

April 21, 1959

K. WINZ

2,882,847

MULTIPLE CONTROL DEVICE FOR SEWING AND THE LIKE MACHINES

Filed Dec. 5, 1956

3 Sheets-Sheet 1

FIG. 1

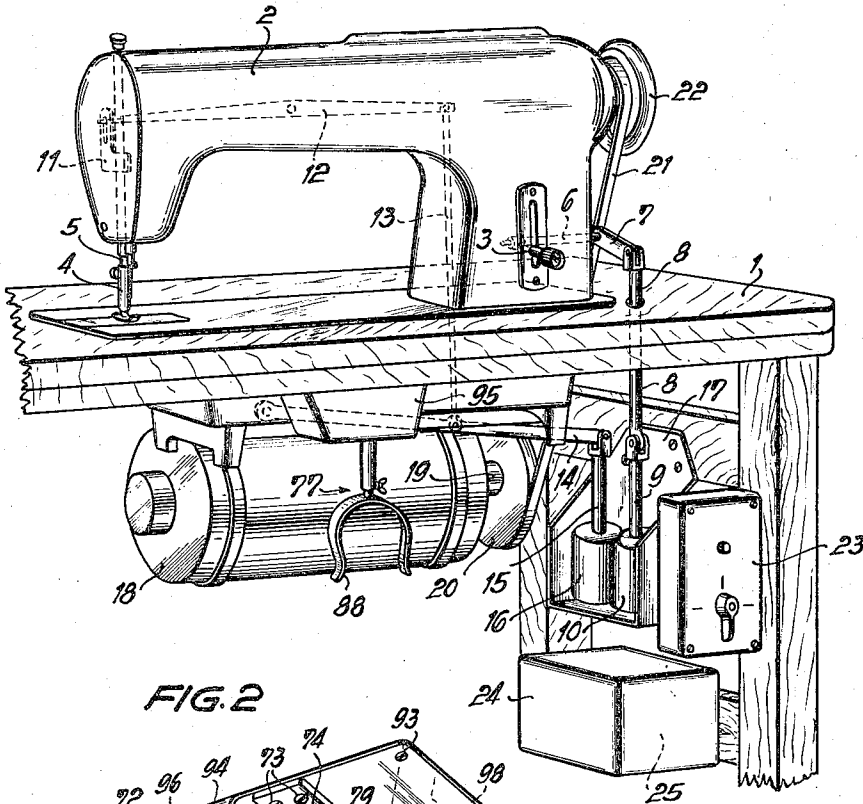
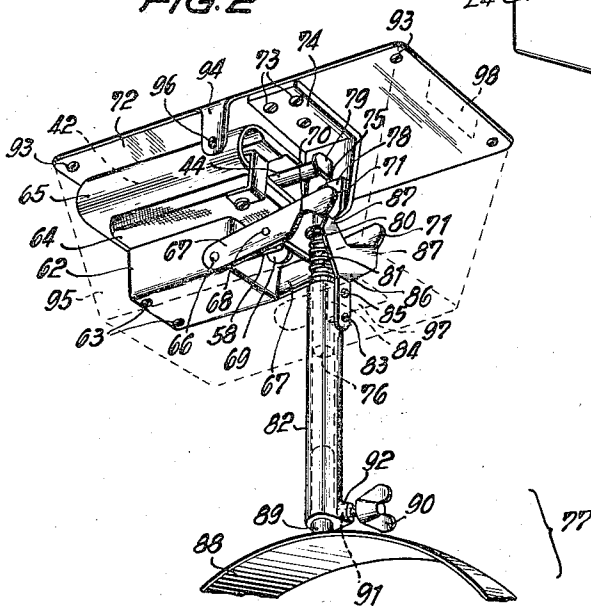


