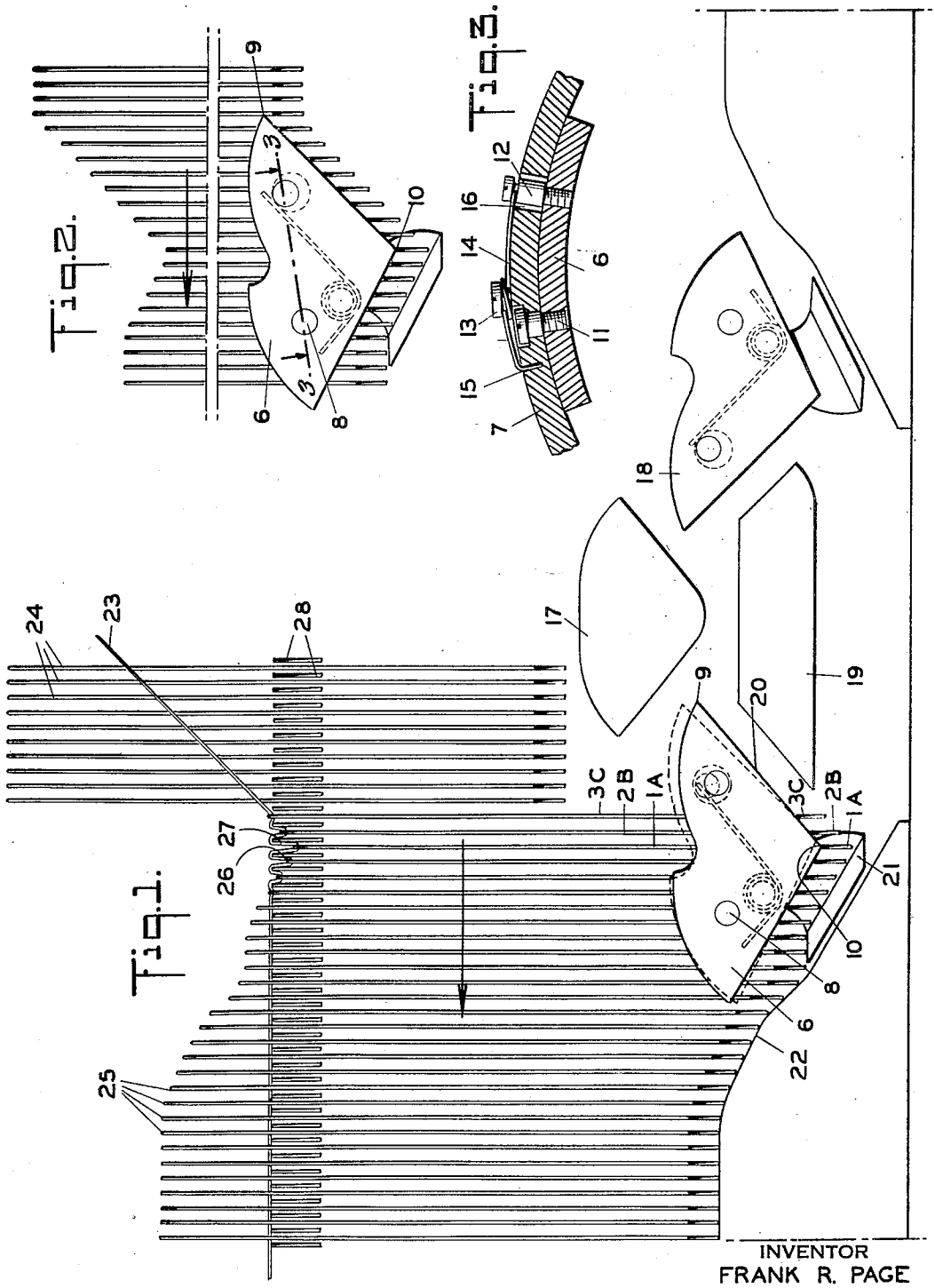
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PROCESS AND MACHINE FOR PRODUCING KNITTED FABRIC

