Feb. 4, 1958 H. I. STANBACK ET AL 2,822,446

ELECTRIC CIRCUIT CONTROLLING DEVICE

Filed Dec. 2, 1953 2 Sheets-Sheet 1

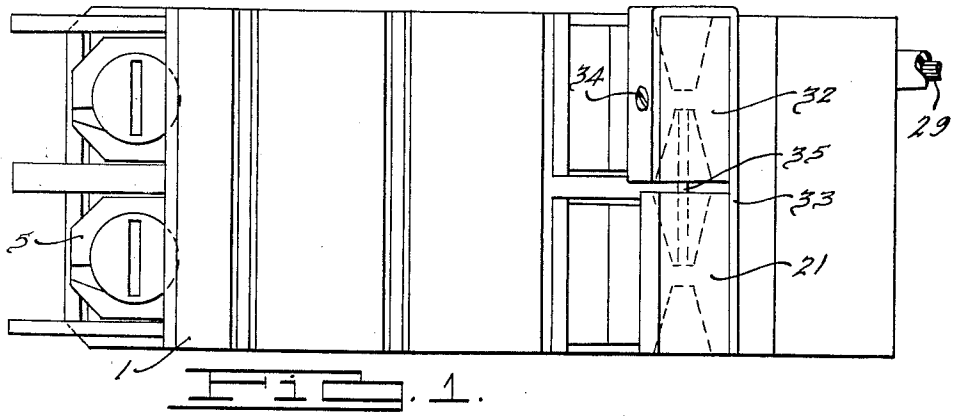


Fig. 1.

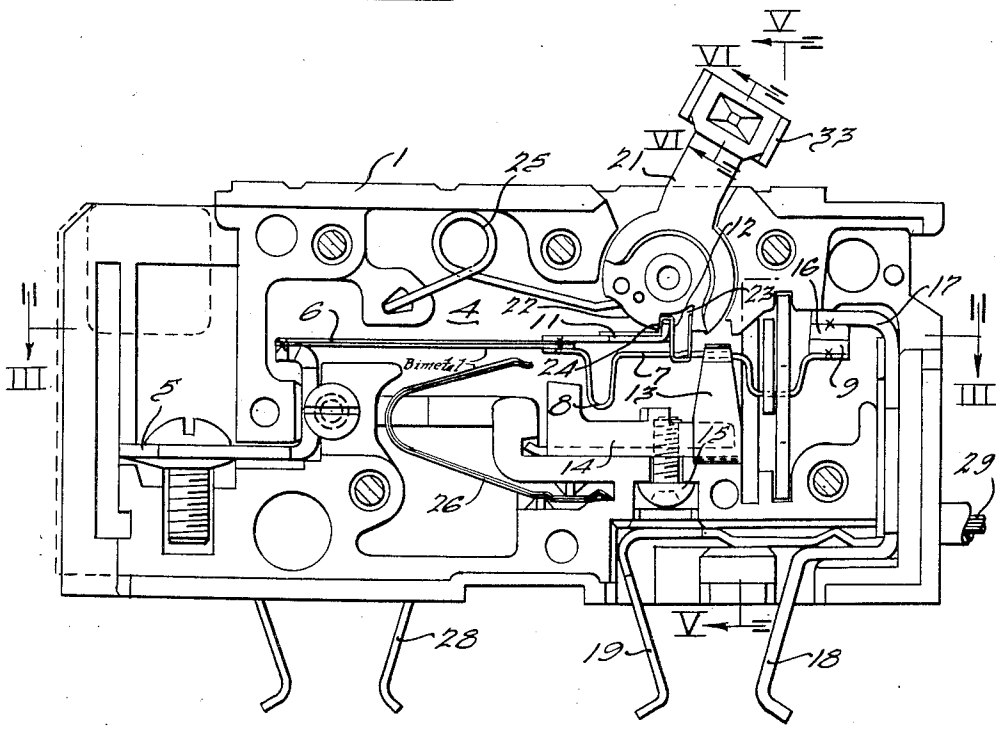


Fig. 2.

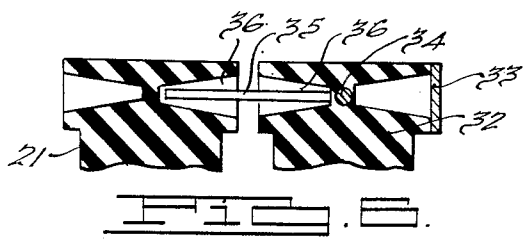


Fig. 3.

