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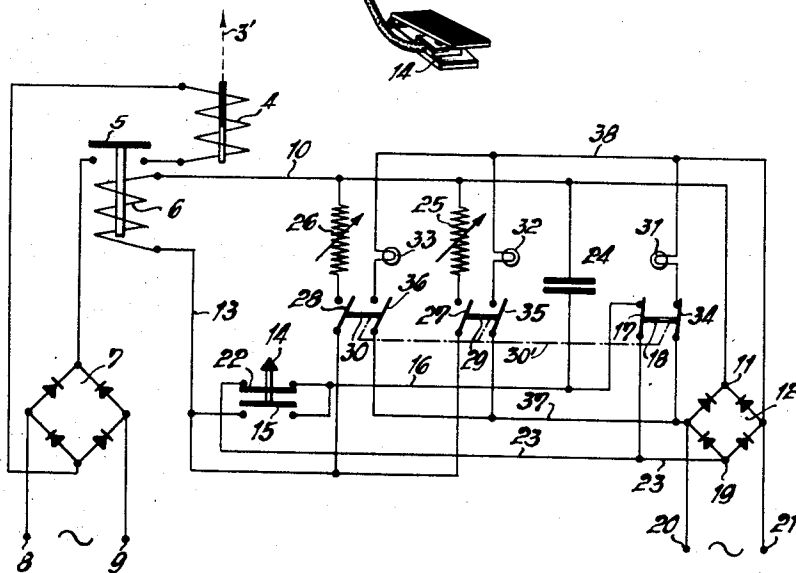
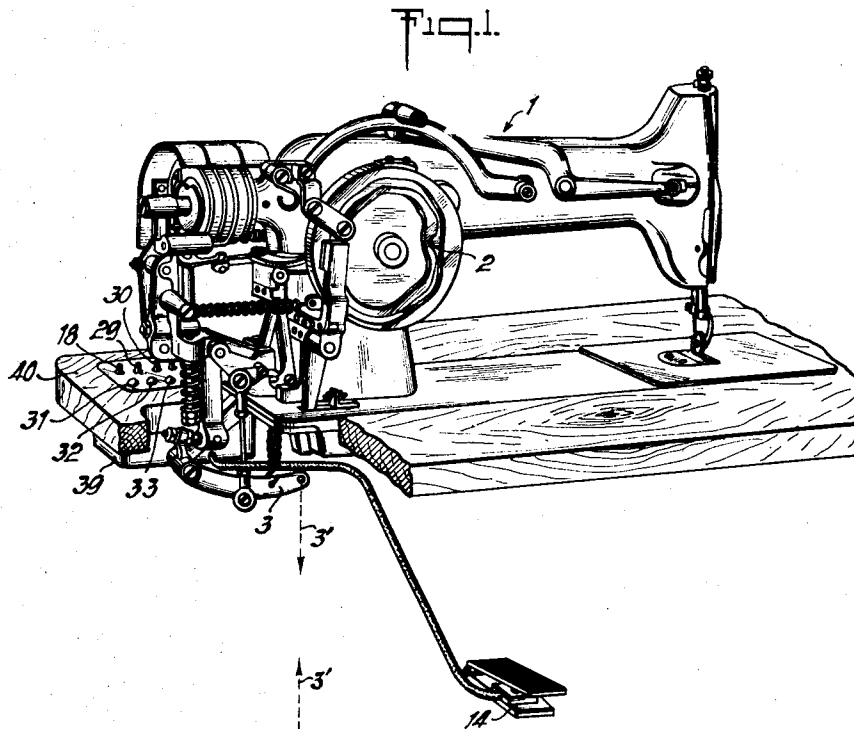
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2,919,666

