Jan. 1, 1929. 1,697,488

E. U. AMES

KNITTING MACHINE

Filed May 31, 1924 3 Sheets-Sheet 1

Fig. 7.

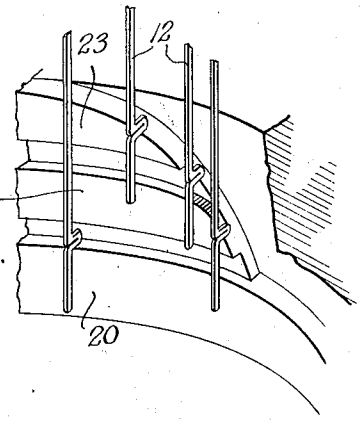


Fig. 1.

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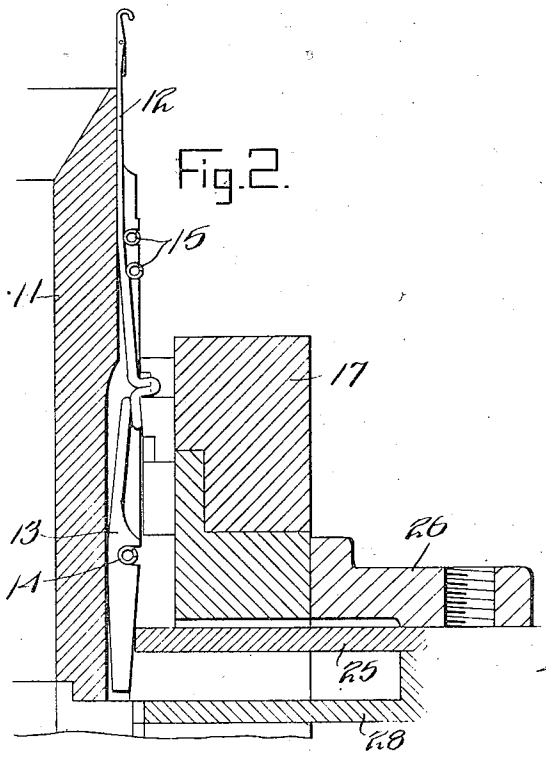


Fig. 2.

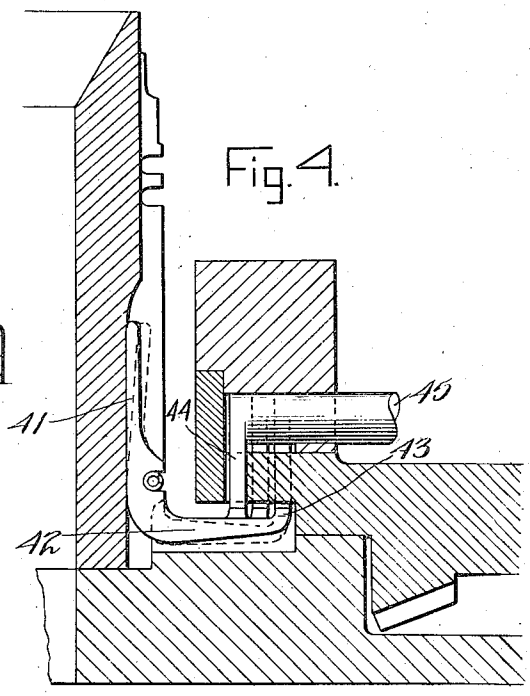


Fig. 4.

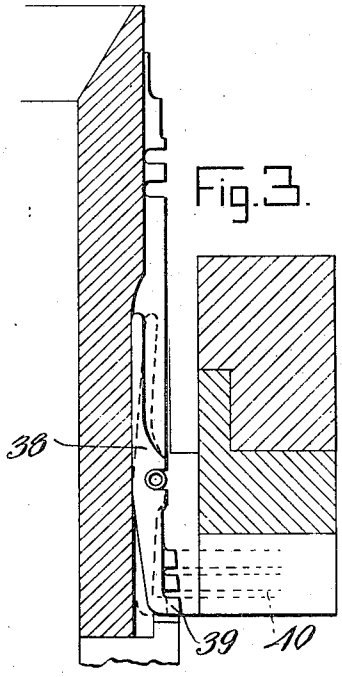


Fig. 3.

