Dec. 17, 1935. N. LEVIN 2,024,530

KNITTING MACHINE WITH HORIZONTAL DESIGN WHEELS

Original Filed Aug. 1, 1931 2 Sheets-Sheet 1

Fig. 1.

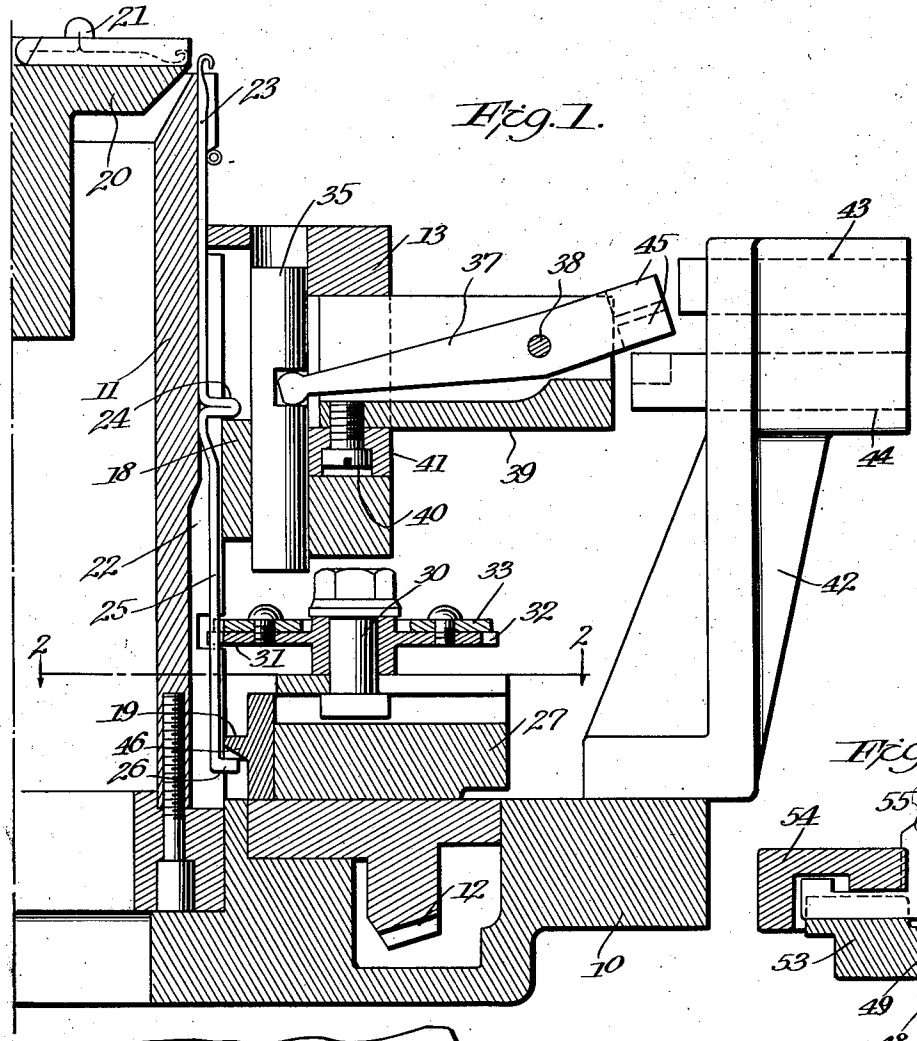


Fig. 6.

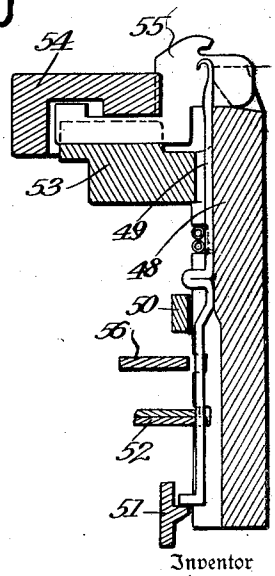
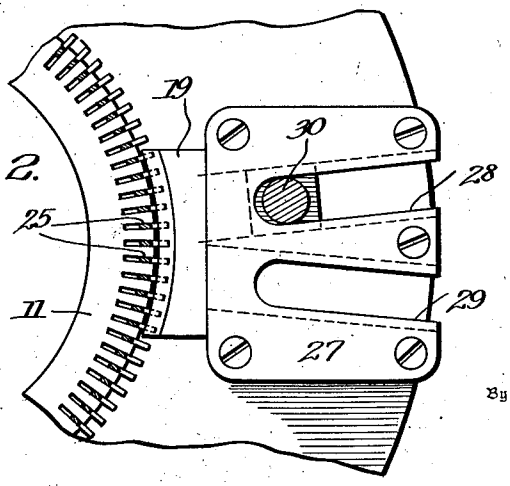


