May 22, 1962 R. SCHMIDT 3,035,425

CONTROL DEVICE FOR KNITTING MACHINES

Filed June 24, 1959 3 Sheets-Sheet 1

Fig. 1

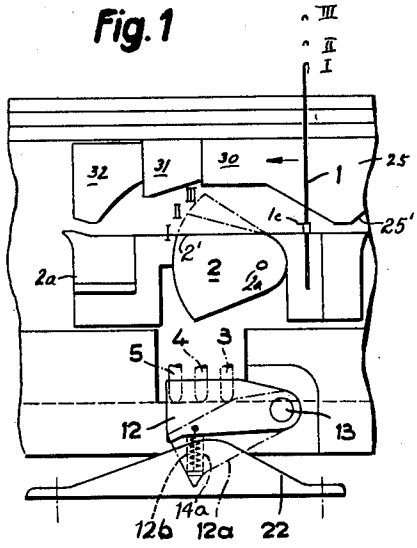


Fig. 3

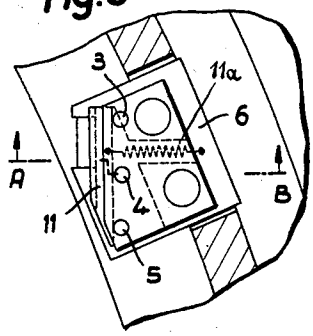
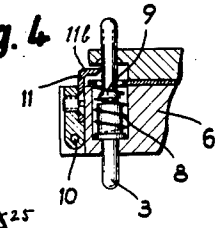


Fig. 4



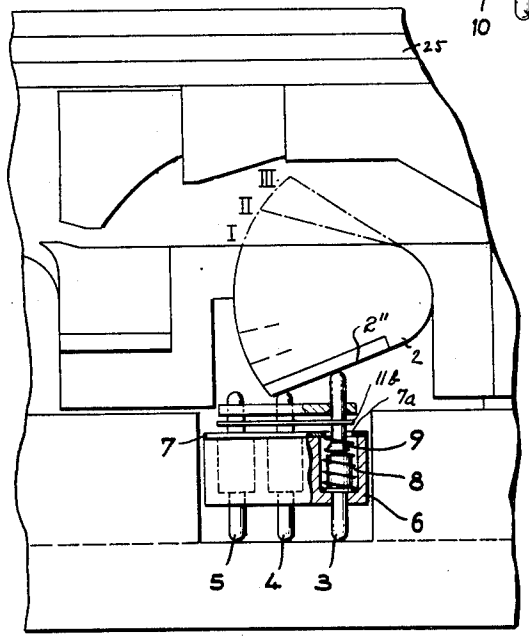


Fig. 2

INVENTOR:
Richard Schmidt
by Michael S. Striker
Attorney

May 22, 1962 R. SCHMIDT 3,035,425

CONTROL DEVICE FOR KNITTING MACHINES

Filed June 24, 1959 3 Sheets-Sheet 2

Fig. 5

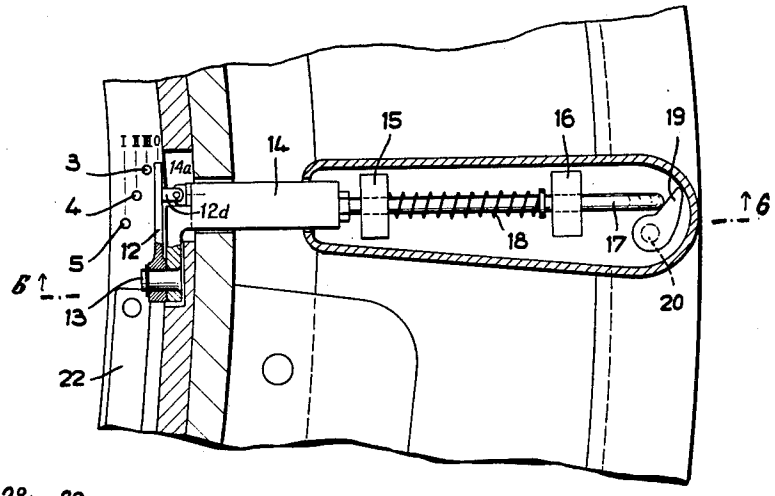
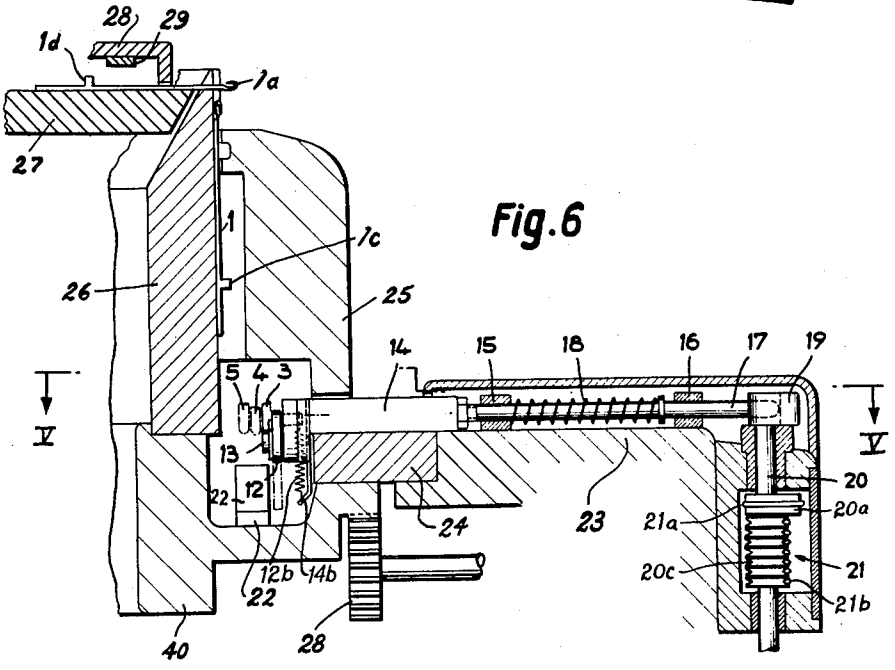