Filed Dec. 19, 1931 3 Sheets-Sheet 1



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PROCESS AND MACHINE FOR PRODUCING KNITTED FABRIC

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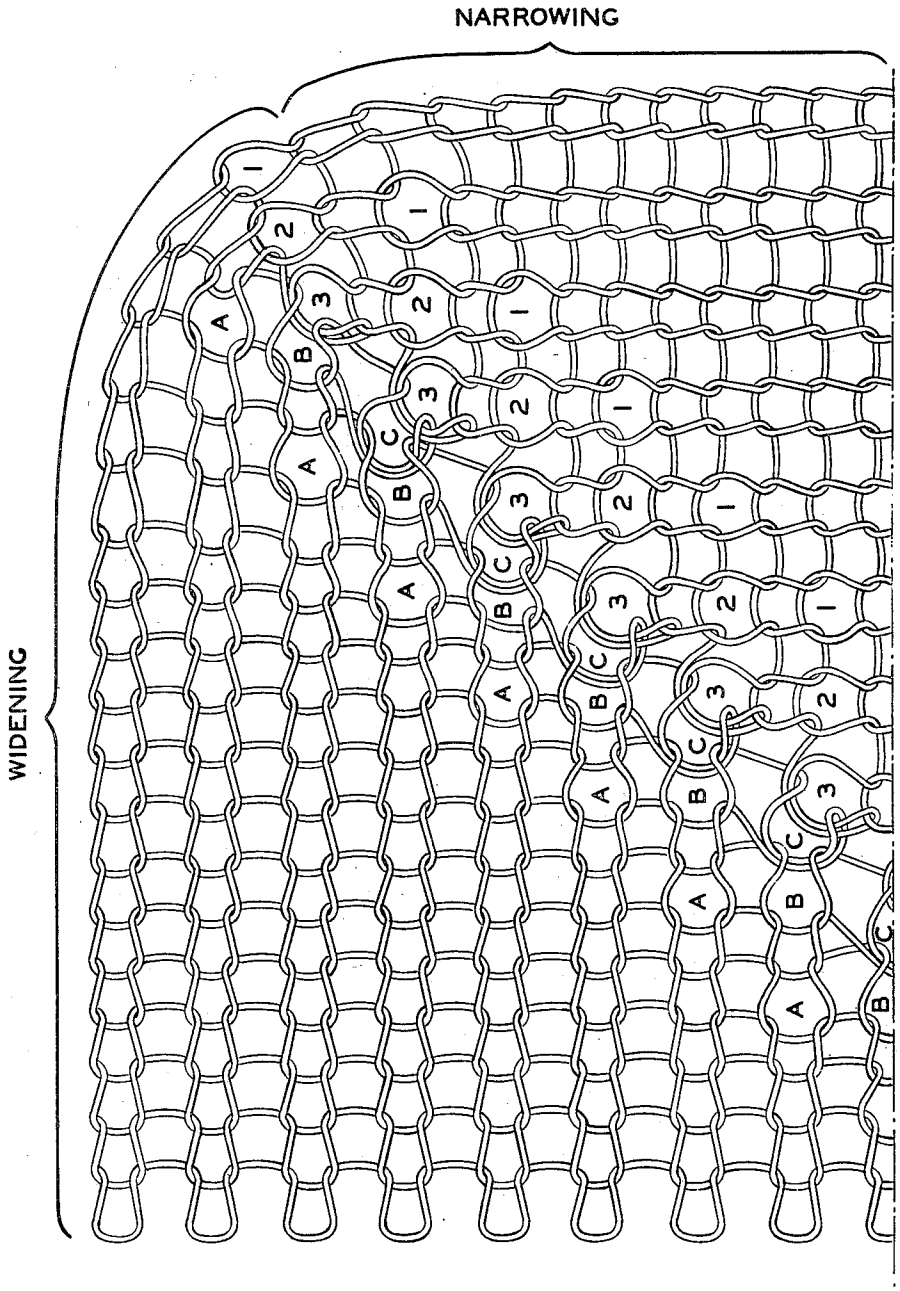


Fig. 4.