FIG. 2



INVENTOR
Karl WINZ
BY
Wm. Wm.
ATTORNEY

April 21, 1959

K. WINZ

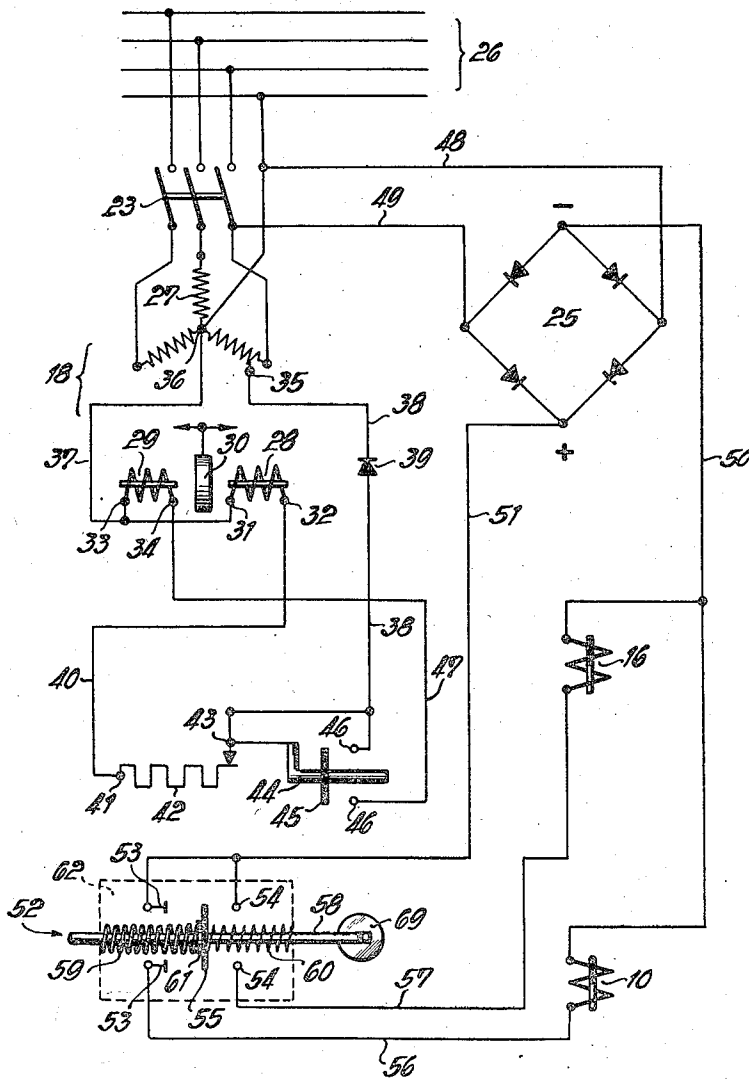
2,882,847

MULTIPLE CONTROL DEVICE FOR SEWING AND THE LIKE MACHINES

Filed Dec. 5, 1956

3 Sheets-Sheet 2

FIG. 3



INVENTOR

Karl WINZ

BY

Wm. W. W.

