A jacquard knitting machine having a built-in stitch transfer, comprising needlebeds arranged in a paired relationship and having grooves for receiving needles. Needle jacks having a butt portion are also positioned in the grooves. Levers are placed beneath the needle jacks and are pivotally movable against the needlebed at one end and are coupled at the other end to a platen means. A lock means having control cams for controlling the needles and the needle jacks overlies the needlebed above the needles and needle jacks. A section means is provided for selectively operating the platen means and lifting the butt portion of the associated needle jack from the lowered position to a raised position or maintaining the butt portion of the associated needle jack in the lowered position. The selection means includes an electromagnetic selection head that operates under control of a crossed bar programmer thereby operating the needle jacks in accordance with a design set in the programmer.

9 Claims, 4 Drawing Figures
The present invention relates to a jacquard knitting machine with built-in stitch transfer, comprising needlebeds arranged roof-like in pairs, provided with grooves in which needles and needle jacks provided with butts are located. The butts of the needle jacks are positioned in two levels in relation to the needlebed by a selection means and comprise locks provided with fixed cams and movable cams which may be at a greater or smaller distance from the needlebeds.

This type of machine already is known, but without stitch transfer. U.S. Pat. No. 944,011 describes one in which the needle jacks, attached to the needles, are pivoted by a design drum either into a lowered position so that their butt is outside the reach of the cams of the locks or into an elevated position where they are entrained by the cams.

In spite of the relative complexity of this machine, it offers a very limited choice of knitting possibilities. In fact, the butt of the needle jack and its needle may remain out of the operation or follow one single course. The design drum makes possible the knitting of simple designs but for each configuration of stitches, a row of pawls must be placed on the drum or a program blade must be mounted. Considering that these are simple designs, the cost of the program is too high.

Moreover, from various machines on the market, locks are known which are equipped with cams which can be placed selectively in distal, half-way or proximal position in relation to their needlebed.

The objective of the invention is to create a simple machine where the needles, selected by a low-cost program carrier, can travel a multitude of courses.

The machine according to the invention is characterized by the fact that one-arm levers, lodged in the grooves and connected to the needlebed by an articulation in their pivoting point, and provided with braces in the form of brackets holding the needle jacks bearing down on their lever have the end of their arms connected by an articulation to a platen, the latter being arranged approximately perpendicularly to its lever and placed in an auxiliary bed, and it carries at its end opposite the lever, an articulated selector, the latter co-acts with an electromagnetic selection head located ahead of the cams, looking in the operating direction of the locks and which pivots the platen in either of two different positions. In one of these positions, the platen is lifted in the direction of its length by a ramp and its articulation pivots the lever upward, placing the butt of its clavette substantially above its needlebed. In the other different position, the platen is not lifted, the lever is not pivoted and the butt of its needle jack emerges slightly above the needlebed, whereby the needle jack lifting cams, as well as the needle jack sorting and lowering cams, can be placed selectively in distal, half-way or proximal position in relation to their needlebed, and whereby the cams controlling the stitch transfer are placed substantially in the center of the locks and whereby the program carrier is constituted by a crossed bar programmer whose reading is controlled on the one hand by counters, in turn controlled by the position of the locks in relation to the needlebeds and on the other hand by controls of the machine.

The attached drawing exemplifies an embodiment of the flat knitting machine with stitch transfer in accordance with the invention:

FIG. 1 is a partial view in section of the needlebeds, a selection head and the locks,
FIG. 2 is a section along II—II across a selection head,
FIG. 3 is a view from the bottom of a lock, and
FIG. 4 is a plan view of a program carrier.

In FIG. 1, the needlebeds 1 and 2 are arranged roof-like in pairs. They are fastened to the frame 3 of the machine. Each needlebed is provided with grooves 4, in which the needles 5 are located. The latter are equipped with butts 6 and housings permitting the transfer of stitches. Each needle has a butt 6. Needle jacks 7 arranged behind the needles 5 are also located in the grooves 4 and are independent of the needles. Each needle jack 7 is provided with a butt 8.

