

June 16, 1964

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3,137,150

METHOD OF PRODUCING KNIT FABRIC

Filed April 30, 1962

2 Sheets-Sheet 1

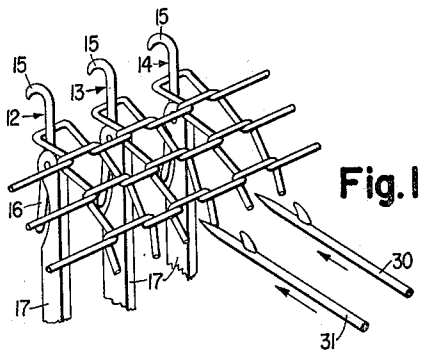


Fig. 1

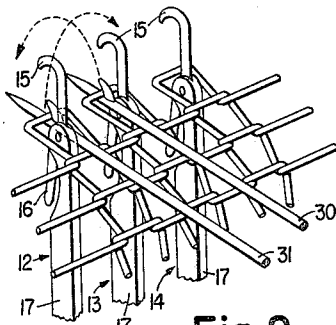


Fig. 2

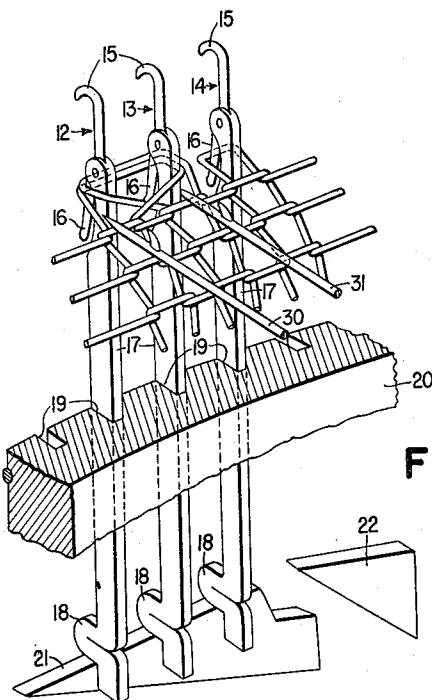


Fig. 3

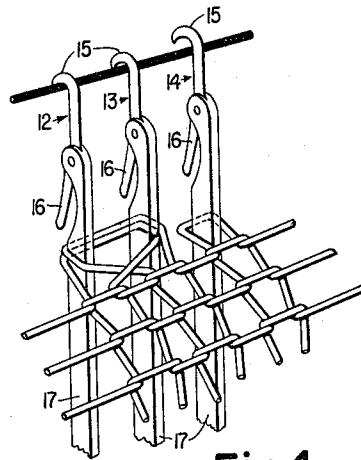


Fig. 4

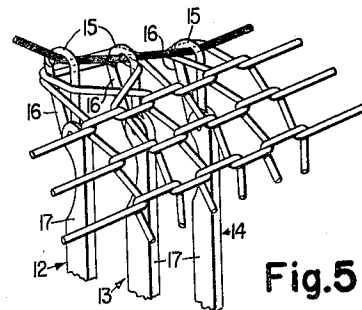


Fig. 5

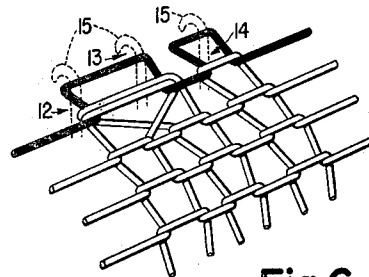


Fig. 6

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2 Sheets-Sheet 2

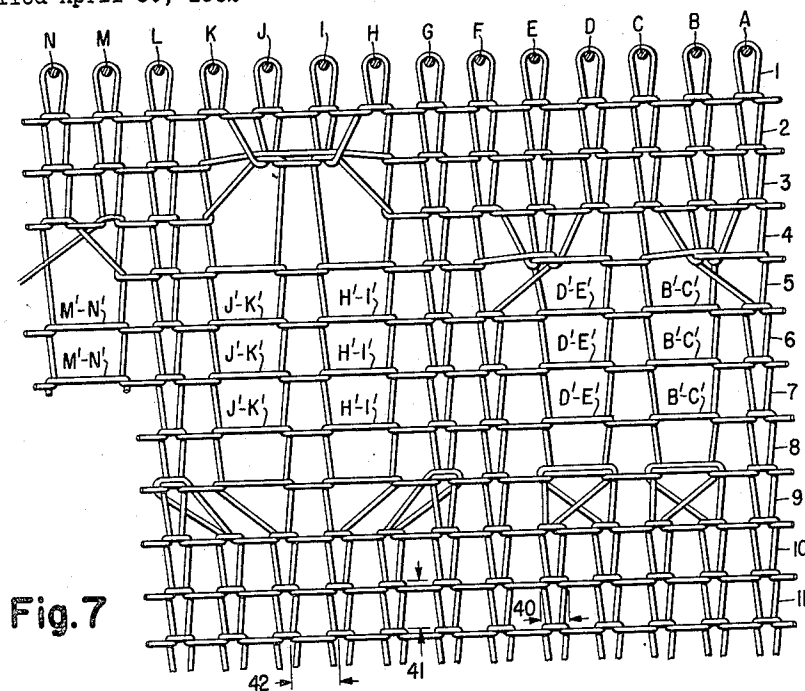
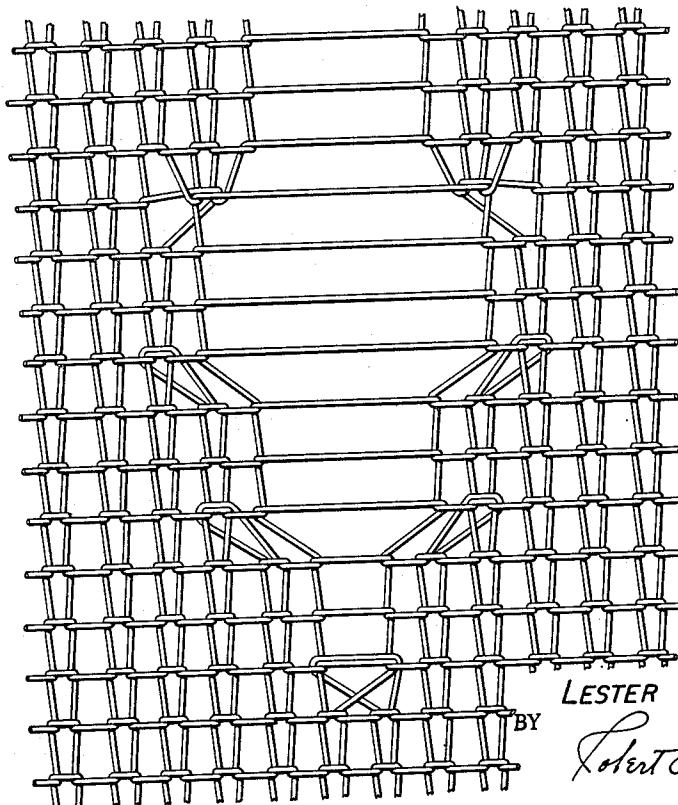


Fig. 8



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METHOD OF PRODUCING KNIT FABRIC

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Filed Apr. 30, 1962, Ser. No. 190,864

7 Claims. (Cl. 66—169)

This invention relates to knit fabrics, and more particularly, to a novel method for producing knit fabrics.

It is an object of this invention to provide for the production of balanced knit fabrics by a novel method for controlling the relation of the width of stitch loops relatively to the width of adjacent reverse or sinker loop throughout the knit fabric.

In this specification and in the claims appended hereto a stitch will be referred to as that loop of yarn in a knit fabric which is drawn through a previous loop or loops by a knitting needle. The loops of yarn connecting adjacent stitches will be referred to as sinker loops even though a sinker might not necessarily be used between needles in all cases. Each yarn formed into successive adjacent stitch and sinker loops produces a course, in the case of a fabric knit on a circular knitting machine each circuit of yarn formed into adjacent stitch and sinker loops is regarded as a separate course. Each vertical chain of interlocked stitches in the fabric will be termed a stitch wale while each vertical chain of interlocked sinker loops will be termed a sinker wale.

It is an object of this invention to provide a novel method for influencing the width of any selected stitch in a knit fabric relatively to the adjacent sinker loops therein.

Another object of this invention is to provide a method for changing the width of stitches in a knit fabric from one point to another along a stitch wale.

It is an object of this invention to provide for the production of patterns in a knit fabric by a novel method for controlling the width of selected stitches in predetermined or repetitive arrangement throughout the fabric.

Still another object of this invention is to provide a novel method for producing knit fabrics in which the count of courses and the count of stitch or sinker wales of the fabric bear any desired relationship through the knit fabric.

