Jan. 30, 1968 R. SCHMIDT ET AL 3,365,917

NEEDLE CONTROL APPARATUS

Filed March 29, 1965 3 Sheets-Sheet 1

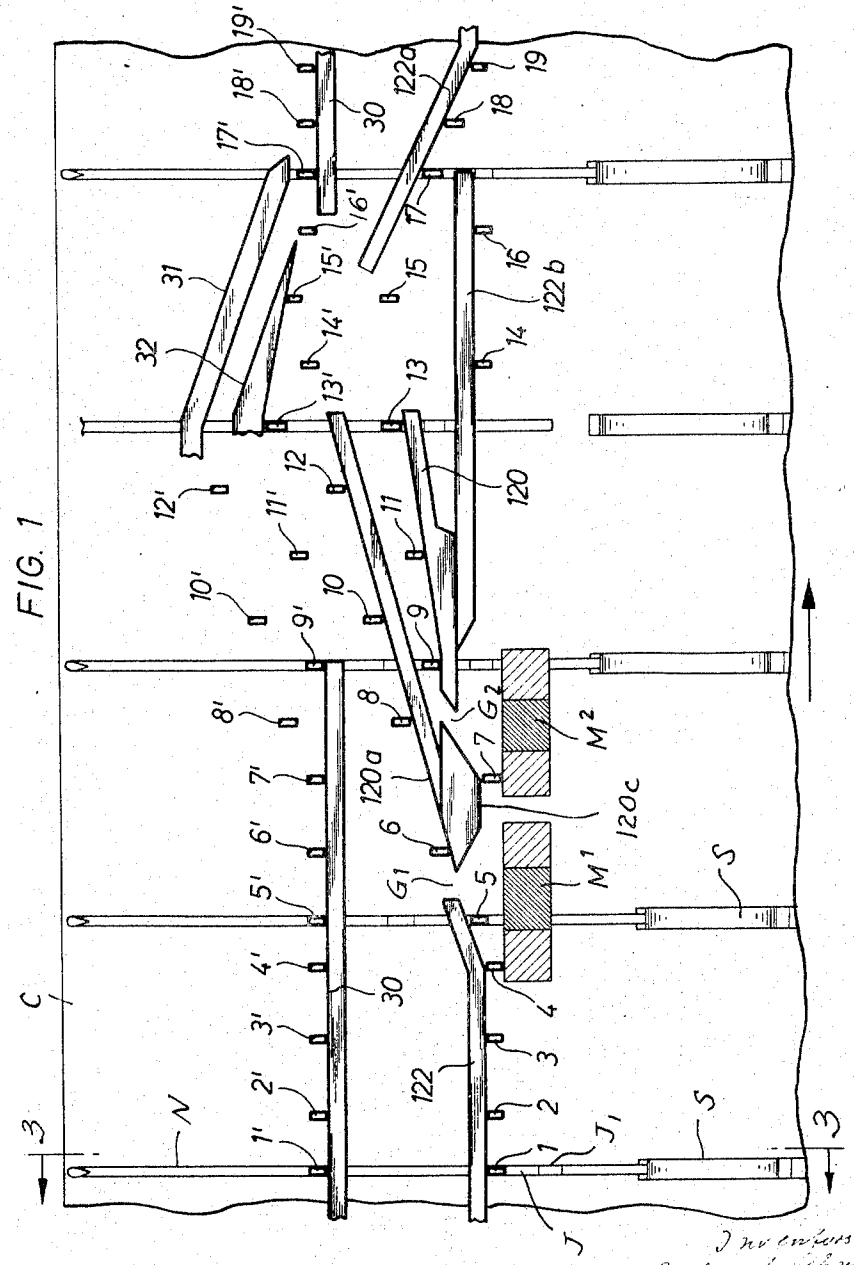

FIG. 1

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Jan. 30, 1968 R. SCHMIDT ETAL 3,365,917