One arm lever 9 is also located in the grooves 4. They are connected to their needlebed by an articulation placed in their pivoting point. Said articulation is formed by a boss 10 which bears down on the bottom 11 of the groove 4 and by a notch 12 partially surrounding a thread 13. The latter is placed perpendicularly to the grooves 4 and fastened to its needlebed. These levers carry on their upper side 14 one needle jack 7 each. They are provided with bracket-shaped braces, which maintain the needle jacks bearing down on the upper side 14. The needle 5, needle jacks 7 and lever 9 are guided laterally by the walls of the grooves 4.

Each lever is connected at its end of the arm to a platen 16 by the articulation 17. The platens are housed in an auxiliary bed 18 which is fastened to the needlebed 1 and/or 2 respectively by a support 19 and they are placed approximately perpendicularly in relation to their lever 9. The platens 16 are connected to the selectors 20 by an articulation 21. These selectors are placed in an extension of the auxiliary bed 18 and guided laterally, like the platens 16, by the walls of the grooves 22 of said auxiliary bed 18.

The selectors 20 move inside selection heads 23, one of which is shown in FIG. 2. For the direction of the operation along arrow A, the selectors are aligned in the hopper 24. They are pulled from either side of the selection head into the construction 25 and then follow the divergent walls 26 by magnetic gluing, which amplifies the selection operated in the construction 25. For the reverse direction of operation, the alignment and amplification operations are reversed, but the selection is likewise made in the construction 25. The latter is connected magnetically to an electro-magnet by the side (not shown). The electro-magnets are connected electrically with the program carrier via amplifiers and other usual circuits (not shown). The inclined walls are connected magnetically with permanent magnets (not shown). Such a selection head is described in the U.S. Pat. No. 3,262,285, see particularly FIG. 6 of said patent.

Each lock 27 is provided with two selection heads 23, located at its ends outside the start and/or finish of the courses formed by the cams. For a given direction of operation of the locks, only the selection heads 23 preceding the cams, that is to say those located ahead of the cams, are activated.

After the selectors 20 arrive at the end of the divergent walls, they undergo a displacement perpendicu-
larly to their direction of operation A. By so doing, they have pivoted the platen 16 attached to them either into position B or into position C. Both positions are different. Those of platens 16, which are in position B, have their butt 28 engaged successively in the entrance of a channel 29, lifted in the direction of the length of the platens by a rising ramp of the channel, maintained at a certain height by a horizontal part of the channel and lowered by a descending ramp of said channel. The entrance and exit of the channel are about opposite the outlets of the selection heads. The superelveled horizontal part of the channel has its start and finish outside the start and finish of the courses formed by the cams. It is evident that the platens 16, whose butt 28 is engaged into the channel 29, are likewise lifted by this rising ramp. The levers 9, attached to them by the articulation 17, pivot upward, thus placing the butt 8 of their needle jack 7 substantially above the surface 30 of their needlebed 1 and 2 respectively.

Those of the platens 16 which are in the other different position, thus in position C, have their nose 31 threaded below the safety thread 32. It is parallel to the auxiliary bed 18 and prevents the platens 16 from lifting accidentally. It thus keeps them in starting position. The levers 9 which are attached to these latter platens 16 are not pivoted upward and the butt 8 of their needle jack 7 emerges slightly above the slot.

The channel 29 is machined in a strip 33 and it is fastened to the lock 27.

A lock 27, shown in FIG. 3, is assigned to each needlebed 1 and 2 respectively. It is provided with a first knitting system 34 and a second knitting system 35. A stitch transfer system 36 is located between said systems. As a result of this arrangement of the systems, the stitch transfer system 36 is located substantially in the center of its lock.

Fixed cams, uniformly identified by reference No. 37 are fastened to each lock 27. The knocking-over cams, identified by 38, as well as their drop-stopping cam identified by 39, are mobile in a plane parallel with the lock.

