Aug. 15, 1961 N. LEVIN 2,995,910

NEEDLE SELECTING DEVICE

Filed Dec. 17, 1958

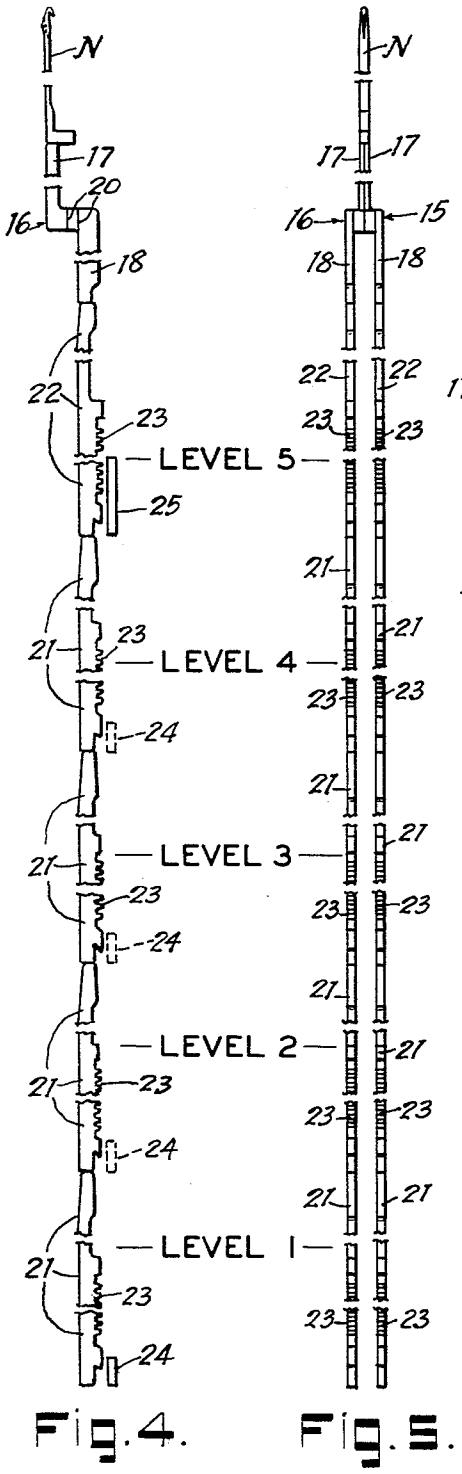


Fig. 4.

Fig. 5.

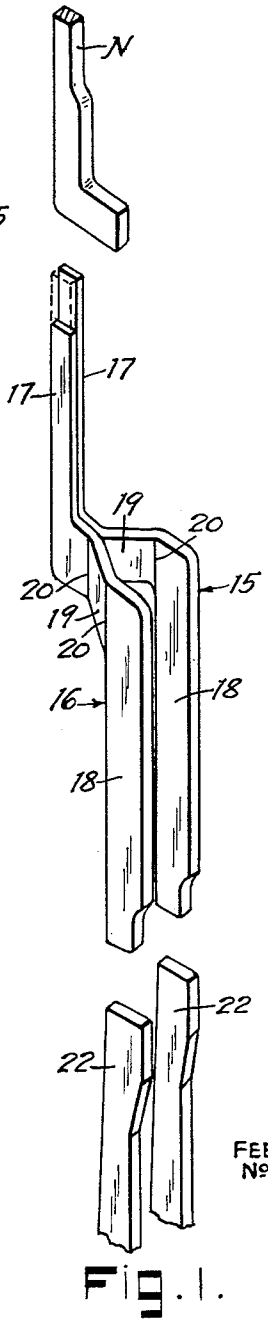


Fig. 1.