ATTORNEY

April 21, 1959

K. WINZ

2,882,847

MULTIPLE CONTROL DEVICE FOR SEWING AND THE LIKE MACHINES

Filed Dec. 5, 1956

3 Sheets-Sheet 3

FIG. 4

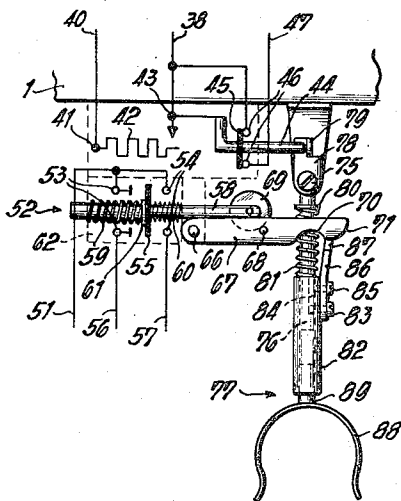


FIG. 5

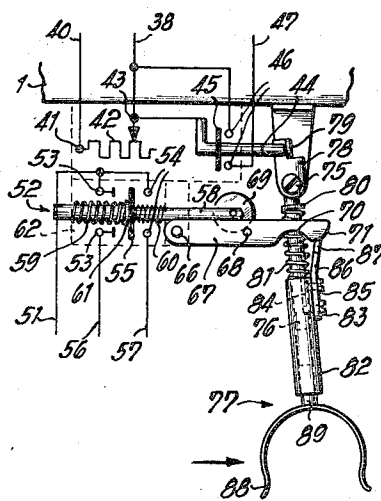


FIG. 6

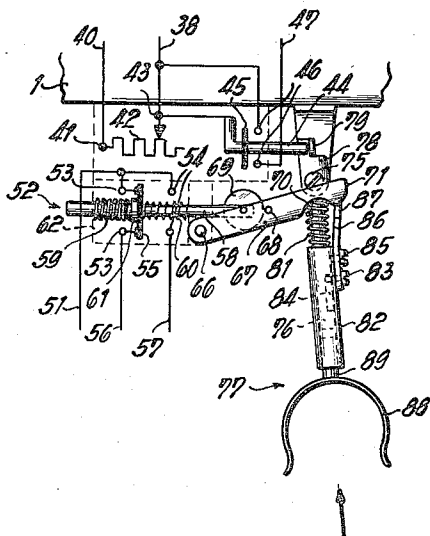
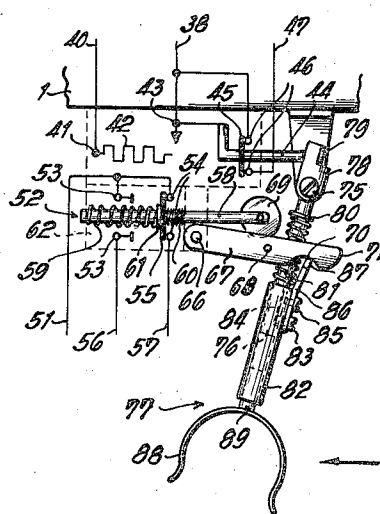


FIG. 7



INVENTOR
Karl WINZ

BY

Wm. T. O'Connell

ATTORNEY

1

2,882,847

MULTIPLE CONTROL DEVICE FOR SEWING AND THE LIKE MACHINES

Karl Winz, Kaiserslautern-Pfalz, Germany, assignor to G. M. Pfaff A.G., Kaiserslautern-Pfalz, Germany, a corporation of Germany

Application December 5, 1956, Serial No. 626,458

Claims priority, application Germany December 9, 1955

5 Claims. (Cl. 112—219)

The present invention relates to control devices for sewing and the like machines, more particularly to a multiple control mechanism operable by a unitary control member, preferably a knee-control lever, to perform a multiplicity of control functions during the operation of the machines.

More particularly, the invention is concerned with electrically operated sewing machines comprising switching and electrical control means cooperating with a single control device (knee-control lever, etc.) to perform a plurality of control functions, in particular to control the operating speed of the machine, to reverse the direction of stitching and to raise and lower the presser foot or work clamp of the machine.

It has already been proposed to control the presser foot and stitch control lever of a sewing machine by means of a single control member in the form of a knee-control lever. The latter is connected with the control devices through suitable links to enable a raising and lowering of the presser foot or operation of the stitch control lever by rotation or deflections of the knee lever in different directions. It has furthermore been proposed to construct the knee lever such as to be rotatable about a pivot within a predetermined plane and to be additionally displaceable in a direction at right angle to the first-mentioned movement. Finally, it is generally known to control the speed of a sewing machine by the operation of a knee-control lever.

Sewing machines equipped with these known devices still require at least two independent and separate operations which have to be controlled simultaneously, that is, the control of the afore-mentioned devices, on the one hand, and the starting and control of the operating speed, on the other hand. If operating errors and interruptions are to be avoided, this places an added burden on the skill and attention on the part of the operator and may result in an early fatigue, due to the fact that the controls must be effected against the action of return springs or the like devices.

Accordingly, a main object of the present invention is to generally overcome the above and related difficulties and to provide a unitary control device adapted to perform the multiple functions of starting and speed control, reversing the stitching direction as well as raising and lowering of the presser foot, substantially without requiring special skill and without causing fatigue and other undesirable defects.