Fig. 2.



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Fig. 3.

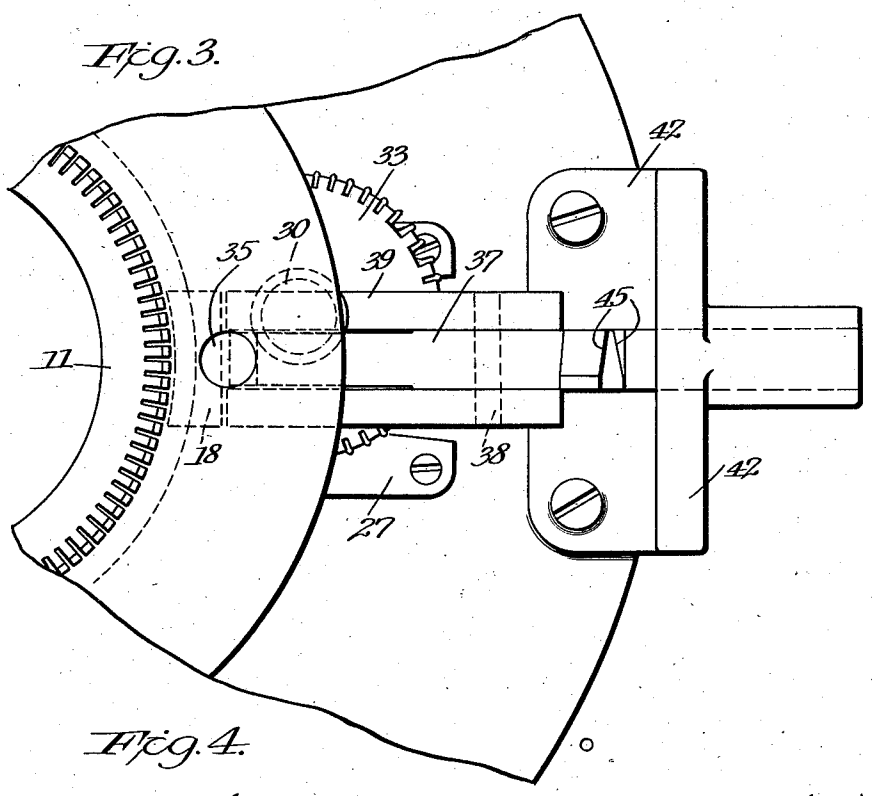


Fig. 4.

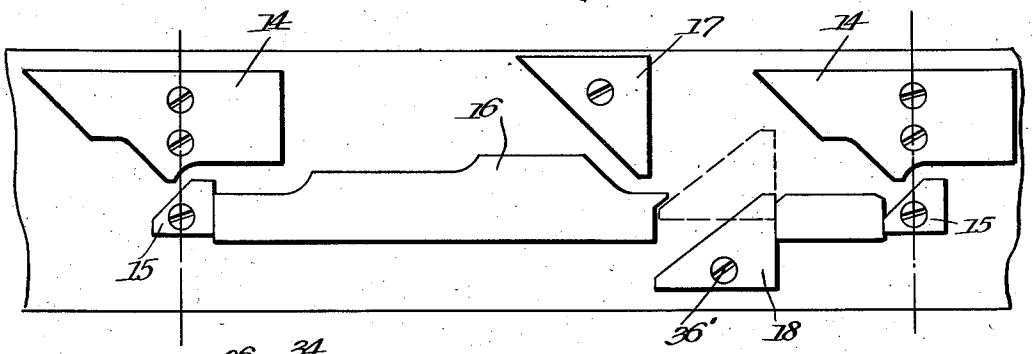
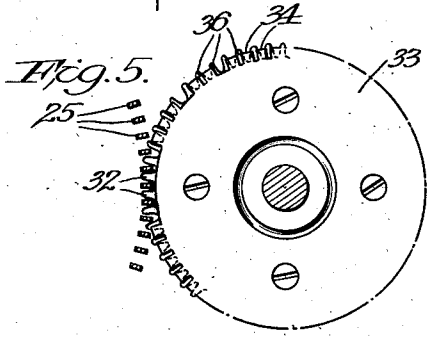
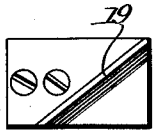


