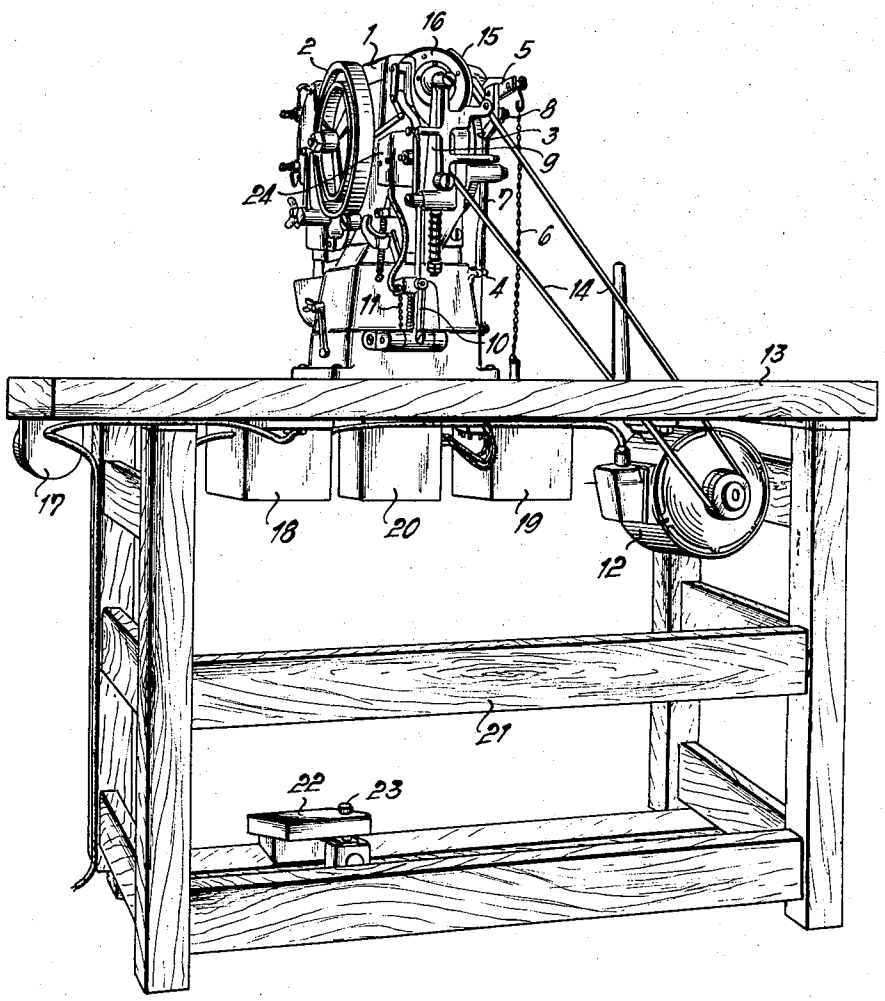
Sept. 29, 1959 K. WINZ 2,906,221

TIME DELAYED SWITCHING DEVICE FOR SEWING AND THE LIKE MACHINES

Filed June 27, 1957 2 Sheets-Sheet 1

FIG. 1



INVENTOR

Karl WINZ

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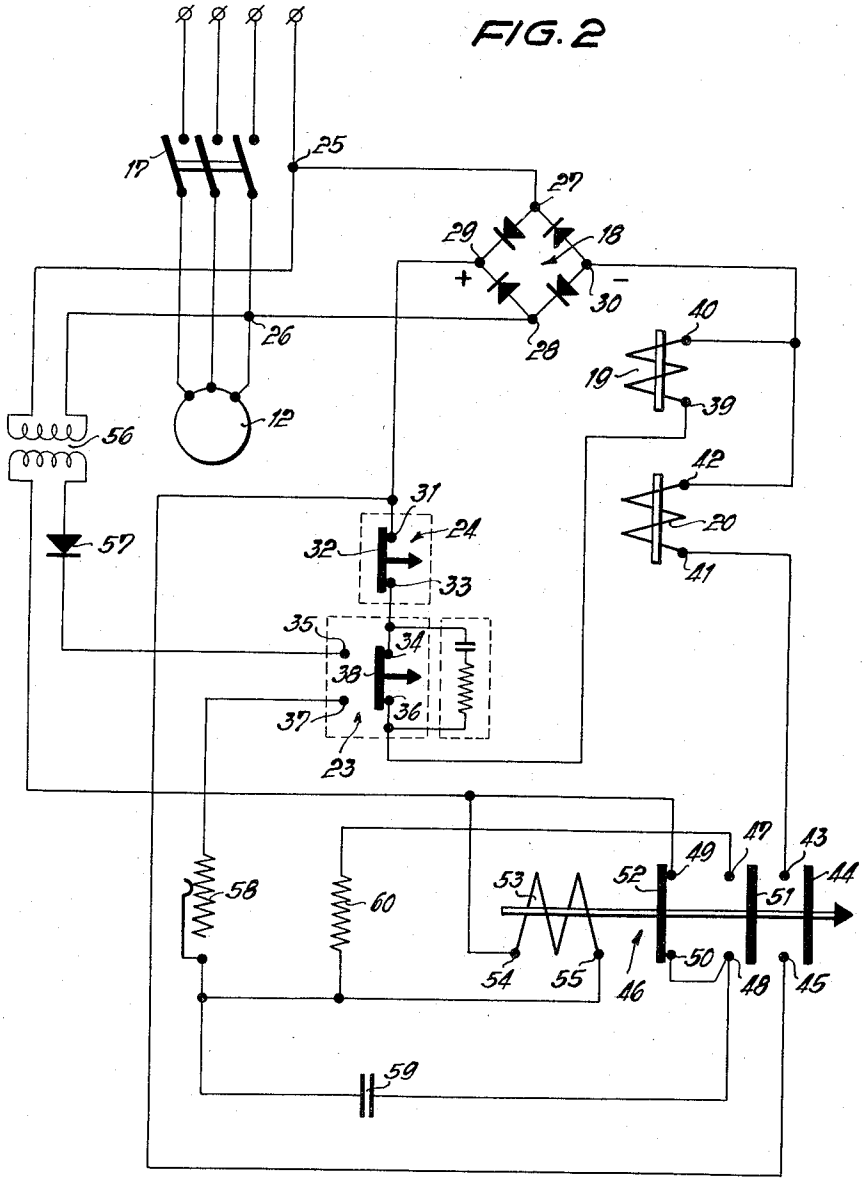
FIG. 2



INVENTOR
Karl WINZ

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2,906,221

TIME DELAYED SWITCHING 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 June 27, 1957, Serial No. 668,376

Claims priority, application Germany June 30, 1956

6 Claims. (Cl. 112—219)

The invention relates to sewing machines, more particularly to control arrangements for sewing machines of the kind in which a predetermined cycle of operation is controlled by control levers which are biased by retraction springs. Sewing machines of this type include, for instance, lockstitch bar tackers, button sewing machines and button hole sewing machines.

This application is a continuation-in-part of my copending application Ser. No. 515,491, filed June 14, 1955, now abandoned.

Sewing machines of the foregoing type, as stated, are provided with a plurality of control levers, the number of these levers corresponding to the number of switching operations needed in the course of one operation cycle. An electromagnet is assigned to each control lever and all the electromagnets are controlled from a single switch or switching device that is manipulated by the operator. The control switch has a series of switching positions the number of which corresponds to the number of the electromagnets under control. These features are disclosed in my previously mentioned copending application Ser. No. 515,491.

It is the principal object of the instant invention to improve the switching arrangement, particularly to assure the proper sequence of the switching actions within the cycle, in order to avoid that any succeeding switching step is carried out before the preceding switching step has been completed.

Generally speaking, this object is accomplished by means of time delay switching. By this arrangement, the electromagnet for only the first switching step is energized directly, while the subsequent switching steps are carried out indirectly by means of a time delay switching device.

In accordance with a preferred embodiment, a switching device of this type includes a time delay relay assigned to each electromagnet and being included in the electric circuit thereof. The time delay for each of these relays is preferably brought about by means of a condenser and a resistor connected in the circuit of the relay, while the charging circuit as well as the discharge circuit for the condsenser may be connected to additional terminals of the relay.

For a fuller understanding of the nature and objects of the invention, reference should be had to the following detailed description, taken in connection with the accompanying drawings, in which:

Figure 1 is a perspective view of a lockstitch bar tacker machine embodying switching apparatus in accordance with the invention; and

Figure 2 is a wiring diagram of the control apparatus of Figure 1.