With the above and additional objects and advantages in view as will hereinafter appear, a preferred embodiment of this invention and knit fabrics produced thereby are illustrated in the accompanying drawings in which:

FIGS. 1 to 6 represent schematic perspective views of a group of adjacent knitting needles and devices associated therewith for the practice of the method of this invention with the parts shown in various positions during the formation of one course of knitting stitches and in which:

FIG. 1 represents the initial rise of the needles each carrying an individual loop of yarn comprising the stitches knit in the preceding course,

FIG. 2 illustrates the insertion of the yarn loop transfer bitts,

FIG. 3 illustrates the position of parts upon completion of the transfer of yarn loops to adjacent needles and as the transfer bitts are being withdrawn,

FIG. 4 illustrates the subsequent rise of the needles to take a fed yarn,

FIG. 5 illustrates the position of parts upon descent of the needles and,

FIG. 6 is a view similar to FIG. 1 but with the needles carrying the loops of the yarn which was knit into the fabric as illustrated in FIGS. 1-5.

FIG. 7 represents a portion of the back or reverse side of a fabric knit in accordance with this invention and

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illustrates the provision of adjacent stitches of different widths, and

FIG. 8 represents a portion of the back or reverse side of a fabric knit in accordance with this invention and illustrates the provision of stitches of which the width varies between courses.

In most instances, the suitability of a knit fabric for use will be enhanced if the fabric is balanced. By balance is meant the substantial equality of stitch dimension lengthwise and widthwise in a fabric. Since a balanced knit fabric yields and recovers substantially evenly in all directions, balanced fabrics have greater customer appeal, and therefore, other factors being equal, balance is a quality feature in knit fabrics.

Heretofore, balance in a knit fabric has been difficult to obtain in many instances. While the lengthwise dimension of the stitch, that is in the direction in which the fabric is knit, may be quite readily changed by changing the relative motion between the needles and the work fabrics in the knitting process, the widthwise dimension of the stitch has heretofore been substantially fixed when the selection is made of the needle size and cut or needle spacing of the machine. Since the stitch width has heretofore been substantially fixed for any particular knitting machine, adjustments in lengthwise stitch dimension to provide for desired fabric weight, for instance, adversely influenced the balance of the cloth.

This invention in providing for a selection of stitch width throughout the fabric thus provides for a wider variation in lengthwise stitch dimension without a sacrifice of balance of the resulting knit fabric.

The method of the present invention for a selection of the stitch width throughout the knit fabric can also be used to provide pleasing design effects in a fabric.

Referring to FIGS. 1-6 of the drawings, three adjacent latch knitting needles 12, 13 and 14 of a circular knitting machine are illustrated in various positions relatively to a fabric being knit during one stitch forming cycle. Each needle is formed with a yarn engaging hook 15, a pivoted latch blade 16, a shank 17, and as illustrated in FIG. 3, a butt 18. The needles are constrained for endwise movement in guide slots 19 in a cylinder 20 in response to the influence on the machine butts of a raising cam 21 and a stitch cam 22. It will be understood that the needles may be influenced by the cams 21, 22 alone or patterning devices such as pattern wheels may be interposed between the raising and stitch cams 21 and 22 to provide for control of the type of stitch, either knit, tuck or welt, to be performed by each needle, and also that many sets of cams 21, 22 may be arranged about the cylinder each set being accompanied by the feed of a yarn to the knitting needles.

In FIGS. 1-6 each of the needles 12, 13 and 14 is shown as being actuated as to produce a knit stitch. In FIGS. 1 and 2, the needles are illustrated as they are being raised through previously seized yarn loops one on each needle. FIG. 1 illustrates a pair of transfer bitts 30 and 31 as they are being moved from a retracted position into engagement with the yarn loops on the knitting needles 12 and 13. FIG. 2 illustrates the transfer bitts 30 and 31 each in engagement with a respective yarn loop with the dashed arrows indicating the ensuing path of travel of the transfer bitts to carry the yarn loop engaged thereby onto the adjacent knitting needle. The paths of travel of the transfer bitts 30 and 31 as indicated by the dashed arrows in FIG. 2 are of course such as to avoid physical interference between the transfer bitts and one bitt must precede or pass over the other bitt. It is unimportant in the practice of this invention, however, which transfer bitt precedes or passes over the other. Furthermore the bitts 30 and 31 may be moved either simultaneously or one before the other in any sequence. As

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illustrated by the disposition of the yarns in FIGS. 3, 4, 5 and 6, the transfer bitt 31 precedes or passes over the transfer bitt 30 during the transfer motion indicated by the dashed arrows in FIG. 2. FIG. 3 illustrates the yarn loops as completely transferred and the transfer bitts being retracted. Whereas the needles 12 and 13 initially each carried a separate loop, after loop transfer the needles 12 and 13 each share the same loops.