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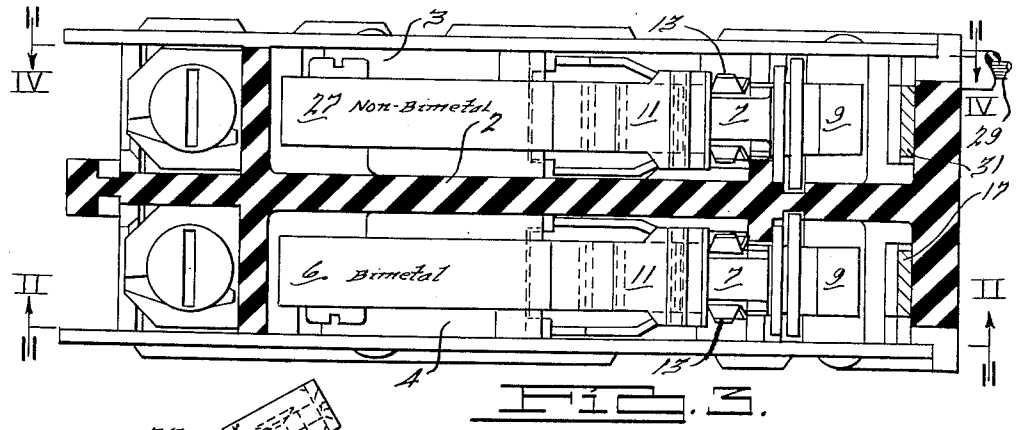


Fig. 3.

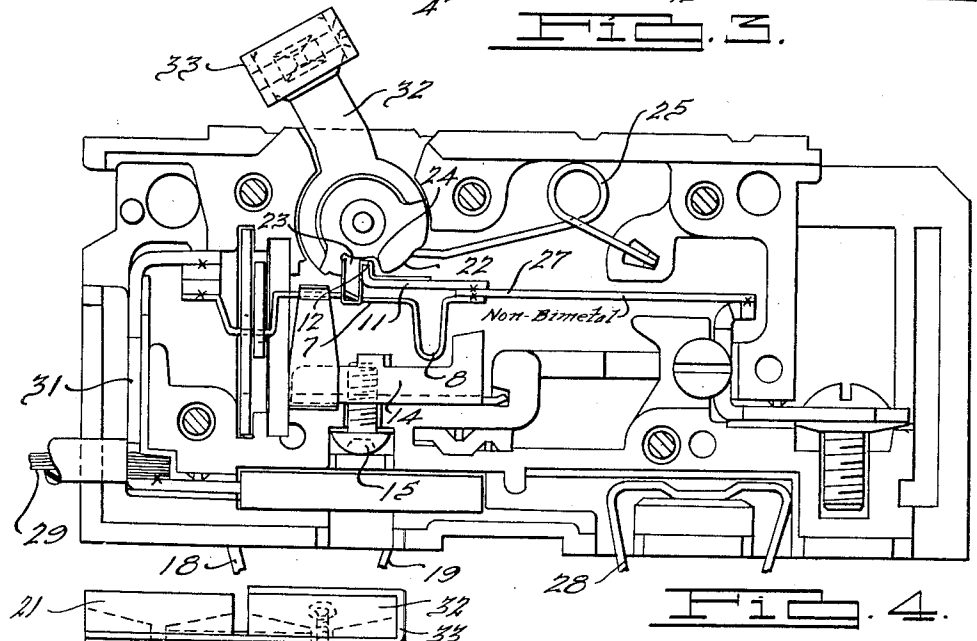


Fig. 4.

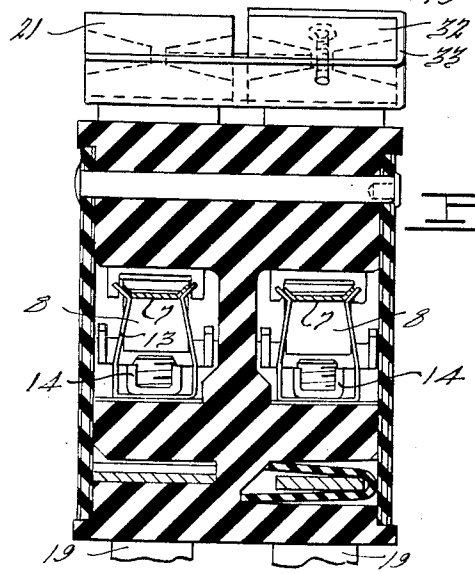


Fig. 5.

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ELECTRIC CIRCUIT CONTROLLING DEVICE

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Application December 2, 1953, Serial No. 395,671

8 Claims. (Cl. 200—114)

This invention relates to an electric circuit controlling device and has for its object the provision of a circuit controlling device having a pair of poles therethrough with one pole controlled manually only and the other controlled both manually and in response to current overload, with means provided ensuring that the manual only pole will not open prior to opening of the manually and automatically controlled pole.