NEEDLE CONTROL APPARATUS

Filed March 29, 1965 3 Sheets-Sheet 2

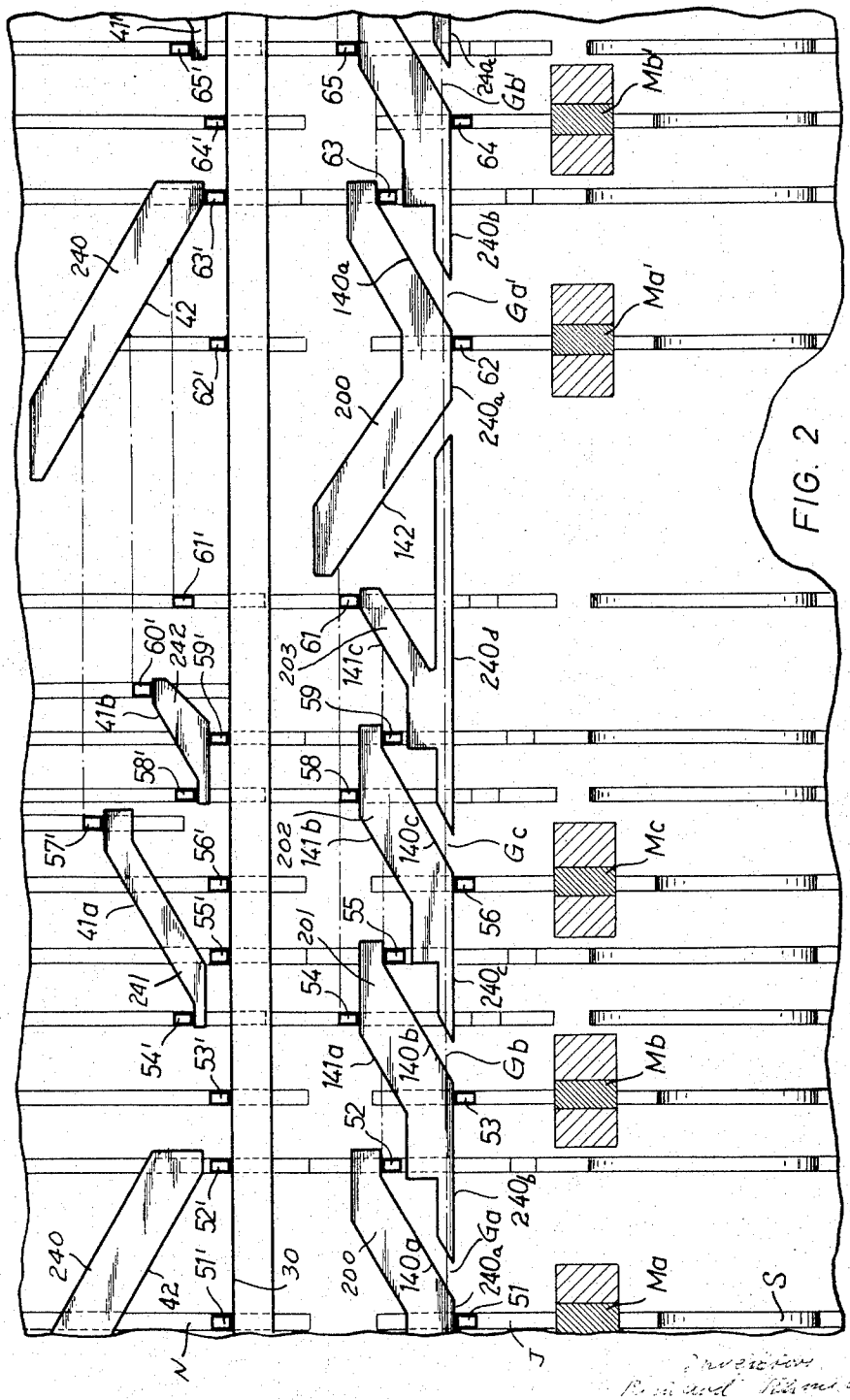

FIG. 2

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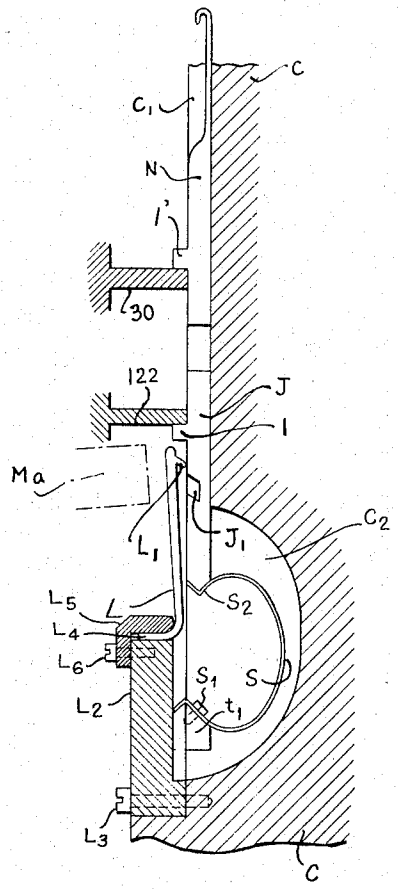
Jan. 30, 1968 R. SCHMIDT ETAL 3,365,917

NEEDLE CONTROL APPARATUS

Filed March 29, 1965 3 Sheets-Sheet 3

FIG. 3.