Fig. 6



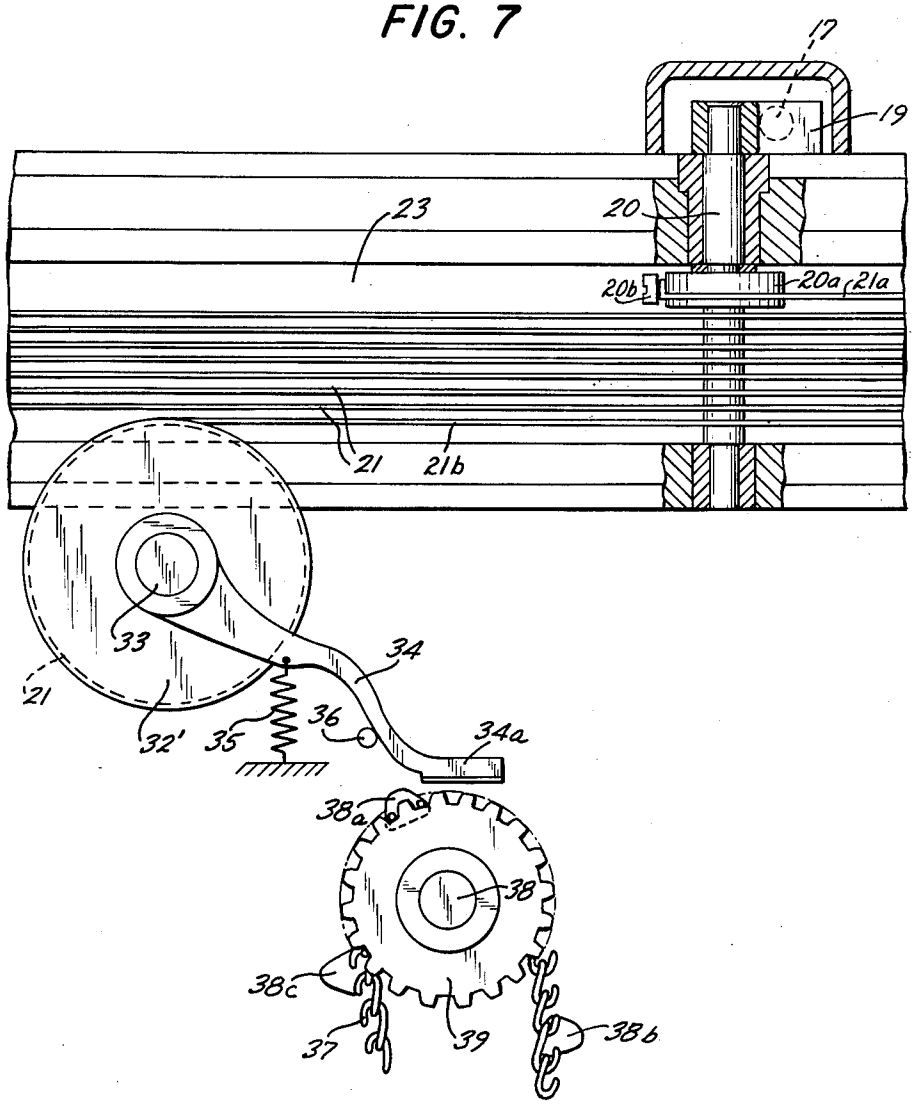
INVENTOR:
Richard Schmidt
by Michael S. Striker
Attorney

May 22, 1962 R. SCHMIDT 3,035,425

CONTROL DEVICE FOR KNITTING MACHINES

Filed June 24, 1959 3 Sheets-Sheet 3

FIG. 7



INVENTOR.