CONTROL SYSTEM FOR GROUP STITCH SEWING MACHINES

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2 Sheets-Sheet 1



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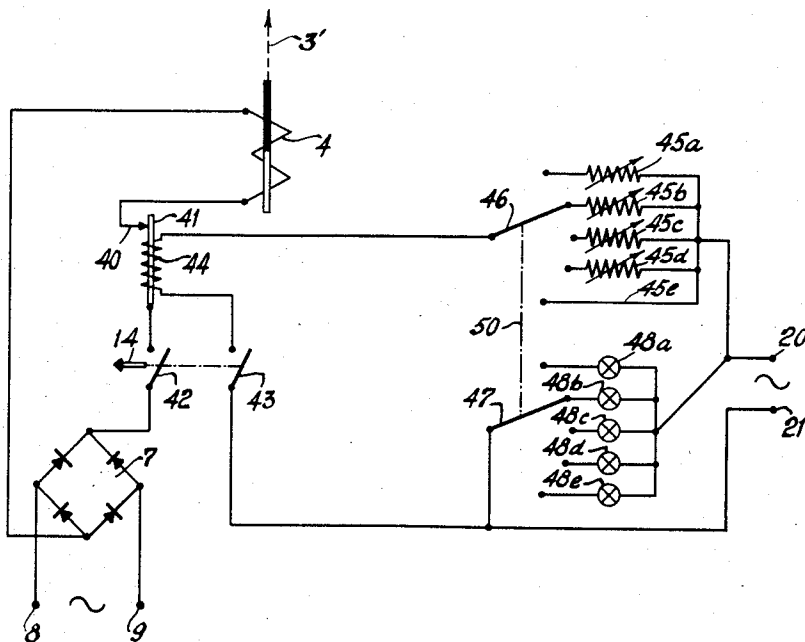
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Fig. 3.



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CONTROL SYSTEM FOR GROUP STITCH SEWING MACHINES

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4 Claims. (Cl. 112—67)

The present invention relates to an electrical control system for group-stitch sewing machines, more particularly, of the type embodying means, such as a cam or control disk, to automatically stop the machine upon completion of a group or predetermined number of stitching operations. Machines of this type operate in a known manner by automatically starting and stopping the stitch forming mechanism, to effect a consecutive series of operating or sewing cycles, as long as a main starting lever or the like is maintained in the closed or operative position.

In the case of many operations performed by means of group stitch sewing machines of this type, varying numbers of consecutive stitching groups are required at the discretion of and under the control by the operator. As an example, it may be desirable to produce a seam the length of which is divided into a plurality of spaced elemental or partial seams each consisting of a group or predetermined number of straight stitches produced during the successive operating cycles of a group stitch sewing machine. Alternatively, it may be desirable or required to produce a plurality of zig-zag stitch groups or patterns in connection with a button hole sewing machine operation well known to those skilled in the art. In all these and similar cases, the machine, after initial starting by the operator by the operation of a suitable starting member from its non-operative to its operative position, is automatically stopped by the control cam or the like at the completion of a desired number of stitching groups or cycles, upon release of said starting member by the operator.

In other words, depressing or otherwise maintaining the starting member in its operative position during a desired time period enables the operator to control the number of automatic consecutive groups of stitching operations of the machine, in such a manner as to produce a desired length or seam comprising a predetermined number of elemental seams or to produce a desired number of zig-zag stitches or groups.

In an operation of this type, if the stitching cycles or lengths of the elemental seams are relatively short, that is, if the individual stitching groups comprise only a small number of stitches and/or if the machine is operated at a high speed, extreme concentration and reaction are required on the part of the operator to release the starting lever or the like at the proper instant in order to insure a close control of the number of group stitching cycles or operations. As a result, skilled labor is required for the operation of known machines of this type, quite aside from the fact that a considerable part of the operator's attention is detracted thereby from the sewing operation proper.

Accordingly, an object of the present invention is the provision of an automatic selective control system for use in connection with group stitch sewing machines by which the foregoing and related difficulties are substantially overcome.

A more specific object of the invention is the provision

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in connection with a group stitch sewing machine of simple and effective means for automatically producing a desired number of consecutive stitching cycles positively and securely, upon initially starting the machine, substantially without requiring any further attention on the part of the operator.

Another object of the invention is to render the number of preselected stitching cycles or consecutive stitching groups substantially independent of the human factor.

A further object of the invention is the provision of novel selecting and control means to enable the sewing of a desired number of stitch groups each comprising a relatively small number of individual stitches.

Yet another object of the invention is the provision of an effective and reliable control system of this type to enable the sewing of a desired number of stitching groups, substantially independently of the operating speed of the machine.

Still another object of the invention is the provision of an automatic control system of the type referred to which is both simple in construction as well as efficient and reliable in operation, while requiring no special skill and experience for its operation.

The invention, both as to its further objects and novel aspects, will be better understood from the following detailed description taken in reference to the accompanying drawing, forming part of this specification and wherein:

Fig. 1 is a perspective view of a conventional group stitch sewing machine embodying improved means to control the number of group stitch operations in accordance with the principles of the invention;

Fig. 2 is an electrical wiring diagram of a preferred type of control system constructed in accordance with the principles of the invention; and

Fig. 3 is a further wiring diagram illustrating an alternative control system for carrying into effect the invention.

