

June 18, 1935.

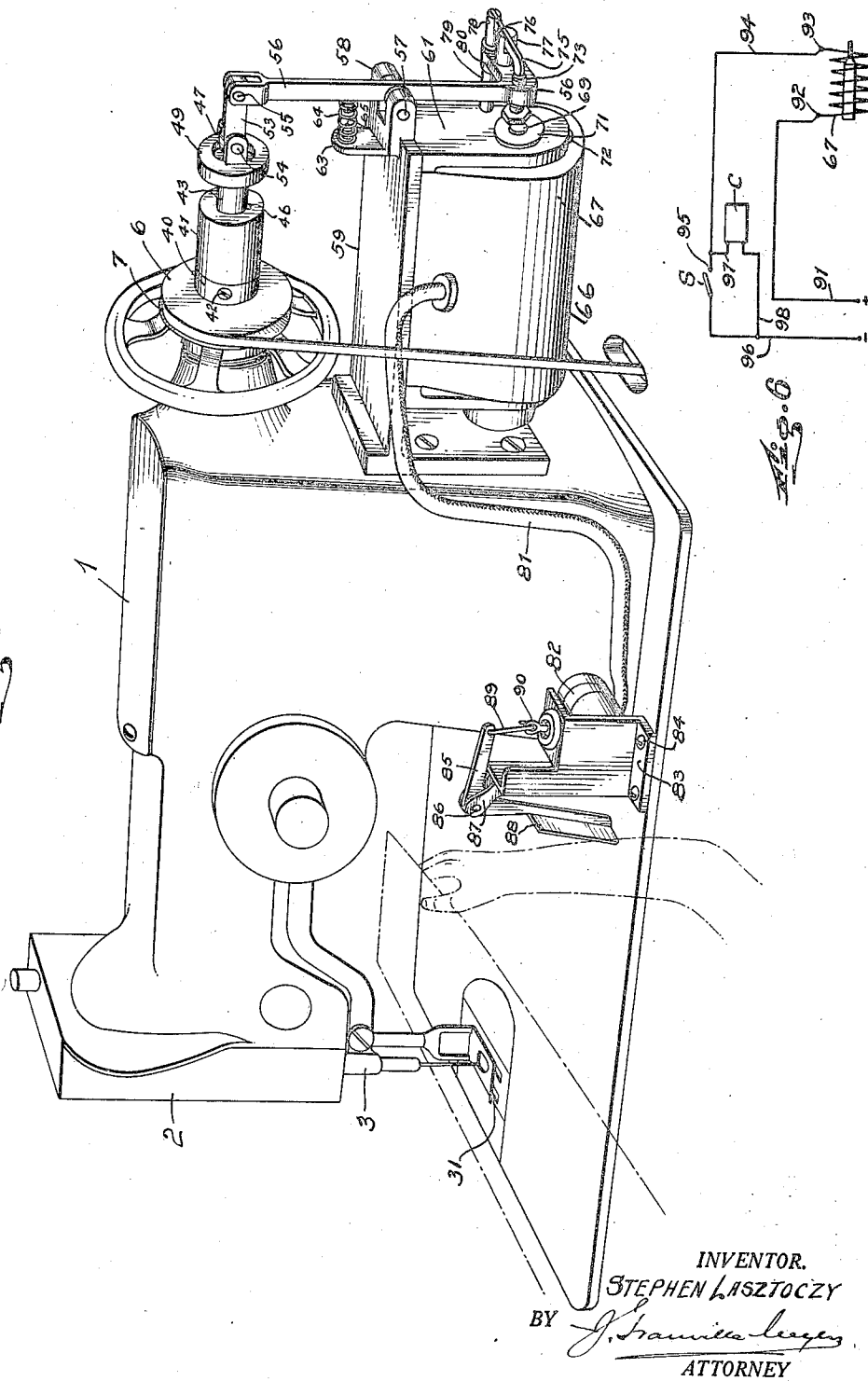
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FEED REVERSING MECHANISM FOR SEWING MACHINES

