

Oct. 27, 1936.

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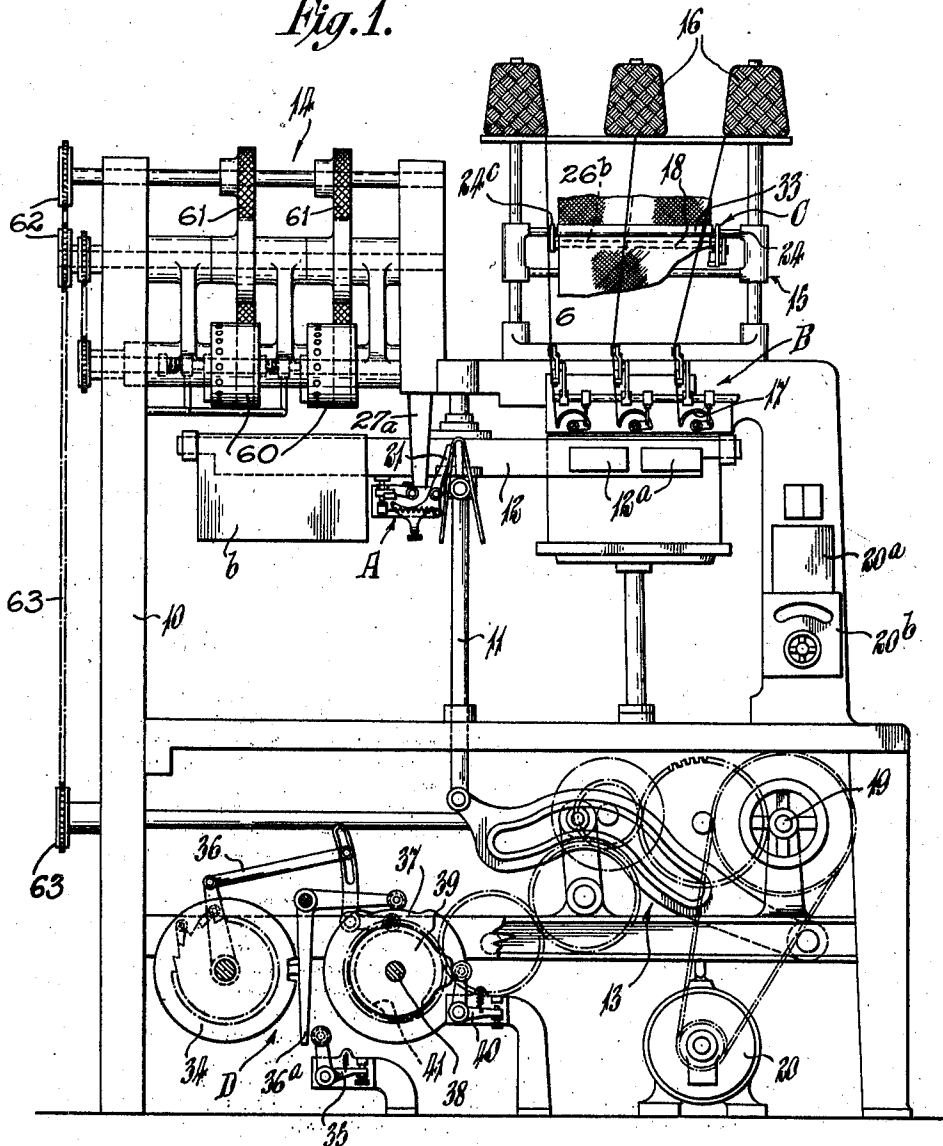
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CONTROLLING DEVICE FOR AUTOMATIC STITCHING MACHINES

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4 Sheets-Sheet 1

Fig. 1.



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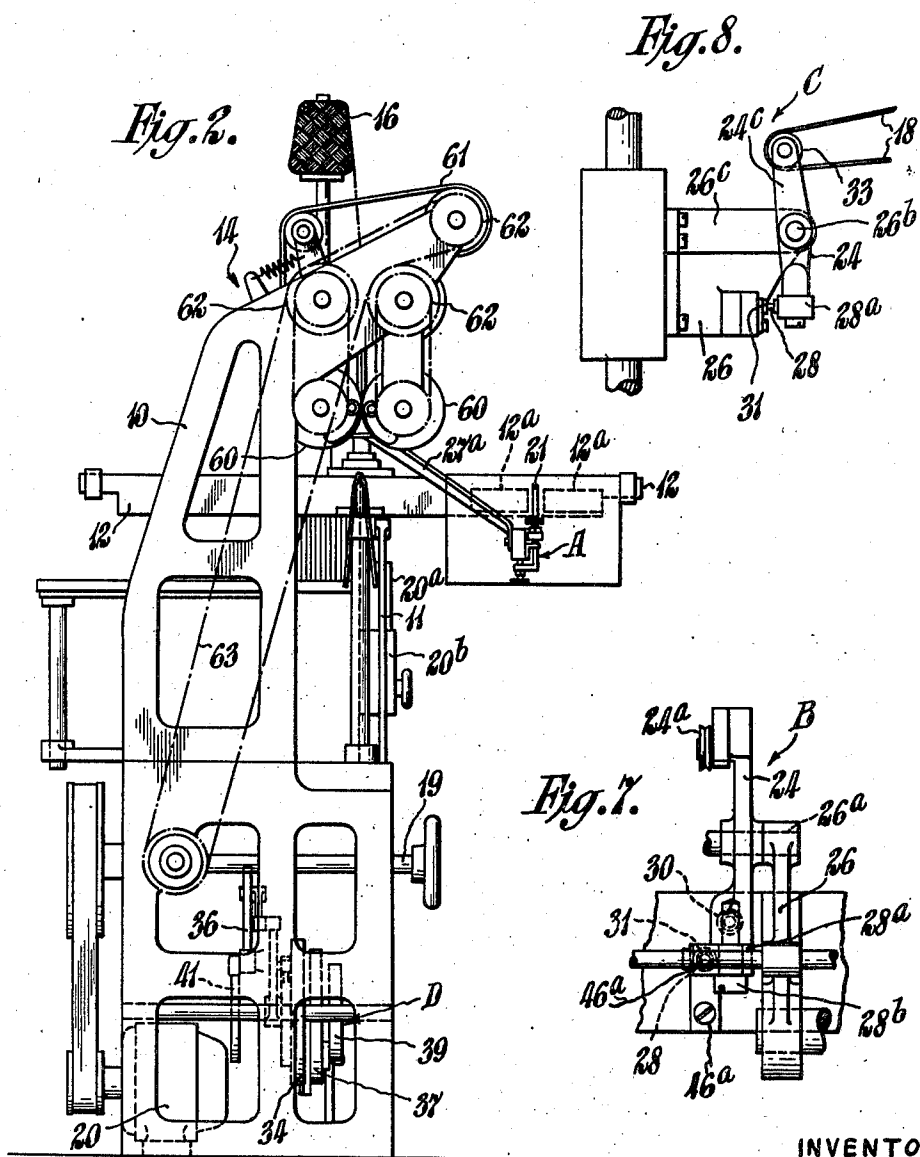
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4 Sheets-Sheet 2