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NEEDLE CONTROL APPARATUS

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13 Claims. (Cl. 66—50)

ABSTRACT OF THE DISCLOSURE

At each knitting station of a knitting machine, selector magnets control locking means to lock or release spring loaded jacks so that only selected released jacks move along slanted cam tracks to different positions to raise corresponding needles to higher and lower knitting positions in accordance with the pattern controlled energization of the selector magnets.

The present invention relates to a needle control apparatus for a knitting machine, and more particularly to apparatus for selecting needles of a circular knitting machine, and for controlling selected needles to move either to a higher knit position, or to a lower tuck position in accordance with a predetermined pattern.

Selector devices serving this purpose are known, and, for example, the U.S. Patent 3,292,393, issued to E. Ribler, discloses various selector arrangements employing a selector magnet, spring-biased needle-influencing jacks, and needles operated by the same to move to a knitting position. The U.S. Patent 3,079,775 discloses another selector arrangement in which small levers, such as resilient wires, are controlled by a selector magnet to cause movement of needle influencing elements provided in a pattern wheel to positions causing the movement of selected needles to operative knitting positions.

The selector arrangements according to the prior art perform the task of moving at each knitting station, selected needles to a knitting position, and permitting non-selected needles to remain in an inoperative position. The electric impulses according to which the selector magnets perform the selecting function, are supplied by program control means which cause impulses in accordance with the desired knitting pattern in accordance with a program.

It is one object of the invention to improve the selector arrangements of known knitting machines, and to provide a needle control apparatus for effecting at the same knitting station, movements of different selected needles to different knitting positions.

Another object of the invention is to provide at each knitting station, a plurality of electromagnetic selector means which successively operate to select needles for movement to higher and lower knitting positions.

Another object of the invention is to move at each knitting station of the knitting machine, selected needles to different knitting positions, without shifting of cams, and by using completely identical needles, and completely identical jacks.

Another object of the invention is to permit alternate knitting of a tubular knitted fabric, and of other fabrics on a knitting machine having two sets of needles. The needle control apparatus of the invention is applicable to flat bed knitting machines, to circular knitting machines with a single needle cylinder, to double-cylinder knitting machines, and to other types of knitting machines in which needles are movable independently of each other. In knitting machines in which two sets of needles are provided, for example a circular knitting machine having cylinder needles and dial needles, a needle control apparatus of the invention can be used for controlling each of the two sets of needles.

One embodiment of the invention comprises rotary carrier means, for example the needle cylinder of the dial of a circular knitting machine; a set of knitting means mounted on the carrier means circumferentially spaced about the same; two or more selector means successively passed by the knitting means during rotation of the carrier means; and at least two cam means following, respectively the several selector means in the direction of rotation.

Each knitting means includes a needle influencing element, and a needle operated by the needle influencing element, which is commonly referred to as a "jack."

The selector means are actuated by program control means to cause movement of different selected knitting means to a position in which the cam means engage needle influencing jacks and corresponding needles selected by the respective selector means, to cause movement of the needle selected by different selector means to different operative knitting positions, for example to the knit position or to the tuck position.

In one embodiment of the invention, the needle influencing jacks are raised by the cam means to different operative positions, and directly shift the corresponding needles to corresponding different knitting positions. In another embodiment of the invention, the cam means shift all selected needle influencing jacks, irrespective by which selector means they were selected, to the same operative position, so that the corresponding needles are shifted to a corresponding intermediate position in which they are engated by cams following the two or more selector means, and having different height and inclination so that the needles selected by different selector means are moved to the higher knit position and to the lower tuck position, respectively.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

FIG. 1 is a fragmentary developed schematic view illustrating a portion of a needle cylinder in the region of a knitting station which includes two selector means, and stationary cam means in accordance with a first embodiment of the invention;

FIG. 2 is a fragmentary schematic developed view of a portion of a needle cylinder in the region of a knitting station including three selector means in accordance with a second embodiment of the invention; and

FIG. 3 is a fragmentary sectional view taken on line III—III in FIG. 1.