FIG. 4 illustrates the latch cleared position of the needles in which the fed yarn shown in black is directed to the needle hooks. FIG. 5 illustrates the needles as they descend and substantially at the knock over position in which the previously held yarn loops, shown in white, are cast over the closed latches and needle hooks. FIG. 6 illustrates the needles in substantially that position illustrated in FIG. 1. It will be noted that, needles 12 and 13 share a common yarn loop and will act conjointly to form a stitch twice as wide as that formed by the needle 14 in succeeding courses.

Fabrics knit in accordance with the method described in connection with FIGS. 1-6 are illustrated in FIGS. 7 and 8. In FIG. 7 the stitch courses in the fabric are designated 1 through 11 in the order in which they were knit, and the knitting needles knitting the fabric are designated A through N. FIGS. 7 and 8 illustrate the reverse side of fabric panels, i.e., the inside of a tube of fabric being knit on a circular knitting machine. In FIG. 7, courses 10 and 11 illustrate fabric resulting from the knitting of each needle carrying a separate yarn loop. In courses 10 and 11, each stitch is of a width 40 and of a length 41 while each sinker loop is of a width 42. In course 9 the yarn loops on needles B and C and on D and E are transferred as illustrated in FIGS. 1-6 so that needles B and C share common yarn loops as do needles D and E. Thereafter needles B and C act conjointly to form the stitches B'-C' shown in courses 4, 5 and 6 of FIG. 7, and similarly needles D and E conjointly form the stitches D'-E'.

FIG. 7 illustrates in course 9 an alternative manner of yarn loop transfer to accomplish wider stitches H'-I' and J'-K' of the original stitches knit by needles H, I, J and K, respectively. In this alternative, one of a pair of transfer bitts in course 3 completely removes a loop of thread from needle H, transfers that loop to the adjacent needle G. The loop of yarn carried by the needle I is handled by a transfer bitt precisely as does either of the transfer bitts 30, 31 of FIGS. 1-6, that is, to transfer a yarn loop previously carried only by the needle I so as to be carried in common by adjacent needles H and I. In succeeding courses the needles H and I will act conjointly to form one wider stitch H'-I' as shown in courses 5, 6, 7 and 8.

FIG. 7 also illustrates three alternative methods of narrowing the width of the stitches B'-C', D'-E', H'-I', J'-K' and M'-N'. In one method as illustrated in the right hand portion of FIG. 7, wide stitches B'-C' and D'-E' are reverted to the original narrower stitches formed each by an individual needle B, C, D and E, by the transfer in course 5 of a loop of yarn from the needle A so as to be carried in common by the needles A and B conjointly, and a loop of yarn from the needle F so as to be carried in common by the needles E and F. Continued knitting of all of the needles in the succeeding courses will then result in the formation of a stitch by each needle A to F in the knit fabric.

In another method as illustrated in FIG. 7, wide stitches H'-I' and J'-K' are reverted to the original narrower stitches made individually by the needles H, I, J and K by raising the needles I and J only to the tuck position in course 8 and thereafter knitting all the needles, the tuck position being, of course, that in which the needle raises to take the fed yarn but not into latch clearing position.

As illustrated in the left hand portion of FIG. 7, a reversion to stitches made by individual needles might

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also be accomplished by raising selected needles to the welt position, i.e., to neither take the fed yarn nor clear the latch. In the course 5 needle N was raised to the welt position while needle M knitted thus providing for the separate yarn loops on needles M and N in course 4 and stitches made by individual needles thereafter.

Courses 6, 7 and 8 of FIG. 7, which may be continued for as many courses as desired, illustrate a fabric knit in accordance with the methods of this invention in which selected stitches in a predetermined pattern throughout a course of stitches 8 are formed conjointly by a plurality of adjacent needles and in which succeeding courses 6 and 7 are knit each stitch formed conjointly by the same number of adjacent needles. Such stitch width control would be suitable for providing texture, design, or balance to a knit fabric not otherwise formed with a texture pattern.