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2 Sheets-Sheet 1



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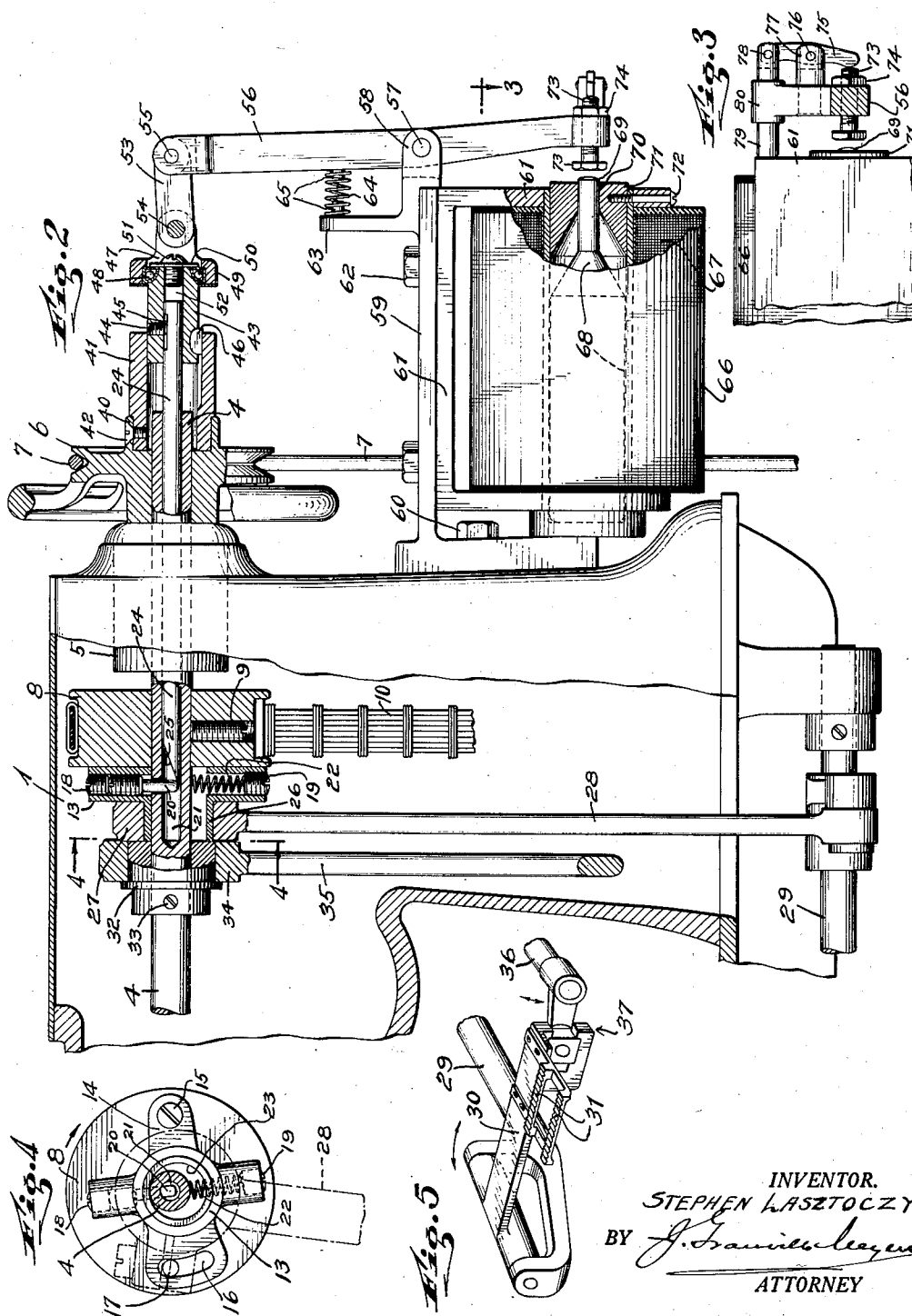
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UNITED STATES PATENT OFFICE

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FEED REVERSING MECHANISM FOR
SEWING MACHINES

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10 Claims. (Cl. 112—210)

My invention relates to sewing machines, and particularly to mechanism for reversing the feed and controlling the stitch.