Like reference numerals denote like parts in the different views of the drawings.

With the foregoing objects in view, the invention involves generally the provision of electrical delayed-action or timing means being selectively adjustable and rendered effective or set into operation upon starting of the machine by the operator, such as by operation of the starting lever or the like from its non-operative to its operative position. The timing means, such as a delayed-action relay, capacitor discharge circuit, bi-metallic heating element etc., after lapse of a predetermined and previously selected or set time period, serves to automatically disconnect the starting lever or the like, thereby to stop the machine. Since the delay time of the delayed-action or timing device is a constant determined by the electrical parameters of the device and/or the associated circuitry, the number of sewing cycles is also a constant and predetermined by the setting of the delay time, in a manner more clearly described and understood from the following. In other words, all that the operator has to do, upon preselecting the number of stitch groups or operating cycles and starting of the machine, is to wait until the machine is automatically stopped after completion of the selected number of stitching operations or cycles. Release of the starting lever or the like then places the machine in a condition for renewed operation with the same or a different number of stitch groups or sewing cycles, as may be desired.

Referring more particularly to Figs. 1 and 2 of the drawings, the numeral 1 represents a conventional group-stitch sewing machine provided in a known manner with a control cam or the like 2 to effect a series of consecutive operating or stitching cycles, say once during each revolution or each half of a revolution, by alternately

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coupling and decoupling the stitch forming tools or mechanism, as long as the machine is maintained in its operative condition upon closing of the starting lever 3 by the aid of the pull rod 3' or the like operating member, in a manner well known and understood by those skilled in the art.

In the example shown, the machine is started by pulling down the rod 3' and stopped by release of said rod, in a manner readily understood. Upon stopping of the machine by release of the lever 3, it will continue to operate until completing the last group of stitches, whereupon it will be finally automatically stopped by the group stitching mechanism controlled by the cam or control disk 2.

According to the present invention, the machine is started and stopped by electrical control means, such an electromagnetic coupling or a starting magnet or solenoid 4, Fig. 2, having a plunger or armature connected to the pull rod 3' or the like operating member of the starting lever 3. The solenoid 4, in the example shown, is energized by a rectifier 7 connected to an A.C. power supply, such as a house lighting network or the like, indicated by terminal posts 8 and 9 in the drawing. Connected in series with the solenoid winding 4 and the source or rectifier 7 is the normally open contact 5 of a control relay 6, the latter being provided with suitable delayed-action means, in accordance with present invention to be described presently.

For the latter purpose, the winding 6 of the control relay, in the example illustrated, is connected to one of the output terminals 11 of a further rectifier power supply 12 through a conductor or lead 10, on the one hand, and to the opposite terminal 19 of the rectifier 12 through a lead 13, the normally open contact 15 of a foot control switch 14 or the like (see also Fig. 1), a lead 16 and the closed contact 17 of a selector switch 18, on the other hand, in the position of the system shown in the drawing. Furthermore, in the position shown, the contact 17 is by-passed or short-circuited by way of the lead 16, the normally closed contact 22 of the foot switch 14 and a further lead or conductor 23. Connected between the conductors 10 and 16 is a storage capacitor 24 and connected between the conductors 10 and 13 are a plurality of control resistors, two such resistors 25 and 26 being shown in the drawing and each having connected in series therewith the contacts 27 and 28 of a pair of further selector switches 29 and 30, respectively.

The additional contacts 34, 35 and 36 of the selector switches 18, 29 and 30 serve to connect indicator or pilot lamps 31, 32 or 33 directly to the power supply source 20, 21 which may be the same as the source 8, 9, whereby to indicate to the operator which of the switches is in the closed or selected position. The switches 18, 29 and 30 are furthermore so constructed, such as by the provision of suitable connecting or coupling means indicated by the dot-dash line 30', whereby only one of the switches may be in the closed position at a time as shown for the switch 18 in the drawing. Such multiple switching devices are well known in the art and used, for instance, extensively for manual push-button tuning purposes in radio and television sets.

The control devices, with the exception of the foot switch 14 and the solenoid 4 may be housed in a casing 39 mounted in the front part of the base plate or table top of the machine, as shown in Fig. 1.