Referring now to FIGS. 1 and 3, a needle cylinder C has circumferentially spaced axially extending grooves C_1. A needle N, and a needle influencing jack J are mounted in each groove for axial movement. Each needle N has a butt numbered 1', 2', 3' and so forth in FIG. 1, and each needle influencing jack J has a butt 1, 2, 3, 4, and so forth as shown in FIG. 1. The lower end of each jack J is engaged by a curved spring S which is located in a cavity C_2 of the needle cylinder C, and has another end resting on a rigid abutment. In the position of FIGS. 1 and 3, butt 1 of the first jack abuts a cam 122 under the action of spring S so that the recess J1 is located spaced from a locking projection L1 of a corresponding locking means which is secured by a ring L2 to the needle cylinder. Ring L2 is

composed of segments secured to the needle cylinder C by screws L3. Projections Z1 on the inside of ring L2 support springs S which are secured by screws S1. The lower ends L4 of locking means L are clamped to ring L2 by members L5 held on ring L2 by screws 6. The butt 1' of the respective needle rests on a higher cam 30.

Only every fifth needle N and every fifth jack J is illustrated in FIG. 1 for the sake of simplicity.

When during rotation of the needle cylinder C, a needle and corresponding jack arrive at the selector station in which two selector magnets M1 and M2 are provided, a selection is carried out in the following manner. Cam 122 has in the region of selector magnet M1 a rising cam portion along which the butt of the jack slides due to the action of spring S as shown for butt 5. Recess J1 passes locking projection L1, and when selector magnet M1 is not energized in accordance with the program, the locking projection snaps into recess J1 and locks the respective jack in an inoperative position in which its upper end is still spaced from the lower end of the corresponding needle. However, if selector magnet M1 is energized, the locking means L is attracted, and cannot snap into recess J1 so that spring S moves the respective jack higher into a gap G1 between the end of cam 122, and the beginning of another cam means which has an upper inclined cam track 120*a*, and a lower cam track 120*c*. The selective energization of the electromagnetic selector means is known and for example described in the U.S. Patent 3,313,129. A selected jack whose butt slides on cam 122 into the gap G1 will move farther and be engaged by the rising cam track 120*a* as shown for butt 6 of the sixth jack. It will be understood that the jacks and needles move with the rotating needle cylinder, while the cams and selector magnets are stationary.

If selector magnet M1 was not energized at the moment in which the respective locking means and jack pass the same, the jack is locked in a slightly raised position, in which it is engaged by the descending portion of cam track 120*c* and urged downward and then assumes the position shown in FIG. 3 so that the oblique shoulders of the respective recess J1 urge the locking projection L1 again out of recess J1 so that a jack whose butt 7 arrives at the second selector magnet is no longer locked. A second selection is now carried out by selector magnet M2. If the locking means L is attracted, spring S can move the respective selected jack into the gap G2 between cam track 120*c* and cam track 120 so that its butt, for example butts 9, 11 and 13 travel along cam track 120 and the respective selected jacks are raised to an operative position in the same manner as the jacks represented by butts 6, 8, 10, 12 were raised by cam track 120*a*.

While the jacks travel toward the first and second selector means M1 and M2, the corresponding needles travel in the inoperative position as indicated by the butts 1' to 7'. Due to the space between the upper end of the jack and the lower end of the needle, the small displacement shown for butt 5 of the fifth jack has no influence on the needle position. However, when cam track 120*a* rasies a jack to the position shown for butts 8, 10, and 12 the corresponding needle is also raised as indicated by the position of the needle butts 8', 10' and 12' until the respective needle reaches the knit position.

The jacks which were selected by the second selector means M2, and which are controlled by the cam track 120 do not rise as high as the jacks selected by the first selector means M1, and after they have engaged the lower ends of the needles, they raise the corresponding needles first to the position indicated for example, by needle butt 11', and then to the position indicated by needle butt 13' which needle position corresponds to the so-called tuck position.

It will be seen that knitting means including a needle and a jack, selected by a first selector means M1 will finally assume a position in which the respective needle is in a higher knitting position, whereas knitting means selected by the second selector means M2, will finally assume a position in which the respective needles are in a lower knitting position.

Non-selected needles and jacks will remain in the inoperative position shown for the butts 14, and 16 of the jacks and for the butts 14' and 16' of the needles.