Prior to my invention there had been proposed several different means for reversing the direction of operation of the feeding mechanism whereby the cloth could be fed in opposite directions so that it was unnecessary for the operator to turn the cloth around to stitch in different directions. There had also been proposed, several arrangements for controlling the length of the stitch, one such arrangement being disclosed in the United States Patent, No. 718,988, to W. F. Dial, et al., wherein a rod having a pointed or beveled end was inserted in the hollow drive shaft in such a manner that the pointed or beveled end would act on the eccentric block, which carries the rod for moving the feed dog, to shift the eccentric slightly to change the position of the feed dog and thus alter the length of the stitch.

All of the proposals and disclosures, of which I am aware, for effecting reversal of the direction of operation of the feeding mechanism or alteration of the length of the stitch, provide for manually operable mechanism either in the form of a foot operated treadle with a connection to a bell crank lever or the like, or a member operable by movement of the knee or other part of the operator's body to reverse the direction of stitching and to maintain the feeding mechanism in reversed position. That is, the apparatus was so designed that in one normal position the feeding mechanism would operate in a predetermined direction, but when the operating member for the reversing mechanism was moved to reverse the direction of feed, it was necessary for the operator to maintain the operating member by manual force in the reversed position either by holding the foot or knee or other part of the body against the treadle or other actuating part connected to the operating member throughout the stitching operation in the reversed direction.

One of the most important objects of my invention is the provision of means for reversing the direction of operation of the feeding mechanism by means which is also effective to maintain the mechanism in reversed operating position without the application of manual force, such mechanism being instantaneously effective to shift the feeding mechanism from one position to another while the machine is stitching, so that the operator is free to use both hands in guiding the cloth and does not have to be concerned with

holding the actuating member against the force tending to restore to normal direction of feed.

Another object of the invention is to provide actuating mechanism for effecting reverse operation of the feeding mechanism, which is compact, durable, and easily applied to machines of existing type, and which may be readily made as part of new machines without substantially altering the design and construction thereof.

Another object of the invention is to provide actuating mechanism for reversing the direction of operation of the feeding mechanism which can also be readily adjusted to alter the length of the stitch.

Still another object of the invention is to provide an operating member for said actuating mechanism which is quick acting and conveniently located to the operator, and to provide in connection therewith, quick acting power means so that the direction of feed may be instantaneously reversed, even though the machine may be operating at a very rapid rate, thus affording the production of a neat and tightly stitched product without knotting or applying several stitches at a single point.

Other objects and advantages of the invention will become apparent during the course of the following detailed description of the accompanying drawings, in which is shown a preferred embodiment of the invention, and in which

Fig. 1 is a perspective view of a sewing machine of the type disclosed in Patent No. 718,988, with my invention applied thereto;

Fig. 2 is a fragmentary longitudinal central vertical sectional view through the machine and the attachment embodying the invention shown in Fig. 1;

Fig. 3 is a detailed view taken on the line 3 of Fig. 2;

Fig. 4 is a view taken on the line 4—4 of Fig. 2;

Fig. 5 is a fragmentary perspective view of the cloth feeding member and actuating parts; and
Fig. 6 is a diagrammatic view showing the circuit controlling the actuating member.

Referring to the drawings, the numeral 1 indicates the casing of the sewing machine having the usual head 2 in which is mounted the needle-bar 3 for reciprocating action by usual mechanism, not shown, and forming no part of the invention. Such needle actuating mechanism is driven by the shaft 4 which is mounted through the casing and which is journaled through a block 5 at one end of the casing. The shaft is driven by the pulley 6 over which is trained the endless belt 7 leading to another pulley driven from any

suitable source of power or mechanism, not shown, but well known in the art. A pulley 8 is keyed on the shaft 4, as by means of the screw 9, and an endless belt 10 engages over said pulley and over a pulley, not shown, which actuates the usual shuttle, not shown, and forming no part of the invention.