Richard Schmidt

BY

Michael S. Striker

Attorney

United States Patent Office

3,035,425
Patented May 22, 1962

3,035,425

CONTROL DEVICE FOR KNITTING MACHINES

Richard Schmidt, Stuttgart-Vaihingen, Germany, assignor to Franz Morat, G.m.b.H., Stuttgart-Vaihingen, Germany

Filed June 24, 1959, Ser. No. 822,679
Claims priority, application Germany June 24, 1958
18 Claims. (Cl. 66—50)

The present invention relates to a control device for setting the needles of a knitting machine, and more particularly to a control device for shifting the setting means, by which the needles of the machine are set, in any desired order between several setting positions.

In circular knitting machines in which two sets of needles are provided, the setting means for the needles is turnably mounted, and is either manually or by a suitable control device, placed in different positions for moving the needles higher, or outward, to different extents.

The known control devices for the setting means of knitting machines permit shifting only from a first to a second position of the setting means, and from the second position to a third position. The machine can then be shifted from the third to the second position, and from the second position to the first position. A shifting from the third position directly to the first position by a single step is not possible in the control devices of the prior art. It is one object of the present invention to overcome this disadvantage of the prior art, and to provide a control device for setting the needles of a knitting machine in any desired and selected sequence.

Another object of the present invention is to provide a reliably operating control device in which the needles of a knitting machine are set to different positions in any desired sequence for obtaining a desired design of a fabric knitted on the machine.

With these objects in view, the present invention mainly consists in a control device for setting the needles of a knitting machine, the control device comprising a lifting cam shiftable between a plurality of setting positions for setting the needles; and a plurality of control members operatively connected to the setting means and being shiftable from an inoperative position to a control position for shifting the setting means to different setting positions; arresting means are movable between a releasing position and an arresting position for arresting any one of the control members in the control position. The arresting means are shifted to the releasing position by each control member which moves from the inoperative position to the control position. In this manner any other control member held in its control position by the arresting means is released, and returns to its inoperative position, and moreover, all control means can be returned to an inoperative position. Consequently, the lifting cam can be shifted to the setting positions in any selected order and any desired pattern can be knitted on the machine.

For each setting position of the setting means, a control pin is provided, and whenever a control pin is moved to its control position for shifting the lifting cam, any control pin which is in control position, is automatically returned to its inoperative position.

The selection of the control member which is to be operated is effected by selector means which are shiftable between an inoperative position and a plurality of operative positions respectively located opposite one of the

control pins. The selector means, preferably a lever, is turnable in each operative position to and from an actuating position for shifting the respective control pin to its control position. Cam means are provided which rotate with the needle cylinder for shifting the selector lever to its actuating position when the selector lever is in one of its operative positions during passage of the cam means.

After each shifting of the selector lever to its operative position by the cam means, the selector means automatically returns to its inoperative position. This has the advantage that the cam produces a shifting movement only when a shifting of the setting means is required, and passes the selector lever by, when no shifting of the setting means is necessary. In this manner, wear of the interengaging parts is limited to a minimum.

The selector lever is preferably mounted on a bar which is movable between a plurality of shifted positions corresponding to the operative positions of the setting lever. This bar may be operated by Bowden cable means through a turnable lug member. According to a modified arrangement, the selector means is shifted between its operative position by electromagnetic means. For example, a plurality of coils, respectively associated with the operative positions and with the inoperative position of the selector means, act on a core means which is operatively connected to the selector means. The coils of the electromagnetic means are aligned in axail direction, and the core is mounted on a bar passing through the coils. The bar is connected in a suitable manner to the selector means so that the same is shifted between its positions in accordance with the energization of the electromagnetic coils.

In the preferred embodiment of the present invention, a row of control pins is shiftably mounted in axial direction in a support, and the free ends of all control pins act on a lateral edge of the setting means. This edge extends at an angle to the free ends of the control pins, so that movement of each control pin through the same distance will effect a different angluar displacement of the turntable setting means. The pin located closer to the turning axis of the setting means will produce turning through a greater angle than the pin which is spaced a greater distance from the turning axis of the setting means. Furthermore, if the control pins are operated by a selector lever, the pin which is farthest spaced from the turning axis of the selector lever, will be moved the greatest distance.

The control pins are provided with inclined catch means, preferably of frusto-conical shape, and the arresting means preferably includes an arresting bar in the form of a leaf spring which is shifted to releasing position by the inclined catch portion, but arrests any one of the control pins by engaging under the catch portion when the respective control pin has moved to its control position. Spring means are provided for returning released control pins to inoperative positions.

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 front view of the control device according to the present invention;

FIG. 2 is a fragmentary front view illustrating the con-

trol device on a larger scale, and being partially in section;

FIG. 3 is a fragmentary plan view of a detail, partially in section;

FIG. 4 is a fragmentary sectional view of a detail taken on line 4—4 in FIG. 3;

FIG. 5 is a fragmentary plan view, partially in section, illustrating the selector means according to a preferred embodiment of the present invention;

FIG. 6 is a fragmentary sectional view of the device shown in FIG. 5 taken on line 6—6 in FIG. 5; and

FIG. 7 is a fragmentary side view of a Bowden cable arrangement applied in the apparatus of the present invention.