Return cam means 31 and 32 are provided for returning the needles from the knitting positions to the initial inoperative position for a selection at the next knitting station, not shown, where another group of selector means M1, M2 is provided. Cam 31 cooperates with the butts of needles selected by the first selector means M1 which have assumed a higher knitting position, and returns the same to the inoperative position in which the butts 18', 19', for example, again rest on the horizontal cam 30.

Return cam 32 engages the butts of needles which were selected by the second selector means M2 to rise to the tuck position, for example butt 13' and butt 15' are lowered by cam 32 so that the corresponding needles are lowered to the inoperative position in which the butts thereof slide on cam 30. The position of butts 18' and 19' does not indicate whether the respective needles were previously selected by one of the selector means, or were not selected at all.

Another return cam 122*a* is provided for returning the selected jacks to the inoperative position. For example, butts 17 and 18 are engaged by cam track 122*a* whereby the corresponding jacks are lowered to the position shown in FIG. 3 and for butt 19 in FIG. 1. While the respective butt is engaged by the end of cam track 122*a*, locking projection L1 passes into recess J1, but is urged out of the same again as the respective jack is further lowered.

It will be seen that in the embodiment of FIG. 1, the jacks have an inoperative posiiion, an intermediate position located either in the gap G1 or in the gap G2 so as to be engaged by cam track 120*a* or 120, and two different operative positions determined by the higher ends of cam tracks 120*a* and 120. In accordance with the higher or lower operative position of the respective jack, the corresponding needle is move to a higher or lower knitting position by direct engagement with the respective jack.

Two successive selections are carried out by selector means M1 and M2 for causing movement of the needles either to the knit position or to the tuck position, and it will be understood that a third selector means may be provided, cooperating with a third less steeply inclined cam track for moving a third group of selected needles to a third knitting position which is still lower.

The second embodiment of the invention illustrated in FIG. 2, provides needles N, jacks J, locking means L, and springs S as shown in FIG. 3. Three selector means are provided at each knitting station, as represented in FIG. 2 by selector magnets M*a*, M*b*, and M*c* at the first knitting station, and by selector magnets M*a'*, M*b'* at the second knitting station, the third seelctor magnet at the second knitting station being omitted.

As compared with the embodiment of FIG. 1 the shape and the position of the cams which respectively cooperate with the needle influencing jacks and with the needles, are different. The manner in which the jacks and needles are selected is substantially the same.

Only a limited number of needles and jacks is illustrated in FIG. 2, and it will be understood that a jack and a needle are mounted in each groove of a carrier, such as a needle cylinder. Each jack J is urged by a spring S to move upwards into engagement with the corresponding needle N from which the upper end of the jack is separated in the normal inoperative position of the needles and jacks as shown, for example, for the first knitting means including a jack J and a needle N on the left end of FIG. 2. The respective spring S urges the jack upward to a position in which its butt 51 abuts a hori-

ontal cam track portion 240*a*, while the butt 51′ of the corresponding needle N rests on a horizontal cam track 30. Cam track 240*a* is part of a cam 200 which includes a return cam track 142 and a selector cam track 140*a*. The first selector magnet M*a* is positioned in the region of cam 200 to cooperate with a locking means L, not shown in FIG. 2, as described with reference to FIG. 3.

Three selector cams 201, 202, and 203 follow cam 200 at each knitting station. Gaps G*a*, G*b*, G*c* are formed between each selector cam track 140*a*, 140*b*, 140*c* and the respective portion of selector cams 201, 202, and 203. When a selector magnet attracts a locking means L, the respective spring S moves the respective jack to move upward into the respective gap to an intermediate position engaging the lower end of a selector cam track 140*a*, 140*b*, 140*c*. During further turning of the thus selected jack with the needle cylinder, the respective butt first slides on one of the cam tracks 240*a*, 240*b*, 240*c* with the needle in an inoperative position, and then slides on one of the cam tracks 140*a*, 141*b*, 141*c* to raise the needle to an intermediate position in which the butt of the needle is located in the region of a cam track 41*a* or 41*b* of two selector cams 241, 242. For example, butt 54′ of a needle in the intermediate position is engaged by cam track 41*a*, and butt 58′ of another needle raised to the intermediate position is engaged by cam track 41*b*. Selector cam track 41*a* follows tracks 140*a*, 141*a*, and selector cam track 41*b* follows selector tracks 140*b*, 141*b*. Following each pair of selector cams 241, 242 at each knitting station, is a return cam 240 which has a descending cam track portion 42 for engaging the butts of needles which have been moved to the highest points of cams 241, 242, respectively, and for returning the respective needles to the inoperative position in which the butts thereof slide on the horizontal cam track 30.