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KNITTING MACHINE

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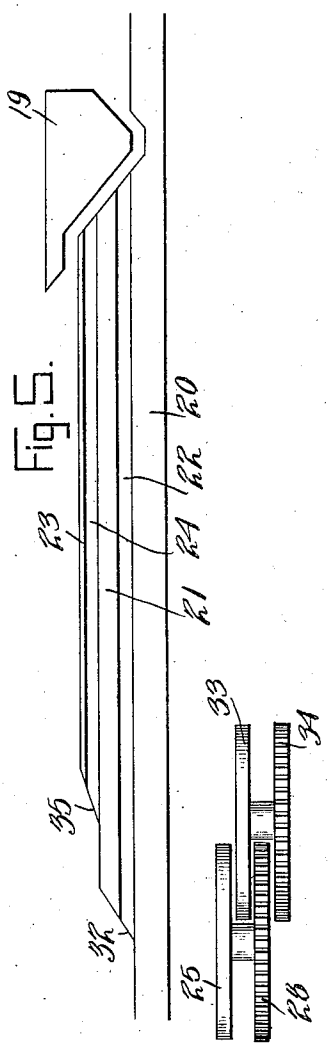


Fig. 5.

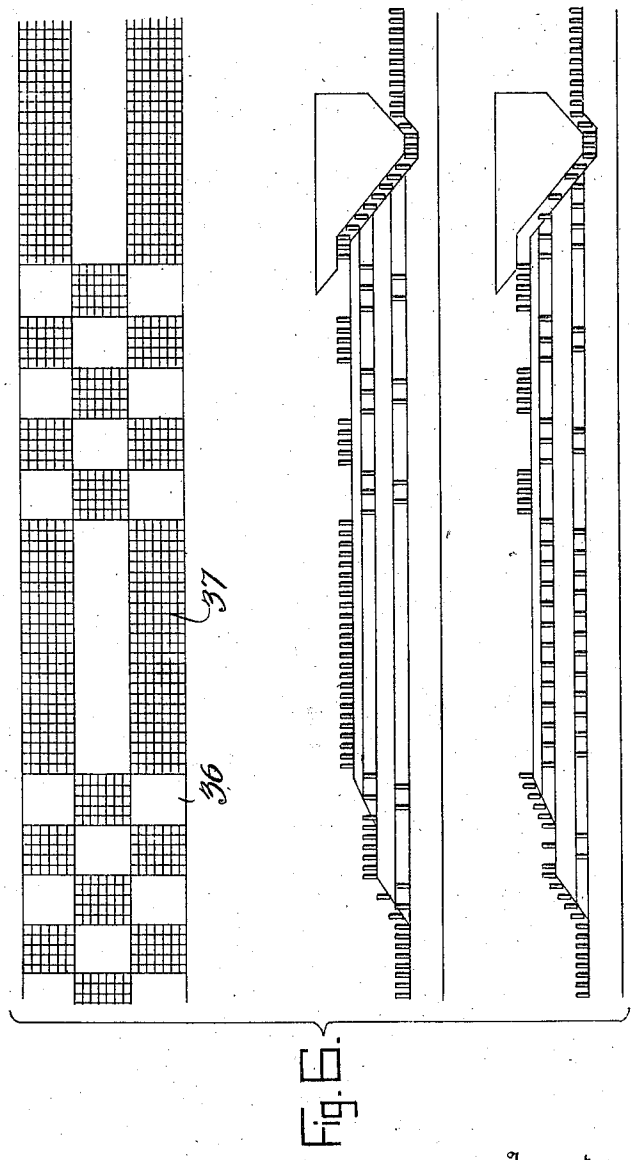


Fig. 6.

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UNITED STATES PATENT OFFICE.

ELMER U. AMES, OF COLLINGSWOOD, NEW JERSEY.

KNITTING MACHINE.

Application filed May 31, 1924. Serial No. 717,182.