Referring now to the drawings, and more particularly to FIG. 6, a ring 24 to which the cap 25 is secured is fixedly mounted on an annular bed 23. The needle cylinder 26 is turnably mounted in member 25 for rotation about a vertical axis, and supports cylinder needles 1 for vertical movement. Needle cylinder 26 is seated on a drive ring 40 provided with gear teeth meshing with the gear 28 driven from a drive motor. The horizontal dial 27 is connected to the needle cylinder 26 for rotation therewith. Dial 27 has radially extending grooves in which a set of dial needles 1*a* is movably mounted.

A fixed dial cam cap 28 is located above dial 27 and supports dial needle cams 29 which cooperate with the butts 1*d* of dial needles 1*a*. Cams 30, 31, 32 are provided on member 25 and include a cam face 25'. The other part of the cam race in which butts 1*c* are guided, is constituted by fixed member 2*a*, and by needle lifting cams 2. The dial needles 1*a* are controlled by cam means 29, and the cylinder needles 1 are controlled by cam means 2 and 30, 31, 32 to be advanced and retracted to produce a ribbed fabric.

During the knitting of the fabric of this type, cylinder needles 1 are moved to the highest latch clearing position, and dial needles 1*a* are moved to the most advanced position for knitting loops. In this most advanced position, the hooks of needles 1 are located in the position III in FIG. 1. In the position II of FIG. 1, needles 1 are in the tuck position in which their latches do not clear the previously formed loops, and in position I the loops are knocked over. At the same time, the dial needles 1*a* are retracted to their innermost position by cam means 29.

Shortly before the cylinder needles reach the position illustrated in FIG. 1, the respective butt 1*c* passes over the cam face 25' so that the needle is retracted to position I. During further movement, the needle 1 passes with butt 1*c* onto the upper cam face 2' of a lifting cam 2. In position I of lifting cam 2, the came face 2' is horizontal so that the needle 1 is not lifted, but passes in inoperative retracted position without performing a knitting operation. If lifting cam 2 is raised to position II, the cam face 2' is raised and inclined, as indicated by dash-and-dot lines, so that neeedle 1 is lifted to tuck position II. If lifting cam 2 is further turned about shaft 2*a* to position III, its upper edge 2' is located even higher, and butt 1*c* and needle 1 are raised to the most advanced knit position III. Thereupon, cams 31 and 32 cooperate with butt 1*c* to retract needle 1 which further passes through the needle race between cam 32 and cam 2*a*.

It is evident that by turning of lifting cam 2 between the three positions I, II, III, the movement of the cylinder needles can be controlled.

Each lifting cam 2 is operated by control pin members 3 and 4 which are mounted in a support 6. The pins 3, 4 and 5 are operated by a selector lever 12.

Support 6 has three bores for the control pins 3, 4 and 5, and a cover 7. Springs 8 are provided for each control pin, and urge the respective control pin to its retracted inoperative position. Each control pin is provided with an inclined catch means 9 of frusto-conical shape which is below cover 7 in the inoperative position of the respective control pins. The openings 7*a* in cover 7 permit passage of the frusto-conical portions 9. When any one pin is advanced in upward directoin as viewed in FIGS. 1 and 2, the catch means 9 passes the arresting bar 11*b* of an arresting means 11 which is mounted on a pin 10 for movement transverse to the row of pins 3, 4, 5. When any one catch portion 9 passes bar 11*b*, the arresting means 11 is pivoted to a releasing position, and then snaps under the catch portion 9 to hold the respective control pin in an advanced control position. The arresting bar 11*b* is long enough to cooperate with all three catch portions 9 and is urged by a spring 11*a*, see FIG. 3, to its arresting position. Assuming that one of the control pins 3, 4, 5 is arrested in its control position by the arresting means 11, it will be released by arresting bar 11*b* when another control pin is moved to its control position, since the catch portion 9 of the other control pin will be effective to move the arresting bar 11*b* to its releasing position for a time sufficiently long to permit the respective spring 8 to retract the control pin which previously was in control position.

As best seen in FIG. 2, pins 3 and 4 are of different length, and the upper ends of pins 3 and 4 engage the lower edge 2'' of lifting cam 2 when lifting cam 2 is in its lowest position I in which cam face 2' will not lift a cylinder needle 1.

