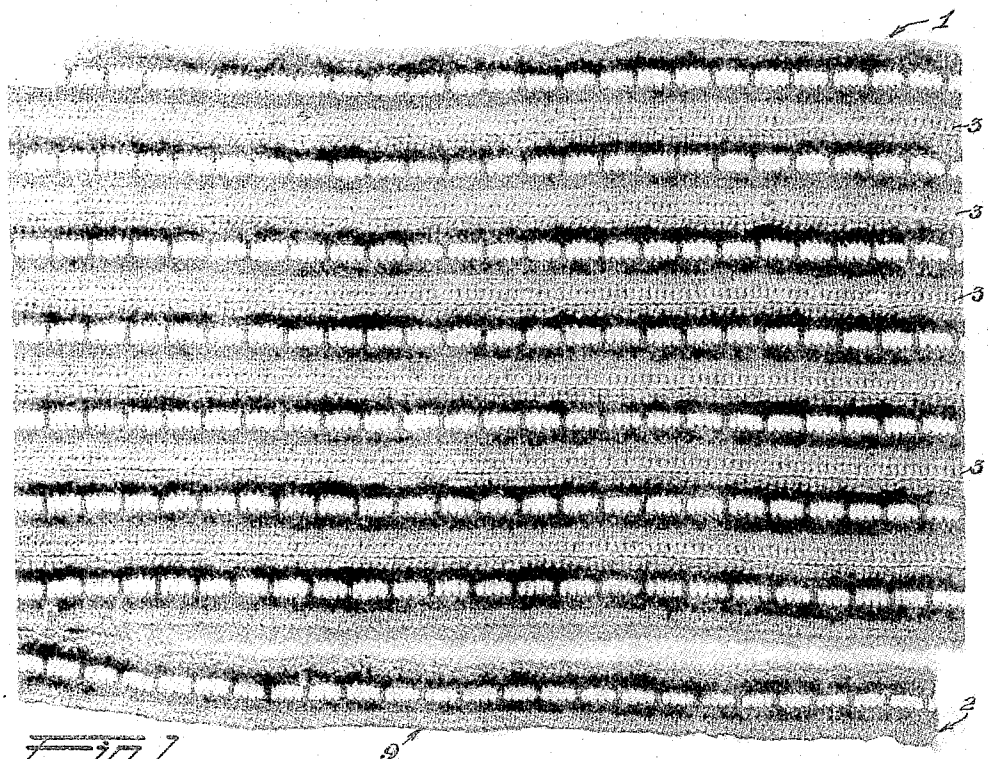


Fig. 1.

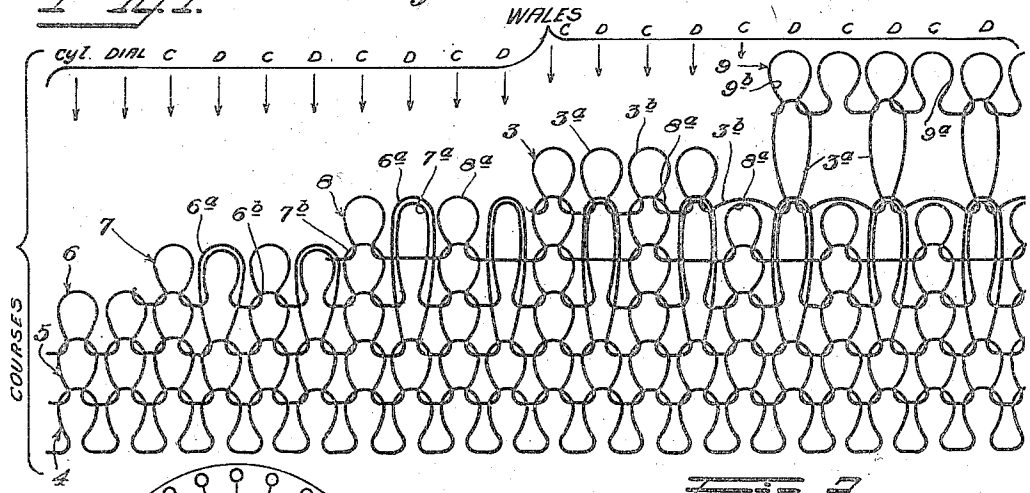


Fig. 2.

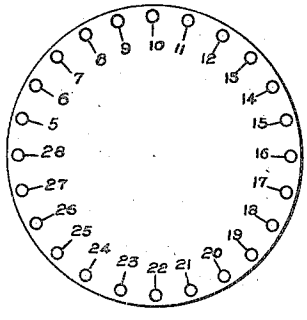


Fig. 3.

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METHOD OF FORMING FLAT KNIT MATERIAL

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1 Claim. (Cl. 66—25)

This invention relates to improvements in the art of knitting and pertains particularly to an improved flat knitted fabric and method of producing the same.