In carrying the invention into effect in one of the embodiments which has been selected for illustration in the accompanying drawings and for description in this specification, and referring now particularly to Figure 1, there is provided a sewing machine, for instance a lockstitch bar tacker machine 1. The machine 1 has a cam 2 for the cyclic actuation of the presser or clamp foot (not shown), and of the feed plate (not shown). The machine 1 has a further cam disc 3 for the operation of a lever 4 which forms part of a thread severing device. A lever 5 is provided with a chain 6 and serves for lifting the clamp foot against the action of a return spring (not shown).

A lever 7 transmits motion from the control disc 3 to the lever 4 of the thread severing device, said lever being connected at its upper end to the lever 5 by means of a lug 8, so that when the lever 5 is operated by the chain 6 to lift the clamp foot, the thread severing device will be operated simultaneously therewith.

The curvature of the cam disc 3 is such that the actuation of the severing device and the lifting of the clamp foot will be prevented during the sewing portion of the cycle. There is further provided a guide lever 9 which is actuated by means of a lever 10 and a chain 11.

The machine 1 is driven by an electric motor 12 which is mounted upon the underside of the work table 13. The motor 12 is continuously running and an endless belt 14 is passed around the motor pulley and an idler pulley (not shown) of the machine 1. The belt 14 may be shifted between the idler pulley and an active pulley 16 of the machine 1 by means of a fork 15 that is secured to the guide lever 9. When the belt 14 is moved to the active pulley 16, the machine 1 will be set in motion.

A switch 17 is provided to connect the motor 12 and the entire switching device to a network, for instance a polyphase network designated R–S–T–O (Fig. 2). The switching device comprises a rectifier 18 (Figs. 1, 2) in order to feed direct current to the device. The rectifier 18 may be mounted in a box upon the underside of the work table 13, for instance alongside the electromagnets 19 and 20 (which are connected to the chains 6 and 11, respectively).

On the supporting frame 21 of the work table 13 there is mounted a treadle 22 which includes a foot switch 23. Furthermore, there is provided a safety switch 24 which is disposed within the path of tilting of the guide lever 9.

Two terminals 25 and 26 of the supply circuit for the motor 12 are connected to terminals 27 and 28 of the rectifier 18, in order to convert the alternating current fed to the motor 12 into direct current to be supplied to the switching device. A terminal 29 of the rectifier 18 constitutes the "plus" terminal for the circuit of the switching device and a second terminal 30 of the rectifier 18 constitutes the corresponding "minus" terminal. The plus terminal 29 is connected to a terminal 31 of the safety switch 24, a second terminal 33 of the safety switch 24 being connected to a terminal 34 of the foot switch 23. The safety switch 24 has a movable contact 32 that will bridge the terminals 31 and 33 when the machine 1 is at standstill. The foot switch 23 includes a terminal 36 that is disposed opposite the terminal 34 and forms therewith a first pair of terminals. Spaced from that first pair of terminals, the foot switch 23 includes a second pair of terminals 35 and 37. A contact 38 is movable between a normal or rest position (Fig. 2), in which it bridges the terminals 34 and 36 and into which normal position it is urged by a biasing spring (not shown), and a second operative position wherein it bridges the terminals 35 and 37. Operation, by the foot of the operator, of the foot switch 23 will move the contact 38 against the action of the biasing spring from the normal position shown into the operative position to bridge the terminals 35 and 37.

The electromagnet 19 (Figs. 1, 2) has a first terminal 39 that is connected to the terminal 36 of the foot switch

23 and a second terminal 40 that is connected to the "minus" terminal 30 of the rectifier 18. The coil of the electromagnet 19 extends between the terminals 39 and 40 thereof. The electromagnet 19 serves the purpose of operating the chain 6.

The electromagnet 20 has a coil which extends between two terminals 41 and 42. The termianl 41 of the electromagnet 20 is connected to a terminal 43 of a relay 46. The relay 46 has a terminal 45 which is disposed opposite the terminal 43 and forms therewith a first pair of relay terminals. The terminal 45 is connected to the "plus" terminal 29 of the rectifier 18. The terminals 43 and 45 of the relay 46 may be bridged by a contact 44 of the relay, when the relay 46 is energized. The second contact 42 of the electromagnet 20 is connected to the "minus" terminal 30 of the rectifier 18. The electromagnet 20 serves to actuate the chain 11.

The relay 46 has additional pairs of terminals, namely a pair of terminals 47 and 48, and a pair of terminals 49 and 50. A contact 51 of the relay 46 cooperates with the terminals 47 and 48, and a contact 52 cooperates with the terminals 49 and 50.

