Feb. 18, 1958 F. G. WEISBECKER 2,823,528

NEEDLE BAR ASSEMBLY AND METHOD OF KNITTING

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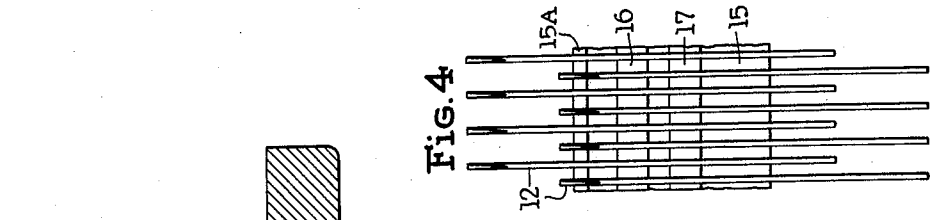


Fig. 4

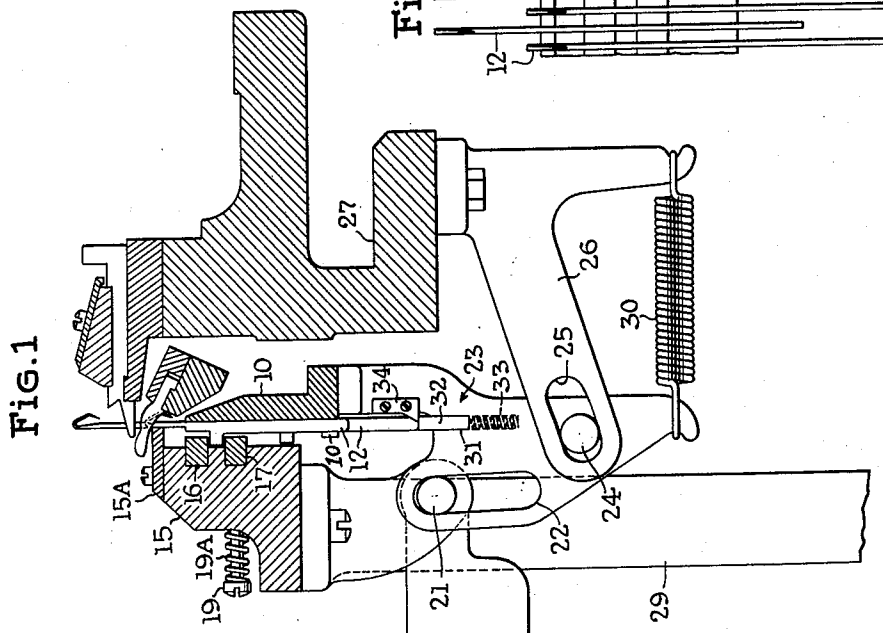


Fig. 1

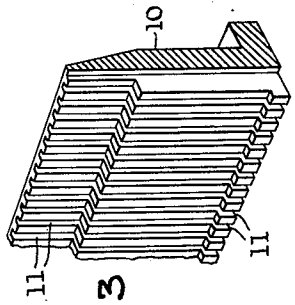


Fig. 3

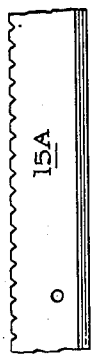


Fig. 5

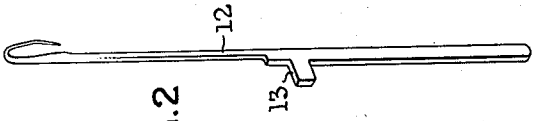


Fig. 2

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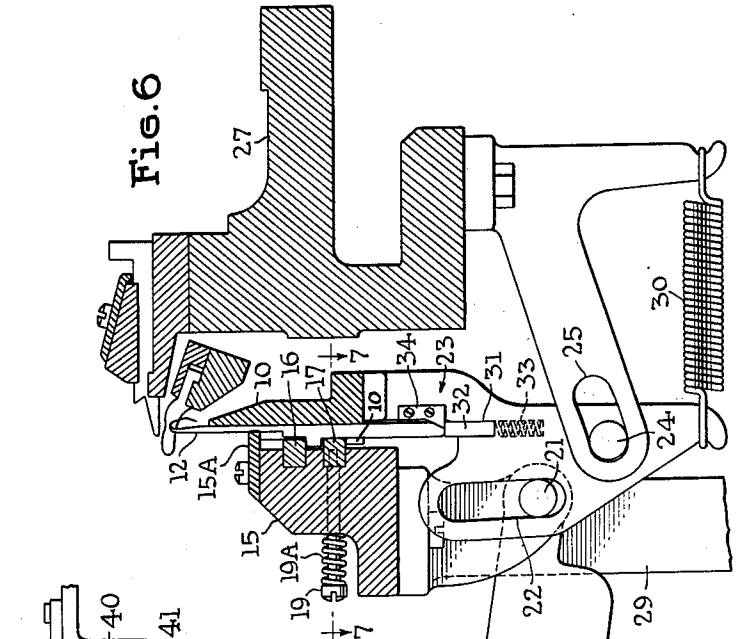
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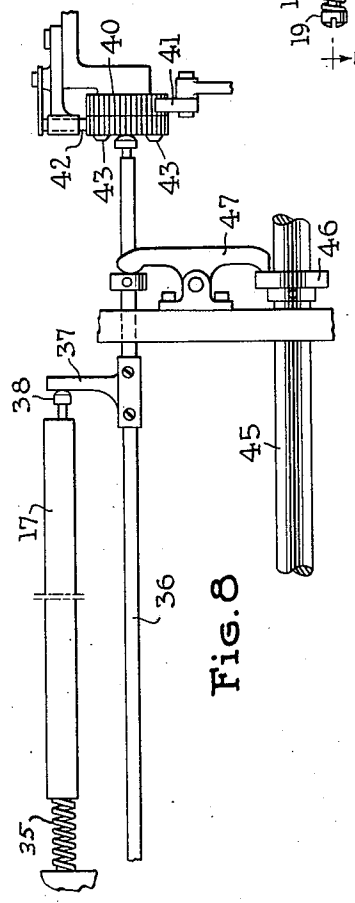
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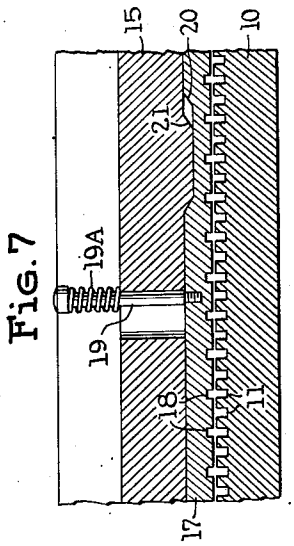
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NEEDLE BAR ASSEMBLY AND METHOD OF KNITTING

Filed Dec. 5, 1956 2 Sheets-Sheet 2







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United States Patent Office 2,823,528 Patented Feb. 18, 1958

2,823,528

NEEDLE BAR ASSEMBLY AND METHOD OF KNITTING

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Application December 5, 1956, Serial No. 626,431

7 Claims. (Cl. 66—5)

This invention relates to automatic knitting machines, and more particularly to a new and improved needle bar assembly for automatic knitting machines of the flatbed, full fashion type.

Conventional flatbed full fashion machines utilize a unitary needle bar to which the individual needles are rigidly affixed. In circular knitting machines, independent needle mounting is conventional, but the principles of independent needle mounting have not heretofore been applied to the full fashion machine. Accordingly, it is the principal object of the present invention to provide a novel needle bar assembly for full fashion machines in which the needles are mounted for movement independently of one another.

It is a further object of the present invention to provide a full fashion machine with a needle bar assembly which is readily convertible from independent to unitary needle motion.

Other objects will be apparent as the description proceeds and complete understanding of the present invention may be had from a consideration of the following specification, taken in conjunction with the attached sheets of drawing in which:

Fig. 1 is a side elevation, partly in section, the section being at a point intermediate opposite ends of one needle bank of the machine.

Fig. 2 is a perspective view of one of the needles used in the machine of the present invention.

Fig. 3 is a perspective view of the rear portion of the needle bar assembly.

Fig. 4 is a plan view of another portion of the needle bar assembly, showing the needles in operative position with respect thereto.

Fig. 5 is a top plan view of a stabilizing guide member for the needles.