The present invention has for its primary object to provide an improved method of knitting flat fabric whereby such fabric may be produced endlessly upon a circular knitting machine and have the wales of the material running or lying across the fabric whereby the elasticity or stretch of the fabric will be in the direction of the length of the same.

Up to the present time no method has been known by which flat knit fabric in the form of a band could be produced endlessly upon a circular knitting machine. Such machines produce the knitted material in the form of a tubular body and while such body may be cut into bands to form flat fabric, two undesirable results are produced by this procedure according to whether the cutting is done across the length of the material or longitudinally thereof, which are that, when material is cut crosswise or across the wales both edges of the band so produced are raw or unfinished and, in addition, ravel easily presenting an unsightly appearance and requiring that the edge be finished before the band can be used and when the cutting is done longitudinally of the material as it comes away from the machine, that is, lengthwise of the wales, the edges of the material are raw and also the stretch of the strip of material is transverse to the length instead of being parallel thereto as is desirable.

Another object of the invention is to provide a novel method of forming knit fabric upon a circular knitting machine whereby the material may be produced as a band of indefinite length with the stretch of the band lengthwise and with a finish or selvage edge so that it may be applied directly to clothing as trimming without having to be "finished".

The invention will be best understood from a consideration of the following detailed description taken in connection with the accompanying drawing forming part of this specification, with the understanding, however, that the invention is not to be confined to any strict conformity with the showing of the drawing but may be changed or modified so long as such changes or modifications mark no material departure from the salient features of the invention as expressed in the appended claim.

In the drawing:—

Figure 1 illustrates a portion of material produced according to the present invention upon a circular knitting machine, showing the manner in which the continuous body of material is banded spirally whereby upon the removal therefrom of a draw thread, a continuous band of flat knit fabric will be obtained.

Figure 2 is a diagrammatic illustration of the method of forming the stitches of the material, showing the initial formation and final formation of the same and the manner in which they are joined or interconnected.

Figure 3 is a diagram illustrating the feed points for the thread or yarn which is fed to the needles of the circular machine in the formation of the fabric.

Referring now more particularly to the drawing, the numeral 1 in Figure 1 generally designates a body of fabric which has been formed or knitted upon a circular knitting machine and which is here shown in side elevation and in a vertical position in which it leaves the machine, that is, with the first formed row of stitching at the bottom and the last formed rows at the top thereof. As is well known to those familiar with the art, such a body of material feeds downwardly from the knitting needles of the circular knitting machine in the form of a tube, the rows or courses of stitching extending in a circular path and being continuous from one end of the tube to the other so that the wales of the fabric extend longitudinally of the tube.

In the formation of the knitted material in accordance with the present invention, the knitting operation of the machine is so controlled that after the formation of a selected number of courses there is run into the material a thread which is knitted on all of the needles of the machine and then released from all of the cylinder needles only and this thread is continued in the formation of the tubular body of fabric so that it spirals about the body with the other threads and delineates a continuous band edge. This thread is intended to be removed from the material after the desired length has been formed and when this is done, the material will unwind as a single flat band of knitted fabric, a portion of which band is shown at the lower part of Figure 1, removed from the body and designated generally by the numeral 2. The body 1, when formed in accordance with the present invention, comes from the circular knitting machine as a tube made up of connected concentrically arranged convolutions of band material, the adjacent edges of the convolutions being temporarily joined or connected by the draw thread which is knitted in, as indicated at 3 in Figure 1.

In Figure 3 which illustrates diagrammatically the yarn feed points, there are shown locations for twenty-four feeds or knitting points which determine the width of the band produced. The number of these feeds may obviously be increased or decreased in accordance with the size of the machine and the width of the fabric band desired to be produced thereon.

Broadly stated, in the operation of the machine according to the present invention for the production of the continuous band material, there will be knitted from feeds five to twenty-four inclusive, twenty rows of normal stitches continuously as on any multiple feed knitting machine. The remaining four feeds have the yarn knitted with special formed stitches as follows. The yarn from the feed twenty-five is knitted normally by the cylinder needles and has tuck stitches formed by the dial needles. The yarn from the feed **26** is knitted by the cylinder needles only, while the yarn from feed **27** is knitted normally on both the cylinder and dial needles and this yarn constitutes the draw thread, indicated at **3**, which is removed from the finished fabric so as to resolve the same into a strip or band. At feed twenty-eight, the stitches of the yarn from feed twenty-seven are released from the cylinder needles and the other stitches are held on the dial needles to draw out the stitches of the draw thread into long loops as hereinafter more specifically described, and the yarn for the next course which will be the first or selvage edge course of the band, is fed from feed point **5** and joined with the drawn out dial stitches of the yarn **3**.

Figure 2 illustrates diagrammatically the development of the stitches starting with the last two or three normally knitted courses of a portion of a band and extending through to the first course or selvage edge of the next convolution of the band and it will be noted that courses four, five and six are normally knitted loops connected together in the conventional manner and it will be understood that such normally knitted rows or courses have the yarn fed thereto from feeds five to twenty-four inclusive.