As shown in Figs. 2 and 4, the pulley 8 serves as a convenient mounting for the adjustable feed eccentric 13, which has a projecting lug 14 through which and into the pulley 8 is tapped a screw 15 so that the feed eccentric may rotate on the screw 15 as a pivot, the eccentric being limited in such movement by the slot 16 and screw 17. The eccentric 13 is also provided with aligned openings to receive the screws 18 and 19 and on the end of the screw 18 there is a projection or abutment 20 extending into the bore 21 in shaft 4, while a spring 22 is compressed between the screw 19 and the shaft 4. The eccentric 13 is also provided with an enlarged central opening 23 through which shaft 4 extends, and the bore 21 of the shaft 4 receives a rod 24 having one end projecting beyond the end of the shaft and its inner end beveled as at 25 with the beveled face contacting the end of the projecting pin 20. The rod 24 will rotate with the shaft 4 and eccentric frame 13. The eccentric 13 has a hub 26 which receives the end 27 of the rod 28, the other end of the rod 28 being connected to the shaft 29, Fig. 5, to actuate the same and to give a backward and forward movement through the connection 30 to the feed dog 31.

Also mounted on the shaft 4 and abutting at one end the hub 26 and end 27 of the rod 28 is an ordinary eccentric 32 made fast on the shaft 4 by the screw 33 and this eccentric 32 receives the upper end of the eccentric rod 35, the lower end of which is connected to and actuates the shaft 36 which through a usual connection designated generally at 37 imparts an up and down motion to the feed dog 31.

The parts thus far described are substantially identical with the arrangement shown in Patent No. 718,988, except that the opening 23 in the eccentric is of greater extent so that the eccentric may be shifted a greater distance across the shaft 4 to shift the rod 28 and the shaft 29 a greater distance to place the feed dog 31 in opposite extreme positions from which it will operate to reverse the direction of feed. Obviously, if the rod 24 is pushed inwardly until the beveled face has completely or nearly completely passed across the lower end of the projection 20 the eccentric 13 will have been moved from the position shown in Fig. 2 upwardly until the lower side of the flange 26 is in contact or substantially in contact with the shaft 4, which is sufficient to reverse the position and operation of the feed dog 31. In said patent the eccentric is provided with an opening large enough to permit movement of the eccentric and parts carried thereby or associated therewith only sufficiently to alter the length of the stitch, and such adjustment can be made manually while the machine is not running, as the stitching most likely will be uniform throughout the complete sewing operation or a step in an operation. However, my invention aims to provide means for moving the eccentric 13 sufficiently to reverse the direction of feed as well as means for altering the length of the stitch, said second means being provided in conjunction with said first means, as will be presently explained. It will be understood by those familiar with the art that the machine operates at a

rapid rate and that unless the feed dog 31 is shifted instantaneously, there will be several stitches applied during the shifting.

Referring to Figs. 1 and 2 it will be noted that I connect to the flange 40 of the pulley 6 for rotation therewith, a tubular block 41 by means of the screw 42. This tubular block receives a tubular link 43 in which the end of the rod 24 terminates, the rod being keyed thereto by a screw 44 engaging in a recess 45 in the shaft 24, and the tubular link being secured to the block 41 for rotation therewith by key 46. Thus, it will be seen that the pulley 6, rod 4, shaft 24, block 41, and link 43 rotate as a unit although the shaft 24 may be shifted or moved axially of or within the shaft 4, when the link 43 is pressed inwardly or pulled outwardly. A coupling 47 is connected to the outer end of the link 43, and due to the fact that link 43 rotates with the shaft 24, I provide a race and ball bearings 48 in the annular end 49 of the coupling 47, to avoid friction between the parts as the links 43 rotates. The link 43 and coupling 47 are secured together by means of a washer 50 which abuts the race 48 and through which a screw 51 is tapped into the bore 52 of the link 43. Another link 53 is pivotally secured by the pin 54 to the coupling 47 and by the pin 55 to the upper end of the lever 56 which is pivoted intermediate its ends at 57 to lugs 58 on the supporting frame 59 which may be secured to the casing of the sewing machine by bolts 60. This supporting frame 59 is preferably located in the position shown and described and also supports a frame 61 which is secured thereto by bolts 62. The supporting frame 59 is also provided with a bracket 63 between which and the lever 55, and preferably between the pivots 55 and 57 is mounted a spring 64 to normally urge the upper end of the lever outwardly to maintain the rod 24 to the position shown in Fig. 2. The spring may be retained in position by means of pins 65 on the lever and bracket 63.