Fig. 6 is a view similar to Fig. 1 but shows the needles in their fully lowered position, while in Fig. 1, the needle bar assembly is shown in its fully raised position.

Fig. 7 is a sectional view along the lines 7—7 of Fig. 6, and

Fig. 8 is a diagrammatic view showing a shogging means for the horizontally movable portion of the needle bar assembly.

Referring now to the drawings for a complete disclosure of the present invention, the rear portion of the needle bar assembly which is grooved to slidably receive each needle is shown in perspective in Fig. 3 and identified by the reference numeral **10**. The grooved face of this member is stepped as shown in order that the other portions of the needle bar assembly which cooperate with the member **10** may have free movement as the needles are driven through the conventional knitting motions. Suffice to say, there are a series of slots or grooves **11** in the outer face of the member **10**, each of which slidingly receives a needle of the type shown in Fig. 2.

Referring now to Fig. 2, the needle **12** is a substantially conventional spring beard type, except for the

fact that the shank is considerably longer than usual, and includes a projection or abutment **13**, which extends at right angles to the shank on the side opposite the beard. The projections **13** cooperate with other portions of the assembly to be hereinafter described which provide the necessary up and down movement of the needles.

The front portion of the needle bar assembly includes a bed or plate member **15** upon which are mounted in horizontal grooves of rectangular cross section in the rearward face thereof, a pair of spaced parallel horizontal bars **16** and **17**. These bars are coextensive in length with the needle bed. The upper bar is solid and rectangular in cross section throughout its length. The lower bar, on the other hand, has a series of slots or grooves **18** in its rearward edge, as appears most clearly in Fig. 7.

Referring now to Fig. 7, that portion **10** of the needle bar assembly which is shown in perspective in Fig. 3 appears in section in Fig. 7. The grooves **11** in this member, therefore, are equal in number to the number of needles employed in each section of the machine. The grooves **18** in the lower horizontal bar **17**, however, are fewer in number, and for illustrative purposes, will be shown and described herein as being so spaced and proportioned that there is one groove for every other needle.

Fig. 7 shows clearly that these grooves in the lower bar member may be aligned with either odd or even numbered needles, depending on the position of the bar member **17** with respect to the member **10**. The bar **17** is supported on the bed or plate member **15** for horizontal reciprocating movement with respect thereto. As shown in Fig. 1, the bar is received within a groove in the member **15**, and referring to Fig. 7, it will be seen that it is linked to this member by a series of bolts **19** which extend through the bed **15** to threadedly engage the bar **17** and which are spring biased as at **19A** in such a way as to retain the bar member in engagement with the base of the groove. Each bolt extends through a slot in the member **15**, rather than a circular hole in order that the bar may move horizontally with respect to the bed. Still referring to Fig. 7, it will be seen that there are mating cam surfaces **20** and **21** on the bar **17** and the bed **15**. The bar member **17**, by reason of these mating cam surfaces, has a limited degree of free movement with respect to the bed member before the cam surfaces engage one another to move the bar in a direction outwardly of the bed member. The amount of horizontal movement which is permitted without engagement of the cam surfaces is such that the grooves **18** in the bar may be shogged a distance equal to the spacing between adjacent needles.

With the structure as thus far described, and referring particularly to Figs. 1, 6 and 7, it will be apparent that whenever the front bed or plate member **15** is moved in a downward direction, all of the knitting needles will be lowered by reason of the fact that the solid upper bar **16** overlies the abutments **13** of each needle. When the same front half of the needle bar assembly begins to rise, however, only one-half of the needles will be raised along with it. This will be obvious from a consideration of Fig. 7. The lower bar member **17** is always so positioned that its grooves surround the abutments of alternate needles. By means of a shogging mechanism to be hereinafter described, the bar is reciprocated on each course, so that on every other course, alternate needles remain in the fully lowered position, while the remaining needles are raised to the fully raised position, in view of the fact that the abutments of half of the needles will overlie the ungrooved portions of the bar member **17**.

The plate **15A** shown in Fig. 5 includes a series of

notches along one edge equal in number to the number of needles. This plate is bolted to the upper surface of **15** as shown in Figs. 1 and 6, to provide a guide for the needles as they are raised and lowered.

