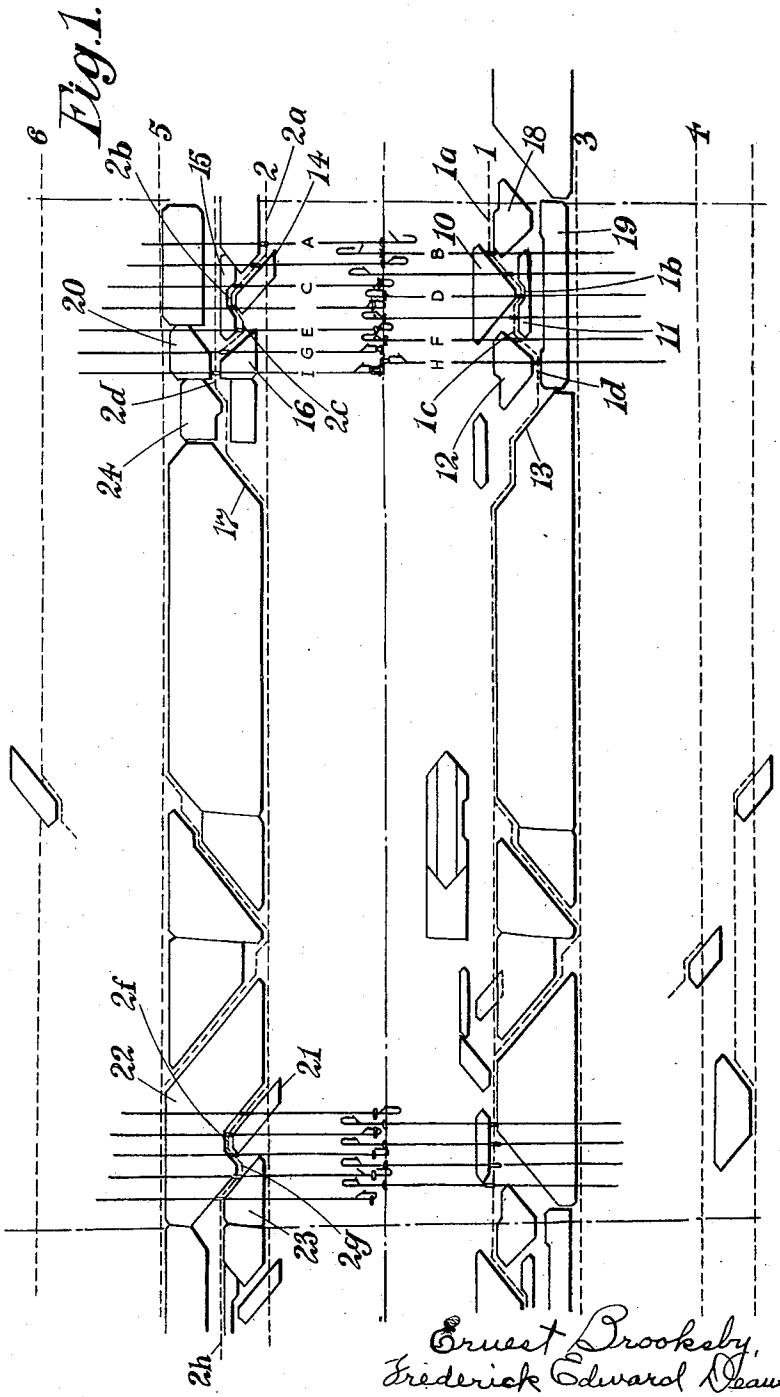
March 12, 1946. E. BROOKSBY ET AL 2,396,489

KNITTING MACHINE

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Fig. 1.



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Fig. 3.