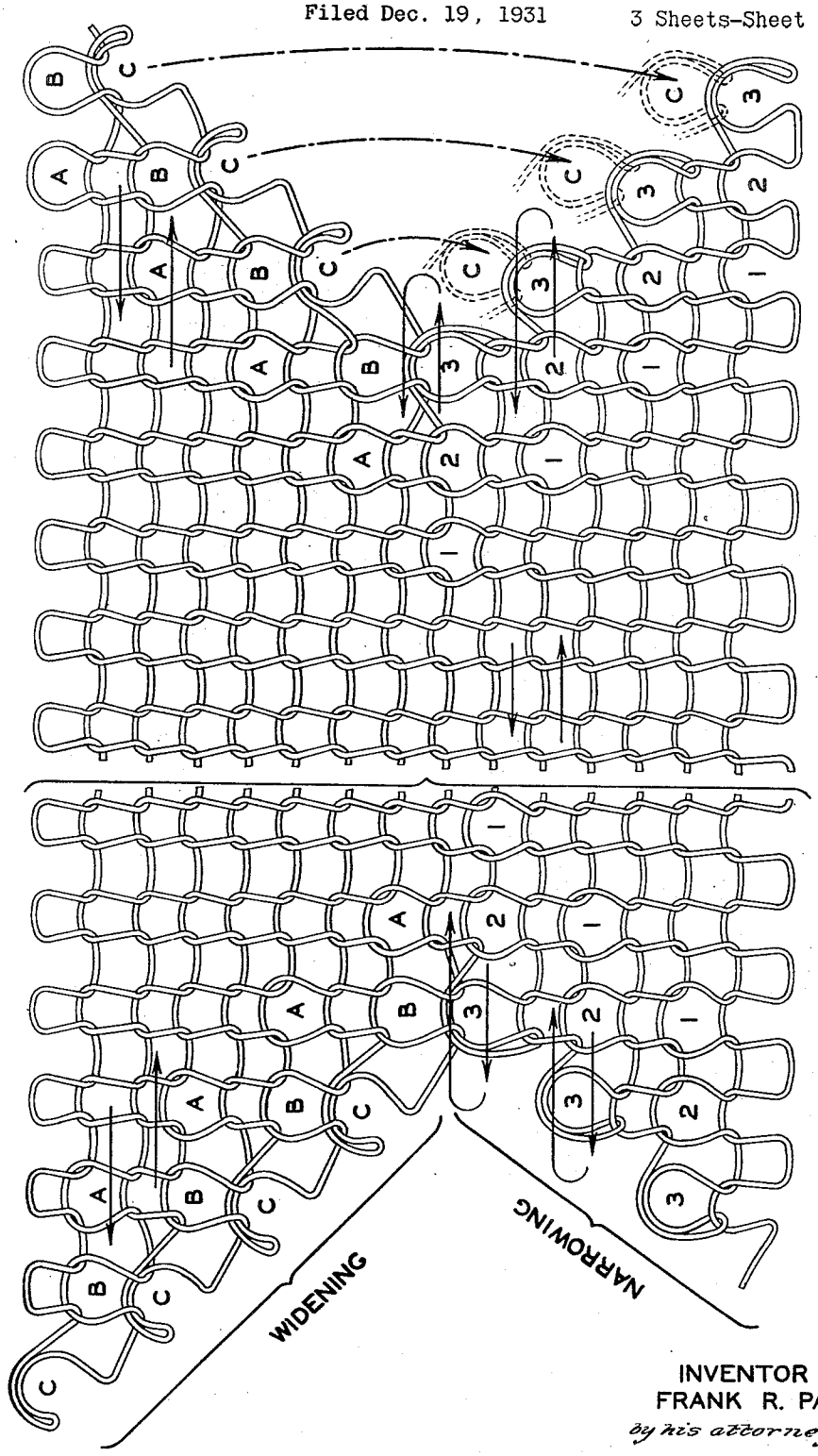
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Fig.5.



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UNITED STATES PATENT OFFICE

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PROCESS AND MACHINE FOR PRODUCING KNITTED FABRIC

Application filed December 19, 1931. Serial No. 582,141.

This invention relates to a process and machine for producing an improved suture or an improved edge in fabric knit reciprocatingly and more particularly an improved suture in narrowed and widened seamless heel and toe pockets. In pulling new loops through old stitches, particularly in the case of latch needle machines, there is a great strain on the old stitch as it passes off over the head of the needle and a locking of the new yarn, with the result that sometimes there is cutting or breaking of the old yarn or subsequent breaking of the new yarn. Instances of such stitches are those at the suture of a seamless heel or toe pocket or the suture at the side of the ordinary split foot stocking. This trouble is especially prevalent in seamless heel or toe pockets where there is a tucked bight of yarn wrapped around the suture needle with the new loop and the final stitch is frequently smaller than the ordinary stitch. This invention is of particular value at the suture between the narrowed segment of a seamless toe and an adjacent gore, such as shown for instance in the patent to J. M. Allen Reissue No. 17,958, dated February 10, 1931, where a large group of needles holding suture loops are brought into action as a group. The applicant has discovered that the breaking out of the stitches can be avoided by drawing longer loops than the normal length loop when knitting the suture or end stitches. Preferably one or two needles next to the suture needle draw longer stitches as well as the actual suture needle. The invention will be shown and described in connection with the well-known Scott & Williams type of circular hosiery knitting machine, and the manufacture of a suture on such a machine in the making of a seamless heel or toe pocket.

