Nov. 3, 1942. R. PEEL ET AL 2,300,804

KNITTING MACHINE AND NEEDLE THEREFOR

Filed March 10, 1939

Fig. 1.

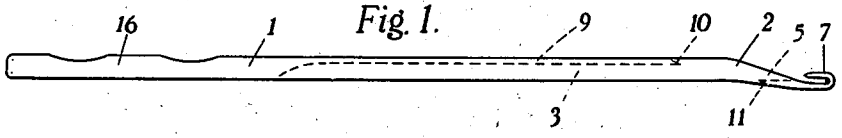


Fig. 2.

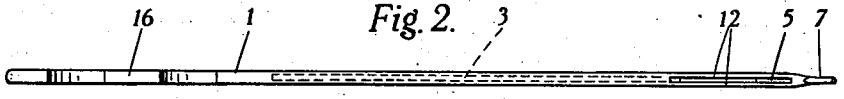


Fig. 3.

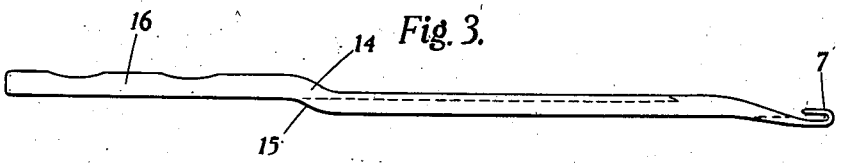


Fig. 4.

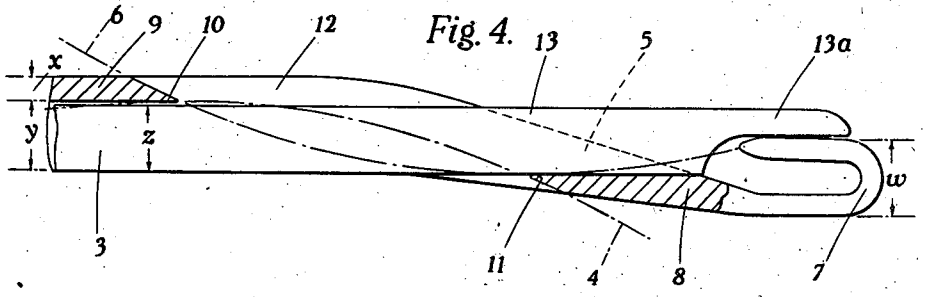
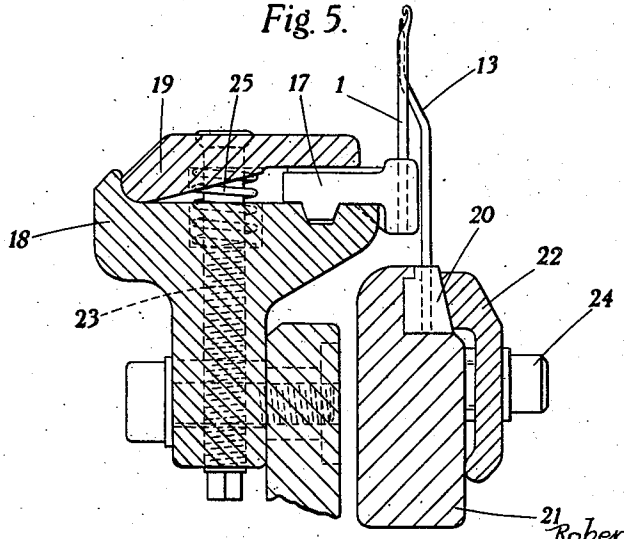


Fig. 5.



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KNITTING MACHINE AND NEEDLE THEREFOR

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Application March 10, 1939, Serial No. 261,130
In Great Britain March 18, 1938

6 Claims. (Cl. 66—86)

This invention relates to knitting machines and to needles for such machines. The invention is concerned with those knitting machines having hook needles that are moved to and fro in timed relationship with separate hook closing members or tongues. Previously, the tongues have been mounted to slide in plain U-shaped grooves in the shanks of the needles. The groove in such a needle is formed in the plane of the needle hook, the latter emerging into the needle shank at the base of the groove and the tip of the hook pointing towards the groove and lying on a line extending along the shank between the side walls of the groove. Towards the hook, the side walls are tapered down so that they vanish at the base of the groove substantially at the point where the hook joins the shank. Thus, in the relative to-and-fro movement between the needle and tongue, the tip of the latter is withdrawn into the groove and then moved forward to a position in which it covers the needle hook. In the operation of the two parts, after a loop has been formed and is held in the hook, the needle is moved longitudinally forward and the tongue moved in the opposite direction. Accordingly, the tip of the tongue becomes concealed in the groove and the loop is lifted, that is displaced transversely to the direction of movement of the needle, by the cam action of the tapered edges of the side walls as the latter move through the loop. The loop then embraces a part of the shank such that the tip of the tongue will pass through the loop as the tongue again approaches the needle hook. However, before the tip of the tongue reaches the tip of the hook a further thread is lapped on the tapered part of the needle shank. This further thread is eventually enclosed in the eye formed by the tip of the tongue overlapping the needle hook. Then, the tongue and needle recede together and the newly lapped thread is pulled into a loop by the needle hook and passes through the original loop which is eventually cast off over the end of the tongue and over the outside of the needle hook.