The needle ascension cams, uniformly identified by reference number 40 and the needle jack ascension cams, identified by 41, as well as the cams for sorting and lowering the needle jacks, identified by 42, are mobile perpendicularly to their lock 27. Cams 41 and 42 may be placed selectively in distal, half-way or proximal position, cams 40 in distal or proximal position, in relation to their slot. These positions generally are changed several times during the knitting and these cams form, together with cams 37, 38 and 39, a multitude of different paths.

The program carrier, represented in FIG. 4, is constituted by a crossed bar programmer 45, called stencil hereinafter. This type of stencil makes it possible to make the selected design visible by contact segments 46 which are plugged, or not plugged, into holes 47 located at the intersections of the bars and representing the stitches. Any other kind of stencil is possible. In this train of thoughts, it also is advantageous to use a torus or MOS memory, etc.

The crossed bar stencil 45 of FIG. 4 is provided with horizontal bars 48 and vertical bars 49. The number of the former shall at least be equal to the number of the different maximum rows desired of the design and the number of the latter shall be equal at least to the number of maximum stitches desired in the direction of the width of the design. This kind of knitting machine often is provided with an impulse generator 50, fastened for example on a selection head 23 and coasting with a rack 56. The latter is fastened against the auxiliary bed 18.

If the entire width of the fabric to be knitted must be filled with these designs, we enter with the impulses from the generator 50 directly on the counter 51, which successively activates the different vertical bars 49.

When an article is knitted, it often is provided to only have, for example, two vertical design bands, the remainder of the article being in stitches of the same configuration. The starts of these bands may be posted on the preselectors 52 which control a counter 53 which controls for it the arrival of the impulses on counter 51. Other usual means for this type of control are not described, but shown in FIG. 4.

The selection of the horizontal bars 48 is controlled from the reader 54 of the work programs. It controls a switch 55 which transmits the data read on a certain horizontal bar 48 to the electro-magnets via logic and power means (not shown).

What is claimed is:

1. A Jacquard knitting machine with a built in stitch transfer comprising:

   needlebeds arranged in paired relationship and having grooves formed therein;

   a plurality of needles disposed in the grooves in the needlebed;

   a plurality of needle jacks arranged in the grooves in the needlebed, said needle jacks having a butt portion thereon;

   lock means having control cams positioned thereon for controlling said needles and said needle jacks;

   said levers disposed beneath said needle jacks, said levers being pivotally movable at a first end thereof;

   platen means pivotally coupled to a second end of said lever for actuating the lever and lifting the butt portion of the needle jack associated with the lever from a lowered position to a raised position;

   selection means for selectively operating said platen means and lifting the butt portion of the associated needle jacks from the lowered position to the raised position or maintaining the butt portion of the associated needle jack in the lowered position;

   and
crossed bar programmer means for generating selection control signals, said selection control signals being utilized to energize said selection means.

2. The Jacquard knitting machine of claim 1 wherein said selection means includes a selector body, said selector body being coupled to said platen means.

3. The Jacquard knitting machine of claim 2 wherein said selection means includes an electromagnetic selector head for positioning said selector body along a lateral path in a first lateral position or a second lateral position.

4. The Jacquard knitting machine of claim 3 wherein said selection means includes ramp means for engaging said platen means, said ramp means engaging said platen means when said selector body has been placed in said first lateral position.

5. The Jacquard knitting machine of claim 4 wherein said platen means is substantially perpendicular to said lever and is pivotally coupled to said selector body.
6. The jacquard knitting machine of claim 3 further including brace means for holding said needle jack in contact with said lever.

7. The jacquard knitting machine of claim 1 including indexing means for signaling the position of the electromagnetic selector head along the needlebed, said indexing means controlling width selection in said crossed bar programmer.

8. The jacquard knitting machine of claim 7 including means for controlling length selection in said crossed bar programmer.

9. The jacquard knitting machine of claim 1 wherein said lock means has stitch transfer control cams positioned centrally between groups of knitting system control cams.

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