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4 Sheets-Sheet 3

Fig. 3

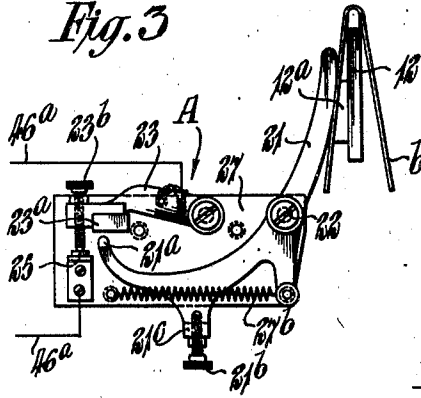


Fig. 4

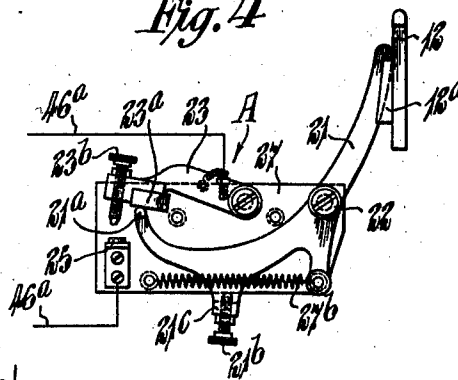


Fig. 5

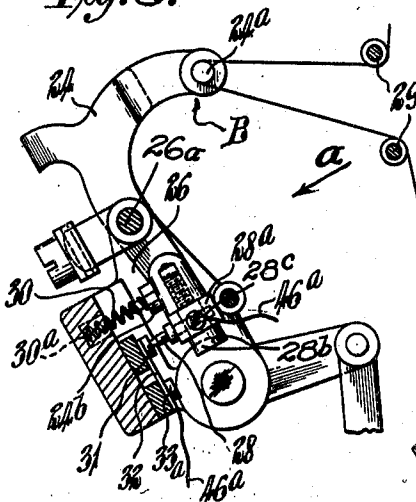
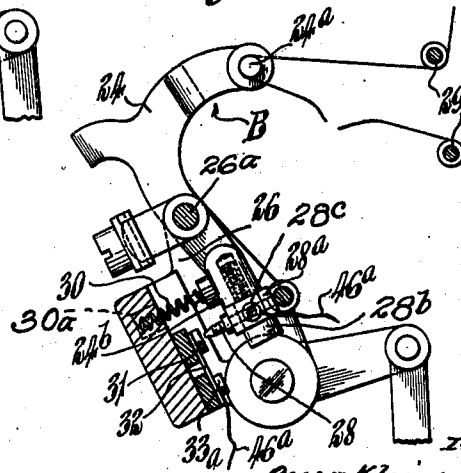