Another object of the invention is the provision of a unitary control device in the form of a knee-control lever being constructed and connected with the operative parts of a sewing machine to perform the functions of starting and speed control of the machine, changing of the stitching direction from forward to reverse stitching and vice versa, and raising and lowering of the presser foot, in such a manner as not to detract from the operator's attention to the sewing operation proper.

The invention, as to its further objects and novel aspects, will be better understood from the following de-

2

tailed description of a preferred practical embodiment, taken in reference to the accompanying drawings forming part of this specification and wherein:

Fig. 1 is a perspective view of a sewing machine embodying a knee-control starting and speed control lever and electromagnetic control means according to the invention operatively associated therewith to actuate the presser foot and stitch control device of the machine;

Fig. 2 is an enlarged perspective view of the knee-control switch mechanism of Fig. 1 for effecting the multiple control functions according to the invention;

Fig. 3 is a wiring diagram of the electrical circuit of the system shown in the preceding figures;

Figs. 4-7 are schematic diagrams of the control and switching device in its various operating positions, viz. the rest position, Fig. 4, the position during operation and for forward stitching, Fig. 5, the position during reverse stitching, Fig. 6, and the position for raising the presser foot of the machine, Fig. 7.

Like reference numerals identify like parts throughout the different views of the drawings.

With the foregoing objects in view, the invention involves generally the provision of an electrical contact or switching device operated by the starting and speed control member of a sewing machine and serving, in turn, to control a pair of electrically responsive actuating devices for the operation of the presser foot and stitch control lever, respectively. More specifically, the construction and operation of the control device of the invention is such as to enable operation and speed control of the machine during either forward or reverse stitching, while the presser foot being normally yielding urged to lowered or work clamping position may be raised only by the starting lever in the non-operative or rest position of the machine.

According to a preferred embodiment of the invention, a conventional knee-control lever is arranged to be deflected about a pivot point within a predetermined plane in one direction, say in anti-clockwise direction, from a rest position in order to start the machine and to control the speed of the machine within a predetermined operating range, in a manner well known by those skilled in the art. In addition to its first deflecting movement, the knee lever may be further displaced or extended in its lengthwise direction, that is at right angle to said first movement, the second movement serving to actuate a switching rod or the like carrying a bridging contact arranged to cooperate with two pairs of switch contacts, one of said contact pairs being connected to energize a solenoid controlling the presser foot and the other contact pair connected to energize a solenoid controlling the stitch control lever of the machine. The end portion of the switch rod engaging or camming with the knee-controlled lever is so shaped as to result in a closing of the switch contacts controlling the stitch control solenoid such as to allow reversing of the stitching direction within the full range of operating speeds of the machine, while preventing a closing of the contact pair controlling the presser foot. In order to operate or raise the presser foot, it is necessary to return the knee-control lever to its rest position and to deflect or rotate same in the opposite or clockwise direction, whereby due to the design or shape of the switch rod camming with the knee lever, the contact pair controlling the presser foot solenoid will be closed and the presser foot raised against the action of a spring or the like normally yielding urging it to its lowered or work clamping position. Further details of both construction and operation of the control and switching device will become more apparent from the following description with reference to the drawings.

Referring more particularly to Fig. 1, the numeral 1 represents a tabletop supporting a conventional sewing

machine 2 being provided in a known manner with a stitch control lever 3 normally yieldingly urged to a position for forward stitching and which may additionally serve to control the length of the stitches, in a manner well known. There is further shown a conventional presser foot 4 connected to a presser foot bar 5. Secured to an extension of the stitch control shaft 6 is a one-arm lever 7 which is, in turn, connected through a pull rod 8 to the armature 9 of a stitch control electromagnet or solenoid 10. The presser foot bar 5, being normally yieldingly urged to its lowered or work clamping position by means of a spring or the like, has secured to it a slotted or lost-motion coupling member 11 engaging the end of one arm of a lever 12 mounted within the upper or overhanging arm of the machine, the opposite end of said lever being connected through a pull rod 13 to a one-arm lever 14 mounted below the table top 1. Lever 14 is, in turn, connected with the armature 15 of the presser foot electromagnet or solenoid 16. The magnets or solenoids 10 and 16 are mounted within a casing 17 connected to the frame of the table or other support of the machine.