When the relay 46 is de-energized (Fig. 2), the contact 52 will bridge the terminals 49 and 50, but the contacts 44 and 51 will be separated from the terminals 43 and 45, and 47 and 48, respectively.

The relay has an energizing coil 53 that extends between two terminals 54 and 55. The relay coil 53 is supplied with low voltage current by means of the following arrangement. From the terminals 25 and 26 of the supply circuit for the motor 12 current is applied to the primary winding of a transformer 56. From the secondary winding of the transformer 56 one lead is connected, by way of a rectifier 57, to the terminal 35 of the foot switch 23, while the cooperating lead connects the secondary winding of the transformer 56 to the terminal 54 of the relay coil 53. The terminal 37 of the foot switch 23, which is opposite to the terminal 35 thereof, is connected by means of a variable resistor 58 to the other terminal 55 of the relay coil 53. When the foot switch 23 is operated, the contact 38 thereof will be moved to the operative position and will bridge the terminals 35 and 37, thereby applying a voltage to the relay coil 53 and energizing the relay 46.

A condenser 59 being connected in the secondary circuit of the transformer 56 in parallel to the relay coil 53, has one terminal connected to the variable resistor 58 and has its other terminal connected to the terminal 48 of the relay 46.

The condenser 59 cooperates with the variable resistor 58 to impart to the relay 46 a time delay in the relay response. Furthermore, there is provided a discharge resistor 60 for the condenser 59. The discharge resistor 60 has one end connected to one side of the condenser 59 and has its opposite end connected to the terminal 47, so that when the relay 46 is energized, the contact 51 will bridge the terminals 47 and 48, whereby the resistor 60 will be applied across the condenser 59.

The operation is as follows.

The motor 12 as well as the entire device will be energized by closure of the switch 17. The electromagnet 19 will be energized by way of the contacts 32 and 38 of the safety switch 24 and of the foot switch 23, respectively, which complete the connection between the "plus" terminal 29 and the terminal 39 of the electromagnet 19. As the terminal 40 of the coil of the electromagnet is connected to the "minus" terminal 30 of the rectifier 18, the electromagnet 19 will now be energized and will operate the chain 6, whereby the lever 5 will raise the clamp foot (not shown) of the machine 1. The machine 1 is now ready for operation, and the sewing material can be fed thereto.

If now the operator actuates the foot switch 23, the terminals 34 and 36 will be disconnected from each other, thereby to interrupt the current supply for the electromagnet 19 and to lower the clamp foot by its biasing spring (not shown) on the material to be worked on.

Operation of the foot switch 23 further causes bridging by the contact 38 of the terminals 35 and 37, thereby exciting the relay coil 53 and actuating the relay 46. The relay 46, however, will not respond immediately due to the time delay of the condenser 59 and resistor 58.

This time delay affords the possibility to raise again the clamp foot in the event that a wrong stitching position has been found to exist by opening the foot switch 23, whereby the current supplied to the relay coil 53 will be interrupted and the circuit for the electromagnet 19 be re-established to raise the clamp foot. There is furthermore avoided by the delayed-action response of the relay 46 the possibility that the machine may be started by a quick or sudden depression of the foot switch before the clamp foot has had sufficient time to be lowered upon the work by the action of the biasing spring.

When the relay 46 finally responds after bridging of the terminals 35 and 37, the contact 44 of the relay 46 will complete the circuit between the terminals 33 and 45 for the electromagnet 20 to actuate the lever 10 of the machine 1. The lever 10 will raise the guide lever 9 which in turn will shift the belt 14 from the idler pulley to the active pulley 16 to start the machine 1.

With the raising of the guide lever 9, the contact 32 of the safety switch 24 will be moved off the terminals 31 and 33, thereby interrupting the circuit for the electromagnet 19. By this arrangement there is precluded the possibility that the electromagnet 19 be energized after the foot switch 23 has been released. If the electromagnet 19 under such conditions were to be re-energized, a pressure would be exerted on the lever 5, the lug 8, the lever 7, and the control disc 3, which would lead to a rapid deterioration of these parts. Furthermore, the power requirement of the motor 12 would be increased.

Upon the response of the relay 46, the contact 52 will be disengaged from the terminals 49 and 50 and the contact 51 will bridge their terminals 47 and 48, thereby to connect the condenser 59 across the resistor 60 so that the condenser 59 will be discharged to be ready for the next cycle.