Fig. 6



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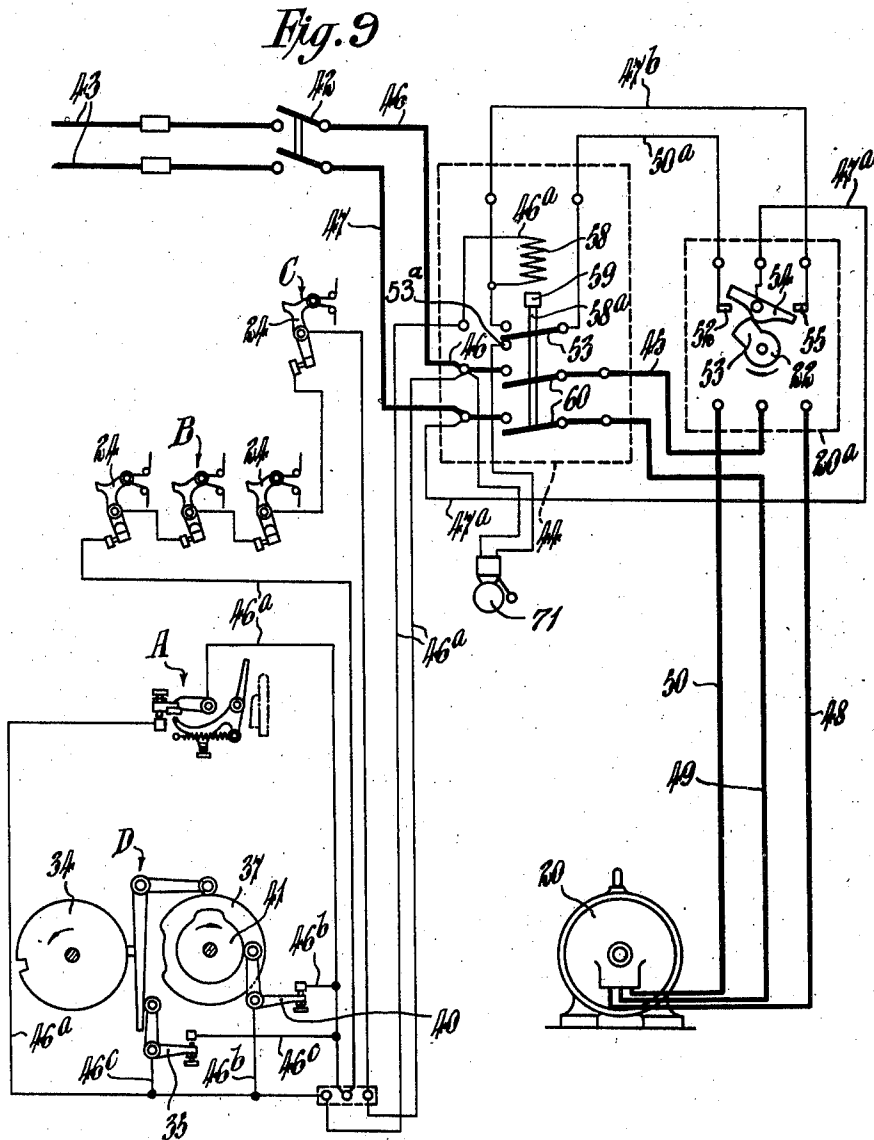
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CONTROLLING DEVICE FOR AUTOMATIC STITCHING MACHINES

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4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

2,058,995

CONTROLLING DEVICE FOR AUTOMATIC
STITCHING MACHINES

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In Germany February 23, 1931

26 Claims. (Cl. 112-21)

In book-stitching machines at present in use the sheets usually are fed into the machine by hand. During this operation the attendant must watch the machine with a view to stopping it by means of a treadle promptly on the breakage of a thread or on the exhaustion of the supply of thread or backing tape or gauze or if the sheet is not accurately registered or in the event of any other disturbance in the operation of the machine.

When use is to be made of an automatic feeder for the sheets it is desirable if permanent personal attendance of the automatic machine is to be avoided, to effect the stoppage of the machine automatically and render it possible to effect this control from every point where disturbances are apt to occur.

According to this invention, in book-stitching machines with automatic sheet feed, means are provided for arresting the operation of the machine on the occurrence of a breakage of thread, faulty sheet supply or like fault, comprising a fault detecting device adapted, on the occurrence of a fault, to close or open an electrical circuit whereby the machine is rendered inoperative or a signal given to an attendant.

To this end a useful form of an automatic control embodying the present invention involves the basic idea that wherever in the machine correct working is apt to become disturbed by some irregularity use is made at the particular point of a detector of any desired type which, during the correct working of the machine, is maintained in some definite inoperative position or suspension and on the occurrence of irregular working at that point is caused to assume a different position thereby, for example, energizing or de-energizing a relay, the armature of which is caused in known manner to stop the whole machine or the feed mechanism or in some suitable way actuate a signal calling for immediate attention. The form of the detectors or the manner of their functioning depends entirely on the mechanism affected by the interruption and may, of course, differ in the thread supply from that, say, in the sheet supply from the pile to the stitcher support or to the stitching point.

A book-stitching machine embodying this invention will now be described by way of example and in reference to the accompanying drawings in which:

Fig. 1 is an elevational view of a rotary arm stitching machine having incorporated therein fault detecting devices according to this invention.

Fig. 2 is a side elevation of the machine shown in Fig. 1.

Figs. 3 and 4 are detail views drawn to a larger scale showing the fault detecting device associated with the sheet carrier.

Figs. 5 and 6 are detail views drawn to a larger scale showing the spring loaded fault detecting device associated with the thread supply and/or backing gauze supply.

Fig. 7 is a front view of Fig. 5 looking in the direction of the arrow *a*.

Fig. 8 is a fragmentary side view of the fault-detecting device associated with the backing gauze supply, and

Fig. 9 is an electrical circuit diagram showing the operative arrangement and interconnections of the various fault detecting and control devices of the machine.

Referring to Figs. 1 and 2, the machine comprises a main frame 10 in which is journaled a vertical spindle 11 adapted to support horizontal radially extending arms 12 each of which is provided with a saddle-shaped sheet carrier.

The arms, which are vertically reciprocated and rotated in known manner by the driving mechanism indicated by the reference numeral 13, are positioned below an automatic sheet feeding device 14 and a book-stitching device 15. By suitable step by step rotation and vertical reciprocation of the said spindle 11 each carrier arm 12 is in turn positioned beneath the automatic sheet feeding device 14 comprising inversely rotating suction rolls 60 and associated conveyor tapes 61 driven by chain and sprocket means 62, 63 from a main drive shaft 19 of the machine. The suction rolls 60 deliver a signature *b* opened thereby and placed straddlewise upon the arm 12 which is then progressed in two stages of movement to beneath the book-stitching device 15.