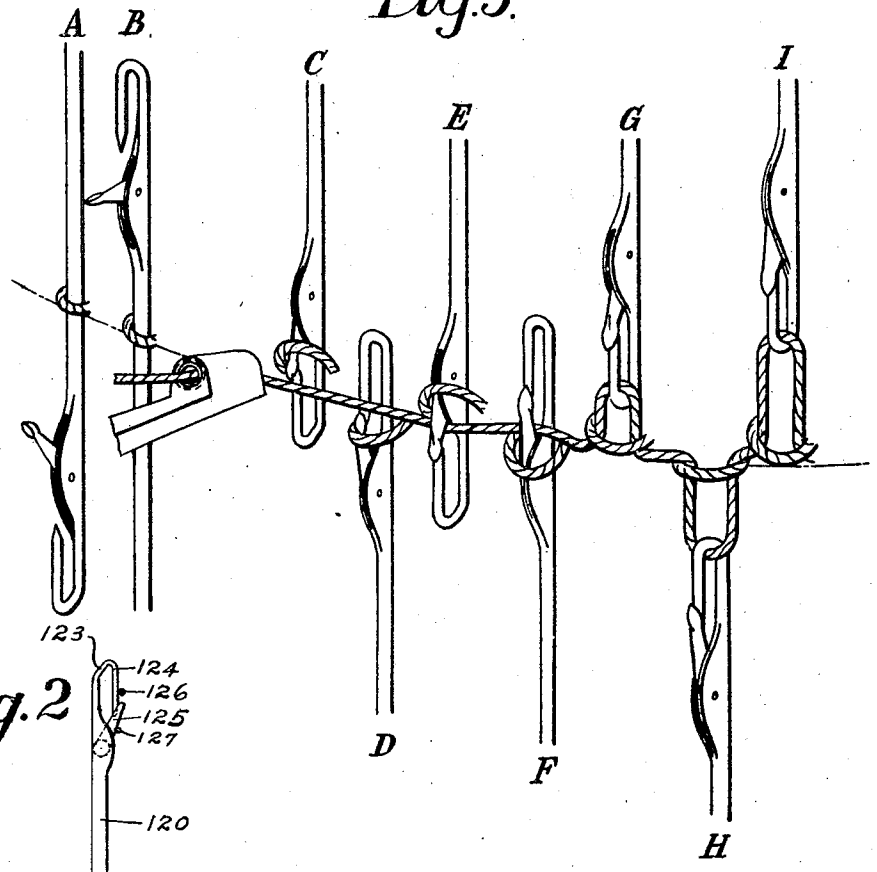
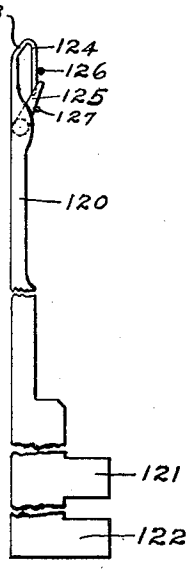


Fig. 2



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Patented Mar. 12, 1946 2,396,489

UNITED STATES PATENT OFFICE

2,396,489

KNITTING MACHINE

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Application August 7, 1943, Serial No. 497,826
In Great Britain July 20, 1942

10 Claims. (Cl. 66—14)

This invention consists in improvements in or relating to knitting machines of the type having independently movable needles. Although the invention is particularly applicable to circular rib machines of the superposed cylinder type, it is not limited to such machines, nor is in it fact limited to circular knitting machines.

In knitting machines hitherto, feed yarn is so supplied that it is laid into the hooks of the needles and, in the case of latch needles, a system of latch guarding devices is necessary in order to ensure that the latches are open when yarn is to be fed to the needles.

According to the present invention, a method of supplying a feed yarn to a needle hook consists in laying the yarn on to the front or nose of the hook and thereafter relatively adjusting the hook and the yarn to slide the latter into the hook.

When the invention is applied to a latch needle the latch, when closed, may be conveniently made so as to project slightly beyond the hook and, should the latch be closed by a loop held by the needle when adjustment is made to slide the yarn into the hook the yarn will ease the latch open sufficiently during that adjustment so as to pass between the latch and the hook.

The invention is equally applicable in circumstances in which, in the case of a latch needle, the latch is not closed by a previously formed loop.

In one example of the invention in which a latch needle is used, the needle and a previously formed loop held by that needle may, prior to sliding the yarn into the hook, be conveniently relatively adjusted to bring the previously formed loop on to the outside of the latch thereby holding the latter resiliently closed and enabling it to be sprung open sufficiently to permit the feed yarn to pass between the latch and the nose of the hook.

By the use of this method of feeding yarn to the needles it is no longer necessary to hold open the latches in order to lay the yarn into the needle hooks, and the usual elaborate system of latch guarding devices is therefore dispensed with.

In machines of the superposed cylinder type the latch guards have always called for great care in manufacture and adjustment. They have also been a source of trouble and restriction in the design or lay-out of the needle cam tracks, a frequent source of trouble in the running of the machine, an obstruction to the laying of the feed yarn into the needle hooks and an obstruction to the view of the knitting operation and accessibility of various parts of the machine. Moreover, latch guards cause considerable strain to be placed upon the drawn stitch, particularly in the upper rib cylinder of a superposed cylinder machine and this is detrimental to the finished appearance of the face of the fabric.

The present invention overcomes all these disadvantages, and includes also a knitting needle designed to facilitate this improved method of feeding yarn to the needle hooks, such a needle having a downturned nose portion of the hook so shaped and sufficiently long as to enable the feed yarn to be received upon it above the latch, and a latch having its free end projecting outwardly beyond the front or nose of the hook to a sufficient extent to catch the feed yarn when the latter is slid down the front of the hook.