The left end of the lever 12 normally engages the upper end of the slot in the member 11, that is, with the presser foot being urged to lowered or work clamping position, as shown in the drawing. If the lever 12 is rotated in clockwise direction by energization of the solenoid 16, the presser foot bar 5 and presser foot 4 are raised against the action of the spring or the like urging it to lowered position. Upon deenergization of the solenoid, return of the lever 12 to the position shown will then enable the spring to return the presser foot to its lowered position due to the lost-motion engagement of the lever with the slot in the member 11.

Further mounted below the table top 1 is an electric motor 18 which is in driving connection with the hand wheel 22 and main operating shaft of the machine through a shaft 19, a belt pulley 20 and a driving belt 21. The main control switch 23 and a casing 24 housing the rectifier 25, Fig. 3, are also mounted upon the frame of the table or other support of the sewing machine.

Fig. 3 shows the wiring diagram of an electrical control system according to the invention. Operating voltage is applied from the three-phase network 26 by way of the main control switch 23 to the stator winding 27 of the three-phase driving motor 18 whose rotor is connected to the driving pulley 20 through an electromagnetic coupling of any suitable type and comprising essentially a continuously driven disc or magnet 28, a stationary magnetic braking disc 29 and an intermediate coupling disc 30 axially displaceable in respect to said first discs. The driving and braking magnets and exciting windings are shown diagrammatically only in the drawing and may be constructed in any known manner, such as shown, for instance, in my co-pending patent application Serial No. 576,011, filed April 4, 1956, entitled, Electromagnetic Clutch for Sewing Machines and the Like. As a result, the driven or coupling disc 30 is subjected to the magnetic field of either the driving disc 28 or the braking disc 29 and is, in turn, connected by way of the shaft 19, pulley 20 and belt 21 with the sewing machine arm shaft, in the manner described and understood.

The magnet winding of the driving disc 28 may be energized by electric current in a known manner through a pair of slip rings and brushes 31 and 32, while the braking disc 29 is energized by way of a pair of stationary terminals 33 and 34. The current for both magnets 28 and 29 is supplied from a tap point 35 of one of the phase windings of the stator 27 and from the neutral or star point 36 through a pair of leads or conductors 37 and 38 and a rectifier 39 in the form of a dry or contact rectifier or of any other well-known type. More particularly, the lead 37 from the star point 36 is connected to the terminal 33 of the braking magnet 29 and from there to the terminal 31 of the driving magnet 28.

The cooperating terminal 32 of the driving magnet is connected by way of a conductor 40 to the stationary terminal 41 of a controller or speed control rheostat 42, while the lead 38 from the tap point 35 including the rectifier 39 is connected to the variable contact 43 of the rheostat 42. The latter is controlled or operated by means of a switch rod or the like 44 which carries a bridging contact 45 cooperating with a pair of fixed contacts 46, one of which is connected to the conductor or lead 38 and the other of which is connected by way of a conductor 47 to the remaining terminal 34 of the braking magnet 29.

Operating current for the electromagnets or solenoids 10 and 16 is directly supplied from one phase of the network 26 through a pair of conductors or leads 48 and 49 and a four-element or bridge rectifier 25 of known type having output leads 50 and 51. The output lead 50 of the rectifier 25 is directly connected to one terminal of each of the solenoids 10 and 16, while the output lead 51 is connected to the opposite terminals of the solenoids through a contact device collectively designated by the numeral 52. The contact device 52 comprises two pairs of stationary contacts 53 and 54 and a cooperating movable or bridging contact 55 arranged intermediate said stationary contacts. The output lead 51 of the rectifier 25 is connected to one contact of each of the pairs 53 and 54, while the remaining contacts are connected to the remaining terminals of the solenoids 10 and 16 through conductors 56 and 57, respectively.