Fig. 4 is illustrative of a point in the knitting cycle in which half of the needles are fully raised and half are fully lowered. This corresponds to the fully raised position of the member **15** shown in Fig. 1.

From an examination of Figs. 1 and 6 of the drawings, it will be apparent to those skilled in the art that there has been no substantial change made in the needle bar actuating mechanism. In each complete cycle for a given needle, that needle describes the same path of travel as is the case in a conventional knitting machine. The principal difference between the conventional machine and the present one is, of course, that the needles are mounted for movement independent of one another and it takes two courses rather than one for each needle to complete a knitting cycle. The slotted portion of the needle bar assembly in which the individual needles are slidably mounted is hinged by the pin **21** which rides in the straight slot **22** in the member **23**, which is rigidly attached to the slotted member **10** of the needle bar assembly. Note further that the member **23** is also pivoted at the pin **24** which rides in a curved slot **25** in the member **26** which is rigidly affixed to the center bed **27**.

The front half of the needle bar assembly which includes the members **15**, **16** and **17** is pinned to the arm **28**, which those skilled in the art will readily recognize as being the arm which produces up and down movement of the needle bar. The arm **29** which depends vertically from the front half of the needle bar assembly is the one which produces in and out motion of the needle bar. It will be apparent, therefore, from a consideration of the two pinned and slotted connections, that the rear portion of the needle bar assembly, which receives the needles, is limited to an in and out movement; that is to say, this member rocks about the pin **24** as a center, in response to movements of the arm **29**. The slot **25**, which is slightly curved, permits this rocking movement. The front portion of the needle bar assembly has both up and down and in and out movement, since it must not only move the needles up and down, but must also follow the rocking movement of the rear portion. The two halves of the needle bar assembly are urged into engagement with each other by means of a spring member **30** shown in Figs. 1 and 6.

From the foregoing description, it will be seen that if both the horizontal bar members **16** and **17** were solid throughout their length, that the knitting would proceed on this machine in a manner identical to that of a conventional flatbed, full fashion machine. The fact that the lower horizontal bar **17** is slotted, however, gives rise to a different knitting and a different stitch. If the number of slots **18** in the lower horizontal bar **17** is equal to one-half the number of needles in each section of the machine, and if this bar is shogged laterally on every course in opposite direction, a distance equal to the distance between adjacent needles, only half of the needles will be raised during the latter portion of each knitting cycle. This will produce a stitch known in the art as an interlock stitch.

Referring again to Figs. 1 and 6 of the drawings, it will be seen that the member **23** includes a longitudinal groove **31** which slidably receives a beam **32**. The beam is floated on a plurality of springs **33** which urge it outwardly of the groove. Its outward movement is adjustably limited by any convenient means such as the stop member **34** which is adjustable vertically with respect to the member **23**. The beam **32** provides a resilient abutment for the needles as they are driven downwardly by the knitting motion. Those needles which remain lowered on one cycle, therefore, rest upon the beam until they are raised on the next cycle.

Referring now to Fig. 8 of the attached drawings, there is shown in somewhat diagrammatic form, one possible means for effecting the shogging of the slotted lower bar member **17**. The bar is biased to the right by means of a spring **35**, so that it may be moved to the left against the force of this spring, and when the moving member is withdrawn, the bar will be returned to its original position. A shaft mounted for reciprocatory movement longitudinally of the machine bed is indicated at **36** in the drawing. Rigidly mounted on this shaft is a projection **37** which engages a button-like extension **38** attached to the end of the slotted bar member **17** at the end remote from the biasing spring. It will be apparent, therefore, that if the shaft **36** is moved to the left, the bar **17** will move to the left, and when the shaft is moved to the right, the spring **35** will return the slotted bar member to its starting position. At the right hand side of this figure, there is shown a simple ratchet and pawl arrangement **40** and **41**. The ratchet **40** is suitably journaled to a fixed portion of the machine bed and the pawl **41** may be driven in any desired fashion from some rotary portion of the knitting machine proper. A spring pressed detent **42** is mounted above the ratchet and serves to engage a portion of the ratchet wheel to prevent counter rotation thereof. The left hand radial face of the ratchet assembly includes a series of cam-like projections **43** which, as the ratchet assembly is rotated, tend to move the shaft **36** to the left by an amount equal to the thickness of the cam surface. It will be readily appreciated that the number of these cam members **43**, together with the rate of rotation of the ratchet assembly, will combine to produce the desired movement of the shaft **36** in timed relation to the knitting action.