Control members 3, 4 and 5 are selectively operated by a selector lever means 12, as shown in FIGS. 1, 5 and 6. Selector lever 12 is mounted on the head portion 14 of a shiftable bar 17 on a pin 13 which permits turning movement of selector lever 12 to an actuating position for shifting one of the control pins 3, 4 and 5. Bar 17 is shiftable in axial direction and is supported in bearings 15 and 16. A spring 18 urges bar 17 to the normal position illustrated in FIGS. 5 and 6 in which the selector lever 12 is in its inoperative zero position. The free end of bar 17 engages a lug member 19 which is turnable about a pin 20 between a plurality of positions for shifting bar 17 from the illustrative normal position to three shifted positions in which lever 12 is located opposite one of the pins 3, 4 and 5 which are arranged in a row inclined to the direction of lever 12. For example, when bar 17 is shifted one step, lever 12 will be located underneath control pin 3 in the position III, and when elever 12 is then turned about pin 13 to an actuated raised position, pin 3 will be engaged and shifted to its advanced position turning lifting cam 2 to position III thereof. When selector means 17, 14, 12 are shifted one step further, lever 12 will be located underneath pin 4 and turning of lever 12 will shift pin 4 to a raised position in which lifting cam 2 is held in its position II. When the selector means is shifted to the third position I in which lever 12 is located underneath pin 5, turning of lever 12 will raise pin 5 so that arresting bar 11*b* is operated by the frusto-conical catch means 9 of pin 5 to release any previously advanced pin 3 or 4 which is returned by spring 8 thereof to its normal retracted position illustrated in FIG. 2 permitting lifting cam 2 to return to its lowest position I.

Selector lever 12 has a bracket 12*d* to which a spring 12*b* is attached, as shown in FIGS. 1 and 5. The other end of spring 12*b* is secured to a part 14*a* of member 14 so that selector lever 12 remains spring-loaded when the selector means 17, 14 are shifted with lever 12 and spring 12*b*.

Bowden cable means are secured to the turnable pin 20 of the control lug 19 for turning the same. The Bowden cable means are preferably operated by the pattern device of the machine, and shift selector lever 12 in accordance with the desired design and pattern of the knitted fabric.

As shown in FIG. 7, a plurality of Bowden cables is provided, the number of which corresponds to the number of knitting stations or feeds of the machine, so that each Bowden cable controls one knitting station. At each

knitting station, one end of the respective Bowden cable is wound about a portion 20*a* of increased diameter of a pin 20, and is secured to the same by screw 20*b* so that the respective pin 20 is turned when the Bowden cable is shifted. The Bowden cables extend along the circumference of the machine and slide in grooves 20*c* of other pins 20 at other knitting stations. The portions 20*a* of different pins 20 are axially staggered in accordance with the location of the respective Bowden cable. The other end of each Bowden cable passes in a loop about a roll 32′ and is secured to the same so that the Bowden cable is shifted and the respective pin 20 is angularly displaced when roll 32′ is turned.

Consequently, the Bowden cables are of different length, the uppermost Bowden cable 21*a* being the longest and having the greatest circumferential extension so that another roll 32′ does not interfere with the lower Bowden cables. Roll 32′ of FIG. 7 is secured to the free end of the lowest and shortest Bowden cable 21*b* which is connected to a portion 20*a*, not shown, which is aligned with Bowden cable 21*b*.

Each roll 32′ is mounted on a pin 33 which is turnable in the machine bed 23. Fixedly connected to roll 32′ is a lever 35 which is urged by a spring 35 against a stop 36 on the machine bed. In this position, the Bowden cable acts through a pin 20 on the respective lug 19 to hold it in the position shown in FIG. 5, so that the selector lever 12 is in the "0" position.

The free end 34*a* of lever 34 is located adjacent the pattern chain 37, which passes about the chain wheel 39 turnably about a shaft 38. Chain wheel 39 is connected to the driven means 28 so that the speed of chain 37 corresponds to the driven speed of needle cylinder 26. Cam lugs 38*a*, 38*b* and 38*c* of different height and respectively corresponding to positions I, II and III, are secured to the chain and move with the same to actuate the lever 34 by engaging portion 34*a*. When cam lug 38*a* engages cam follower lever 34, lever 34 and roll 32′ turn and Bowden cable 21 is shifted to such extent that lug 19 turns to effect movement of the selector lever 12 to a position located below pin 3. The cam 22 is secured to the ring 40 which rotates with the needle cylinder.

When cam 22 passes lever 12, the lifting cam is set to position III. When the next higher cam lug 38*b* actuates lever 34, Bowden cable 21 is shifted to move selector 12 under pin 4 to move the lifting cam 2, to position II. The highest cam lug 38*c* turns roll 32′ and lug 19 to shift selector lever 12 into the region of the clearing pin 5 so that lifting cam 2 returns to the position I, since either pin 3, or pin 4 is cleared due to the operation of the arresting bar 11 by the knitting pin 5. Since the Bowden cable rolls 32′ are urged by spring 35 acting on lever 34 to a normal position in which the lug 19 is in "0" position, lug 19 and lever 12 automatically move back to "0" position after each actuation of the selector lever 12.