In the drawings,

Figure 1 is a development of the cams creating the knitting wave and the needles seen from the inside of a revolving cylinder hosiery machine embodying the new invention, the arrow indicating the direction of the movement of the needles and the needles passing under the stitch cam being the needles near the suture;

Figure 2 is a similar view of the stitch cam of Figure 1, showing the passage thereunder of needles other than the needles near the suture;

Figure 3 is a sectional plan view of the stitch cam of Figures 1 and 2 taken through the two points of attachment of the stitch cam to the needle cylinder, i. e., on the line 3—3 of Figure 2;

Figure 4 is a diagram of the intermeshing of the loops on one side of a seamless heel pocket made in accordance with the new process; while

Figure 5 is a diagram of the loops near the point of the seamless heel or toe pocket, the narrowed and widened segments being shown separated at the sutures and the location of the suture stitches which are intermeshed in the actual fabric being indicated at one end in dotted lines.

In the embodiment of the invention shown in the drawings the slackening of the stitches near the suture is obtained by motion of the stitch cam, and more specifically by giving the switch cam a pivoted mounting. It should be understood that the slackening may be obtained in other ways. The stitch cam 6 is mounted pivotally on the inside of the cam cylinder 7 at a pivot center 8 by means of a screw 11. This pivot point is located below the upper end 9 and above the lower end 10 of the switch drawing surface 20 of the cam. Being thus intermediate the ends of the stitch drawing surface it follows that pressure at one end of the surface tends to tilt the cam in one direction and pressure at the other end tends to tilt it in the other direction. As can be seen from Figures 1 and 2, pressure on the switch drawing surface 20 at its upper end 9 tends to tilt the surface up while pressure near the lower end 10 tends to tilt it down. The pivot point 8 of the cam is near the end of the cam away from the surface 20. Thus, tilting the cam down moves the lower end 10 to a lower level than usual, causing the drawing of a long stitch.

The extent of the pivotal movement of the cam is determined by a screw 12 in the cam near the upper end of the stitch drawing surface, and an opening 16 in the cam cylin-

der through which the screw projects to the outside of the cylinder (Fig. 3). The opening 16 is larger than the shank of the screw 12 and the play of the latter in the former determines the extent of the tilting. There is a spring 14 partly wound on a screw 13 on the outside of the cam cylinder tending to tilt the stitch drawing surface 20 down. One end of the coiled spring is held in a hole 15 in the cam cylinder and the other arm lies against the upper side of the shank of the screw 12 forcing it down against the lower edge of the opening 16. The parts of the machine are so adjusted with relation to the usual top center cam 17 and the clearing cam 18 and the lower center cam 19 that the uppermost position of the stitch cam is the normal one, i. e., the one drawing the normal length of stitch. However, even in the lowermost position, the upper end 9 of the stitch drawing surface is high enough to meet any needle coming from the top center cam 17 and guide it down the stitch drawing surface rather than over the top of the stitch cam. The stitches are drawn over the usual web-holders 28.

The cam system of the machine shown is of the usual stitch and clearing cam type in which the stitch cam 6 becomes the clearing cam on knitting in the reverse direction, and the clearing cam 18 becomes the stitch cam.