The operation of the control device shown in Figs. 1 and 2 will now be described. The position shown in the drawing corresponds to the rest position of the foot switch 14 and closing of the selector switch 18 for effecting a single stitch group or manual control of the number of stitch groups, as will be understood. This operating condition is indicated by the pilot lamp 31. As a result, in the position shown, the capacitor 24 is charged by the source or rectifier 12 through lead 23, the closed contact 22 of the foot switch 14 and lead 16. At

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the same time, the capacitor is connected to the source 12 by way of the contact 17 of switch 18, while the pilot lamp 31 is lit by its connection to the power source 20, 21 through the switch contact 34.

Upon depressing the foot switch 14, to start a sewing cycle, contact 22 is opened, while the capacitor 24 remains connected to the voltage source 12 by way of the closed contact 17 of the selector switch 18. At the same time, contact 15 of the foot switch is closed, whereby to energize the control relay 6 directly by the source 12 through the leads 10, 13 and 16. This, in turn, causes a closing of the relay contact 5 and energization of the solenoid winding 4, resulting in starting of the sewing machine. The machine continues to operate by automatically effecting consecutive group stitching cycles as long as the foot switch is held in the depressed position. When the foot switch is released, the machine continues to complete the last operating cycle, whereupon it is automatically stopped by the group stitch control mechanism associated with control cam or disk 2. If only a single stitching group is desired, the foot switch is depressed briefly and released instantly, to prevent the initiation of a second group of stitches.

In order to effect a predetermined number of stitching groups, one of the remaining selector switches, say the switch 29, is closed prior to the starting of the operation of the machine, whereby to automatically open the switch 18 in the manner described hereinbefore. As a result, pilot lamp 32 is lit, while the capacitor 24 is now connected to the voltage source solely through the lead 23 contact 22 of the foot switch 14 and lead 16, that is, without the by-pass or short-circuit by the switch contact 17 in the closed or operative connection of the switch 18.

As a result, if now the foot switch 14 is depressed to start the machine, the capacitor 14 is disconnected from the voltage source 12 and discharged upon the relay winding 6, to initiate the starting of the machine, in substantially the same manner as described hereinbefore. The relay 6 remains energized until the capacitor has been discharged sufficiently, whereupon the relay armature or contact 5 is released and the starting lever 3 operated from its operative to its non-operative or rest position.

In order to control the discharge time of the capacitor and, in turn, the delayed-action period of the relay 6, the resistor 25 connected in parallel to the capacitor by the switch contact 27 is suitably adjusted to result in an electric time constant of the discharge circuit of a desired value. Substantially the same operation occurs upon closing the selector switch 30 whose associated discharge resistor 26 is so adjusted as to result in a different time constant or delay time and a corresponding number of stitching groups or operating cycles of the machine.

The resistors 25 and 26 are advantageously variable, to enable an adjustment of the delay time or number of stitching groups, respectively, to adapt the machine to existing conditions and operating requirements. Any desired additional number of selector switches and associated discharge resistors may be provided connected in the same manner to the capacitor 24 and relay winding 6 as shown, to enable the sewing of any desired number of stitching groups by closing of the respective switch, in a manner readily understood from the foregoing.

Referring to Fig. 3, there is shown an alternative system according to the invention utilizing a bi-metallic heating element as a delayed-action or timing device, to control the disconnection of the machine after completion of a preselected number of stitching groups or operating cycles. There is shown, for this purpose, a bi-metallic heating element 41 constituting a movable switch member cooperating with a fixed switch contact 40, to form a bi-metallic switch being connected in series with the solenoid winding 4 and rectifier or equivalent voltage source 7. Element 41 is normally urged to closed position with the contact 40, such as by constructing it with

sufficient inherent resiliency or by means of a separate spring or biasing source, as will be readily understood.

Further included in the circuit of the bi-metallic element 41 is a switch contact 42 forming part of the foot switch 14, the latter having a further contact 43 operated synchronously with the contact 42 and being connected in the heater circuit of the bi-metallic element 41. The heater circuit includes the heater winding 44 overlying or wound upon the element 41, one of the selectively connectible adjustable series resistors 45a-45e and a suitable A.C. power source 20, 21. Resistors 45a-45e may be connected by means of a multiple switch having a common switch arm 46 which is coupled for uni-control, as indicated at 50, with the arm 47 of a further multiple switch for the connection directly to the power source 20-21 of a corresponding number of pilot or indicator lamps, one being coordinated to each of the resistors 45a-45e, respectively, to indicate the respective delayed-action time of the bi-metallic switch and corresponding number of group stitch operating cycles.