A further advantage of the method of this invention is that it facilitates the knitting of stiff or abrasive yarns such as paper yarns. The use of a plurality of needles conjointly to form a stitch not only divides the load or stress applied to any particular needle, but it also reduces the number of sinker loops to be formed simultaneously at any particular feeding station on the knitting machine. As a consequence, reeving of the yarn through previous loops in the fabric, particularly between knock over position and the final stitch setting position of the needles, is appreciably reduced.

For influencing the balance or texture of isolated portions of knit fabric, the transition of stitch width as illustrated in courses 3, 4, 5, and 9 of FIG. 7 may be used.

FIG. 8 illustrates a portion of knit fabric having selected stitches formed by a plurality of adjacent needles and in which the number of said plurality of adjacent needles is charged between adjacent courses. In FIG. 8 the transition from greater or fewer needles acting conjointly to form the selected stitches may be accomplished in the manner described with relation to FIG. 7.

Having thus set forth the nature of the invention, what is claimed herein is:

1. The method of producing on a knitting machine having a plurality of evenly spaced parallel knitting needles, a patterned knit fabric including a series of courses of stitches arranged in adjacent stitch wales, comprising knitting selected stitch wales in a predetermined pattern throughout said fabric with the stitches of each of said selected stitch wales formed conjointly by a plurality of adjacent needles.

2. The method of producing on a knitting machine having a plurality of evenly spaced parallel knitting needles, a patterned knit fabric including a series of courses of stitches arranged in adjacent stitch wales, comprising forming selected stitches in the fabric conjointly by a plurality of adjacent needles, arranging said selected stitches in a predetermined pattern throughout a course of stitches in said knit fabric, and knitting succeeding courses in said fabric to form stitch wales each formed conjointly by same number of adjacent needles.

3. The method of producing on a knitting machine having a plurality of evenly spaced knitting needles, a patterned knit fabric including a series of courses of concatenated stitches arranged in adjacent stitch wales, comprising knitting selected stitches in said fabric conjointly by a plurality of adjacent needles, and arranging said selected stitches in a repeated pattern throughout said fabric.

4. The method of producing on a knitting machine having a plurality of evenly spaced knitting needles, a patterned knit fabric including a series of courses of concatenated stitches arranged in adjacent stitch wales comprising forming stitches in selected stitch wales conjointly by a plurality of adjacent needles, and effecting between adjacent courses of stitches in said fabric a change in the number of said plurality of adjacent needles used to form stitches in said selected stitch wales.

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5. The method of producing on a circular knitting machine having a plurality of evenly spaced parallel endwise movable knitting needles a knit fabric including a series of courses of stitches arranged in adjacent stitch wales and having substantially balanced stitches comprising, influencing the endwise motion of said knitting needles relatively to a fabric being knit thereon to control the stitch length of the resulting fabric, rearranging selected stitches between successive courses in the fabric to embrace conjointly a changed number of adjacent knitting needles, and forming stitch wales in said fabric corresponding in width to said rearranged selected stitches by knitting the stitches of said stitch wales conjointly by said changed number of adjacent needles to control the stitch width of the resulting fabric.

6. The method of producing on a knitting machine having a plurality of evenly spaced knitting needles, a knit fabric of paper yarn comprising forming selected stitches in the knit fabric conjointly by a plurality of adjacent knitting needles, and knitting succeeding courses in said fabric to form stitch wales each formed conjointly by the same number of adjacent needles.

7. A knit fabric including yarn knit into a series of successive courses of stitches each stitch being concatenated with at least one stitch of a preceding course and said stitches being arranged in adjacent stitch wales, comprising a pattern effect in the fabric in which selected adjacent stitch wales join at a selected course in the fabric to form a single common stitch wale having a width equal to the sum of the widths of said selected adjacent stitch wales, and in which a selected common stitch wale divides at a selected course in the fabric to form a plurality of separate adjacent stitch wales of which the sum of the widths is equal to the width of said divided common stitch wale.

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enated with at least one stitch of a preceding course and said stitches being arranged in adjacent stitch wales, comprising a pattern effect in the fabric in which selected adjacent stitch wales join at a selected course in the fabric to form a single common stitch wale having a width equal to the sum of the widths of said selected adjacent stitch wales, and in which a selected common stitch wale divides at a selected course in the fabric to form a plurality of separate adjacent stitch wales of which the sum of the widths is equal to the width of said divided common stitch wale.

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