The construction of the machine having been described, the process will now be set forth in connection with that machine. Assuming that the machine is about to begin the narrowing for the heel pocket, the instep needles 24 have been thrown up out of action and the machine is ready to knit reciprocatingly on the heel needles 25. Assuming that the needles are moving to the left, as shown in Figs. 1 and 2, the active needles 25 pass over the upper surface of the clearing cam 18 and under the top center cam 17. The stitch cam 6 is in its lowermost position as shown in solid lines in Fig. 1 until the leading active needle strikes the upper end 9 of its stitch drawing surface. The butt of the leading needle tilts the cam up to the dotted line position of Fig. 1 as soon as it hits the upper end of the surface. As the needles move down the surface and their places are taken by other active needles the leading needle butts pass below the level of the pivot point 8 and tend to tilt the cam down. However, the parts are so arranged and coordinated that the butts at the upper end 9 counterbalance those at the lower end 10 and are able to keep the cam tilted up. The needles therefore pass under the point of stitch cam drawing loops 26 of normal length with the stitch cam in dotted, i. e., normal position (Figure 1). Thence the needles travel up the surfaces 21 and 22 as usual. The needles are shown in Fig. 2 drawing these normal length loops, the arrow showing the direction of movement of the needles. As the knitting approaches the suture line, i. e., the suture, the situation changes to that shown in Fig. 1. As the last few needles of the active group—say three needles—move down the stitch drawing surface 20, they are not replaced at the upper end 9 of the surface by any other needle butts and the state of balance of the cam is upset. The butts of the last three needles 1A, 2B and 3C therefore tilt the cam down to the position shown in solid lines in Fig. 1 as they pass below the level of the pivot point 8. In this position the lowermost point of the cam is lower than usual and therefore the first needle 1A, then the needle 2B and finally the suture needle 3C will draw an enlarged, longer or slacker loop 27 (Fig. 1). Looking at Fig. 5 and assuming that the lowermost course is the first course of the narrowing segment, the loops marked 1, 2 and 3 are the ones drawn by the needles 1A, 2B and 3C of Fig. 1. After the suture needle 3C, preceded by all the other needles of the active group, has passed up the inclined surfaces 21 and 22, the needle cylinder reverses its direction of movement. The suture needle 3C is then raised out of action by the usual up-pick (not shown), as the machine starts the second course, knitting from right to left as shown in Fig. 5. The needle 3C being raised out of action with the suture loop 3 around its shank, a tucked bight of the yarn 23 is laid around the shank as the second course commences, thus tending to lock the yarn in the loop. At the end of the second course the operations are repeated, leaving enlarged loops 1, 2 and 3 at the left end of the course as viewed in Fig. 5. These operations are continued until the entire narrowed segment is completed, the direction of knitting in the courses being indicated by arrows in Fig. 5. The widened segment is made in a similar manner, the interlooping shown being that resulting from the usual "two down one up" widening process. Preferably, enlarged loops A, B and C are drawn near the suture at the end of the knitting of each course in the widening in the manner of the drawing of the loops 1, 2 and 3 in narrowing. As each suture needle draws its suture loop C through the old stitch 3 and its bight, the slackness of the old stitch and that of its neighbors 2 and 1 enable it to become large enough to pass over the hook of the needle without damage or inconvenience to the old stitch or the new yarn. The resulting intermeshing of stitch 3 and stitch C is indicated in dotted lines at the right of Fig. 5, the dot and dash lines identifying the stitch C intermeshing with each stitch 3. Of course there are usually more courses in the heel pocket than are shown in Figs. 4 and 5. In Fig. 5 the fabric for both sides of the heel is shown, while in Fig. 4 I show only one side of the fabric as

it actually appears with the suture loops intermeshed.

It will be obvious that the invention is also useful in fabrics where the sections are not tapered but where the courses approach the suture at right angles to the latter.

As already mentioned, the invention is also useful in making the free edges of a section of fabric knit reciprocatingly, whether these edges are straight or tapered. Thus, for example, the invention is useful in making a narrowed section such as shown in Fig. 5 without the widened section.

I claim:—

1. A method of knitting fabric having a suture therein comprising the steps of knitting courses of stitches on one side of the suture in which the loops at the suture are slacker than the normal loops, and interlooping the enlarged loops at the suture by drawing through them loops from the other side of the suture.

2. A method of knitting fabric having a suture, comprising the steps of knitting a source of stitches drawing a longer loop than usual on the needle at the suture, leaving the enlarged loop on the shank of the last needle and subsequently drawing a new loop through said enlarged loop.

3. A method of knitting fabric having a suture therein comprising the steps of knitting a course of stitches on one side of the suture in which the loop at the suture is slacker than the normal loop, laying a bight of yarn around the needle carrying said enlarged loop before the loop is removed from the needle and subsequently drawing a loop from the other side of the suture through said enlarged loop.

4. A method of knitting comprising the steps of knitting a course of stitches on a group of needles and drawing a longer loop than usual on the last needle to knit, leaving the enlarged loop about the shank of the last needle and locking the loop by knitting further stitches, and subsequently drawing a new loop through said enlarged loop.

5. A method of knitting comprising the steps of knitting a course of stitches on a group of needles and drawing a larger loop than usual on the last needle to knit, leaving the loop about the shank of the last needle and continuing knitting with that yarn, and subsequently drawing a loop through the enlarged loop left on that last needle.

6. A method of knitting fabric having a suture comprising the steps of knitting a course of stitches toward said suture and drawing a slacker loop than usual on the needle at the suture locking the yarn by forming a bight on said suture needle and subsequently knitting a course of stitches on the other side of the suture and drawing a new loop through said enlarged loop and bight.