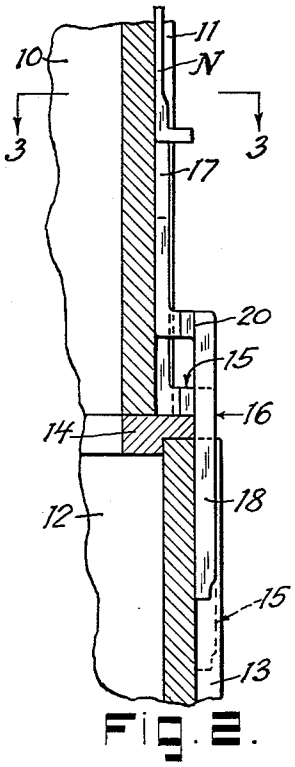


Fig. 2.

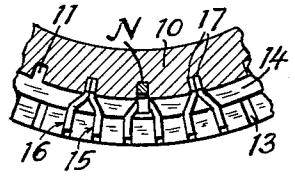


Fig. 3.

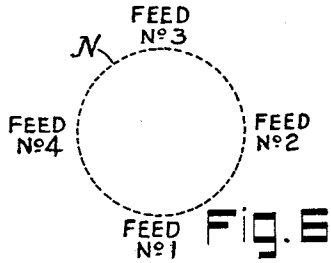


Fig. 6.

INVENTOR.

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NEEDLE SELECTING DEVICE

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12 Claims. (Cl. 66—50)

The present invention relates generally to the art of knitting and more particularly to selecting devices for knitting machines of the type having independently movable needles, or the like, and to the method of operating the same.

In certain types of selecting devices, particularly for use in circular machines, for the control of independently movable needles, or other independently movable knitting instrumentalities, one or more pattern jacks may be associated in unitary alignment with each of the needles to be selectively raised by the jacks, each jack itself being selectively moved out of the sphere of action of a jack raising cam by one or more butts thereon. This selective movement of the jacks being caused by individual ones of a series of jack selecting cams individually aligned with said butts, these cams, in turn, being selectively moved into butt engaging positions by a pattern drum or trick wheel. In this type of device, the number of needles capable of being individually selected by each trick wheel is not greater than the number of butts on each of the pattern jacks. Also, uniform movements only are imparted to the selected needles by the pattern jacks.

It is an object of the present invention to provide an improvement in the type of selecting device above set forth, wherein, in combination with the machine itself, the number of needles capable of being individually selected by each trick wheel is substantially greater than the number of butts on each of the pattern jacks, to thereby accordingly increase the needle selecting capacity of the machines having the selecting devices thereon.

It is a further object of the present invention to provide an improvement in the type of selecting device above set forth, wherein, in combination with the machine itself, the raising movements caused to be imparted to the selected needles by each trick wheel may be selectively varied so that the individual needles may be moved to full latch clearing positions or may be moved only to tuck positions to thereby accordingly increase the switch making capacity of the machines having the selecting devices thereon.

It is a still further object of the present invention to operatively associate a plurality of non-aligned pattern jacks with individual needles of a machine in such manner that each such plurality of pattern jacks may be selectively controlled by a single set of jack selecting cams which, in turn, may be selectively operated by a single trick wheel, and wherein, by special operation of the pattern jacks, the needle selecting capacity and the stitch making capacity of the machine will be increased.

These and other objects of the invention will become apparent from the following detailed description of the preferred forms of the invention shown in the accompanying drawings, and from the appended claims.

In the drawings:

FIG. 1 is a perspective view of a pair of needle lifters associated with a single needle, and of a portion of a pair of master pattern jacks respectively associated with the needle lifters.

FIG. 2 is a sectional view of a portion of the needle and jack cylinders of a four feed circular knitting machine of the Reading CK type, showing a needle and a pair of needle lifters associated therewith.

FIG. 3 is a sectional view of the needle cylinder taken on line 3—3 of FIG. 2, showing one relative disposition

of the needle and jack slots of their respective cylinders.

FIG. 4 is a side view of a needle, a pair of needle lifters associated therewith, a series of five jacks associated with each of the needle lifters, and the jack lifting cams.

FIG. 5 is a front edge view of the parts shown in FIG. 4, without the jack lifting cams.

FIG. 6 is a diagrammatic plan view of a needle circle and four feeding stations associated therewith.