As explained above, the selector lever 12 can be shifted in each of its operative positions I, II, and III to an actuated position, and such shifting is effected by the cam 22 which turns in synchronism with the knitting machine and is secured to drive ring 40 of needle cylinder 26 for rotation with the same about the cylinder axis. The spring 12*b* urges selector lever 12 to its normal position 12*a* illustrated in dash and dot lines, while the dwell of cam 22 shifts selector lever 12 to its actuated position when passing selector lever 12. Parts 23, 24 and 25 are stationary, and during each revolution of the needle cylinder 26, cam lug 22 passes selector lever 12 once. If selector lever 12 is in the zero position thereof, it is raised and turned about pivot 13, but does not engage one of the pins 3, 4 or 5. In the shifted positions I, II or III, the selector lever 12 actuates pins 3, 4 or 5 when raised by the passing cam lug 2. Consequently, each lifting cam 2 is operated once during each revolution of the needle cylinder, if selector lever 12 is placed underneath pins 3 or 4. If selector lever 12 is placed underneath pin 5, pins 3 and 4 are cleared, and lifting cam 2 remains in its lowest inoperative position I. As explained above, only one of the control pins 3, 4 and 5 is raised by the actuated selector lever 12 corresponding to the shifted operative position of the same. Lever 12 is engaged by cam 22 in all three operative positions, since cam 22 is wide enough and extends over all three control pins 3, 4 and 5, as best seen in FIG. 5. When the cam dwell has passed the selector lever, bar 17 is returned by spring 18 to its inoperative position, and selector lever 12 again assumes its normal zero position.

Consequently, lifting cam 2, and needles 1 are shifted and set after the selector lever 12 has moved from normal zero position to one of its operative positions.

Every time selector lever 12 in one of its operative positions is shifted to actuated position by cam 22, and one of the control pins 3 and 4 is raised to a control position, and the lifting cam 2 engaged by the respective pin is turned through a corresponding angle for setting the needles 1 correspondingly.

As explained above, each control pin 3, 4, and 5 in control position is arrested by the arresting means 11 and remains in its control position until another control pin is raised. The frusto-conical catch member 9 of the other control pin pushes the arresting bar 11*b* back, so that the previously arrested control pin is released and returns to its retracted position under the action of the respective spring 8. Thereupon, arresting bar 11*b* returns to arresting position under the action of spring 11*a*, and engages the groove under frusto-conical catch portion 9 of the advanced control pin which is thus held in control position until another control pin is shifted.

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 control devices for knitting machines differing from the types described above.

While the invention has been illustrated and described as embodied in a control device for shifting the setting means of a knitting machine in any selected order, 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. Control device for setting the needles of a knitting machine, and comprising, in combination, lifting cam means shiftable between a plurality of setting positions for setting the needles; a plurality of control members operatively connected to said lifting cam means, each control member being shiftable from an inoperative position to a control position for shifting said lifting cam means to a different setting position, said control members tending to assume said inoperative position; cam means adapted for moving in synchronism with the knitting machine; selector means shiftable between an inoperative position and a plurality of operative positions respectively located opposite one of said control members, said selector means tending to return to said inoperative position, said selector means being shiftable in each of said operative positions to and from an actuating position for shifting the respective control member to said control position thereof, said selector means being shifted to said actuating positions by said cam means in each of said operative positions thereof and returning to said inoperative position after each actuation by said cam

means; shifting means for shifting said selector means to selected operative positions thereof; and arresting means movable between a releasing position and an arresting position for arresting any one of said control members in said control position thereof.

2. A device as set forth in claim 1, wherein said shifting means include Bowden cable means.

3. A device as set forth in claim 1, wherein said shifting means include electromagnetic means.

4. A device as set forth in claim 3 wherein said electromagnetic means include a core means connected to said selector means, and a plurality of coaxially arranged coils in which said core means is movable in axial direction, whereby said selector means is shifted to selected operative positions by selective energization of said coils.

5. A device as set forth in claim 4 wherein one coil of said electromagnetic means is provided for each of said operative positions, and one coil is provided for said inoperative position of said selector means.

6. Control device for setting the needles of a knitting machine, and comprising, in combination, lifting cam means shiftable between a plurality of setting positions for setting the needles; a plurality of control members operatively connected to said lifting cam means, each control member being shiftable from an inoperative position to a control position for shifting said lifting cam means to a different setting position, said control members tending to assume said inoperative position; cam means adapted for moving in synchronism with the knitting machine; selector means shiftable between a plurality of operative positions respectively located opposite one of said control members, said selector means being shiftable in each of said operative positions to and from an actuating position for shifting the respective control member to said control position thereof, said selector means being shifted to said actuating positions by said cam means in each of said operative positions thereof; a bar shiftable between a normal position and a plurality of shifted positions, said shiftable bar supporting said selector means for movement to and from said actuating positions and shifting said selector means between said operative positions when moving to said shifted positions thereof; and spring means for urging said bar to said normal position; a turnable lug member engaging said bar and adapted to be turned between a plurality of positions for moving said shiftable bar from said inoperative position to said shifted positions.

