Oct. 15, 1957 P. A. MAHLER 2,809,507

STITCH CAM FOR CIRCULAR KNITTING MACHINES

Filed Feb. 1, 1956

FIG. 1.

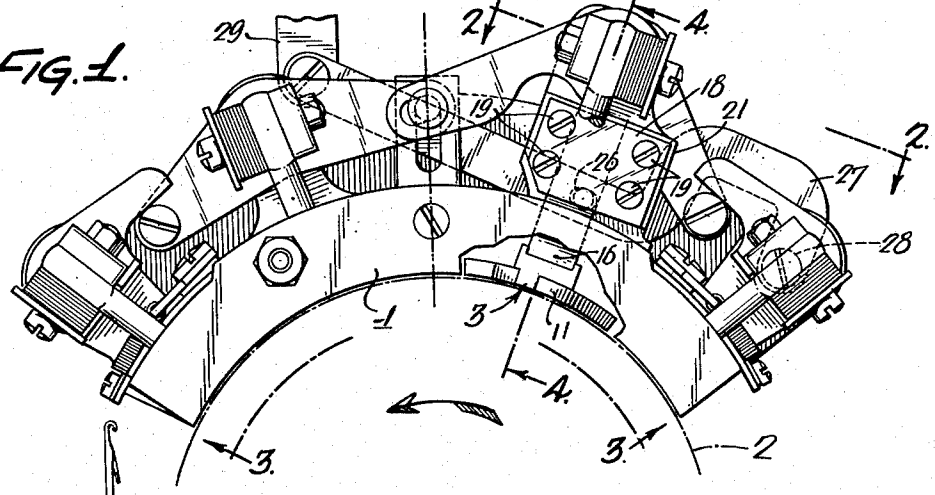


FIG. 2.

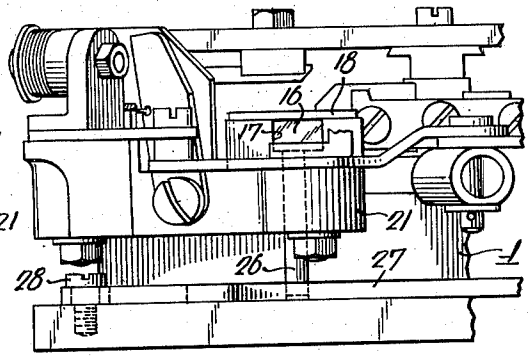


FIG. 5.

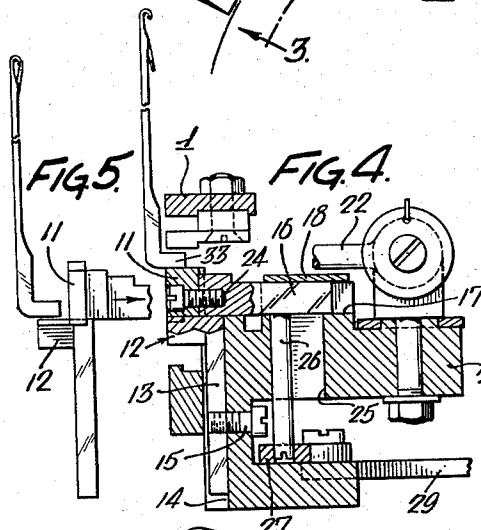


FIG. 4.

FIG. 7.

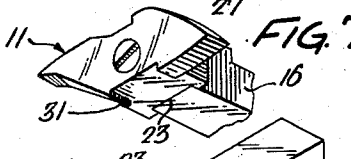


FIG. 6.

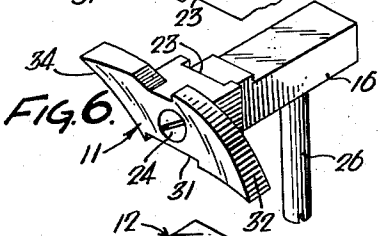


FIG. 8.

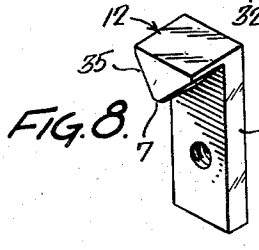
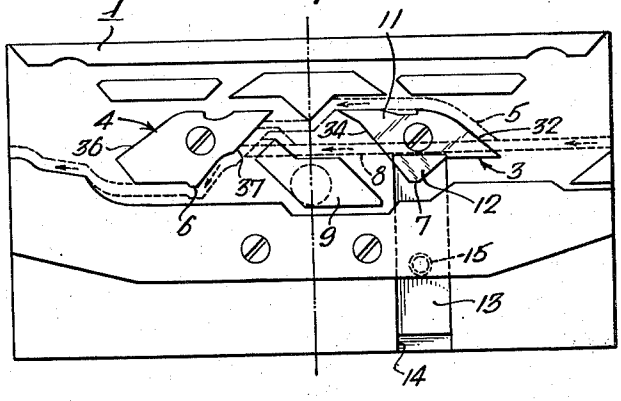


FIG. 3.