The bridging contact 55 is freely movable or floating upon a switching rod or the like 58 and is subjected to the action of a pair of coil springs 59 and 60 encircling said rod, the force of the spring 59 exceeding the force of the spring 60. Spring 59 is arranged to engage a ring 61 secured or integral with the rod 58, on the one hand, and to engage the inside of the casing 62 of the device, on the other hand, while the spring 60 engages the bridging contact 55 abutting against the ring 60, on the one hand, and the opposite side of the casing 62, on the other hand. The casing 62 is mounted by means of screws or the like upon an insulating plate 64 which is, in turn, secured to the underside of the controller casing 65.

Mounted crosswise within the casing 62 of the contact device 52 is a shaft 66 to the ends of which is secured a two-arm control lever 67 whose arms are further connected through a cross rod or shaft 68. The cross rod 68 is in camming engagement with a roller 69 mounted upon the end of the switching rod 58. The free ends of the arms of the control lever 67 are provided with recesses 70 followed by suitable shaped curved end portions 71 the purpose and functions of which will be described presently.

The controller casing 65 is mounted upon a base plate 72 which is, in turn, secured to the underside of the table top 1 by means of screws or in any other suitable manner. Further secured to the base plate 72 by means of screws 73 is an angular member or bracket 74 to which is rotatably connected about a pivot screw 75 the flattened end 78 of the operating rod 76 of a knee-control lever 77. A corner 79 of the part 78 is bent at right angle to engage the end of and actuate the switching rod 44 of the controller 42.

Connected to or integral with the rod 76 is a ring 80 acting as abutment for one end of a compression spring 81 encircling the rod 76, the opposite end of the spring 81 engaging the end of a sleeve 82 placed over the rod 76. The sleeve 82 is secured to and guided by the rod 76 by means of a screw 83 engaging a key or slot 84 in the rod. The screw 83, together with a further screw 85, also serves to secure a fork-shaped actuating member 86 upon the sleeve 82, said member having its forked ends 87 engaging and cooperating with the ends of the control lever arms 67 of the switching device 52.

Secured to the lower end of the sleeve 82 is an arched

5

or bow-shaped member 88 adapted to receive the knee of the operator and provided with an extension or rod 98 fitting inside the sleeve 82 and secured thereto by means of a wing nut 90 engaging a tapped bore 91 of a boss 92 upon the sleeve 82.

The base plate 72 is secured by means of screws 93 to the underside of the table top 1 and is provided with two depending extensions 94 for securing a protective cover 95 by means of screws 96. An opening 97 of the cover 95 serves as a passageway for the knee lever 77 and a further opening 98 is provided for the insertion of the connecting wires.

The operation of the switching and control device according to the invention is described in the following.

If no pressure is applied to the knee lever 77, the latter will remain in a position as shown in Fig. 4, corresponding to the normal or rest position of the sewing machine. In this position, the contacts 46 are bridged by the contact 45 carried by the rod 44 of the controller 42. As a result of the closing of contacts 46 the braking magnet 29 is energized, whereby to attract and safely arrest the coupling disc 30. Furthermore, the bridging contact 55 of the switching device 52 is in a central position midway between the contact pairs 53 and 54, whereby to interrupt the circuits of the electromagnets or solenoids 10 and 16 controlling the stitch control and presser foot, respectively. As a result, the presser foot 4 due to the action of a return spring or the like is in its lowered or work clamping position and, likewise, the stitch control lever 3 also under the action of a control spring is urged into its position for forward stitching.

The central position of the contact 55 between the stationary contacts 53 and 54 is due to the fact that the ends 87 of the forked-shaped member 86 engage the curved portions 71 of the arms of the control lever 67, whereby the latter assumes an essentially horizontal position and the connecting rod 68 engages the roller 69 of the switch rod 58 against the action of the spring 59, thus maintaining the bridging contact 55 in a position midway between the fixed contact pairs 53 and 54. Furthermore, in this position, the end of the screw 83 engages the lower end of the key or groove 84 in the rod 76.