In the first stage of this movement the sheet carrier arm together with the sheet carried thereon is rotated through 90° of its horizontal travel and moved upwardly. At this point of its travel the first fault detecting device A is positioned.

One or a series of fault detecting devices B or are arranged to form part of the mechanism guiding the supply of thread from the bobbins 16 to the rotary sewing needles 17 of the stitching device 15 while a third fault detector device C is associated with the backing strip or gauze supply indicated by the reference numeral 18.

The main drive shaft 19 of the machine is belt driven from an electric motor 20 and the latter is controlled from a switchboard 20a which includes a rheostat starter (not shown) in circuit

with the motor and controlled from a three stage rotary hand switch 20b in a manner hereinafter described.

A timing device D gear driven from the main drive shaft 19 is placed in circuit with the fault detector devices A, B and C and the motor 20.

Referring more particularly to Figs. 3 and 4, the detector device A comprises an insulated plate 27 adapted to be mounted in the machine on a bracket 27a (Fig. 1) and positioned closely adjacent the first stage raised position of the sheet carrier arms. The plate 27 has pivotally mounted thereon by means of the pivot 22 a bent lever 21 the upwardly extending arm of which is curved to lie closely adjacent the path of the vertically moving arms 12. The downwardly extending arm of the lever 21 is shaped to a nose piece 21a and is provided with a downwardly projecting lug to which is attached a helical tensioning spring 27b which is anchored at its further extremity to the plate 27. The spring 27b urges upwardly the nose piece 21a of the lever 21 and the upward movement of the lever is adjustably limited by the set screw 21b, which passes through a second downwardly extending offset lug 21c forming part of the lever 21, and engages the lower edge of the plate 27.

A rocking lever 23, pivotally mounted on the plate 27, is provided at its free end with a block drilled and tapped to receive an adjustable contact screw 23b, the downwardly projecting point of which contacts with a contact carried by a terminal block 25 which is also mounted on the plate 27 as shown in Figs. 3 and 4. An insulated block or stop 23a mounted on the rocking lever 23 is adapted to engage the nose 21a of the lever 21 and the lever 23 is thus lifted when upward movement is imparted to the lever 21 and the contact broken between the stud 25 and screw 23b.

Each sheet carrier arm is provided with a pair of the wedge-shaped blocks 12a (Figs. 1 to 4) which form part of the saddle-shaped sheet carriers above described and are slightly spaced apart laterally to provide a slot positioned to receive the upwardly extending portion of the lever 21 (Fig. 4). When a folded sheet b is placed straddlewise upon the sheet carrier arm 12 and blocks 12a the space or slot between the blocks is covered and the upwardly extending portion of the arm 21 held outwardly so that the nose piece 21a is depressed against the tension of the spring 27b (Fig. 3). The conducting leads 46a connected to the rocking lever 23 and terminal block 25 form part of an electrical circuit hereinafter to be described.

The fault detecting devices (Figs. 1, 5, 6 and 7) associated with the sewing needles 17 each comprise a vertical bent arm 24 pivoted at 26a to a bracket 26 mounted on the machine frame above the sewing needles 17 and positioned adjacent the path of the threads leading from the bobbins 16 to the needles 17. A grooved pulley 24a is rotatably mounted on the upper extremity of the arm 24 and serves to receive the tensioned thread which passes from the bobbin 16 round one of a pair of guiding pulleys 29, around the grooved pulley 24a and then passes round the second of the guiding pulleys 29 and so down to the corresponding sewing needle 17.

The lower portion of the arm 24 carries an insulated block 28a secured thereto by a screw 28b. Mounted upon the block 28a is a control pin 28, adapted to engage with a contact stud 31 mounted upon an insulated terminal block 32 which is in turn secured to the bracket 26. The two con-

tacts 28, 31 are urged apart by reason of the helical compression spring 30, one end of which is seated in a recess 30a in the bracket 26, and the other end engages a suitable boss 24b formed near the lower end of the arm 24. A suitable terminal 33a mounted upon the block 32 and in connection with the stud 31 serves to connect one of the leads 46a of the circuit, while a second terminal 28c mounted upon the block 28a and in connection with the contact pin 28 serves to connect the other lead 46a.

As above described, the spring 30 tends to separate the two contacts 31, 28 by reason of its interposition between the fixed bracket 26 and the rocking arm 24, but when the thread passes around the grooved pulley 24a carried by the arm 24 on its way from the bobbins 16 to the sewing needles 17 at the tension normal to the operation of the machine the top half of the lever 24 will be drawn towards the guiding pulleys 29, and thus cause the contact 28 to be brought into engagement with the contact stud 31 and thus complete a circuit by way of leads 46a and this contact will be maintained as long as the thread passes around the pulleys under tension.

Upon the breaking or undue slackening of the thread, the spring 30 will cause the lower end of the arm 24 to move away from the bracket 26 and the contacts 28, 31 will separate to break the circuit.

The fault detecting device C (Fig. 1) associated with the backing strip supply is mechanically similar to the device B above described. In this case, however, the thread guiding grooved pulley 24a is replaced by a strip guiding bar 33 having one end rotatably journaled in a bent arm 24 carried by a bar 26b pivotally mounted in brackets 26, 26c and having its other end carried in a bearing arm 24c also carried by the bar 26b. The tensioned backing strip 18 passes around the guiding bar 33 and so holds the contact pin 28 in contact with the contact stud 31 against the action of the helical compression spring 30 in a similar manner to that described with reference to the thread in Figs. 3, 4 and 5.