In this arrangement, the tongue and needle may either be constrained to move in straight line paths or to oscillate about a fixed axis. In either case, it not infrequently happens in practice that the needle and tongue, instead of moving in predetermined paths, traverse paths such that the tongue may lift out of the needle groove to such an extent as to interfere with the smooth passage of a loop up the needle shank and to prevent the tongue in its movement towards the hook from passing safely through the loop, so that the loop, instead of being cast off, remains beneath the tongue while a new loop is being drawn. The lifting of the tongue may also result in the latter never reaching a position in which it satisfactorily overlaps the tip of the needle hook so as to provide a substantially closed eye for casting the formed loops off the needle and tongue into the knitted fabric.

According to the invention, a hook needle has a shank formed with a longitudinal groove open along the face of the shank at which the hook emerges, the groove being provided to serve as a guide for the associated tongue. The transverse part of the wall bounding the groove is, therefore, in such a position that it prevents the tongue from lifting away from the path in which it is in correct alignment with the needle hook. The tongue is prevented from moving in the other direction, that is to say out of the mouth of the groove, by a bearing constituted by a second transverse part of the needle that must be provided at the junction between the shank and the hook. This second transverse part is the base of a further groove, the side walls of which are tapered for the purpose of lifting the loops of thread to enable the tongue to pass through them. This groove, as well as the main groove for the tongue, may be formed by milling operations. Then, the second transverse part lies somewhat ahead of the transverse part of the main groove and the two parts, together with the side walls of the shank that join these parts, provide an opening through which the tongue passes.

In order that the invention may be clearly understood, and readily carried into effect, constructions in accordance therewith will now be described, by way of example, with reference to the accompanying drawing, in which:

Figure 1 is a side elevation of one form of needle, on an enlarged scale;

Figure 2 is a plan of the needle in Figure 1;

Figure 3 is a side elevation of a modified form of the needle shown in Figures 1 and 2;

Figure 4 is a part sectional side elevation, on an even larger scale, of the hook end of a needle such as those shown in Figures 1 to 3, the front end of the tongue co-operating with the needle being shown; and

Figure 5 shows a method of mounting needles, of the kind shown in Figure 1, in a warp knitting machine.

The needle shown in Figures 1 and 2 has a straight shank 1 which is tapered at 2. This shank is initially solid and a groove 3 is cut in

it by a milling cutter 4, as indicated by chain lines in Figure 4. On the opposite face of the shank a further groove 5 is cut by a milling cutter 6, as indicated by chain lines in Figure 4. The needle hook 7, which is swaged and then bent, emerges from the transverse part 8 of the groove 5, the tip of the hook 7 being disposed towards the transverse part 9 of the groove 3; that is to say, the hook emerges from the face of the shank at which the groove 3 opens. When the two grooves 3 and 5 have been formed, there is an opening defined between the front edge 10 of the transverse part 9 and the rear edge 11 of the transverse part 8, the sides of this opening being constituted by side walls 12, Figure 2, which are the result of the milling operations. The tongue 13, with which needle shown in Figures 1 and 2 co-operates, passes through this opening, as shown in Figure 4, the tip of the tongue being formed with a shallow part 13a which overlaps the needle hook during the operation of the needle. The transverse part 9 of the groove 3 prevents the tip of the tongue from lifting away from the tip of the hook. The transverse part 8 of the groove 5 ensures that the tip of the tongue shall not foul the hook.

The needle in Figure 3 is similar to that shown in Figures 1 and 2, except that the needle shank is cranked at 14. This enables the milling cutter to be run straight out of the needle shank at the oblique face 15, when the groove 3 is formed.

When needles, such as those shown in Figures 1 to 4, are to be mounted in a warp knitting machine, the arrangement shown in Figure 5 can be employed. The tail ends 16 of the needle shanks are moulded in blocks 17, which may be of lead or synthetic resin. These blocks, each of which carries a number of needles, are secured side by side along a needle bar 18 by a clamp plate 19. Thus, there is a long row of needles, side by side and parallel to each other, extending along the neede bar. The tongues are similarly moulded into blocks 20 secured side by side along a tongue bar 21 by a clamp plate 22. The tongues, of course, are allocated respectively to the needles, and each tongue has a cranked configuration so that, although it projects upwards from its respective block, it enters and can reciprocate in the groove 3 of its associated needle.