In order to operate the machine in the forward stitching direction, the knee lever 77 is rotated towards the right or in anti-clockwise direction, as indicated by the arrowhead in Fig. 5. As a result, the turned-up corner 79 of the rod 76 actuates the rod 44 of the controller 42 by displacing it towards the left and opening the contacts 46. This, in turn, de-energizes or interrupts the braking magnet 29. The motor is then started and the operating speed controlled by a greater or lesser deflection of the knee lever 77 and corresponding control of the rheostat 42, to suit any sewing requirements or conditions, in a manner well known and understood by those skilled in the art. During this forward stitching operation or control, the arms of the control lever 67 are maintained in a substantially horizontal position by virtue of the shape of the curved portions 71 of the ends of the control lever arms 76, that is, the bridging contact 45 is maintained in a position substantially midway between the contacts 53 and 54 throughout the entire range of operating speeds of the machine.

If it is desired to reverse the stitching direction, all that is necessary is to lift or apply a pressure in the direction of the knee lever 77, as indicated by the arrow, Fig. 6, whereby to displace the sleeve 88 in the lengthwise direction of the rod 76 against the action of the spring 81. As a result, the control lever 67 is deflected in anti-clockwise direction by the member 86. This, in turn, causes the cross rod 68 to move upwardly and to cam with the roller 69, whereby to displace the switching rod 58 towards the left against the action of the spring 59 and to close the contact pair 53. Accordingly, the solenoid 10 becomes energized and attracts its armature. This,

6

in turn, moves the stitch control lever 3 from the position for forward stitching of its reverse stitching position, in a manner readily understood from the foregoing.

Since the bridging contact 55 is movably mounted upon the rod 58, the speed control of the machine 2 during reverse stitching is not impaired or affected by the engagement of the contact 55 with the fixed contact pair 53, due to the fact that the spring 60 causes the contact 55 to be in continuous engagement with the contacts 53. In order to stop the machine, the knee lever 77 is simply returned to its rest position as shown in Fig. 4.

In order to raise the presser foot 4, the knee lever 77 is deflected towards the left from its rest position, Fig. 4, that is, in clockwise direction as shown and indicated by the arrow in Fig. 7. As a result, the ends 87 of the member 86 engage the recess 70 in the arms of the control lever 67, whereby to release the roller 69 from the rod 68, in such a manner that the spring 59 overcoming the force of the spring 60 causes the bridge contact 55 to engage the contact pair 54. As a result, the magnet 16 is energized, causing thereby the lifting of the presser foot in a manner readily understood from the foregoing. After the work has been properly arranged upon the cloth plate, the presser foot is again lowered by returning the knee lever 77 to its rest position, Fig. 4, whereupon the machine may be operated with either forward or reverse stitching in the manner described hereinabove.

In this manner, all the essential controls are carried out by the operation of a single knee-controlled lever, whereby to leave both hands of the operator free and enabling her to devote all the attention to the sewing operation proper, substantially without fatigue or other defects heretofore experienced in the operation of sewing and the like machines of this type.

There is thus provided by the invention a unitary control device comprising, in its preferred embodiment, a main control lever 76 rotatable by transverse pressure from a zero position in a first (anti-clockwise) direction to effect a control (operating speed, etc.) within a predetermined operating range. The same control lever is utilized to effect two additional controls by controlling a first electrical contact or switching device from any point within said predetermined operating range and controlling a second electrical contact or switching device by transverse pressure upon said lever from said zero position in the direction opposite to said first direction. To this end, the invention provides a common actuating element 58 resiliently urged to and operable in either direction from a normal position to control either of said switching devices and an auxiliary control lever 67 having a first portion 68 engaging and camming with said actuating element (through 69) and having a second portion 70-71 engaging and camming with a control element 86 relatively displaceable by longitudinal pressure upon said main control lever. The last mentioned camming portion of said control lever is so designed as to be effective (cam portion 70) to operate said control lever in one direction from any point within said predetermined operating range and to operate said control lever in the opposite direction upon rotation of said main operating lever by lateral pressure in a direction opposite (clockwise) to said first direction from said zero position.

In the foregoing the invention as been described with reference to a specific illustrative device. It will be evident, however, that variations and modifications, as well as the substitution of equivalent elements and devices for those shown herein for illustration, may be made without departing from the spirit and scope of the invention, as defined in the appended claims. The specification and drawings are accordingly to be regarded in an illustrative rather than in a limiting sense.