In FIG. 2, 10 indicates a needle cylinder the circumference of which is provided with a number of equally spaced vertical slots 11 for independent slidable movement of latch needles N therein. A larger diameter jack cylinder 12, the circumference of which is also provided with a number of equally spaced vertical slots 13, is adjustably disposed in fixed relation to the needle cylinder 10 by means of the intermediate adapter ring 14 to which both cylinders may be suitably secured. As may be seen in FIG. 3, the number of individual slots 13 in jack cylinder 12 is greater than the number of individual slots 11 in needle cylinder 10, and, in the present instance, the number of slots 13 is preferably twice the number of slots 11. The width of slots 11 may be up to twice the width of the slots 13 in order that needles of a certain gauge may be individually placed in each of the needle cylinder slots while needle lifters of approximately half the needle gauge may be individually placed in each of the jack cylinder slots and may also be placed, in pairs or dually, in each of the needle cylinder slots. By means of the adapter ring 14, the cylinders 10 and 12 may be relatively angularly adjusted, and, as shown in FIG. 3, one such adjustment places the needle cylinder slots 11 midway between pairs of associated jack cylinder slots 13.

A pair or right and left hand needle lifters, FIG. 1, 15 and 16 respectively, is provided for each needle N, each lifter being of elongated shape with spaced generally parallel upper and lower leg portions 17 and 18 extending in opposite directions from the ends of a transversely extending base portion 19. In FIG. 1 the upper leg 17 of one of the lifters, for example, left hand lifter 16 is shown as being somewhat shortened (in full lines) relative to the normal length leg 17 of right hand lifter 15, however, the upper leg of lifter 16 may also be of the same normal length (as appears in dotted lines) as the upper leg of lifter 15. The shorter leg lifter 16 (full lines) is used when it is desired to provide selective tucking for the needles, while a normal leg length lifter 16 (dotted lines) is used when it is desired to provide for increased needle selecting capacity. Obviously a lifter having a shortened leg will raise a needle to a lesser extent than will a lifter having a normal length leg.

As may be seen in FIGS. 2 and 3, each pair of right and left hand needle lifters 15 and 16 is disposed in the needle and jack cylinder slots so that their lower leg portions 18 are individually placed in a pair of successive jack cylinder slots 13 while their upper leg portions 17 are placed, as a pair dually, in the intervening needle slot 11, their base portions 19 being free of the slots and being disposed above the exposed top portion of adapter ring 14. In order that each pair of the lifters 15 and 16 may be so placed, their base portions 19 may each be provided with an appropriate double transverse bend along the spaced vertical lines 20 so that the legs 17 may be in juxtaposition while the legs 18 are spaced. In one arrangement, the thickness of legs 17 may be less than that of the legs 18 in order that the pair of legs 17 may be readily accommodated in each of the needle slots and may be free to move therein relative to each other. Raising either one of the lifters 15 or 16, of each pair thereof, will accordingly raise the needle N associated therewith,

Similarly, lowering of a needle N will lower either one or both of its associated lifters.

As may be seen in FIGS. 4 and 5, there is a series of five jacks, four regular pattern jacks **21** at levels 1 through 4 and a master pattern jack **22** at level 5, vertically aligned with each of the needle lifters **15** and **16**, each series of five jacks being disposed in the same slot along with its associated needle lifter in the jack cylinder **12**. Each of the jacks is provided with a series of frangible butts **23** by means of which, at each level, they may be selectively operated in the usual manner by a series of jack selecting cams and a trick wheel, in each direction of knitting. Each trick wheel will, at each of the levels 1 through 4, act through its jack selecting cams to select those of the jacks **21** which are to be slightly raised by the jack cam **24** at that level to accordingly slightly raise their associated master jacks **22**. The so-selected raised master jacks are further raised by a master cam **25** at level 5 to raise the corresponding needle lifters and the needles N, to their tuck or to their full latch clearing positions. Each of the levels 1 through 4 is normally associated with one feed of the four feed machine designated in FIG. 6, so that the jack selection at each of the numbered levels is made for the correspondingly numbered feed of the machine.