Upon the termination of the automatic sewing portion of the cycle, the machine 1 will be automatically stopped. At the same time, the contact 32 of the safety switch 24 will be closed so that the electromagnet 19 will be energized to raise the clamp foot and to actuate the thread severing device by means of the lug 8 and the lever 7. The machine 1 will then be ready for the next cycle.

By the preceding release of the foot switch 23, the coil 53 will be de-energized, whereby to return the contacts 44, 51 and 52 into the normal or rest position (shown in Fig. 2).

I wish it to be understood that I do not desire to be limited to the exact details of construction shown and described, for obvious modifications will occur to a person skilled in the art.

Having thus described the invention, what I claim as new and desire to be secured by Letters Patent, is as follows:

1. In a sewing machine of the type having a starting member, first electrically operable actuating means having an exciting circuit to operate said starting member from rest to operative position of said machine upon energization of said first actuating means, a work clamping device normally being urged to work engaging position, and second electrically operable actuating means having an exciting circuit to operate said clamping device to work disengaging position during energization of said second actuating means; in combination, a control system comprising a control switch having first stationary contact means to control said second exciting cir-

cuit, a movable contact normally urged into engagement with said first contact means to energize said second exciting circuit and to disengage said clamping device, second stationary contact means of said control switch to control said first exciting circuit, said movable contact being operable into engagement with said second contact means, to interrupt said second exciting circuit and to cause said clamping device to return to work engaging position while closing said first exciting circuit to start said machine, and electrical time delay means operatively associated with said first exciting circuit, to prevent starting of said machine until after operation of said clamping device to final work engaging position.

2. In a control system as claimed in claim 1, including a relay having a winding controlled by said second stationary contact means and controlling said first exciting circuit, said last-mentioned means being comprised of a capacitor connected in parallel and a resistor connected in series with said control winding.

3. In a control system as claimed in claim 1, said first and second actuating means being comprised of a pair of electromagnets controlled by said first and second circuits, respectively, a relay having a winding controlled by said second stationary contact means and controlling said first exciting winding, said last-mentioned means being comprised of a capacitor connected in parallel and a resistor connected in series with said winding.

4. In a group-stitch sewing machine of the type having a starting member and automatic stop-motion means, to effect stoppage of the machine upon sewing of a predetermined number of stitches, after starting of the machine by said starting member, first electrically operable actuating means having an exciting circuit to operate said starting member from rest to operative position of said machine upon energization of said first actuating means, a work clamping foot normally being urged to work engaging position, second electrically operable actuating means having an exciting circuit, to raise said clamping foot to work disengaging position during energization of said second actuating means; in combination, a control system comprising a control switch having first stationary contact means to control said second exciting circuit, a movable contact being urged into engagement with said first contact means, to energize said second exciting circuit and to disengage said clamping foot, second stationary contact means of said control switch to control said first exciting circuit, said movable contact being operable into engagement with said second contact means, to energize said first exciting circuit and to start said machine while interrupting said second exciting circuit and causing said clamping foot to return to work engaging position, electrical time delay means operatively associated with said first exciting circuit, to prevent starting of said machine until after operation of said clamping foot to final work engaging position, and further switch means controlled by said machine to interrupt said first exciting circuit during the operation of said machine.

5. In a control system as claimed in claim 4, including a relay having a winding controlled by said second stationary contact means and controlling said first exciting circuit, said last-mentioned means being comprised of a condenser connected in parallel and a resistor connected in series with said winding.

6. In a system of the character described comprising a first operating member, first electrically operable actuating means having an exciting circuit to operate said member to operative position upon energization of said actuating means, a second operating member normally urged to operative position, second electrically operable actuating means having an exciting circuit to operate said second member to inoperative position during energization of said second actuating means, a control switch having first stationary contact means to control said second exciting circuit, a movable contact normally urged into engagement with said first contact means, to energize said second exciting circuit and to operate said second member to inoperative position, second stationary contact means of said control switch to control said first exciting circuit, said movable contact being operable into engagement with said second contact means, to interrupt said second exciting circuit and to return said second member to operative position, while closing said first exciting circuit to operate said first member to operative position, and electric time delay means operatively associated with said first exciting circuit, to prevent operation of said first member until after return of said second member to its final operative position, whereby to sequentially operate said second and first members from inoperative to operative position upon operation of said movable contact into engagement with said second stationary contact means.

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