The frame 61 supports an electro-magnet or solenoid 66 including the coil 67 and movable core 68, the outer end 69 of which is mounted through an opening 70 in the block 71, said block being retained in position by means of the screws 72 extending through the lower end of the frame 61 and tapped into the block. The lower end of the lever 56 receives a screw 73 in alignment with the end of the projection 69, the screw being adjustable with respect to the end of the projection 69, and a nut 74 being provided on the screw for holding the same in adjusted positions. The outer end of the screw abuts one end of a small lever 75 which is pivoted at 76 to a stud 77 carried by or formed on the lower end of the lever 56, and the other end of the lever 75 is pivotally connected at 78 to a rod 79 which extends through a boss 80 also on the lower end of the lever 56. The inner end of the rod 79 abuts the support 61 and thus limits the movement of the lever. It should be obvious that when the screw 73 is turned to move its head away from the end of the projection 69 its outer end moves the lever 75 so that the rod 79 is moved through the boss 80 and support 61 so that the lever 56 is afforded less possible movement relative to the support 61 and the projection 69 is afforded an increase in possible extent of movement.

In order to energize the electro-magnet 66 to move the core 68 and projection 69, I provide the usual wires, not shown, and housed in a cable 81

and leading into the switch which may be of any quick make and break type, but preferably of the spring tumbler type indicated at 82. Such switches are so well known that it is deemed unnecessary in this application to disclose the structure. The switch should be mounted convenient to a part of the operator's body, such, for instance, as the foot, knee, or arm, and preferably the latter, as shown in Fig. 1, where the switch is secured to a support 83 which in turn is secured by screws 84 to the base of the machine and convenient to the position of the operator's right arm. The switch may be operated, to efficiently accomplish the purpose of the invention, by a bell crank lever 85 pivoted at 86 to lugs 87 on the support 83. The bell crank lever is shown as having an enlarged depending end 88 disposed at a point adjacent which the operator will naturally place her or his arm. The other end of the bell crank lever is connected by a link 89 to the switch operating extension 90.

In Fig. 6, the wiring diagram is illustrated, the same including a positive lead 91 connected to the coil 67 at 92, the coil being connected at 93 to a wire 94 leading to one contact 95 of the switch S, the other terminal of the switch being connected to the negative terminal 96. It is preferable to interpose in the circuit a condenser C which is connected by the wire 97 to the wire 94 and to the wire 96 by the wire 98 so that the condenser will absorb the rebound of the high tension current when the circuit is broken to prevent the switch from being burned out, it being understood that the switch operates very rapidly to make and break a circuit through the coil 67 when the bell crank 85, which is under spring tension of the switch mechanism, is depressed to move the member 90 to operate the switch.

In operation the cloth shown in dot and dash lines in Fig. 1, is positioned beneath the presser foot of the machine over the feed dog 31 in the usual manner, and assuming that the parts are in the position shown in Fig. 2 with the point of the tapered end 25 of the rod under the projection 20, the pulley 6 is caused to rotate so that the shaft 4 will drive the needlebar, and the belt 10 will operate the shuttle for the purposes specified. With the parts in the position shown in Fig. 2 the cloth will be fed away from the operator as the stitching is applied thereto by the needle. However, when it is desired to have the cloth fed back toward the operator, it is only necessary for the operator, by a quick movement of his or her arm, to push the end 88 of the bell crank 85 toward the support 83 so that the link 89 will pull the member 90 upwardly and establish a circuit described in connection with Fig. 6, at which time the electro-magnet will be energized and the projection 69 on the core 68 will be projected outwardly and engaging the head of the screw 73 will move the lower end of the lever outwardly and the upper end of the lever inwardly against the action of the spring 64 so that the rod 24 will be instantaneously shoved in so that the tapered face 25 will slide under the projection 20 and move the eccentric 13 and rod 28 upwardly, or across the shaft, to reverse the position of the feed dog 31. This reversed position will be maintained so long as the switch remains closed and the electro-magnet is energized. It will be noted that the movement of the lever 56 is an oscillating movement and that the upper end moves in an arcuate path, whereas the rod 24 is to slide in a straight line path. The