Fig. 5.





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2,024,530

KNITTING MACHINE WITH HORIZONTAL DESIGN WHEELS

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Application August 1, 1931, Serial No. 554,567
Renewed April 4, 1934

18 Claims. (Cl. 66—36)

My said invention relates to a knitting machine embodying a novel means for putting needles out of action at predetermined times, whereby the machine can make fabric with special or fancy stitches such as tuck fabric, drop stitch fabric, etc. It is an object of my invention to provide the machine with such special mechanism and it is a further object of the invention to provide means whereby the action of said mechanism may be nullified, as where a length of plain fabric is to be made between two lengths of ornamental or other special fabric.

Another object of the invention is to provide means whereby all the needles may be rendered inoperative at one or more of the feeds on a multiple feed machine.

Another object of the invention is to provide special needles and other special mechanisms suitable to purposes such as those herein set forth.

Referring to the drawings, which are made a part of this application and in which similar reference characters indicate similar parts:

Fig. 1 is a partial vertical central section of a machine embodying my improvements,

Fig. 2 a section of the same on line 2—2 of Fig. 1,

Fig. 3 a plan illustrating the means for controlling a plain knitting cam,

Fig. 4 an elevation of the interior of a cam ring such as that of Fig. 1,

Fig. 5 a detail of a design wheel and means for driving the same, and

Fig. 6 a partial vertical section of an open-topped machine.

In the drawings reference character 10 indicates a part of the table of a rib knitting machine which table includes means for supporting a fixed needle cylinder 11, a revolving ring gear 12 and a cam ring 13 provided with a stitch cam 14 for each yarn feed (of which there may be any suitable number according to the diameter of the knitting head). This ring is also provided with cams 15 adjacent the stitch cam for returning the needles to normal idle level, a cam 16 for raising them to tuck level and a cam 17 for returning them to idle or welt level. Under certain conditions the last named cam is removed so that the needles move on toward the stitch cam 14 at the tuck level until they are raised by one or the other of the plain knitting cam 18 and the special butt actuating cam 19.

A dial 20 is provided at the upper end of the needle cylinder as usual and has dial needles 21 positioned therein to cooperate with the cylinder needles. The cylinder at its upper end has the usual needle slots but the cylinder is made longer than usual and at its lower end the needle slots are preferably, though not necessarily, deepened as indicated at 22. The cylinder needles 23 are also elongated and are provided at about the usual distance from the hooks of the needles with butts 24, below which they have elongated resilient tails as indicated at 25 and butts 26 are provided adjacent the lower ends of the spring tails. The cam ring is located in elevated position so that its cams may cooperate with butts 24 and means are provided below the ordinary cams for coacting with the spring tails of the needles to determine what part the individual needles shall take in making the fabric.

The means cooperating with the spring tails and the butts thereon comprises the cam 19 (Figs. 1 and 4) which normally engages underneath all the butts 26 to elevate the needles to the normal knitting position or to the normal position where yarn is taken preliminary to the formation of a new stitch by the operation of the stitch cam on the needles. For the purpose of putting certain needles out of action I have provided a design wheel which is on a support 27 having undercut grooves at 28 and 29 to receive a bolt 30 on which the hub of the wheel rotates. It will be seen that the slotted support provides means whereby the position of the wheel may be adjusted so that its teeth shall coact properly with the needles. The wheel consists of a lower portion 31 which may be integral with the hub and which part is slotted as indicated at 32 to provide spaced teeth which are always in mesh with the needles for the purpose of driving the design wheel, and which teeth are uniformly spaced about this part of the wheel. Above the part 31 is a plate 33 suitably secured to the plate-like portion 31 and this plate 33 has teeth 34 separated by notches 36 of varying width. At points where a notch 36 corresponds with a notch in the lower plate it will be evident that the needles are not affected by the design wheel but remain in operative engagement with the cam 19 so that they are raised to normal knitting position. Where, however, the notch in the lower plate is covered by a tooth in the upper plate the spring tail of the needle will be pushed inward so as to remove its butt out of range of the cam 19. If the wheel is positioned with its bolt in notch 29 (Fig. 2) the needles which are put out of action are put out of action at the idle or welt level and so do not rise to take a new yarn, causing welt stitches