When the butt of a selected jack has arrived at the highest point of a selector track 140*a*, 140*b*, 140*c*, it moves with the rotating needle cylinder to a position engaging a corresponding selector track 141*a*, 141*b*, 141*c* of selector cams 201, 202, 203 and is raised by the respective cam tracks to the same height. Consequently, irrespective by which selector magnet M*a*, M*b*, M*c* a jack was selected, the respective selected jack is raised to the same operative position. Since in this operative position, the corresponding needle is engaged and raised by the jack to the intermediate position, the final position of the needle is not determined by the jack, but by the height of the selector cams 241, 242 which have different shapes so as to raise needles engaged by the same to different heights, for example to the knit position and to the tuck position. The jacks raised by selector cam track 141*c* to the operative position, raise the corresponding needle to a third knitting position which is lower than the positions to which needles are raised by cams 241 and 242. Following each group of selector cams 201, 202, 203 at each knitting station, is a cam 200 which includes the return cam track 142 engaging the butts of all selected jacks for returning the same to the inoperative position in which the butts of the jacks slide on the horiozntal cam track 240*a*. During movement of the respective butts over the lowest portion of cam track 142, the projection L1 of the respective locking means passes into and then again out of the recess J1 described with reference to FIG. 3 so that the locking means and jacks are in the inoperative position shown in FIG. 3 when moving along cam track 240*a*.

If a jack is not selected, it remains in the inoperative position, with its butt moving in a horizontal plane along cam tracks 240*b*, 240*c*, 240*d*, and 240*a* of the next following knitting station.

The butts of the needles are designated 51′ to 65′ in FIG. 2. The butts of the corresponding jacks are designated 51 to 56, 58, 59, and 61 to 65. In the position illustrated in FIG. 2, the first selector means M*a* has selected the needles with butts 52′, 54′ and 57′. Jack butt 52 is still engaged by cam track 140*a* so that the corresponding needle is still in the inoperative position. Jack butt 54 is in its operative highest position, so that the corresponding needle is in an intermediate position in which its butt 54′ is just engaged by cam track 41*a*. Butt 57′ has been raised by cam track 41*a* to the highest position so that the respective needle is in the highest knitting position. The respective jack has remained in its high operative position in which its butt, not shown, is in the same position as butt 54.

The second selector means M*b* has selected the needles with butts 55′, 58′, and 60′ so that the same are raised to the tuck position. The third selector means M*c* has selected the needles with the butts 59 and 61 which are to be raised to a position lower than the tuck position which is achieved by providing no cam engaging the butts of needles selected by the third selector means M*c*, but leaving the needles in the position to which they are raised by the corresponding jack in its operative position shown for jack 61 on top of cam track 141*c* of selector cam 203.

The jack and needle represented by butts 62 and 52′ have not been selected by any of the selector means M*a*, M*b*, M*c* and move in inoperative position along horizontal cam tracks 30 and 240*a*. Still within the same knitting station, return track 142 of cam 200 returns all selected jacks from the operative raised position to the inoperative position sliding on horizontal cam track 240*a*. The same function is performed for the needles by return cam 240 whose track 42 engages the butts of all selected and raised needles and returns the same to the inoperative position as shown for butt 63′. However, the needle associated with butt 63′ was selected by selector means M*a*′ of the next following knitting station, and while butt 63′ was still moving along return cam track 42, butt 63 of the jack passed through gap G*a*′ onto track 140*a* and to the highest point of the same while the respective jack moved up to a position in which its upper end just engages the lower end of the respective needle. Further movement of jack 63 along cam track 140*b* will cause raising of the respective needle to the intermediate position in which it can be engaged and further raised by cam 241 of the second knitting station.

The embodiment of FIG. 2 permits the start of the selection while the respective needle is still being returned, so that the available space about the circumference of the knitting cylinder or corresponding needle carrier, can be fully utilized for a great number of knitting stations each of which may include three selector means as shown in FIG. 2, or even a greater number if desired.

The raising of selected jacks is first accomplished by the force of the respective spring S, and then by the driving force by which the needle cylinder, or other carrier of the jacks and needles, is rotated since the rotary movement of the needle cylinder urges the butts of the jacks and needles revolving with the needle cylinder against the rising cam tracks of the selector cams.