In operation, as the foot switch 14 is closed, the solenoid 4 becomes energized, thus starting the operation of the sewing machine as a result of the normally closed bi-metallic switch contacts 40 and 41 and closing of the foot switch contact 42. At the same time, the heating circuit of the bi-metallic element is closed by the closing of the foot switch contact 43, thus gradually raising the temperature of and causing the bi-metallic element to be deflected away from the stationary contact 40. The heating cycle or rate of heating is determined by the value of the respective resistors 45a-45e previously selected by control of the selector switches 46, 47, 50. After the bi-metallic element has been sufficiently heated or deflected, contact 40 will become open which will result in a disconnection of the solenoid winding 4 and operation of the starting lever 3 to its non-operative or rest position, in a manner readily understood from the foregoing.

Again, by the proper choice of resistors 45a-45e, one of which, such as 45e as shown in the drawing, may be a practical short-circuit to obtain a minimum delayed-action or operating time, any number of stitching groups or operating cycles may be preselected and controlled fully automatically, in substantially the same manner as described with reference to Fig. 2.

In the foregoing the invention has 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 parts or elements for those shown and disclosed herein for illustration, may be made without departing from the broader scope and spirit of the invention as set forth in the appended claims. The specification and drawings are accordingly to be regarded in an illustrative rather than in a restrictive sense.

I claim:

1. In combination with a group stitch sewing machine of the type having starting means and stop-motion means to automatically arrest said machine after sewing a group comprising a predetermined number of stitches, upon initial starting by said starting means; a control system to effect a predetermined selectable number of consecutive group-stitching operations comprising electrical actuating means controlling said starting means, a relay controlling said actuating means, a starting switch, an electrical capacitor, a source of direct current voltage to charge said capacitor to a predetermined potential in the rest position of said switch, means to discharge said capacitor through said relay upon operation of said switch from its rest to its operative position, a plurality of electrical resistors, selector switch means comprising a plurality of switch elements to selectively connect said resistors to said capacitor and said relay, whereby to control the capacitor discharge time and, in turn, the response time of said

relay, to thereby control the number of stitching groups sewn by said machine, said selector switch means including a further switch element for directly connecting said source to said relay in the operative position of said starting switch.

2. In combination with a group stitch sewing machine of the type having starting means and stop-motion means to automatically arrest said machine after sewing a group comprising a predetermined number of stitches, upon starting by said starting means; a control system to effect a predetermined selectable number of consecutive group-stitching operations comprising electrical actuating means controlling said starting means, a relay controlling said actuating means, a starting switch, electrical capacitor means, a source of direct current voltage to charge said capacitor means to a predetermined potential in the rest position of said switch, resistance means, means to discharge said capacitor means through said relay and said resistance means upon operation of said switch from its rest to its operative position, said capacitor and resistance means forming an electric timing circuit controlling the capacitor discharge time and, in turn, the response time of said relay, and means including multiple selector switch means comprising a plurality of switch elements to selectively control the time constant of said circuit in predetermined steps, to thereby control the number of stitching groups sewn by said machine, said multiple switch means including an auxiliary switch element for directly connecting said source to said relay in the operative position of said starting switch.

3. In combination with a group-stitch sewing machine of the type having starting means and stop-motion means, to automatically arrest said machine after effecting a group comprising a predetermined number of stitches, upon initial starting by said starting means; a control system to effect predetermined selectable numbers of consecutive group-stitching operations comprising an electromagnet controlling said starting means, a relay controlling said electromagnet, a starting switch, an electrical capacitor, a source of direct current voltage to charge said capacitor to a predetermined potential in the rest position of said starting switch, means to discharge said capacitor through said relay upon operation of said starting switch from its rest to its operative position, a plurality of resistors, selector switch means comprising a plurality of switch elements to selectively connect said resistors in parallel to said capacitor and said relay, whereby to vary the capacitor discharge time and, in turn, the response time of said relay, to thereby control the number of group stitching operations of said machine, said selector switch means including a further switch element for directly connecting said source to said relay in the operative position of said starting switch.

4. A control system as claimed in claim 1, including auxiliary switch elements associated with and controlled in synchronism with each of said first switch elements, and individual indicating means controlled by said further switch elements, to indicate the number of stitching groups effected by said machine.

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