The timing device D incorporates a known pawl and ratchet counting device whereby a notched timing disc 34 is rotated step-by-step in accordance with the stitching operations performed by the machine and so permits the actuation of a make and break contact device 35 through the bell-crank lever 36a and cam 37. An adjustable driving linkage 36 transmits the throw of a cam 41 mounted on the shaft 38 and so rotates the disc 34 step by step.

A cam 39 also mounted on the shaft 38 serves to actuate a second make and break contact device 40 for a purpose hereinafter to be described.

Referring to Fig. 9 it will be seen that the fault detecting devices A, B and C together with the driving motor 20, switchboard 20a, relay control 44, and timing device D are connected in series with the power mains.

A main switch 42 serves to connect the mains 43 to the relay control 44 over the main leads 45, 47 and the relay control 44 is in circuit with the switchboard 20a and motor 20 over the leads 45, 48, 49 and 50.

The switchboard controls include the three-stage rotary hand switch 20a and a rheostat starter (not shown) is incorporated in the motor circuit.

The normal operation of the machine is as follows:

After the main switch 42 is thrown over, the

rotary hand switch 22 is rotated in the direction of the arrow and in the first stage of the movement the cam-faced projection 53 moves the contact bridge 54 to make contact with the contact 55.

A shunt circuit comprising the leads 46, 46a, 47b, 47a and 47 is thus closed and current is passed through the fault detecting devices A, B and C and the electromagnet 58 which forms part of the relay control 44. The electromagnet 58 being energized pulls up the armature 59 together with the contact bridges 50 and 53 thus closing the motor starter circuit formed by the lead 46, contact bridges 60, lead 45, rheostat starter (not shown), motor circuit and leads 49 and 47.

The second stage of rotation of the switch 22 causes the contact bridge 54 to contact with contact 52 while remaining in contact with contact 55 whereby in known manner the motor control circuit is passed through the electromagnet 58.

The motor 20 is thus started and the switch 22 is rotated to the third stage of its movement whereby contact between contact 55 and bridge contact 54 is broken while the second stage contact, i. e. contact 52 and bridge contact 54 remains closed. The relay shunt circuit 47b is thus broken and the electromagnet energized solely by the motor control circuit above described.

The electromagnet 58 is energized by current passing through the leads of the series circuit of the fault detecting devices A, B and C and if this circuit is broken the electromagnet 58 is de-energized and releases the pulled up armature 59 and contact bridges 53 and 60 whereupon the motor circuit is opened and the machine stopped. Upon the release of the contact bridge 53, it falls back onto a contact 53a, whereupon current is fed from main 47, over lead 47a, bridge 54, contact 52, lead 50a, bridge 53, contact 53a to warning device 71, and thence to main 46.

Cut-out circuits 46b and 46c associated with the contact make and break devices 35 and 40 respectively are utilized to render ineffective as desired the fault detecting devices.

The detecting device A is rendered ineffective by the leads 46b when the make and break device 40 is closed. The latter member remains closed until opened by the rotation of the cam 41 and the cam is set to open the cut-out circuit 46b only when each carrier arm is moving upwards past the detecting device A. That is to say the normally closed motor control circuit comprising leads 46, 46a, 46b and 47 is then thrown open to apply a test through the fault detecting device A.

When the machine is used to form an idle stitch after the final section of each completed book it is required also to by-pass the circuit of the device A once for each completed book. This is necessary since a sheet or book section is not present on the sheet carrier arm beneath the sewing needles when the idle stitch is formed.

For this purpose the cut-out circuit comprising the leads 46c and contact make and break device 35 is utilized under the control of the known counting mechanism above described to render ineffective the detector device A at timed periods of the machine operation and in accordance with the number of book sections constituting a complete book.

The complete operative cycle of the machine is controlled in the following manner:

The machine is started as above described and by means of the sheet opening and feeding device 14 a folded sheet is positioned straddlewise upon

one of the radial carrier arms which is automatically positioned therebelow. By means of the mechanism 19 the carrier arm 12 and sheet now placed thereon move vertically downwards, rotate through 90° and then ascend to the position adjacent the fault detecting device A as shown in Fig. 1.

The constantly rotating cam 41 is set to open the contact make and break device 40 when the ascending carrier arm moves past the bent lever 21 of the detecting device A. The latter device is thus, during this period, included in the motor control circuit and functions as follows:

A sheet when present on the sheet carrier arm serves to bridge the gap between the spaced blocks 12a and the lever 21 contacts with the sheet on the ascending carrier arm and is rocked about its pivot 22 against the force of the tension spring 27b. The contact screw or pin 23b therefore remains in contact with the contact stud 25 thus keeping the fault detecting circuit closed and the machine in operation (providing that the other fault detecting devices are also maintained in operative position).

In the absence of a sheet from the carrier arm when the latter moves past the device A, the bent lever 21 is permitted to enter into the gap between the blocks 12a and is thus allowed to rock about its pivot 22 under the influence of the spring 27b whereby the contact is broken between the pin 23b and contact stud 25 whereupon the motor circuit is thrown open and the machine rendered inoperative.

As above described, when the absence of the sheet is occasioned by the formation of an idle stitch, the counting mechanism D operates to by-pass the circuit of the detector A so that the latter is rendered ineffective and the machine continues to operate.