pivotal connections at 55 and 54, however, transmit the force of the lever in a straight line path, as will be obvious. When the cloth has been fed back toward the operator a sufficient distance and the stitching is to be reversed so that the cloth will be again fed away from the operator, it is only necessary to again, by a quick movement of the arm, shove the end 88 of the bell crank 85 toward the bracket 83 so that the member 90 will again be moved upwardly to open the switch and break the circuit described in Fig. 6, whereupon the spring 64 will return the lever to the position of Fig. 2 and the core 68 will be moved back in the magnet.

If it is desired to regulate or vary the length of the stitch, it is only necessary to operate the screw 73 in the manner heretofore described to move the lever 75 and rod 79 so that the position of the head of the screw will be changed with respect to the end of the plunger 69, it being apparent that the greater the length of the plunger disposed between the bracket 61 and the boss 80 the less movement the lever 56 can have.

The strength of the electro-magnet, of course, is proportioned to the strength of the spring 64 and the force of both are calculated on the basis of the force necessary to shift the eccentric 13, rod 24, rod 28, and feed dog 31, which depends on their size, weight, and other details of construction.

It should be apparent from the foregoing, that the invention broadly may be utilized to operate feeding mechanisms other than the exact construction and arrangement of feed reversing mechanism illustrated, as one of the principal features resides in the provision of the actuating mechanism which is also effective to maintain the parts in two different predetermined positions without the necessity of the operator applying, exerting or maintaining physical effort during the time that the parts are desirably located in either of such positions. The only physical effort required is that involved in moving the switch operating mechanism against the action of the switch and this can be accomplished by a quick movement of any part of the body convenient to the switch operating member.

What I claim is:

1. Apparatus for instantly reversing the feed mechanism of sewing machines while the machines are operating comprising a member operatively associated with said mechanism, a lever to move said member, means normally urging said lever in one direction of movement and adapted to hold said lever and member in a predetermined position establishing operation of said feed mechanism in a predetermined direction, electrically controlled means for moving said lever and member to establish operation of said mechanism in a reverse direction, and a manually operated switch for operating said electrically controlled means.
2. Feed reversing mechanism for sewing machines having a cloth feeding member, a drive shaft, an adjustable eccentric on said shaft, and mechanism connecting said cloth feeding member and eccentric, comprising a rod movable axially of said shaft, cooperating means on said rod and eccentric for moving the eccentric, a lever, means connecting said rod and lever, means normally urging said lever in one direction to move and hold said lever and rod in a predetermined position, electrically actuated means engageable with said lever to move said lever in the reverse direction and to maintain said lever and rod in another predetermined position, a manu-

ally controlled switch for energizing and deenergizing said electrically actuated means, and means located conveniently to the operator for operating said switch to effect change in direction of operation of said cloth feeding member while the machine is operating.

3. Apparatus for instantly reversing the feed mechanism of sewing machines while in operation comprising a member operatively associated with said mechanism, a lever operatively associated with said member, means normally urging said lever in one direction of movement and adapted to hold said lever and member in a predetermined position without application of manual force to establish operation of said feed mechanism in one direction, and electrically controlled means for moving said lever in reverse direction to another predetermined position to move said member and feed mechanism to a reverse feeding position, said second means being effective to maintain said lever in said second position against the action of said first means without application of manual force.