7. Control device for setting the needles of a knitting machine, and comprising, in combination, lifting cam means pivotable between a plurality of setting positions for setting the needles; a support; a plurality of control members operatively connected to said lifting cam means, each control member being mounted in said support shiftable the same distance from an inoperative position to a control position for shifting said lifting cam means to a different setting position; and means for moving any one of said control members to said control position thereof.

8. Control device for setting the needles of a knitting machine, and comprising, in combination, a lifting cam means turnable between a plurality of setting positions for setting the needles; a support; a plurality of control members mounted in said support shiftable from an inoperative position to a control position for engaging said lifting cam means for shifting said lifting cam means to different setting positions; spring means urging each of said control members to assume said inoperative position; and means for moving any one of said control members to said control position thereof.

9. Control device for setting the needles of a knitting machine, and comprising, in combination, a lifting cam means turnable between a plurality of setting positions for setting the needles; a support; a plurality of control members mounted in said support shiftable from an inoperative position to a control position for engaging said lifting cam means for shifting said lifting cam means to

different setting positions; spring means urging each of said control members to assume said inoperative position; cam means adapted for moving in synchronism with the knitting machine; selector means shiftable between a plurality of operative positions respectively located opposite one of said control members, said selector means being shiftable in each of said operative positions to and from an actuating position for shifting the respective control member to said control position thereof, said selector means being shifted to said actuating positions by said cam means in each of said operative positions thereof; and shifting means for shifting said selector means to selected operative positions thereof.

10. Control device for setting the needles of a knitting machine, and comprising, in combination, a lifting cam means turnable between a plurality of setting positions for setting the needles; a support; a plurality of control members mounted in said support shiftable from an inoperative position to a control position for engaging said lifting cam means for shifting said lifting cam means to different setting positions, and a clearing control member having a control position spaced from said lifting cam means; spring means urging each of said control members to assume said inoperative position; means for moving any one of said control members to said control position thereof; and arresting means movable between a releasing position and an arresting position for arresting any one of said control members in said control position thereof, said arresting bar being shifted to said releasing position by each of said control members moving from said inoperative position to said control position for releasing any other control member held in said control position by said arresting bar so that the respective released control member returns to said inoperative position, whereby said lifting cam means can be shifted to said setting positions in any selected order.

11. Control device for setting the needles of a knitting machine, and comprising, in combination, lifting cam means shiftable between a plurality of setting positions for setting the needles; a plurality of control pin members operatively connected to said lifting cam means, each control pin member being shiftable from an inoperative position to a control position for shifting said lifting cam means to a different setting position, said control pin members tending to assume said inoperative position each control pin member having a catch portion; means for moving any one of said control members to said control position thereof; and arresting means movable between a releasing position and an arresting position for arresting any one of said control members in said control position thereof by engaging said catch portion.

12. Control device for setting the needles of a knitting machine, and comprising, in combination, lifting cam means shiftable between a plurality of setting positions for setting the needles; a plurality of control pin members operatively connected to said lifting cam means, each control pin member being shiftable from an inoperative position to a control position for shifting said lifting cam means to a different setting position, said control pin members tending to assume said inoperative position each control pin member having an frusto-conical catch portion; means for moving any one of said control members to said control position thereof; and arresting means including an arresting bar transversely movable between a releasing position and an arresting position for arresting any one of said control members in said control position thereof by engaging under said frusto-conical catch portion, said arresting means being shifted to said releasing position by said frusto-conical catch portion of each of said control members moving from said inoperative position to said control position for releasing any other control pin member held in said control position by said arresting means so that the respective released control member returns to said inoperative position, whereby said lifting cam means can be

shifted to said setting positions in any selected order.

13. Control device for setting the needles of a knitting machine and comprising, in combination, a lifting cam means turnable between a plurality of setting positions for setting the needles; a support; a plurality of control pins arranged in a row, each control pin being mounted in said support shiftable from an inoperative position to a control position for engaging an edge of said lifting cam means for shifting said lifting cam means to different setting positions, said edge being inclined to said pins, each control pin having an inclined catch portion; spring means urging each of said control pins to assume said inoperative position; means for moving any one of said control pins to said control position thereof; and an arresting bar extending along said row of control pins and being mounted on said suport movable in a transverse direction between a releasing position and an arresting position for arresting any one of said control pins in said control position thereof by engaging under said inclined catch portion, said arresting bar tending to move to said arresting position and being shifted to said releasing position by the catch portion of each of said control pins when the same moves from said inoperative position to said control position so that any other control pin held in said control position by said arresting bar is released and returns to said inoperative position whereby said lifting cam means can be shifted to said setting positions in any selected order.