at the point where the needles are thus idled; if, on the other hand, the design wheel is located with its bolt in the notch 28 as shown in Fig. 2 the butts on the spring tails will have reached the tuck level before they come under control of the design wheel, and therefore any needle that is put out of action at this time will be at the tuck level, so that it will take the yarn but as its latch has not been cleared through the loop it will not knit off its old stitch but will make a tuck stitch.

The construction so far described will repeat persistently at a feed a pattern such as is predetermined by the arrangement of teeth and notches on the plate 33. Should it now be desired to make plain knitting at such feed, this is done by means comprising a plain knitting cam 18 movable from the solid line position of Fig. 4, where it does not take part in the operation of the needles, to the dotted line position in said figure where it raises to normal knitting position any needles which have been put out of action either at the welt or idle level or at the tuck level by the design wheel and this nullifies the action of the cam 19. For this purpose I provide the plain knitting cam 18 with a vertically slidable support in the form of a short bar or shaft 35, here shown as being cylindrical in shape. This shaft is mounted for rocking movement in an opening in the cam ring 13 and has the cam 18 secured thereto by a screw 36' (Fig. 4) or in any other suitable manner. A lever 37,—a so-called tuck bar—is pivoted at 38 in a tuck bar holder 39 set into an opening in the cam ring and held by a screw 40. A bracket 42 on the table 10 carries slides 43, 44 which are controlled by any suitable pattern mechanism and which are provided at their inner ends with cam faces adapted to co-act with cam faces at 45 on the tuck bar for moving the same either clockwise or counter-clockwise about its pivot to raise or lower the shaft 35 and the attached cam 18.

When the cam 18 is elevated to the dotted line position of 34 it may well happen that some of the spring tail needles which were bent inward by the design wheel have passed the design wheel and spring back to normal position with their butts 26 underneath cam 19. Upon raising the cam 18, the butts 26 would catch under the cam 19 and interfere with this operation. For this reason I bevel off the underside of the cam 19 in an upward and inward direction as indicated at 46, so that the butts on needles located as in Fig. 1 simply slide up the bevel surface and are flexed, the tails bending sufficiently to permit the butts to pass by the cam 19. In cases where tuck work is to be made, but no needles are to be put out of action at the idle or welt level the cam 17 is preferably removed from the machine since its only effect is to lower all needles to idle level and thus cause them to make one additional reciprocatory movement which is unnecessary under such circumstances.

In Fig. 1, I have shown my improvements as applied to a rib machine but it will be obvious that the same may be applied equally well to an open top machine and I have shown in Fig. 6 such application with an additional improvement. In said figure the needle cylinder 48, the needle 49, the plain knitting cam 50, the cam 51 for the butts on the spring tails of the design wheel 52 may all be substantially as hereinbefore described, except for the slight difference in the cylinders used on an open topped machine and a rib knitting machine, there being also a sinker bed 53, a sinker cam cap 54, and sinkers 55. In addition to the operations which may be performed by the mechanism previously described, I have here shown a cam 56 which may be pushed inward by manual means or by a suitable pattern control to engage the spring tails of all the needles and put them out of action at a feed. In such case the yarn normally taken by the needles at that feed will merely float inside the cylinder while the yarns at other feeds continue to knit, and knitting may be resumed by merely withdrawing the cam 56. Such a construction is of use for example in cases where different colored yarns are supplied at different feeds. In such cases the arrangement of horizontal stripes in the fabric may be varied by putting out of action the needles at a feed so that for example if three feeds have respectively green, red and yellow yarns, successive stripes of the three may be knitted or by putting one feed out of action successive stripes of two colors only, e. g., red and yellow may be made for as many courses as may be desired. Preferably the spring tail needles have their tails offset outwardly as shown in Figs. 1 and 6, the offsetting of the spring tail and the deepening of the needle slot providing ample room for the flexing of the tails. Obviously offset spring tails can be used with a slot of uniform depth if desired and many other changes within the scope of my invention will be obvious to those skilled in the art; 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.