Preferably, the downturned front or nose portion of the hook is formed straight and substantially parallel with the back of the hook, and the latch itself is short as compared with that of a needle of corresponding size having the usual form.

In order that the invention may be more clearly understood, a preferred form of the invention will now be described with the aid of the accompanying drawings, in which—

Figure 1 illustrates a development of part of a needle cam system for a superposed cylinder knitting machine operating in accordance with the present invention,

Figure 2 is a side elevation of a preferred form of needle hook, and

Fig. 3 is a diagrammatic perspective view of some of the needles illustrated in Fig. 1.

In Figure 1 the dotted line 1 represents the line of travel of the needle butts in the operative or knitting track for the needles of the lower cylinder. Dotted line 3 shows the line of travel of the same butts in the out-of-action track, and the dotted line 4 represents the line of travel of the needle transfer butts in the normal out-of-action position of the needle. Dotted lines 2, 5 and 6 represent lines of travel corresponding to lines 1, 3 and 4 for the needles of the upper cylinder. It is assumed that the cams are stationary and the needle cylinders are rotating in the direction from right to left in Fig. 1.

In Fig. 1 some of the needles are shown in a purely diagrammatic manner, and the action of these needles will be those described hereinbelow. Fig. 3 on a much enlarged scale diagrammatically illustrates a view of the needles in the positions shown at the right-hand end of Fig. 1.

The letters A to I being employed to represent corresponding needles in both these figures. In Fig. 3 a feeder is shown as having delivered yarn to needle E, with the needles D and C just about to take the yarn.

The knitting butts of the needles which are in operation follow along tracks 1 and 2 and in this postiion, on their approach to the knitting cams, the needles carry the old loops round their stems below and clear of the latches. Considering first the operation of the needles in the lower cylinder, the knitting butts first encounter fixed cam 10 by which they are drawn downwardly to a position 1*b* and at this height the old loop has just closed the latch of the needle but remains thereon, and the feed yarn has been laid on to the front of the needle hook above the latch. Further travel of the needle brings its butt on to a slight rise on cam 11 which raises the butt to the height 1*c* and at this height the new or feed yarn has slipped into the hook. The latch will have been opened sufficiently either by the pressure of the feed yarn or by centrifugal force and gravity when the raising of the needle eases the loop around the latch, or by a combination of both these effects. The amount by which the latch will open will depend on the loop length of the old loop and on the tension and elasticity of the yarn. Knitting cam 12 then operates on the needle butts to move the needles so as to draw the new yarn into a loop through the old one, and at the height 1*d* the new loop is fully drawn and the old loop has passed over the needle head into the fabric. The needle is thereafter again raised to the height 1*a* by cam 13 and the cycle of operations for knitting one stitch is complete.

The knitting butts of the needles in the upper cylinder which approach the cam system at the height 2 follow through a similar cycle of operations with the aid of cams 14, 15, 16 and 17, the line of travel of the knitting butts of the active needles in the upper cylinder having been given a similar notation in which the positions 2*a*, 2*b*, 2*c* and 2*d* correspond to the positions 1*a*, 1*b*, 1*c*, and 1*d* respectively. In the lower cylinder as usual there are two stitch cams 12 and 18 respectively and a guard cam 19 which are adjustable for height to vary the stitch length as required and in the upper cylinder the stitch cam 16 and the guard cam 20 are also adjustable for a similar purpose.

The knitting butts of those needles in the two cylinders which are to be retained out of action remain at a constant level indicated by the lines 3 and 5.

In Figure 2 a needle is shown which is designed specially for use in the manner just described and comprises as usual a stem 120 on which is a knitting butt 121 and a transfer butt 122. The hook 123 is formed with an extended front or hook portion 124 which lies substantially parallel with the back of the hook and is considerably longer than usual. The latch 125 is relatively shorter than needles in general use and projects slightly beyond the front or nose so that the feed yarn which is laid on to the nose of the hook at a position indicated at 126 will, when the needle is raised, engage the projecting lip of the latch and slip between it and the nose of the needle into the hook. Meanwhile, the old yarn will be in the position indicated at 127.