14. Control device for setting the needles of a knitting machine and comprising, in combination, a lifting cam means turnable betwen a plurality of setting positions for setting the needles; a support; a plurality of control pins arranged in a row, each control pin being mounted in said support shiftable from an inoperative position to a control position for engaging an edge of said lifting cam means for shifting said lifting cam means to different setting positions, said edge being inclined to said pins, each control pin having an inclined catch portion; spring means urging each of said control pins to assume said inoperative position; cam menas adapted for moving in synchronism with the knitting machine; selector means shiftable between a plurality of operative positions respectively located opposite one of said control members, said selector means being shiftable in each of said operative positions to and from an actuating position for shifting the respective control member to said control position thereof, said selector means being shifted to said actuating positions by said cam means in each of said operative positions thereof; shifting means for shifting said selector means to selected operative positions thereof; and an arresting bar extending along said row of control pins and being mounted on said support movable in a transverse direction between a releasing position and an arresting position for arresting any one of said control pins in said control position thereof by engaging under said inclined catch portion, said arresting bar tending to move to said arresting position and being shifted to said releasing position by the catch portion of each of said control pins when the same moves from said inoperative position to said control position so that any other control pin held in said control position by said arresting bar is released and returns to said inoperative position whereby said lifting cam means can be shifted to said setting positions in any selected order.

15. Control device for setting the needles of a knitting machine and comprising, in combination, a lifting cam means turnable between a plurality of setting positions for setting the needles; a support; a plurality of control pins arranged in a row, each control pin being mounted in said support shiftable from an inoperative position to a control position for engaging an edge of said lifting cam means for shifting said lifting cam setting means to different setting positions, said edge being inclined to said pins, each control pin having an inclined catch portion; spring means urging each of said control pins to assume said inoperative position; cam means adapted for moving in synchronism with the knitting machine; selector means shiftable between an inoperative position and a plurality of operative positions respectively located opposite one of said control members, said selector means tending to return to said inoperative position, said selector means being shiftable in each of said operative positions to and from an actuating position for shifting the respective control member to said control position thereof, said selector means being shifted to said actuating positions by said cam means in each of said operative positions thereof and returning to said inoperative position after each actuation by said cam means; shifting means for shifting said selector means to selected operative positions thereof; and an arresting bar extending along said row of control pins and being mounted on said support movable in a transverse direction between a releasing position and an arresting position for arresting any one of said control pins in said control position thereof by engaging under said inclined catch portion, said arresting bar tending to move to said arresting position and being shifted to said releasing position by the catch portion of each of said control pins when the same moves from said inoperative position to said control position so that any other control pin held in said control position by said arresting bar is released and returns to said inoperative position whereby said lifting cam means can be shifted to said setting positions in any selected order.

16. Control device for setting the needles of a knitting machine and comprising, in combination, a lifting cam means turnable between a plurality of setting positions for setting the needles; a support; a plurality of control pins arranged in a row, each control pin being mounted in said support shiftable from an inoperative position to a control position for engaging an edge of said lifting cam means for shifting said lifting cam means to different setting positions, said edge being inclined to said pins, each control pin having an inclined catch portion; spring means urging each of said control pins to assume said inoperative position; cam means adapted for moving in synchronism with the knitting machine; selector means shiftable between an inoperative position and a plurality of operative positions respectively located opposite one of said control members, said selector means tending to return to said inoperative position, said selector means being shiftable in each of said operative positions to and from an actuating position for shifting the respective control member to said control position thereof, said selector means being shifted to said actuating positions by said cam means in each of said operative positions thereof and returning to said inoperative position after each actuation by said cam means; a bar shiftable between a normal position and a plurality of shifted positions, said shiftable bar supporting said selector means for movement to and from said actuating positions and shifting said selector means between said operative positions when moving to said shifted positions thereof; spring means for urging said bar to said normal position; a turnable lug member engaging said bar and adapted to be turned between a plurality of positions for moving said shiftable bar from said inoperative position to said shifted positions; an arresting bar extending along said row of control pins and being mounted on said support movable in a transverse direction between a releasing position and an arresting position for arresting any one of said control pins in said control position thereof by engaging under said inclined catch portion, said arresting bar tending to move to said arresting position and being shifted to said releasing position by the catch portion of each of said control pins when the same moves from said inoperative position to said control position so that any other control pin held in said control position by said arresting bar is released and returns to said inoperative position whereby said lifting cam means can be shifted to said setting positions in any selected order.

17. A device as set forth in claim 16 wherein said selector means is a lever pivotally mounted on said bar for movement to and from said actuating position; and including spring means urging said lever out of said actuating position.

18. A device as set forth in claim 17, wherein said cam means is a rotary cam ring having a single cam dwell engaging said lever once during each revolution for shifting said lever to said actuating position.

References Cited in the file of this patent

UNITED STATES PATENTS

2,260,579	Miller	Oct. 28, 1941
2,391,665	Wildt et al.	Dec. 25, 1945
2,696,720	Miller	Dec. 14, 1954
2,756,574	Shortland	July 31, 1956