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STITCH CAM FOR CIRCULAR KNITTING MACHINES

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2 Claims. (Cl. 66—40)

This invention relates to improvements in circular knitting machines and more particularly in machines, such as those designed for production of hosiery, wherein provision is made for oscillating the head and for producing a course of stitches in each reverse movement.

A principal object of the invention is to provide a machine of this type capable of producing a more consistently uniform fabric than the machines of the prior art.

More particularly, the invention contemplates an improved form of stitch cam relatively free from wear and capable over long periods of use of producing stitches of uniform size.

Still more particularly, the invention contemplates a machine of the stated type having novel means for maintaining the critical relationship between the two primary stitch cams which is essential to production of a uniform fabric free from visible stitch variations.

The invention resides also in certain novel structural details and arrangements hereinafter described and illustrated in the attached drawings, wherein:

Fig. 1 is a fragmentary plan view of the cam ring of a circular knitting machine comprising my invention;

Fig. 2 is a fragmentary elevational view from the line 2—2, Fig. 1;

Fig. 3 is a face view of the cam ring from the line 3—3, Fig. 1, showing the stitch cams with which the invention is primarily concerned;

Fig. 4 is a sectional view on the line 4—4, Fig. 1;

Fig. 5 is a fragmentary elevational view illustrating details of the novel stitch cam of the invention;

Fig. 6 is a view in perspective of one section of the stitch cam;

Fig. 7 is a view in perspective of the same section of the stitch cam showing the underside of the said section, and

Fig. 8 is a view in perspective of the other section of the stitch cam.

With reference to the drawings, the reference numeral 1 indicates a section of the cam ring of a conventional circular hosiery knitting machine, the needle cylinder of which is indicated by the broken line 2. In accordance with the usual practice in machines of this type, the ring 1 carries the needle actuating cams including the two primary stitch cams 3 and 4. The machine illustrated is of the rotary cylinder type, and in producing the circular knit tubular leg portion of the stocking the cylinder 2 rotates in the direction indicated by the arrow in Fig. 1. During this part of the knitting operation the cam 3 functions in conventional manner to elevate the needles to receive the yarn, and the needles are subsequently depressed by the cam 4 to draw the loop. In this sequence the needle butts follow the path shown in broken lines and indicated by the reference numeral 5. The length of the loop thus drawn is a function of the depth of the cam 4 as determined by the low point 6.

When, in knitting certain parts of the stocking, the rotary movement of the cylinder is changed to oscillatory movement, and every alternate course of stitches is produced by a movement of the cylinder reverse to the direction of normal rotation indicated by the arrow aforesaid, the cam 4 in each such reverse movement will function to elevate the needles to receive the yarn, and the cam 3 will assume the prior function of the latter cam to depress the needles to draw the loops. In this case the needle butts follow a path which may be considered the reverse of the path 5. In this case also the length of the loop is a function of the effective depth of the cam 3 as determined by the position of the low point 7. In order, therefore, to produce loops of uniform length in both knitting directions, the low points 6 and 7 of the cams must be in alignment, and the permissible tolerance for misalignment particularly for machines adapted for production of "sheer" hosiery, is very small.

Conventionally, the cam 4 is fixed, whereas the cam 3 is adjustable to permit its retraction from the path of the butts of some or all of the needles. When the cam 3 is thus retracted the butts which clear the cam will follow a path indicated in broken lines at 8 in Fig. 3 and will if subsequently acted on by a cam 9, effect an elevation of the needles to yarn pick-up position but not sufficiently high to cause the latch to clear the previously formed loop which is then retained by the needle as it moves downwardly under guidance of cam 4 to form a tuck stitch. If, on the other hand, the cam 9 is retracted from the path of a needle butt, that needle will not be elevated to yarn pick-up position in which case the yarn will be floated across the back of the fabric. The function of the cam 9 and the operations described above are well understood in the art and the cam forms no part of the present invention.

The aforesaid adjustability of the cam 3 inevitably results in frictional wear of the cam-supporting elements, and this wear is necessarily accompanied by displacement of the cam from the normal position. Such displacement, even though small, affects the aforesaid critical alignment of the cams 3 and 4 and, with the cams of the prior art, tends to produce fabrics which by reason of inequality of stitch formation are visibly defective.

In order to avoid this undesirable effect, I propose to form the cam 3, as shown in Figs. 6, 7 and 8, of two complementary parts, 11 and 12 respectively, the part 11 being adjustably mounted in accordance with the usual practice, and the part 12 being mounted in fixed position on the cam ring. This is made possible by the fact that the latter part does not participate in the needle-elevating function and occupies a position below the path 8 traversed by the needle butts when the part 11 has been adjusted to inoperative or semi-inoperative position. In the advanced operative position which the part 11 occupies in plain circular knitting and also when the cylinder is oscillated, the complementary parts 11 and 12 form in effect a single stitch cam of functionally conventional form; and when the part 11 has been fully retracted from the path of the needle butts, as shown in Fig. 5, the part 12 remains as a functionally inoperative element remote to the path traversed by the needle butts. Since the cam 4 and the cam part 12 are thus permanently in fixed position on the cam ring, their original relative positions are maintained without change and the stitches are not subject to the variations described above. Wear developing in the adjustable part 11 of the composite cam 3 or in its supporting elements have no effect upon the fixed relation of the cam part 12 and cam 4.