Referring to the operation of the fault detecting devices B and C, it will be appreciated that the tension of the continuously fed thread or gauze backing strip as the case may be, serves to hold in engagement the contact pin 28 and contact stud 31 so that the operative motor circuit remains closed.

Should the thread or backing strip break or the supply thereof become exhausted the tension release permits the arm 24, under the influence of the spring 30, to rock about its pivot so as to break the contact between the contact pin 28 and contact stud 31. The motor circuit is thus opened to render the machine inoperative.

It is sometimes necessary, in the operation of book-stitching machines, periodically to slacken the thread and/or backing strip during the complete stitching of each book. Obviously a timing device and cut-out circuit similar to that above described could be incorporated in the machine in order to render ineffective during such periods the fault detecting devices B and C.

When the machine is rendered inoperative by the circuit breaking function of any of the detector devices A, B or C, the machine is restarted by a switching operation exactly similar to that above described.

The type of book-stitching or binding machine to which this invention may be applied is immaterial and the number of fault detecting devices and/or the manner of operation thereof is not confined to the arrangement above described, since it will be appreciated that many constructional forms of the present invention can be held to fall within the ambit of the invention as defined by the appended claims.

Moreover the above described fault detecting device could readily be adapted to function in a modified way by arranging for the energization of the relay upon the occurrence of a fault in the operation of the machine so that the armature movement would break the operative circuit and thus halt the machine.

The expression "its associate" appearing in certain of the claims is intended to include the "thread supply", "work carrier" and/or "backing material supply", recited in those claims and with which the mechanisms are recited as being associated.

What we claim is:—

1. A book-binding machine including, in combination, a machine drive, an electrical circuit for controlling said machine drive, a manually operated starting switch, at least one fault-detecting device comprising electric circuit make and break contacts, a motor control relay having a normally closed energizing circuit completed by way of said manually operated switch at starting, and held energized during operation of said machine by a circuit in series with said fault-detecting devices, means for causing at least one fault-detecting device to operate and open said circuit and arrest said machine when a failure occurs in a step in the book-binding operation, warning means adapted to operate upon the opening of said relay circuit, means for intermittently rendering ineffective at least one of said fault-detecting devices, a timing device actuated from said machine drive to operate said last-mentioned means, and a further timed means actuated from said machine drive for periodically rendering ineffective at least one of said fault-detecting devices during that part of the operative cycle of the machine it is unaffected by the first-mentioned timed means.

2. A book-binding machine as claimed in claim 1, including a fault-detecting device comprising coacting electric contacts mounted upon a supporting base and normally held separated by one end of a spring-urged two-armed bent lever pivoted to said base, wedge-shaped blocks mounted in pairs upon said movable sheet carrier and spaced apart to receive the other arm of said bent lever between them in such a manner the presence of a sheet or signature correctly positioned upon said movable carrier will prevent the entry of the end of said bent lever between said blocks during a period of the operation of said movable carrier, causing said bent lever to be moved and effect the closing of said contact means.

3. A book-binding machine as claimed in claim 1, including a fault-detecting device comprising a fixed electric contact mounted upon a fixed support, a movable electric contact carried by one arm of a two-armed lever pivoted to said fixed support and spring-urged to separate said contacts, a thread-engaging device mounted upon the extremity of the other arms of said two-armed lever, coacting thread-engaging means fixed to said machine frame, so arranged that the pull of the tensioned sewing thread causes said contact means to close against the action of said spring.

4. A book-binding machine as claimed in claim 1, including a fault-detecting device comprising a fixed electric contact mounted upon a fixed support, a movable electric contact carried by one arm of a two-armed lever pivoted to said fixed support and spring-urged to separate said contacts, a backing strip guiding bar journaled between the other arm of said two-armed lever and

a supporting lever pivotally mounted upon said machine frame, coacting backing strip guiding means fixed to said machine frame so arranged that the pull of the tensioned backing strip causes said contact means to close against the motion of said spring.

5. A book-binding machine as claimed in claim 1, including a movable sheet carrier driven from said machine drive, a fault-detecting device associated with said carrier, thread-stitching means, fault-detecting devices associated with said means, a source of supply of book-backing material, and a fault-detecting device associated with said supply of book-backing material.

6. A book-stitching machine comprising, in combination, a machine drive, an electrical circuit adapted to control said machine drive, a pivotal work carrier, a fault-detecting device associated with said work carrier, and comprising contact make and break members incorporated in said machine drive circuit, a source of thread supply, a fault-detecting device associated with said thread supply and comprising contact make and break members incorporated in said machine drive circuit, a source of backing material supply, a fault-detecting device associated with said backing material supply and comprising contact make and break members incorporated in said machine drive circuit, means for operating any of said fault-detecting devices upon failure of the correct functioning of its associate, so that said machine drive circuit is affected to arrest said machine drive, and means for periodically rendering ineffective said fault-detecting devices.

7. A book-stitching machine comprising, in combination, a machine drive, an electrical circuit adapted to control said machine drive, a pivotal work carrier, a fault-detecting device associated with said work carrier, and comprising contact make and break members incorporated in said machine drive circuit, a source of thread supply, a fault-detecting device associated with said thread supply and comprising contact make and break members incorporated in said machine drive circuit, a source of backing material supply, a fault-detecting device associated with said backing material supply and comprising contact make and break members incorporated in said machine drive circuit, means for operating any of said fault-detecting devices upon failure of the correct functioning of its associate, so that said machine drive circuit is affected to arrest said machine drive, means for periodically rendering ineffective said fault-detecting devices, and means associated with said machine drive for timing the periodical interruption of said fault-detecting devices.