4. In a sewing machine including a drive shaft, a driving wheel connected to said shaft, an adjustable eccentric mounted on said shaft, cloth feeding mechanism including a horizontally movable feed dog, a connection between said eccentric and said mechanism for moving said feed dog, a rod mounted in said drive shaft for longitudinal movement therein and projecting through and beyond said driving wheel, said rod having a beveled face and said eccentric having an internal abutment for contact by said beveled face to shift said eccentric when said rod is moved in said shaft to move said feed dog, the combination of a lever mounted at an angle to said rod and having one end adjacent the projecting end thereof to move said rod, electrically actuated means for engaging the other end of said lever for moving the same in one direction and maintaining it in a predetermined position, means normally urging the lever to a position opposite to that established by said electrically actuated means, a switch for energizing and deenergizing said electrically actuated means, and a connection between said rod and lever permitting rotation of the rod.

5. Feed reversing means for a sewing machine having a drive shaft, a feed controlling eccentric mounted on said shaft, a rod extending into said shaft, means on said eccentric and rod for shifting the position of the eccentric sufficiently to reverse the feed when the rod is moved, a pivoted lever, a connection between said lever and rod, an electro-magnet adapted to move said lever to move said rod relative to said eccentric, a switch for establishing a circuit through said electro-magnet, and an operating member for said switch located convenient to the operator of the machine.

6. The structure of claim 5 wherein the lever is pivoted intermediate its ends and a spring is mounted between said pivot and the connection between the lever and the rod and the electro-magnet is mounted on the other side of said pivot.

7. Feed reversing mechanism for sewing machines having a cloth feeding member, a drive shaft, an adjustable eccentric on said shaft, a rod slidably mounted in said drive shaft, said rod having a tapered end adjacent the eccentric, an abutment on the eccentric engageable with

said tapered end of the rod whereby the eccentric may be shifted by movement of the rod, said rod and shaft being rotatable as a unit, non-rotatable means for moving said rod relative to said eccentric and abutment, a connection between said rod and means permitting rotation of the rod and shaft, electrically controlled means for actuating said non-rotatable means, and means convenient to the operator for operating said electrically controlled means.

8. Actuating mechanism for reversing the feed mechanism of a sewing machine, comprising a support secured to the machine, an electro-magnet carried by said support having a movable core, a lever pivoted to said support, an abutment on said lever engageable by the core of the electro-magnet to move said lever, means normally urging said abutment toward said core, said abutment being adjustable with respect to the core, a second lever carried by said first lever and having one end engageable by said abutment, and a stop carried by said second lever and movable with respect to said first lever by the movement of said abutment and said second lever to regulate the amount of movement of the first lever.

9. In combination with a sewing machine having a rotatable drive shaft and means for rotating the same, feed reversing mechanism comprising an adjustable eccentric mounted on the shaft, a horizontally movable feed dog, a connection between said eccentric and feed dog for moving said feed dog, a rod extending into said shaft and projecting beyond an end of said shaft, said rod having a beveled face and said eccentric having an internal abutment for contact by said beveled face to shift said eccentric, means connecting said rod with the means for rotating the shaft whereby the shaft and rod may rotate as a unit, said connection permitting sliding movement of the rod within the shaft to move said eccentric, a lever, and a coupling connecting said lever and rod to accord shifting movement of the rod relative to the shaft by said lever and also permitting rotation of the rod relative to the lever.

10. In combination with a sewing machine having a rotatable drive shaft and means for rotating the same, feed reversing mechanism comprising an adjustable eccentric mounted on the shaft, a horizontally movable feed dog, a connection between said eccentric and feed dog for moving said feed dog, a rod extending into said shaft and projecting beyond an end of said shaft, said rod having a beveled face and said eccentric having an internal abutment for contact by said beveled face to shift said eccentric, means connecting said rod with the means for rotating the shaft whereby the shaft and rod may rotate as a unit, said connection permitting sliding movement of the rod within the shaft to move said eccentric, a lever, and a coupling connecting said lever and rod to afford shifting movement of the rod relative to the shaft by said lever and also permitting rotation of the rod relative to the lever, and means normally holding said lever, coupling and rod in a predetermined position establishing movement of the feed dog in a predetermined direction and permitting shifting movement of the lever, coupling and rod to change the direction of movement of the feed dog.

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