My said invention relates to knitting machines and it is an object thereof to provide means for selectively actuating the needles to produce variations in the design of the fabric made by the machine.

Another object of the invention is to provide means for variously selecting needles to form different patterns and to do this with certainty and precision without interfering with the operation of the machine in other respects.

Referring to the accompanying drawings which are made a part hereof and on which similar reference characters indicate similar parts,

Figure 1 is a vertical section of the principal parts of my machine showing certain needle-lifting cams in end elevation.

Figure 2, a similar section on a smaller scale showing the parts in a different position,

Figure 3 a similar view of a modified form of the invention,

Figure 4, a similar view of a further modification,

Figure 5, an interior elevation of the cams of a feed and certain wheels cooperating therewith,

Figure 6, a consolidated plan view showing how the needles may be operated in conjunction with yarn-changing means for producing a pattern, and

Fig. 7 is a perspective view showing the interior of the cam set at the point where the wheels act upon the needles.

In the drawings reference character 10 indicates the frame of the machine to which is attached in any conventional or desirable manner a stationary needle cylinder 11 having slots in which the needles 12 are slidably mounted as usual. Near the lower end of the cylinder the slots are deepened to make room for jacks 13 which are held in place by an annular coiled spring 14 similar to those shown at 15 for holding the needles in place and similarly located in an annular groove of the cylinder. The jacks have reduced upper arms buried in the needle slots behind the lower or butt ends of the respective needles. They also have lower arms so formed as to extend beyond the outer periphery of the needle cylinder, or if preferred the ribs between which the needle slots are formed may be reduced so as to expose the outer faces of said lower arms. These arms are cut away at 16 on an incline so that the rear side of the jack is provided with a rocking bearing.

A cam ring 17 is mounted on the frame of the machine and has a beveled gear 18 secured thereto in usual manner for revolving the cam ring, it being understood that the needle cylinder may revolve if preferred while the cam ring is stationary and that the needle holder may be a flat bed with cams reciprocating relative to it if desired. The cam ring has a set of cams including a stitch cam 19 (Fig. 5), a lower cam ledge 20 provided with a notch below the stitch cam and with an upper margin at a higher elevation for raising the needles to relieve the strain on the yarn after the stitches are drawn, a ledge 21 separated from the ledge 20 by a groove 22 for the needle-butts of needles at the idle level and a ledge 23 separated from the ledge 21 by a groove 24 for the butts of needles at the tuck level. The needles whose butts pass along the upper side of the ledge 23 are those needles which take the yarn to form new loops and thereafter knit off the old loops as they pass the cam 19.

As will be evident from consideration of Figure 1 the needles will remain at the idle level unless some means is provided for lifting them above the same. In the present embodiment of the invention I have shown a wheel or disk 25 secured to a projection 26 on the cam ring by a bolt 27 which forms an axle about which the wheel revolves. The wheel is driven by a gear 28 also rotating on the axle 27 and secured to the wheel 25 in any convenient manner. The gear 28 has teeth meshing with teeth 29 on the stationary ring 30 below the needle cylinder. This wheel is exteriorly notched as indicated at 31 so that it may pass a jack as clearly indicated in Figure 1 without moving it. However, should a high part of the wheel engage the lower arm of the jack then the jack will rock and the upper arm will flex the needle as shown in Figure 2, so as to carry the butt into the field of action of the incline shown at 32 (Fig. 5) whereby the needle or several needles according to the length of the high part of the wheel will be elevated to the tuck level.

Figure 2 illustrates also how the needles at their upper ends approximately from the upper spring ring 15 to the top remain in their slots so as to exclude dust and lint from the slots while the needle butts are being acted on by the cams. The dotted lines at 33 and 34 (Figure 1) indicate another wheel and another gear which may be mounted in overlapping relation to the wheel 25 and its gear 28

and which act in similar manner on the jacks after they have passed the first wheel to force the needle butts into the field of action of the second incline at 35 whereby the needles are carried up to the knitting level, the two wheels providing primary and secondary pattern means for the needles.