While the embodiment in FIG. 1 shows an arrangement in which selected needles can be raised at each knitting station to different knitting positions, the embodiment of FIG. 2 utilizes the available space better, and permits the raising of selected needles to three different knitting positions.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of needle control and selector apparatus for knitting machines differing from the types described above.

While the invention has been illustrated and described as embodied in a seelctor apparatus for selecting at each knitting station of a circular knitting machine, a plurality of needles for movement to different knitting positions, it is not intended to be limited to the details shown, since various modifications and structural changes may be made

without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be secured by Letters Patent is:

1. A needle control apparatus for a knitting machine, comprising, in combination, rotary carrier means; a set of knitting means mounted on said carrier means circumferentially spaced about the same and respectively movable between an inoperative position, an intermediate position, and a plurality of operative positions; a knitting station including at least two electromagnetic selector means successively passed by said knitting means during rotation of said carrier means, each of said electromagnetic selector means causing movement of different selected knitting means from said inoperative position to said intermediate position; and at least two cam means following, respectively, the two selector means in the direction of rotation, and respectively engaging knitting means in said intermediate position selected by said selector stations, respectively, for guiding the same to different operative positions, respectively, at said knitting station.

2. A needle control apparatus for a knitting machine, comprising, in combination, rotary carrier means; a set of knitting means mounted on said carrier means circumferentially spaced about the same, each knitting means including a needle movable between an inoperative position and a plurality of knitting positions, a needle influencing element aligned with the needle and movable between an inoperative position, an intermediate position, and a plurality of operative positions for moving the respective needle to said knitting positions, and biasing means for urging said needle influencing elements to said operative positions; a knitting station including at least two electromagnetic selector means successively passed by said needle influencing elements during rotation of said carrier means, each of said electromagnetic selector means selectively preventing movement of selected needle influencing elements by said biasing means to said operative position, and causing movement of different selected needle influencing elements front said inoperative position to said intermediate position; and at least two cam means following, respectively, said two electromagnetic selector means in the direction of rotation, and respectively engaging needle influencing elements in said intermediate position for guiding the same to different operative positons, respectvely, so that needle influencing elements selected by diffrent electromagnetic selector means move the respective needles to different knitting positions at said knitting station.

3. A needle control apparatus for a knitting machine as claimed in claim 2, the first cam means in the direction of rotation being steeper inclined than the second cam means so that needles selected by the first selector means are raised to a higher knitting position, and needles selected by the second selector means are raised to a lower knitting position.

4. A needle control apparatus for a knitting machine as claimed in claim 2 and comprising a first return cam means following said two cam means for engaging needles in said knitting positions for returning the same to said inoperative position; and a second return cam means following said first return cam means for engaging needle influencing elements in said operative positions for returning the same to said inoperative position.

5. A needle control apparatus as set forth in claim 2 wherein said carrier means has circumferentially spaced axially extending grooves, wherein a needle influencing element and a needle are mounted in each groove for axial movement; and wherein a needle influencing element in said inoperative positions is spaced from the respective needle in said inoperative position and is moved by said cam means to a position engaging the respective needle.

6. A needle control apparatus as set forth in claim 2, said biasing means including spring means engaging said needle influencing elements for urging the same to said operatvie positions; and wherein each electromagnetic selector means includes a selector magnet and means controlled by said selector magnet for locking needle influencing elements in said imperative position and for preventing movement of selected needle influencing elements under the action of said spring means to said operative positions.

7. A needle control apparatus for a knitting machine as claimed in claim 2, wherein said carrier means is a rotary needle cylinder means having axially extending circumferentially spaced grooves guiding needle movable between an inoperative position and a plurality of knitting positions, and a needle influencing element aligned with the needle and movable between an inoperative position, an intermediate position, and a plurality of operative positions.

8. A needle control apparatus for a knitting machine, comprising, in combination, rotary carrier means; a set of knitting means mounted on said carrier means circumferentially spaced about the same, each knitting means including a needle movable between an inoperative position, an intermediate position, and a plurality of knitting positions, a needle influencing element aligned with the needle and movable between an inoperative position, an intermediate position, and an operative position for moving the respective needle to said intermediate position, and biasing means for urging said needle influencing elements to said operative positions; a knitting station including at least two electromagnetic selector means successively passed by said needle influencing elements during rotation of said carrier means, each of said electromagnetic selector means selectively preventing movement of selected needle influencing elements by said biasing means to said operative position, and causing movement of different selected needle influencing means from said inoperative position to said intermediate position; and at least two cam devices following, respectively, said two electromagnetic selector means in the direction of rotation, each cam device including a first cam means respectively engaging needle influencing elements in said intermediate position for guiding the same to said operative position so that the needle influencing elements selected by different selector means move the respective needles to said intermediate position, and a second cam means respectively following said first cam means and engaging needles in said intermediate position, said second cam means of said two cam devices having different shapes for guiding engaged needles to different knitting positions at said knitting station.