The next course is indicated by the numeral **7** and is formed from yarn supplied through feed twenty-five and it will be noted from the diagram that in this course normal knitting is carried out by the cylinder needles and tuck stitches are formed by the dial needles, that is, the dial needle loops formed in the course six are not connected over the dial loops formed in this course seven but the dial needles hold the loop formed in the course six, while another loop is formed in the course seven. In the stitch diagram, the arrows designate the wales formed by the cylinder and dial needles, the first wale of the diagram being formed by cylinder needles and the next by dial needles and this alternate order is repeated throughout the circumference of the tubular body of material. Thus, it will be noted that the tuck stitches formed in course six are, as previously stated, formed on a dial needle and it will be seen that the operation just described results in putting two stitch loops from the courses six and seven over the dial needles. This results in the dial needle loops of course six becoming longer, as indicated at *6a*, and the cylinder needle loops of course six, indicated by the numeral *6b*, becoming shorter and tighter around the loops formed in course seven. This elongation of the dial needle loops *6a* and tightening of the cylinder needle loops *6b* is brought about by the weight employed for pulling the fabric downwardly as the stitching proceeds.

The next course of yarn is indicated by the numeral **8** and is supplied to the needles through the feed twenty-six and normal knitting of this course eight is carried out by the cylinder needles only. The loops of course eight which are formed by the cylinder needles are indicated by the numeral *8a*. During the knitting of the yarn in course eight, the dial needles remain out of action and no new loop is formed over them but they retain the loops formed thereon from courses six and seven and the previously elongated loops *6a* are further lengthened and the loops of course seven are elongated, as indicated at *7a*. The cylinder loops *6b* and the cylinder loops *7b* become tighter with this operation, as a result of the weight pulling downwardly upon the fabric, as previously stated.

The next course is indicated by the numeral **3** and the yarn is fed to form this course from feed twenty-seven and in this course normal knitting is carried out by both the dial and the cylinder needles forming the loops *3a* and *3b* respectively, thereon. The elongated dial needle loops *6a* and *7a* formed in courses six and seven respectively, are joined with the dial loops *3a*.

At the next feed, feed twenty-eight, all of the cylinder loops *3b* of the course three are released and the weight of the fabric is thus concentrated on the loops *3a* so that the previously formed cylinder loops *3b* will be straightened out and the dial loops *3a* will be elongated, as shown in the diagram, as a result of the concentrated pull upon these loops by the weight on the fabric. By the straightening out of the cylinder loops *3b*, the cylinder loops *8a* of course eight which were joined therewith will be released. The disconnected cylinder loops *8a* of course eight will not become further disconnected from the fabric because the pull on the fabric is on the dial loops formed in the yarn of courses six and seven, thus making the cylinder loops *7b* which are joined with the disconnected cylinder loops *8a* shorter and tighter and thereby locking the freed cylinder loops.

The next course, which is indicated by the numeral **9**, has the yarn therefor supplied from the feed five where normal knitting is carried out by both the cylinder and dial needles. In this course, new loops are formed over the bare cylinder needles, such loops being indicated by the numeral *9a* and the dial needle loops of this course nine indicated by the numeral *9b* are joined with the elongated dial needle loops *3a* of the course three which forms the draw yarn of the fabric. The course nine is the first of the normally knitted courses of the continuous strip of fabric and when the loops *3a* of the draw yarn are cut and removed, the loops *9a* and *9b* of course nine will form one edge of the band. After this course nine is knitted there may be formed a course of tuck stitches or a row of stitches on the cylinder needles only, joined to the course nine to give to the finished edge a raised or heavier effect, if such is desired. This last mentioned row in which the tuck stitches may be formed has not been illustrated as such operation is common and will be readily understood by those familiar with the art. After forming course nine and the next course having the tuck stitches, if the use of such a course is desired, normal knitting is repeated in the following courses up to feed twenty-four whereupon the courses described and designated seven, eight and three are repeated in the manner stated.

From the foregoing, it will be readily apparent that by following the herein described process, the amount of flat knitted band material which may be formed upon the cylinder machine is limited only by the amount of yarn available as the yarn of the draw course three may be cut and removed as the material comes away from the machine so that the band material can be produced in one piece and continuously.

I claim:—

The method of forming flat knit band material on a cylinder knitting machine which consists in forming a series of courses of normal knitted yarn, then knitting a course with stitch loops formed on cylinder needles only and forming tuck stitches on the dial needles, then knitting a course with normal stitch loops formed on the cylinder needles only, the dial needles meanwhile being out of action and holding said tuck stitches, then knitting a course of normal knitted stitches on the dial and cylinder needles to join the same with the tuck stitches held by the dial needles, then releasing all of the cylinder needle held loops of the last course whereby said last loops will straighten out to elongate the dial needle loops, and repeating the steps, the first of the series of normally knitted courses formed in such repetition having the dial needle loops joined with the dial loops of the said last course.

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