It will be understood that the above description relates to a preferred embodiment of the invention and that in some cases a single wheel may be used for carrying the needles from the idle to the knitting level, the tuck level being omitted if desired. The two wheels at different heights may also be used to carry needles from one level to another on each of several feeds on a machine of smaller diameter than would be possible if the wheels could not overlap.

Where two wheels are used to a feed, the term "feed" being used here to indicate a set of cams which operate the needles to knit or tuck or pass without taking yarn, the cams will first raise all the needles to a height which will relieve the strain on the yarn after drawing the stitch at the last feed, but not high enough to take yarn at the next feed. A wheel then acts on the jacks to flex certain needles outward so that their butts will engage a cam which will raise them to a higher level say to a level at which they will take yarn at the next feed, but not high enough to let their latches get above the old loops, thus taking yarn but not knitting off which is called tucking. A second wheel is placed back of the first which will select certain jacks and cause them to flex their needles out once more to engage a second raising cam which will carry them up to the height at which they will clear the old loops, take yarn and knit off the old loops. In this way certain needles will knit, certain others will tuck and the remaining needles will not knit, tuck or take yarn, but they will pass the cams. On the next feed or the one following the needles which tucked on the first feed should knit off to avoid loading up too many stitches.

In knitting with a plurality of feeds with a different color at each or alternate feeds in a design where there are several adjacent needles tucking, the face yarn is thrown back of these needles causing a long "float" or loose stretch of yarn not knitted in, which is undesirable in that it is unsightly and is likely to catch and pull the adjacent fabric or break. This may be avoided by the use of the two wheels per feed as above described, the first wheel carrying up the needles that are required to knit and those that are required to tuck while the remaining needles each of which is between two that go up to tuck, will not go up but pass under the stitch cam without taking yarn but holding its old loop made on a previous feed, which will be knitted off on a subsequent feed, the result being a fabric with no objectionable floated stitches in the back.

Figure 6 illustrates the method of forming a figured fabric having white parts 36 and blue parts 37 arranged as here shown partly in squares and partly in rectangles of greater length and width. The two sets of cams, or two feeds, are brought into superposed relation for convenience of illustration and the needle butts are shown in the positions to which they are brought by the pattern wheels illustrated in this application or by pattern mechanism of other types such for example as shown in my copending applications No. 717,183 and No. 717,184 of even date herewith. Each feed has a yarn changer and these are so operated that the blue feed in the first row of blocks will be changed to white in the second row and the white feed in the first row of blocks will be changed to blue in the second row and so on. The pattern shown in this figure is of course merely illustrative since patterns of many varieties may be formed by the use of my improvements.

In the modification of my invention shown in Figure 3 the jacks 38 have regularly extending fingers 39 at different elevations, said fingers being arranged for actuation by a cam or a "bob-pin" indicated in dotted lines at 40 and controlled by pattern mechanism of any desirable character to engage with said fingers as desired for actuating the corresponding jacks to bring the desired needles into the field of action of the cams and thus vary the pattern of the fabric as desired.

In Figure 4 a still further modification is illustrated, said modification comprising elbow-shaped jacks having upper arms 41 buried in the needle-slots behind the lower ends of the needles and horizontal lower arms 42 terminating in fingers 43 adapted to be engaged by a cam face on a projection 44 of a pattern-controlled slidable rod 45. In the present embodiment of the invention I have shown elbow-shaped jacks having horizontal arms of three different lengths but it will be evident that the number of different jacks can be changed, the position of the slide rod being similarly varied. It will be evident that change of position of the slide rod will cause it to actuate a different set of jacks and thereby flex a different set of needles to bring them into position for actuation by the cams.

Various modifications of my device will be obvious to those skilled in the art, those shown being merely illustrative of preferred forms of the same and therefore I do not limit myself to what is shown in the drawings and described in the specification but only as indicated in the appended claims.

Having thus fully described my said invention, what I claim as new and desire to secure by Letters Patent, is:

1. In a knitting machine, a needle holder

having slots, needles slidable in the slots, needle cams, rocking jacks adapted to move the needles into the field of operation of the cams, a notched wheel acting to push against the jacks substantially in a radial direction, and a second notched wheel overlapping the first, substantially as set forth.