9. A needle control apparatus for a knitting machine as claimed in claim 8, the second cam means leading in the direction of rotation being steeper inclined than the second cam means trailing in the direction of rotation so that needles selected by the first selector means are raised to a higher knitting position, and needles selected by said second selector means are raised to a lower knitting position.

10. A needle control apparatus for a knitting machine as claimed in claim 8 and comprising, a first return cam means following said first cam means in the direction of rotation for engaging needle influencing elements in said operative position for returning the same to said inoperative position; and a second return cam means following said first return cam means for engaging needles

in said knitting positions for returning the same to said inoperative position.

11. A needle control apparatus as set forth in claim 8 wherein said carrier means has circumferentially spaced axially extending grooves, wherein a needle influencing element and a needle are mounted in each groove for axial movement; and wherein a needle influencing element in said inoperative position is spaced from the respective needle in said inoperative position and is moved by the respective first cam to a position engaging the respective needle.

12. A needle control apparatus as set forth in claim 8, said biasing means including spring means engaging said needle influencing elements for urging the same to said operative position; and wherein each electromagnetic selector means includes a selector magnet and means controlled by said selector magnet for locking needle influencing elements in said imperative position and for preventing movement of selected needle influencing elements under the action of said spring means to said operative position.

13. A needle control apparatus for a knitting machine as claimed in claim 8 wherein said carrier means is a rotary needle cylinder means having axially extending circumferentially spaced grooves guiding a needle movable between an inoperative position, an intermediate position, and a plurality of knitting positions, and a needle influencing element aligned with the needle and movable between an inoperative position, an intermediate position, and an operative position.

14. A needle control apparatus as set forth in claim 8 and including a third selector means following said two selector means; a third cam means following said two first cam means for guiding needle influencing elements selected by said third selector means to said operative position so that the corresponding needles are raised to an operative knitting position.

15. A needle control apparatus as set forth in claim 8 wherein each of said first cam means includes first and second overlapping spaced rising cam tracks, said needles being spaced from said needle influencing elements while the same are engaged by said first cam track, and engaged and raised by the same to said intermediate position while the same are engaged by said second cam track.

16. A needle control apparatus for a knitting machine, comprising, in combination, rotary carrier means; a set of knitting means mounted on said carrier means circumferentially spaced about the same and respectively movable between an inoperative position, an intermediate position, and a plurality of operative positions; a knitting station including at least two electromagnetic selector means successively passed by said knitting means during rotation of said carrier means, each of said electromagnetic selector means causing movement of different selected knitting means from said inoperative position to said intermediate position; at least two cam means following, respectively, the two selector means in the direction of rotation, and respectively engaging knitting means in said intermediate position selected by said selector stations, respectively, for guiding the same to different operative positions, respectively; and return cam means following said cam means in said direction of rotation for engaging said knitting means and for returning selected knitting means from said operative positions to said inoperative positions at said knitting station.

17. A needle control apparatus for a knitting machine, comprising, in combination, rotary carrier means; a set of knitting means mounted on said carrier means circumferentially spaced about the same, each knitting means including a needle movable between an inoperative position and a plurality of knitting positions, and a needle influencing element aligned wth the needle and movable between an inoperative position, an intermediate position, and a plurality of operative positions for moving the respective needle to said knitting positions; a knitting station including at least two electromagnetic selector means successively passed by said needle influencing elements during rotation of said carrier means, each of said electromagnetic selector means causing movement of different selected needle influencing means from said inoperative position to said intermediate position; at least two cam means following, respectively, said two selector means in the direction of rotation, and respectively engaging needle influencing elements in said intermediate position selected by said two selector means for guiding the same to different operative positions, respectively, so that needle influencing elements selected by different selector means move the respective needles to different knitting positions; a first return cam means following said two cam means for engaging needles in said knitting positions for returning the same to said inoperative position; and a second return cam means following said first return cam means for respectively engaging needle influencing elements in said operative positions for returning the same to said inoperative position at said knitting station.

18. A needle control apparatus as set forth in claim 17 said biasing means including spring means for moving said needle influencing elements along said first cam tracks.

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