8. A book-stitching machine comprising, in combination, a machine drive, an electrical circuit adapted to control said machine drive, a pivotal work carrier, a fault-detecting device associated with said work carrier, and comprising contact make and break members incorporated in said machine drive circuit, a source of thread supply, a fault-detecting device associated with said thread supply and comprising contact make and break members incorporated in said machine drive circuit, a source of backing material supply, a fault-detecting device associated with said backing material supply and comprising contact make and break members incorporated in said machine drive circuit, means for operating any of said fault-detecting devices upon failure of the correct functioning of its associate, so that said machine drive circuit is affected to arrest said machine

drive, means for periodically rendering ineffective said fault-detecting devices, and counting means actuated step by step by said machine drive in accordance with each operative cycle of the machine for timing the periodical interruption of said fault-detecting devices.

9. A book-binding machine including, in combination, stitching means, a thread supply for said stitching means, a pivotal work carrier arranged to present the work to said stitching means, means for supplying backing material, driving means for imparting operative movement to said stitching means and said work carrier, an electrically operated controlling device arranged automatically to control the actuation of the driving means for said stitching means and said work carrier, electrical circuit make and break contacts incorporated in the circuit of said controlling device, and mechanism associated with said backing material supply means, said mechanism being arranged to respond to a failure of the correct functioning of its associate so as to arrest said stitching means and said work carrier.

10. A book-binding machine including, in combination, stitching means, a thread supply for said stitching means, a pivotal work carrier arranged to present the work to said stitching means, a source of backing material supply, driving means for imparting operative movement to said stitching means and said work carrier, an electrically operated controlling device arranged automatically to control the actuation of the driving means for said stitching means and said work carrier, electrical circuit make and break contacts incorporated in the circuit of said controlling device, mechanism associated with said thread supply to influence selected ones of said contacts, and mechanism associated with said backing material supply to influence selected ones of said contacts, each of said mechanisms being arranged to respond to a failure of the correct functioning of its associate so as to arrest said stitching means and said work carrier.

11. A book-binding machine including, in combination, stitching means, a thread supply for said stitching means, a pivotal work carrier arranged to present the work to said stitching means, a source of backing material supply, driving means for imparting operative movement to said stitching means and said work carrier, an electrically operated controlling device arranged automatically to control the actuation of the driving means for said stitching means and said work carrier, electrical circuit make and break contacts incorporated in the circuit of said controlling device, mechanism associated with said work carrier to influence selected ones of said contacts, and mechanism associated with said backing material supply to influence selected ones of said contacts, each of said mechanisms being arranged to respond to a failure of the correct functioning of its associate so as to arrest said stitching means and said work carrier.

12. A book-binding machine including, in combination, stitching means, a thread supply for said stitching means, a pivotal work carrier arranged to present the work to said stitching means, a source of backing material supply, driving means for imparting operative movement to said stitching means and said work carrier, an electrically operated controlling device arranged automatically to control the actuation of the driving means for said stitching means and said work carrier, electrical circuit make and break contacts incorporated in the circuit of said controlling de-

vice, mechanism associated with said thread supply to influence selected ones of said contacts, mechanism associated with said work carrier to influence selected ones of said contacts, and mechanism associated with said backing material supply to influence selected ones of said contacts, each of said mechanisms being arranged to respond to a failure of the correct functioning of its associate so as to arrest said stitching means and said work carrier.

13. A book-binding machine comprising, in combination, means for inserting at least one stitch in the folded edge of a folded sheet, a thread supply for said stitching machine, a pivotal work carrier arranged to receive a folded sheet placed straddlewise thereon, means for driving said machine to impart operative movement to said work carrier and to said stitching means so that the sheet carried by said carrier is presented to said stitching machine and attached to the previously stitched sheet by stitches inserted in the folded edges thereof, an electrically operated warning device, circuit make and break contacts incorporated in the circuit of said warning device, and mechanism associated with said work carrier to influence said contacts, said mechanism being arranged to respond to a failure of the correct functioning of its associate to operate said warning device, and means for periodically rendering ineffective said warning device.

14. A book-binding machine comprising, in combination, means for inserting at least one stitch in the folded edge of a folded sheet, a thread supply for said stitching machine, a pivotal work carrier arranged to receive a folded sheet placed straddlewise thereon, means for driving said machine to impart operative movement to said work carrier and to said stitching means so that the sheet carried by said carrier is presented to said stitching machine and attached to the previously stitched sheet by stitches inserted in the folded edges thereof, an electrically operated warning device, circuit make and break contacts incorporated in the circuit of said warning device, mechanism associated with said thread supply to influence selected ones of said contacts, mechanism associated with said pivotal work carrier to influence selected ones of said contacts, said mechanism being arranged to respond to a failure of the correct functioning of its associate to operate said warning device, and means for periodically rendering ineffective said warning device.

15. A book-binding device comprising, in combination, a machine drive, an electrically operated controlling device arranged to control said machine drive, stitching means, a source of thread supply for said stitching means, a pivotal work carrier arranged to present work to said stitching means, a source of backing material supply, circuit make and break contacts incorporated in the circuit of said controlling device, mechanism associated with said thread supply to influence selected ones of said contacts, mechanism associated with said work carrier to influence selected ones of said contacts, and mechanism associated with said backing material supply to influence selected ones of said contacts, each of said mechanisms being arranged to respond to a failure of the correct functioning of its associate to arrest said machine drive.

16. In a book-binding machine, the combination set forth in claim 15, and means for periodically rendering ineffective said controlling device.