The above-described method of operating the needle in relation to the yarn can be used not only in the feeding of a new yarn into the hook as just described but also to return an old loop which has been cleared of the latch into the hook when desired. This, for instance, is advantageous when making a welt of the type usual in circular knitting machines. The welt is generally made on a 1 and 1 rib foundation, that is to say, alternate needles are knitting in one needle bed and the intermediate needles are knitting in the other needle bed. During the knitting of the welt the needles of one bed, generally the lower cylinder, continue to knit normally, whilst in a selected course or selected courses those in the other needle bed retain their loops in the hooks but do not receive the new yarn. For this purpose it has been customary hitherto to provide in the needle cam system a special welt track extending all round the circle of cams in order to keep the needles in the required positions to retain their loops. With the present method, however, it is not necessary to have this special welt track except for a very short circumferential extent near the feed point. In the cam system illustrated a welt cam, which is in the form of a bolt cam, is indicated at 21 and the needles approach this cam, after they have left the knitting cam system, at the normal knitting height. The cam 21 when it is in operation returns the needles to a height 2*f* equivalent to height 2*b* and at this point the old loop has been moved to encircle the nose of the hook above the latch. A movement obtained by means of guard cam 22 similar to that already described for feeding the new yarn then takes place, that is to say, the needle butts are moved to a height 2*g* at which the old loop will have passed into the hook of the needle, whereafter cam 23 withdraws the needle to a height 2*h* which represents the usual welt position. At this height the needle then approaches the knitting cams but passes the feed point at a position that will cause the needle to miss the feed yarn and the needle will eventually be returned to a height 2*a* by means of cams 24 and 17.

The elimination of the welt track simplifies the cam system, not only directly but it also avoids the necessity for providing movable cams which would otherwise be required to be out of action when making a welt and to be in action when needles are being taken across the welt track.

A similar means of operating the needle to bring an old loop into the needle hook may also be used with advantage for other purposes such. for instance, as in a tucking operation.

A similar cam arrangement may be provided in the cam system for the companion needle bed, that is to say, for the lower cylinder in the specific example illustrated, when a reverse welt is to be made.

Other cams illustrated in the accompanying drawings form no part of the present invention and are concerned mainly with the transference of loops from needles in one cylinder to needles in the other, and this transfer system constitutes part of our co-pending application which has matured as U. S. Letters Patent No. 2,380,822, granted July 31, 1945.

We claim:

1. A method of knitting having an operational sequence which comprises advancing a needle to a height sufficient to clear an already formed loop below the opened latch of the needle, then retracting the needle to a height at which the feed yarn will be laid on to the nose of the needle, subsequently raising the needle sufficiently to pass the newly received yarn into the hook of the needle and finally fully retracting

the needle to clear the old loop to the back thereof.

2. A method of knitting according to claim 1 in which the latch, if closed, is opened by the yarn itself during the raising of the needle to the height which is sufficient to pass the newly received yarn into the hook.

3. In a knitting machine, a series of latch needles, a needle cam system comprising successive cam elements and cooperating yarn feeding means, so constructed and arranged as to bring a previously formed loop held by a needle on to the outside of the latch thereby holding the latter resiliently closed, to lay the new yarn on to the front or nose of the hook of the needle while the latch is so held, and thereafter relatively adjust the hook and the yarn to slide the latter between the latch and the hook without materially opening the latch.

4. A method of knitting according to claim 1 in which when the needle is raised sufficiently to pass the newly received yarn into the hook of the needle this movement will bring the old loop previously held by the needle on to the outside of the latch in order to hold the latter resiliently closed.

5. A method of transferring into the hook of a needle a previously formed loop held by that needle below its latch which consists in adjusting the height of the needle relatively to the position of the previously formed loop so that the latter is first slid on to the nose of the needle above the latch whereafter a further movement of the needle in a reverse direction slides the loop back into the hook of the needle.

6. A method of knitting according to claim 1 in which the relative adjustment of the hook and yarn to slide the latter between the latch and the hook occurs without materially opening the latch.

7. A method of forming a welt in which each needle approaches the welt cams at the normal knitting height and is operated by those cams to pass the old loop into the hook of the needle in the manner defined in claim 9, and subsequently is returned to the normal welt track height.

8. A method of forming a welt in which each needle approaches the welt cams at the normal knitting height and is operated by those cams to pass the old loop into the hook of the needle in the manner defined in claim 9, and subsequently is returned to the normal welt track height, the said needles being caused to travel at welt track height only between the welt cam system and the knitting cam.

9. A method of forming a welt which comprises causing each successive latch needle to approach the welt cams of a knitting machine at the normal knitting height, moving the needle by means of a welt cam to cause the old loop to encircle the nose of the needle hook above the latch, then moving the needle to a height at which the old loop will have passed into the hook of the needle, and subsequently moving the needle to normal welt track height.

10. A method of forming a welt according to claim 9 in which the needles only travel at welt track height between the welt cam system and the knitting cam.

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