7. A method of knitting comprising the steps of knitting a course of stitches on a group of needles and drawing a longer loop than usual on the last needle to knit, leaving the enlarged loop about the shank of the last needle and locking the loop by knitting further stitches on the other needles, and subsequently drawing a new loop through said enlarged loop.

8. A method of knitting a suture comprising the steps of knitting in one direction on a group of needles and drawing a larger loop than normal on the last needle to knit, knitting in the reverse direction on said group of needles but leaving the enlarged loop on the last needle, and subsequently knitting another course of stitches of which the last stitch is drawn through the enlarged loop on said last needle.

9. A method of knitting a suture comprising the steps of knitting a course in one direction on a group of needles and drawing a larger loop than normal on the last needles to knit, knitting a course in the opposite direction but feeding yarn to the said last needle without knitting on said needle, and subsequently knitting a course in the first mentioned direction including said last needle.

10. A method of knitting a narrowed and widened pocket comprising knitting a narrowed segment with loops larger than normal on the last active needle or needles of each course, and subsequently interknitting those enlarged loops with the courses of the widened segment.

11. A method of knitting a narrowed and widened pocket on a circular knitting machine comprising knitting reciprocatingly and reducing the number of active needles at each oscillation, leaving on each idled needle a stitch larger than the normal stitch and a bight of yarn, and subsequently increasing the number of active needles at each oscillation and interknitting said enlarged stitches with other stitches.

12. A method of knitting a narrowed and widened pocket on a circular knitting machine comprising knitting reciprocatingly and reducing the number of active needles at each oscillation, leaving on each idled needle a stitch larger than the normal stitch and a bight of yarn, and subsequently increasing the number of active needles at each oscillation and interknitting said enlarged stitches with other enlarged stitches.

13. A method of making knitted fabric comprising passing a series of independent needles through a knitting wave, first in one direction and then in the other, and causing a needle at the end of the series on an oscillation in each direction to draw a longer stitch than the normal stitch.

14. A method of knitting comprising knitting reciprocatingly on a series of independent needles and causing a needle at an end

of the series to draw a longer stitch than normal.

15. A method of knitting fabric comprising knitting in alternating directions on a series of needles and causing an end needle when knitting in each direction to draw a longer stitch than normal.

16. A knitting machine having a series of independent needles and means adapted to cause reciprocatory knitting on said needles, in combination with means cooperating with said needles to draw a longer stitch than normal on an end needle of those passing through the knitting wave.

17. A knitting machine having a series of independent needles and means adapted to cause reciprocatory knitting on said needles, in combination with means cooperating with said needles to draw a longer stitch than normal on the last needle of those passing through the knitting wave.

18. A knitting machine having a series of independent needles and means adapted to cause reciprocatory knitting on a varied number of needles, in combination with means cooperating with said needles to draw a longer stitch than normal on an end needle of those passing through the knitting wave.

19. A knitting machine having a series of independent needles and means adapted to cause reciprocatory knitting on a varied number of needles, in combination with means cooperating with said needles to draw a longer stitch than normal on the last needle of those passing through the knitting wave.

20. A knitting machine having a series of needles therein; means adapted to select a group of needles from said series; a cam system adapted to produce knitting movements in said group of needles, said cam system including a stitch cam having motion to draw a longer stitch through the last few needles of the group to pass it.

21. A knitting machine having a cam system acting directly on the looping elements to produce the knitting movements, said cam system including a stitch cam pivoted to change the length of stitch and controlled by the looping elements.

22. A knitting machine having a stitch cam with a loop-forming surface, said cam being movably mounted to change the length of stitch, in combination with means tending to force said cam to draw a long stitch, said mounting being adapted to permit pressure at the upper end of the loop-forming surface to resist the pressure of said means.

23. A knitting machine having a stitch cam with a needle-retracting surface, an element on which said cam is pivotally mounted, the pivot point being so constructed that pressure of needle butts at the lower end of the retracting surface tends to swing the cam to draw a larger loop while pressure of needle butts at the upper end of the surface resists such down swing.

24. A knitting machine having a stitch cam with a loop-forming surface and an element on which said cam is pivotally mounted, said pivot point being vertically between the upper and lower ends of said surface and horizontally at a point following said surface for the purpose of permitting pressure at the lower end of the surface to tend to move the cam to draw a larger loop and pressure at the upper end to oppose such movement.

In testimony whereof I have signed my name to this specification.

FRANK R. PAGE.