The shaft **45** which appears in the lower portion of Fig. 8 is the cam shaft of the knitting machine. A collar member **46** is affixed to the shaft and in such position that it engages a tiltable lever **47** which is journaled as indicated to a fixed portion of the machine bed. If the cam shaft is manually moved to the right, it will be seen that the slotted bar member **17** will be moved a corresponding distance to the left. It is this movement which is effective to move the slotted bar member outwardly of the groove in member **15** in which it is slidably mounted (see Fig. 7), and against the force of the springs **19A** in order so to position the slotted bar member that the slots **18** are ineffective and all needles therefore move together. Stated in another way, when the cam shaft **45** is moved to the right, the slotted bar member **17** moves sufficiently outwardly of the slot in which it is mounted, due to engagement of the cam surfaces **20** and **21**, that the projections **13** of all needles are then engaged by both the upper and lower bars **16** and **17** throughout each knitting cycle. This control is necessary in order that the narrowing motion of the standard knitting machine may be utilized.

From the foregoing, it will be recognized by those skilled in the art, that there is herein shown and described a novel and useful needle bar assembly for a conventional straight bed, full fashion machine. The utility of the machine will be equally apparent.

While a preferred embodiment has been herein shown and described, applicant claims the benefit of a full range of equivalents within the scope of the appended claims.

I claim:

1. In a straight bed full fashioned knitting machine, the improvement which comprises: means for supporting each of the needles for knitting movement independently of one another; means for lowering needles from their uppermost to lowermost position including pressing each needle as it passes the press edge; means for raising a portion of the needles from lowermost to uppermost position; and means operating in timed relation to the knitting action for selecting on each course different needles and raising them from lowermost to uppermost position.

2. The combination as defined by claim 1, in which odd numbered needles are raised on one course and even numbered needles are raised on the succeeding course.

3. The combination defined by claim 1, and including manually operable means for causing all needles to knit at the same time.

4. In a straight bed full fashioned knitting machine, a needle bar assembly comprising: a rear bed member including a plurality of vertically extending slots, each slot being of a sufficient cross-section to receive a knitting needle and to allow the needles to slide freely with respect to said bed member; means connecting said bed member to the in and out needle bar motion producing arm of the machine; a front member which cooperates with the bed member and is co-extensive therewith; means biasing said front and bed members into engagement with each other; means connecting said front member to both the in and out and up and down needle bar motion producing arm of the knitting machine; a plurality of needles, each including an elongated shank and a protrusion extending outwardly of said shank on the side opposite the beard, one such needle being received in each of the slots in said bed member; a first horizontal bar, mounted rigidly on and co-extensive in length with said front member; and a second bar, mounted on said front member for longitudinal sliding motion with respect thereto, said second bar being located below and spaced vertically from said first bar by an amount substantially equal to the vertical height of said needle shank protrusions, said second bar being further characterized by a series of grooves in its outer edge, said grooves being of sufficient cross-section that when aligned with a given group of needles, the needle shank protrusions will slide freely through said grooves.

5. The combination defined by claim 4 and including manually operable means for moving said second bar member outwardly of said front member a distance sufficient to place the base of said grooves beneath the needle protrusion whereby all needles will then knit as a unit.

6. The method of knitting an interlock stitch on a flat bed full fashioned machine which has been modified to provide for independent needle movement, the steps comprising: laying down a course of yarn on the sinkers and dividers and forming sinker or divider loops around each needle; lowering all needles together in a normal knitting action to cast off stitches from the previous course; raising only selected needles, while leaving the remainder in their lowered position; laying down a further course of yarn on the sinkers and dividers and forming loops around each raised needle; lowering each raised needle in a normal knitting action; raising only those needles which remained lowered on the previous course; and repeating the above steps until a desired length of fabric is attained.

7. The method as defined by claim 5, in which every other needle remains in its lowered position on every other course.

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