There is a jack selecting unit including jack selecting cams, a trick wheel, and a cam **24**, at each of the levels 1 through 4 for each direction of reciprocation of the cylinders of the machine, the jack selecting units at each level being angularly related to its corresponding feed position. At level 5, in addition to a pair of jack selecting units at one of the feeds, there is a master jack cam **25** for each of the four feeds for each direction of reciprocation of the machine. The action which causes the jacks, the needle lifters, and the needles to be selectively raised is well known in the art and is to be found, for example, upon the Reading CK four feed machine and as disclosed in British Patent No. 790,141 of February 5, 1958.

In the present invention, by associating individual ones of the needles with a pair of normal overall length right and left hand needle lifters, FIG. 4, each needle may be fully raised by either lifter and since a pair of pattern jacks at each level (for each feed) of the machine is associated with each such pair of needle lifters, it follows that each needle may now be selectively raised at each feed by either of a pair of side by side pattern jacks, thus substantially doubling the needle selecting capacity of the machine. The pattern jack associated with each right hand needle lifter will be referred to as a right hand jack and the jack associated with each left hand lifter will be referred to as a left hand jack.

There are a number of ways of setting up the butts on the right and left hand jacks to take advantage of the increased selective capacity of the machine. It is preferred that separate level control butts be provided on the left hand and on the right hand jacks, considered either as a whole or as groups thereof, in order that the left hand jacks may be made inactive while a needle selection is made with the right hand jacks, and vice versa. In addition to the control butts, separate pattern butt layouts may be made upon the left hand jacks and upon the right hand jacks, or a pattern butt layout may be made upon one of them, for example, the right hand jacks while the left hand jacks have only the control butts thereon. It will be obvious that the other needle and jack groupings and other jack butt arrangements may be devised by those skilled in the art, within the general framework of the above description.

In the present invention, by associating individual ones of the needles (which may be all, part, or spaced ones thereof) with a pair of right and left hand needle lifters one of which has a shortened leg **17**, FIG. 1, these needles may be partially raised to form tuck stitches thereon, in addition to being fully raised to form regular stitches and in addition to not being raised at all to miss the yarn entirely. The shorter left hand needle lifters are used to raise selected needles for tuck stitch knitting while the right hand needle lifters are used for these needles when regular stitches are to be made thereon. As previously explained, right and left hand pattern jacks are associated with the right and left hand needle lifters, so the tuck stitch pattern may be set out on the left hand jacks while the knit or float pattern may be set out on the right hand jacks. It should be noted that the tucking is selective due to the pattern jack control of the shortened needle lifters so that the particular needles be tucked at various places in the fabric may be selected, within the pattern range of the jacks and the trick wheel. With this arrangement, at each feed, it is possible to have certain of the needles knit while others tuck and still others miss the yarn completely, in other words, to selectively tuck, knit, or float the yarn with respect to individual ones of the needles.

There are a number of ways of setting up the jack butts to take advantage of the increased stitch capacity of the machine. Separate level control butts may, if desired, be provided on the left hand and on the right hand jacks so that the right and the left hand jacks may be group controlled. A pattern of butts may also be set out on the left hand jacks to provide for tucking by individual ones of the needles. The jack butt pattern may also be set out on both the right and left hand jacks to provide for any desired mixed knitting of tuck, regular, and float thread stitches. It will be obvious that various other jack butt arrangements may be devised within the present invention by those skilled in the art, particularly with reference to particular tuck stitch requirements in various portions of the fabric. The present arrangement permits tuck stitches to be selectively made in both directions of reciprocating knitting as well as in single direction rotary work.

While the right and left hand needle lifters **15** and **16** are shown as being independent of each other, it is within the scope of the present invention to provide a one-piece construction therefor wherein their upper legs are joined in unitary formation. Additionally, the construction of the independent lifters may be such that one of each pair acts to lift the other thereof so that the latter, whether being raised independently of or by its mate, acts to lift the needle.