Each tongue block 20 carries as many tongues as its associated needle block 17. Thus, when it is desired to remove a particular block, bolts 24, securing the clamp plate 22 to the tongue bar 21, are removed as well as the clamp plate 22. In addition, bolts 25, securing the clamp plate 19 to the needle bar 18, are loosened to enable springs 25 to lift the clamp plate 19 away from the blocks 17. Then, any one of the blocks 20 can be removed, together with the associated one of the blocks 17, while the tongues and needles, on the blocks being removed, remain in engagement. This system of clamping the blocks in position forms no part of the present invention.

The tongues and needles are reciprocated in straight line vertical paths and in timed relationship by imparting vertical to and fro motion to the bars.

Some of the dimensions, in inches, of the example shown in Figure 4 are as follows:

$w=0.026$, $x=0.008$, $y=0.022$, $z=0.019$

The above dimensions are, of course, given purely by way of example, and it will be appreciated that needles in accordance with the invention may be made in a very wide variety of gauges.

The needles and tongues may be so mounted and formed that there is substantially no contact between them. However, when they are subjected to bending loads, due to the threads being knitted, some contact may take place and the transverse parts 8 and 9 then prevent any appreciable deviation between the paths of the needles and the paths of the tongues.

The needles and tongues may, of course, be mounted for straight line reciprocation in horizontal or oblique paths. Or, they may be mounted for arcuate movement and, in that event, they may be made arcuate, as seen in side elevation.

We claim:

1. A needle for a knitting machine, comprising a tongue, a shank formed at one end with a hook and further formed with a longitudinal two-part groove one part open along the face of the shank at which said hook emerges and sunk deeply in said shank, the other part of said groove opening into the opposite face and disposed between the end of the shank opposite said hook and said first-mentioned grooved part to provide a continuation of the latter, said two grooved parts serving as a guide, adapted to constrain the tongue against lateral movement in any direction transversely to said grooved parts, said tongue reciprocable in said grooved parts for covering and uncovering the tip of said hook.

2. A needle for a knitting machine comprising, in combination, a tongue, a shank having a pair of parallel side walls, a transverse part joining corresponding edges of said side walls at the ends of the latter and providing a bearing surface for the lower face of said tongue reciprocable in a straight line path between said side walls, a hook emerging from said transverse part as a continuation thereof and bent so that the tip of said hook lies between the planes of said side walls, and a second transverse part joining the edges of said walls remote from those joined by said first-mentioned transverse part, said second transverse part providing a relatively long U-shaped bearing surface for the opposite face of the tongue parallel to said first-mentioned bearing surface and in line therewith.

3. A warp knitting machine comprising, in combination, a bar, a row of needles mounted on said bar and formed at their ends remote from said bar with hooks, said needles being further formed respectively with longitudinal two-part grooves one part open along the under faces of the needle shanks at which said hooks emerge, a further bar, a row of tongues mounted on said further bar and extending into said grooves, said tongues being adapted to cover and uncover the tips of said hooks when said bars are moved to and fro relatively to each other, and the shank of each needle being also formed with a second part of said groove opening into the face of the shank opposite to the face into which said first-mentioned grooved part opens to provide with said first-mentioned grooved part a guide for the associated tongue.

4. A needle assembly for a knitting machine comprising, in combination, a needle shank having a hook, a pair of side walls tapering towards the base of said hook, a transverse part joining said side walls close to said hook, and a second transverse part joining said side walls thereby to provide a two-part substantially straight line groove, the two parts being U-shaped in cross

section and facing in opposite directions, the tapering parts of said side walls being located between said second transverse part and said hook, and a tongue formed to move to and fro in neat sliding engagement with said side walls and said transverse parts and to be restrained thereby from lateral movement in any direction relatively to said needle, the to and fro motion being between a position in which the tip of said tongue overlaps said hook and a position in which the tip lies between the deeper portions of said side walls.

5. A needle assembly for a knitting machine comprising, in combination, a needle having a hook, parallel side walls tapering at one end to the base of said hook, a transverse part joining said side walls close to said hook, and a second transverse part joining said side walls, said side walls and said transverse parts defining a two-part groove U-shaped in cross section and opening on opposite sides of the needle, and a tongue adapted to reciprocate in a straight line in said groove while being prevented thereby from any lateral movement relatively to said needle between a position in which the tip of said tongue overlaps said hook and a position in which the tip lies between the deeper portions of said side walls.

6. A warp knitting machine comprising a bar, a row of needles mounted on said bar, each needle having, in combination, a shank with a hook at its end remote from said bar, a pair of side walls tapering towards the base of said hook, a transverse part joining said side walls below and close to said hook, and a second transverse part joining said side walls above said hook, the machine further comprising a second bar and a row of tongues mounted on said second bar and allocated respectively to said needles, each tongue being formed to move to and fro in neat sliding engagement with said side walls and with said transverse parts and to be restrained thereby from lateral movement in any direction relatively to said needle, the to and fro motion being between a position in which the tip of said tongue overlaps said hook and a position in which the tip lies between the deeper portions of said side walls.

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