I claim—

1. In a knitting machine, the combination of a series of independent needles, a stitch cam, a cam for normally raising the needles of the series to the normal level for knitting, means adjustable along the series of needles for selectively moving needles of the series out of range of said raising cam, and a support for said adjustable means having provision for locating said means in either one of two positions so as to move needles selectively out of range of said raising cam at different stages in their upward movement.

2. A device as in claim 1, with means adapted to be positioned for engaging the selected needles and restoring them to normal position in the needle-wave before they reach the adjacent yarn feed.

3. In a knitting machine, the combination of a series of independent needles, a stitch cam, a cam for normally raising the needles of the series to the normal level for knitting, means for selectively moving needles of the series out of range of said cam, a support for said means having provision for locating said means to so move needles selectively either at an idle level or at the tuck level, means adapted to be positioned for engaging the selected needles and raising them to normal yarn-taking level, said last-named means comprising a plain knitting cam, butts on the needles adjacent said cam, a rod-like element movable parallel to a needle, a lever engaging the rod-like element, and pattern-controlled means for actuating said lever to place said last-named cam in or out of operative relation to said last-named butts.

4. In a knitting machine, the combination of a series of independent needles, a stitch cam, a cam for normally raising the needles of the

series to the normal level for knitting, means for selectively moving needles of the series out of range of said cam, and a support for said means having provision for locating said means to so move needles selectively either at an idle level or at the tuck level, means adapted to be positioned for engaging the selected needles and raising them to normal yarn-taking level, said last-named means comprising a plain knitting cam, butts on the needles adjacent said cam, a rod-like element movable parallel to a needle, a lever engaging the rod-like element, and pattern-controlled means for actuating said lever to place said last-named cam in or out of operative relation to said last-named butts, said first-named cam having an upwardly-inwardly inclined under surface, as and for the purpose set forth.

5. In a knitting machine, a needle cylinder having slots of normal depth at the upper end of the cylinder and of greater depth at the lower end, needles having butts approximately midway of their length and having below said butts a relatively long resilient tail with a butt adjacent the lower end, a cam acting on the lower butts for raising the needles to normal knitting position, a design wheel above said cam providing means for selectively flexing the tails of the needles to move their butts out of operative relation to said cam, and a support for said design wheel having means for supporting the wheel in different positions circumferentially of the needle cylinder so as to remove the needles selectively from said cam at different heights according to the position of said wheel.

6. In a knitting machine, a needle cylinder having slots of predetermined depth at the upper end of the cylinder and of greater depth at the lower end, needles each having a butt approximately midway of its length and having below said butt a relatively long resilient tail with a butt adjacent the lower end of the needle, a cam acting on the lower butts for raising the needles to normal knitting position, a horizontal design wheel providing means for selectively flexing the tails of the needles to move their butts out of operative relation to said cam, and a plain-knitting cam directly above said wheel adapted to be brought into operative relation to said first-named butts for returning to normal position in the needle-wave needles which have been selectively acted on by said needle-flexing means.

7. In a knitting machine, a slotted needle cylinder, needles in the slots of the cylinder with long resilient tails offset outwardly from the axis of the needle, butts adjacent the lower ends of said tails, means for elevating the needles to normal knitting position including a needle-raising cam acting on said butts, means acting selectively on said needles for flexing their tails to move the butts of selected needles out of operative relation to the needle elevating means, and means whereby the needle-selecting means may be positioned to make its selection at different stages of elevation of the needles.