While one of the lifters is shown as having its upper leg portion **17** shortened to form the tuck stitches, alternately, its lower leg portion **18** may be similarly shortened, or both its leg portions **17** and **18** may each be partially shortened, to achieve the same result. In the case of one-piece lifters, either one of its lower legs may be shortened to provide for the tuck stitches.

I claim:

1. In needle selecting apparatus for a plurality of feeds of a circular knitting machine of the type wherein its needles are adapted to be selectively raised at said feeds by jacks each having a plurality of needle selecting butt levels thereon and wherein said jacks are disposed at a plurality of levels equal in number to said plurality of feeds, means at said plurality of jack levels to provide at said feeds for individual needle raising of each needle of a group of needles the number of which is greater than the number of said plurality of butt levels, the said means including other jacks at said plurality of jack levels for the raising of needles at said feeds.

2. In needle selecting apparatus for a circular knitting machine as set forth in claim 1 wherein said plurality of feeds and said plurality of jack levels are each four in number.

3. In needle selecting apparatus for a circular knitting machine as set forth in claim 1 wherein those of said first named jacks and those of said other jacks which raise needles at a single feed are disposed at a single jack level.

4. In needle selecting apparatus for a circular knitting machine as set forth in claim 1 wherein said machine

is adapted to reciprocate, wherein said needles are adapted to be selectively raised in each direction of reciprocation, and wherein said means and said other jacks are operable in each direction of reciprocation.

5. In needle selecting apparatus for a single feed of a plurality of feeds of a circular knitting machine of the type wherein its needles are adapted to be selectively raised at said feeds by jacks each having a plurality of needle selecting butt levels thereon and wherein said jacks are disposed at a plurality of levels equal in number to said plurality of feeds, means at one of said jack levels to provide at said single feed for individual needle raising of a first and of a second group of needles wherein each group of needles contains a number of needles not greater than the number of said plurality of butt levels and wherein both groups of needles together contain a number of needles greater than the number of said plurality of butt levels, the said means including other jacks at one of said jack levels for the raising of the needles of at least one of said groups of needles at said single feed.

6. In a selecting device for the needles of a circular knitting machine of the type wherein its needles are adapted to be selectively raised by jacks, a pair of jacks for each needle to be raised, each jack of each pair thereof being individually and operatively related to its associated needle to raise the same.

7. In a needle selecting device as set forth in claim 6 wherein needle lifting means is interposed between each jack of each pair thereof and its associated needle.

8. In a needle selecting device as set forth in claim 6 wherein a needle lifter is individually interposed between each jack of each pair thereof and its associated needle.

9. In a needle selecting device as set forth in claim 6 wherein the needle associated with each pair of jacks is adapted to be raised a certain distance by one of its associated jacks and is adapted to be raised a lesser distance by its other associated jack.

10. In a needle selecting device as set forth in claim 6

wherein a needle lifter is individually interposed between each jack of each pair thereof and its associated needle, the pair of needle lifters associated with each pair of jacks having one lifter shorter than the other thereof.

11. In a selecting device for the needles of a circular knitting machine of the type having a slotted needle cylinder for said needles and having a slotted jack cylinder for jacks associated with said needles and adapted to selectively raise the same, at least a pair of jacks individually disposed in spaced jack slots, and needle lifting means individually disposed in said spaced slots in operative relation to the said jacks therein, said means also being disposed in one of said needle slots in operative relation to the needle therein in such manner that the latter is adapted to be selectively raised by each jack of said pair thereof.

12. In a selecting device for the needles of a circular knitting machine of the type having a cylinder of a certain diameter wherein a certain number of slots are provided for said needles and having a cylinder of a larger diameter wherein double said certain number of slots are provided for jacks associated with said needles and adapted to selectively raise the same, and needle lifters individually disposed in said jack slots and dually disposed in said needle slots in operative relation to the jacks and to the needles in their respective slots in such manner that individual ones of said needles are adapted to be selectively raised by each of a pair of said jacks.

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