17. A book-binding machine comprising, in combination, a machine drive, stitching means, a source of thread supply for said stitching means, a pivotal work carrier arranged to present work to said stitching means, a source of backing material supply, an electrically operated warning device, circuit make and break contacts incorporated in the circuit of said warning device, mechanism associated with said thread supply to influence selected ones of said contacts, mechanism associated with said work carrier to influence selected ones of said contacts, mechanism associated with said backing material supply to influence selected ones of said contacts, each of said mechanisms being arranged to respond to a failure of the correct functioning of its associate to operate said warning device, and means for periodically rendering ineffective said warning device.

18. In a book-binding machine, the combination set forth in claim 9, and a warning device operable by any of the contact influencing mechanisms.

19. In a book-binding machine, the combination set forth in claim 9, and means for intermittently rendering ineffective the controlling device.

20. In a book-binding machine, the combination set forth in claim 9, including means for intermittently rendering ineffective the controlling device, and a timing device actuated by the driving means to operate said first means.

21. A book-binding machine as set forth in claim 9, and means for automatically feeding the work to the work carrier.

22. A book-binding machine including, in combination, means for inserting at least one stitch in the folded edge of a folded sheet, a thread supply for said stitching machine, a pivotal work carrier arranged to receive a folded sheet placed straddlewise thereon, means for driving said machine to impart operative movement to said work carrier and to said stitching means so that the sheet carried by said carrier is presented to said stitching machine and attached to the previously stitched sheet by stitches inserted in the folded edges thereof, an electrical circuit for controlling said driving means, a manually operated starting switch, a fault-detecting device, comprising electric circuit make and break contacts, a motor control relay having a normally closed energizing circuit completed by way of said manually operated switch at starting, and held energized during operation of said machine, a circuit in series with said fault-detecting device, means for causing said last-mentioned device to operate and open said circuit and arrest said machine when a failure occurs in a step of the book-binding operation, and means for intermittently rendering ineffective the fault-detecting device.

23. A book-binding machine including, in combination, means for inserting at least one stitch in the folded edge of a folded sheet, a thread supply for said stitching machine, a pivotal work carrier arranged to receive a folded sheet placed straddlewise thereon, means for driving said machine to impart operative movement to said work carrier and to said stitching means so that the sheet carried by said carrier is presented to said stitching machine and attached to the previously stitched sheet by stitches inserted in the folded edges thereof, an electrical circuit for controlling said driving means, a manually operated starting switch, at least two

fault-detecting devices, each comprising electric circuit make and break contacts, a motor control relay having a normally closed energizing circuit completed by way of said manually operated switch at starting, and held energized during operation of the said machine by way of a circuit containing said fault-detecting devices all arranged in a series circuit, means for causing at least one of said fault-detecting devices to operate and open said circuit and arrest said machine when a failure occurs in a step of the book-binding operation, and means for intermittently rendering ineffective at least one of the fault-detecting devices.

24. A book-binding machine including, in combination, means for inserting at least one stitch in the folded edge of a folded sheet, a thread supply for said stitching machine, a pivotal work carrier arranged to receive a folded sheet placed straddlewise thereon, means for driving said machine to impart operative movement to said work carrier and to said stitching means so that the sheet carried by said carrier is presented to said stitching machine and attached to the previously stitched sheet by stitches inserted in the folded edges thereof, an electrical circuit for controlling said driving means, a manually operated starting switch, a fault-detecting device, comprising electric circuit make and break contacts, a motor control relay having a normally closed energizing circuit completed by way of said manually operated switch at starting, and held energized during operation of said machine, a circuit in series with said fault-detecting device, means for causing said last-mentioned device to operate and open said circuit and arrest said machine when a failure occurs in a step of the book-binding operation, means for intermittently rendering ineffective the fault-detecting device, and a timing device actuated from the machine drive to operate said last-recited means.

25. A book-binding machine including, in combination, stitching means, a pivotal work carrier adapted to present the work to said stitching means, means for feeding the work to said carrier, a machine drive, an electrical circuit for controlling said machine drive, a manually operated starting switch, at least two fault-detecting devices, each comprising electric circuit make and break contacts, a motor control relay having a normally closed energizing circuit completed by way of said manually operated switch at starting, and held energized during operation of the said machine by way of a circuit containing said fault-detecting devices all arranged in a series circuit, means for causing at least one of said fault-detecting devices to operate and open said circuit and arrest said machine when a failure occurs in a step of the book-binding operation, means for intermittently rendering ineffective at least one of the fault-detecting devices, and a timing device actuated from the machine drive to operate said last-recited means.

26. A book-binding machine including, in combination, means for inserting at least one stitch in the folded edge of a folded sheet, a thread supply for said stitching machine, a pivotal work carrier arranged to receive a folded sheet placed straddlewise thereon, means for driving said machine to impart operative movement to said work carrier and to said stitching means so that the sheet carried by said carrier is presented to said stitching machine and attached to the previously stitched sheet by stitches inserted in the folded edges thereof, an electrically operated

controlling device arranged automatically to control the actuation of the driving means for said stitching means and said work carrier, electrical circuit make and break contacts incorporated in the circuit of said controlling device, 5 mechanism associated with said thread supply to influence selected ones of said contacts, mechanism associated with said work carrier to in-

fluence selected ones of said contacts, each of said mechanisms being arranged to respond to a failure of the correct functioning of its associate so as to arrest said stitching means and said work carrier, and means for automatically 5 feeding the work to the work carrier.

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