2. In a knitting machine, a needle holder having slots, needles slidable in the slots, needle cams comprising means for maintaining needles at idle, tuck and knitting levels, rocking jacks adapted to move the needles into the field of operation of the cams, a notched wheel acting on the jacks to raise selected needles to tuck level, and a second notched wheel operlapping the first said second wheel acting on selected jacks to raise their needles to knitting level, substantially as set forth.

3. In a knitting machine, a needle holder having slots, needles slidable in the slots, needle cams for raising needles to tuck and knitting levels, said cams being equidistant from the needle holder, and means for moving needles outward at different elevations into the field of operation of said cams, substantially as set forth.

4. In a knitting machine, a needle holder having slots, needles, slidable in the slots, needle cams for raising needles to tuck and knitting levels, said cams being equidistant from the needle holder, and means for moving selected needles outward at different elevations into the field of operation of said cams said means including rocking jacks each having an arm underlying a needle, substantially as set forth.

5. In a knitting machine, a slotted needle bed, needles in the slots of the bed, needle cams including means for maintaining needles at idle, tuck and knitting levels, jacks operative on the needles to move them into the field of operation of the cams, pattern means acting on selected jacks to cause their needles to be moved to tuck level, and secondary pattern means acting on certain of said selected needles in the same course to cause them to be moved to knitting level.

6. In a knitting machine, a needle holder having slots, needles slidable in the slots, needle cams for raising needles to tuck and knitting levels, said cams being equidistant from the needle holder, means for moving selected needles outward at different elevations into the field of operation of said cams, said means including rocking jacks each having an arm underlying a needle, and pattern means operative on the individual jacks.

7. In a knitting machine, a slotted needle cylinder, needles in the slots of the cylinder, rocking jacks in said slots having arms lying behind the shanks of the needles, needle cams rotatable relatively to said needle cylinder, and a pattern wheel geared to the cylinder, said wheel having notches in its periphery permitting corresponding jacks to remain idle and having integral high peripheral parts between said notches for pressing radially against corresponding jacks to rock them and move corresponding needles into the field of action of the cams.

8. In a knitting machine, a needle cylinder, a set of needles, needle-actuating cams, a set of rocking jacks, and means for acting on said jacks to differentiate the operation of said needles by said cams including overlapping horizontal disks with peripheral notches, whereby jacks entering the notches remain idle while other jacks are actuated by the portions of the disks between said notches, substantially as set forth.

9. In a knitting machine, a slotted needle bed, a series of needles in the slots of the bed, cams for actuating the needles, jacks for controlling the needles and a wheel traveling bodily past said series of needles, said wheel having high peripheral parts acting on the jacks to move the needles selectively outward into the field of action of said cams and having notches between the high parts permitting correspondingly located jacks to remain idle.

10. In a knitting machine, a slotted needle cylinder, a series of needles in the slots of the cylinder, needle actuating cams normally out of reach of the needles, jacks for controlling the needles, and a planetary wheel traveling with said cams relatively to the said series of needles, said wheel having high peripheral parts acting on the jacks to move the needles selectively outward into the field of action of said cams and having notches between the high parts permitting correspondingly located jacks to remain idle.

11. In a knitting machine, a slotted needle bed, a set of needles in the slots of the bed, a needle cam set, jacks coacting with individual needles, primary pattern means for acting on the jacks to move selected needles into the field of action of the cams of said set, and secondary pattern means operative at the same cam set on part of the selected needles to make a further selection among the selected needles.

12. In a knitting machine, a slotted needle bed, a set of needles in the slots of the bed, a needle cam set, jacks coacting with individual needles, primary pattern means for acting on the jacks to move selected needles into the field of action of the cams of said set, and secondary pattern means operative selectively at the same cam set on the jacks of the selected needles to further vary the relation of their needles to the needle cams.

In witness whereof, I have hereunto set my hand at Philadelphia, Pennsylvania, this 15th day of May, A. D. nineteen hundred and twenty-four.

ELMER U. AMES.