8. In a knitting machine, a slotted needle cylinder, needles in the slots of the cylinder with long resilient tails offset outwardly from the axis of the needle, butts adjacent the lower ends of said tails, means for elevating the needles to normal knitting position including a needle-raising cam acting on said butts, means acting selectively on said needles for flexing their tails to move the butts of selected needles out of operative relation to the needle elevating means, means whereby the needle-selecting means may be positioned to make its selection at different stages of elevation of the needles, and means including a plain-knitting cam whereby the selected needles may be returned to normal knitting elevation before reaching the adjacent yarn-feed.

9. In a multiple feed knitting machine, a slotted needle bed, independent needles therein having long resilient tails, butts on said needles, a needle cam adjustable to an idle position or to a position for acting on said butts to elevate needles to normal knitting level, means acting on the tails of said needles below said butts for elevating them, means for flexing the tails of needles selectively to take them out of reach of said second-named elevating means, and means adjustable to a position to flex the tails of all the long-tailed needles to take them out of reach of said second-named elevating means and so interrupt the knitting at a feed.

10. In a multiple feed knitting machine, a slotted needle bed, independent needles therein having long resilient tails, means acting on said tails for selectively elevating said needles to normal knitting position, and means adjustable to a position to flex the tails of all the long-tailed needles for intermitting the knitting at a feed.

11. In a knitting machine, a slotted needle bed, needles therein having resilient tails, upper and lower butts on said needles, means adapted to coact with the upper butts for plain knitting, said means including a stitch cam and a needle-elevating cam, means for rendering said needle-elevating cam inoperative, needle-elevating means coacting with said lower butts to elevate needles to normal knitting position, and means for selectively flexing the tails of the needles to take their lower butts out of reach of said coacting needle-elevating means.

12. In a knitting machine, the combination of a series of independent needles, a stitch cam, a cam normally engaging and raising the needles of the series to the normal level for knitting, means adjustable along the series of needles for selectively moving needles of the series out of the range of said raising cam, and a support for said adjustable means having provision for locating the same in different positions for deflecting needles selectively at different stages in their upward movement.

13. In a knitting machine, a slotted needle bed, slidable needles in the slots of the bed said needles having butts, a stitch cam for engagement with said butts, resilient tails on said needles, butts on said tails, a needle-advancing cam acting on said last-named butts, and a pattern wheel contacting the tails of the needles near the butts on said tails for moving such butts selectively out of range of said advancing cam.

14. In a knitting machine, a slotted needle bed, slidable needles in the slots of the bed said needles having butts, a stitch cam for engagement with said butts, resilient tails on said needles, butts on said tails, a needle-advancing cam acting on said last-named butts, and a pattern surface movable past the series of needle tails, said pattern surface embodying means for contacting with said tails to flex them selectively so as to take their butts out of range of said advancing cam.

15. In a knitting machine, a slotted bed, reciprocable elements slidable in the slots of said bed, butts on said elements, a retracting cam engaging said butts, resilient tails on said elements, butts near the free ends of said tails, an

advancing cam acting on said last-named butts, and a pattern wheel contacting the tails of said elements selectively to flex them and so to move their butts out of range of said advancing cam.

16. In a knitting machine, a slotted bed, reciprocable elements slidable in the slots of said bed, butts on said elements, a retracting cam engaging said butts, resilient tails on said elements, butts near the free ends of said tails, an advancing cam acting on said last-named butts, and a pattern surface movable along the series of reciprocable elements, said pattern surface embodying means for contacting with the tails on said elements to flex them selectively so as to take their butts out of range of said advancing cam.

17. In a knitting machine, a slotted bed, reciprocable elements slidable in the slots of said bed, butts on said elements, a retracting cam engaging said butts, resilient tails on said elements, butts near the free ends of said tails, an advancing cam acting on said last-named butts, a pattern wheel having means for contacting the tails of said elements selectively to flex them and so to move their butts out of range of said advancing cam, and a nullifying cam movable into a position for advancing the elements not moved by said advancing cam.

18. In a knitting machine, a slotted needle cylinder, needles with resilient tails in the slots of the cylinder, a stitch cam, butts on the needles for engagement with said cam, other butts near the free ends of said tails, a needle-advancing cam acting on said last-named butts, and a pattern wheel geared to the tails of the needles to be rotated thereby for moving such last-named butts selectively out of range of said advancing cam.

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