The detailed form of cam 3 and the manner in which the parts thereof are mounted is clearly illustrated in the drawings. The part 12 has a depending stem 13 which is secured in a slot 14 in the cam ring by a screw 15. The low point 7 of the part 12 is in exact alignment circumferentially of the ring 1, with the low point 6 of cam 4. The part 11 of cam 3 is carried at an end of a

block 16 which is slidable in radial guide groove 17 in the cam ring and which is confined to the groove by a cover plate 18 detachably secured to the ring by screws 19. In the present instance the groove 17 is at the top of an extension 21 of the ring 1 which provides a mount for one of the picker fingers 22 and underlies said finger. The cam part 11 has at the outer side thereof a groove 23 which receives the end of block 16, and a screw 24 rigidly attaches the said part to the block.

The cam ring 1 has a vertical slot 25 the upper end of which intersects the groove 17, and a pin 26 depends from the block 16 through the slot 25 and into a slightly elongated aperture in a cam actuating lever 27. This lever is pivotally attached at 28 to the cam ring and the opposite end thereof is operatively connected by a rod 29 to a pattern chain or drum (not shown) in conventional manner. As shown in Fig. 4, the slot 25 is elongated radially of the ring 1 to provide for the required adjustments of the block 16 and cam part 11, previously described; under operation of lever 27.

As shown in Figs. 3, 6 and 7 the cam part 11 has in the underside thereof a recess 31 in which the upper end of the cam part 12 is slidably fitted. The part 11 has the inclined needle-butt-deflecting or guide surface 32 which in an advanced position of the cam part, as shown for example in Fig. 4, intersects the path of the needle butts 33 and serves to elevate the needles as described. At the opposite side, the cam part 11 has a similarly inclined surface 34 which, when the direction of cylinder movement has been reversed, serves to depress the needles, and the proximate face 35 of cam part 12 forms a continuation of the surface 34 and thus guides the needle butts to the low point 7. The cam 4 has a corresponding needle elevating face 36 at the side thereof remote to the cam 3, and at its opposite side, the conventional needle depressing face 37 which terminates in the point 6.

It will be evident that while the invention has particular application to knitting machines of the type wherein provision is made for oscillatory as well as completely circular knitting, the novel cam structure constitutes in itself a valuable medium for maintaining uniform stitch size and therefore more uniform fabric.

I claim:

1. In a circular knitting machine of the type described comprising a needle cylinder and latch needles carried thereby, a cam ring coaxial with said cylinder, said ring and cylinder being selectively relatively rotatable and relatively oscillatable about the common axis, a pair of complementary stitch cams carried by said ring and operative to actuate the needles in the stitch forming function for each direction of relative movement of the cylinder and ring, the relatively remote faces of the cams being designed to elevate the needles to yarn pick-up and

latch-clearing positions and the proximate faces of the cams being designed to depress the needles to cast the loops cleared from the latches, one of said cams being fixed to the ring and the other of said cams having a separable upper part containing in its entirety the needle elevating face of the cam and being retractable on the ring from the needle path, the lower part of the cam being fixed to the ring and being inoperative to elevate the needles, and a middle lower cam intermediate the stitch cams formed to intercept the needles moving past the fixed lower cam part when the said upper part has been retracted and to elevate the needles to an intermediate position of elevation for subsequent depression by the other stitch cam, said intermediate position of elevation permitting the needle to pick up yarn while retaining its loop above latch clearing position, thereby precluding casting of the loop in the said subsequent depression by the other cam.

2. In a circular knitting machine of the type described comprising a needle cylinder and needles carried thereby, a cam ring coaxial with said cylinder, said ring and cylinder being selectively relatively rotatable and relatively oscillatable about the common axis, a pair of complementary stitch cams carried by said ring in justaposition to each other and operative to actuate the needles in the stitch forming function for each direction of relative movement of the cylinder and ring, the relatively remote faces of the cams being designed to elevate the needles to yarn pick-up positions and the proximate faces of the cams being designed to depress the needles to form the stitch loops, and the lower extremities of the cams being in alignment with each other so that the said loops are of equal length for both directions of said relative movement, one of said cams being fixed to the ring and the other of said cams having a separable upper part containing the needle elevating face of the cam and being retractable on the ring from the needle path, and the lower part of the said other cam being fixed to the ring and being inoperative when the said upper part is retracted to elevate the needles to the yarn pick-up position while permitting movement of the needles into engagement with the needle depressing face of the other cam.

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