I claim:

1. In a sewing and the like machine having stitch control means to change from forward to reverse stitch-

ing, and vice versa, and a presser foot, first and second electrically controlled actuating means for said stitch control means and said presser foot, respectively, speed control means actuatable by movement from a zero position in a first direction within a predetermined range of operating speeds of said machine, first and second switch means to control said first and second actuating means, respectively, means to operate said first switch means by operating said speed control means from any position within said operating range in a direction different from said first direction, to thereby control the stitching direction, and means to operate said second switch means by said speed control means by operation from said zero position in a direction substantially opposite from said first direction, thereby to raise and lower said presser foot.

2. In a sewing or the like machine having speed control means, stitch direction control means and a presser foot, first and second electrically-actuatable operating means for said stitch direction control means and presser foot and first and second control circuits therefore, respectively, a unitary control member operable in substantially opposite first and second directions from a normal rest position, means to actuate said speed control means by operation of said member in said first direction within a predetermined speed operating range including zero speed of said machine, a switching device having first and second contact means connected in said first and second control circuit, respectively, a cooperating contact therefore, an actuating member for said cooperating contact, further means to operate said control member in a third direction substantially normal to said first and second directions, and cooperating cam and cam follower means upon said control and actuating members, respectively, being in resilient camming engagement with one another, to effect operative engagement of said first contact means with said cooperating contact by operation of said control member in said third direction from any position thereof within said speed operating range, to control the stitching direction, and to effect operative engagement of said second contact means with said cooperating contact by operation of said control member in said second direction from said rest position, to operate said presser foot.

3. In a sewing or the like machine having speed control means, stitch direction control means normally resiliently urged to a position for forward stitching and operable to a reverse stitching position, a presser foot normally resiliently urged to work-engaging position and operable to work-disengaging position, first and second electrically-actuatable operating means for said stitch direction control means and said presser foot and first and second electric control circuits, therefore, respectively, a unitary control member operable in a first and second substantially opposite direction from a normal rest position, means to actuate said speed control means by operation of said control member in said first direction within a predetermined speed operating range including zero speed of said machine, a switching device having first and second contact means connected in said first and second

control circuit, respectively, a cooperating contact therefore, further means to operate said control member in a third direction substantially normally to said first and second directions, a control lever for said switching device pivoted at one end and having a camming surface at its opposite end, a cam follower carried by said control member in resilient camming engagement with said surface, to cause said cooperating contact to engage said first contact means by operation of said control member in said third direction from any position thereof within said speed operating range, to reverse the stitching direction, and to cause said cooperating contact to engage said second contact means by operation of said control member in said second direction from said rest position, to raise said presser foot.

4. In a control system as claimed in claim 3, said control member being comprised of a pivoted knee-control lever having a knee-receiving loop at one end, said lever being deflectible in opposite directions from a rest position, to control the speed and presser foot, respectively, and a yieldingly mounted slidable member upon said lever carrying said loop and said cam follower.

5. In a sewing or the like machine having speed control means and first and second auxiliary control means, to control the operation of said machine, first and second electrically-actuatable operating means and first and second control circuits for said auxiliary control means, respectively, a unitary control member operable in substantially opposite first and second directions from a normal rest position, means to actuate said speed control means by operation of said member in said first direction within a predetermined speed operating range of said machine, switch means having first and second contact means connected in said first and second control circuits, respectively, a cooperating contact therefore, an actuating member for said cooperating contact, further means to operate said control member in a third direction substantially normal to said first and second directions, and cooperating cam and cam follower means upon said control and actuating members in resilient camming engagement with one another, to cause said first contact means to engage said cooperating contact by operation of said control member in said third direction from any position thereof within said speed operating range, to operate said first auxiliary control means, and to cause said second contact means to engage said cooperating contact by operation of said control member in said second direction from said rest position, to actuate said second auxiliary control means, respectively.

References Cited in the file of this patent

UNITED STATES PATENTS

2,722,184	Sweet	Nov. 1, 1955
2,759,444	Schwab et al.	Aug. 21, 1956

FOREIGN PATENTS

376,722	Great Britain	Jan. 9, 1931
---------	---------------	--------------