Another object of the invention is the provision of a circuit controlling device in accordance with the preceding object in which the manually and automatically controlled pole is provided with a line terminal, preferably of the pressure-frictional type, while the manual only pole is provided with a flexible lead for connection to a circuit terminal.

Another object of the invention is the provision of an electric circuit controlling device in accordance with the first object in which the poles are provided with manual operators connected for certain common movements and for certain independent movements but in which all movements of the manual operators provide for disengagement of the manual and automatic pole not later than disengagement of the manual only pole and for engagement of the manual only pole not later than the engagement of the manual and automatic pole.

Other objects and features of the invention will be readily apparent to those skilled in the art from the specification and appended drawings illustrating certain preferred embodiments in which:

Figure 1 is a plan view of the electric circuit controlling device according to the present invention.

Figure 2 is a longitudinal vertical sectional view inside one side cover of the circuit controlling device as indicated on line II—II of Figure 3.

Figure 3 is a horizontal longitudinal sectional view on the line III—III of Figure 2.

Figure 4 is a vertical longitudinal sectional view under a side cover on the line IV—IV of Figure 3.

Figure 5 is a transverse sectional view on line V—V of Figure 2.

Figure 6 is a detail sectional view through the handle connection on the line VI—VI of Figure 2.

In the drawing, in which like reference numerals indicate like parts, there is shown a base 1 having a central wall 2 dividing the base into two side opening cup-shaped compartments 3 and 4 in which are disposed the individual poles of the device. Within the compartment 4 is disposed a manually and automatically operable electric circuit breaker conforming substantially to the form shown, described and claimed in the copending application of John G. Jackson and Ralph H. Kingdon, Serial No. 309,862, filed September 16, 1952, for Circuit Breaker, now Patent No. 2,697,151, issued December 14, 1954. This comprises a load terminal 5 mounted on an end ledge at one end of the base 1 and extending within the compartment 4 to support one end of a bimetal strip 6. At the opposite end of the bimetal strip are mounted a

resilient switching arm 7 having looped portion 8 and carrying at its free end a movable contact 9. Also mounted at the free end of the bimetal strip 6 is an armature element 11 having a flanged free end about which is mounted a spring 12 for operation as more fully explained in the aforesaid application. The switch arm 7 is normally latched in engaged position by a U-shaped spring 13 adjustably held in the base by a stationary magnetic yoke 14 controlled by an adjusting screw 15. A stationary contact 16 is mounted on a connector 17 extending to the exterior of the base at the back thereof to form a terminal 18 cooperating with a spring member 19 to form a clamping jaw. A manual operator 21 is pivoted in the base 1 and is provided with a cam surface 22 cooperating with the upper portion of the spring 12, as viewed in Figure 2, to maintain the movable contact 9 in the open position. The cam surface 22 cooperates with a recess 23 to provide an abutment surface 24 which bears against the spring 12 to move the movable contact manually to open position. A handle spring 25 biases the manual operator 21 toward the handle position corresponding to contacts disengaged position. A compensating bimetal 26 is provided which is responsive to ambient temperature to influence the movement of the bimetal strip 6 in response to current overload.

The opposite pole of the circuit controlling device is shown in Figure 4 and is similar to the mechanism of the circuit breaker shown in Figure 2 with the omission of the current responsive portions. In this pole, the bimetal strip 6 has substituted therefor a bronze strip 27 which does not flex in response to change in temperature. Also in this pole the compensator 26 is omitted. A further distinction in the devices is that the spring clip 28 is non-current carrying and insulated from the parts within the breaker and that instead of an exterior line terminal there is provided a flexible lead 29 which extends into the interior of the breaker and there connects to a terminal 31 upon which the stationary contact is mounted.

An important distinction in the manual operation of the two poles of the circuit controlling device lies in the relation between the manual operators and the switching parts. In the circuit breaker of Figure 2 it is seen that the abutment 24 between the cam surface 22 and the recess 23 is against the spring 12, whereas in Figure 4 it is apparent that this abutment, on operator 32, is spaced from the spring 12. Accordingly, as the operators are moved together toward "off" position, the contacts of the circuit breaker will be opened prior to the contacts of the switch only pole and similarly as the operators are moved toward the "on" position the contacts of the switch only pole must close before the contacts of the circuit breaker may close.

Upon the operator 32 is mounted a rigid bar 33 by means of a looped portion extending around the operator 32 and maintained in place by a screw 34, this bar 33 having an abutting engagement with the operator controlling contact 27 will move it to contacts disengaged position as the operator 32 is moved. Ordinarily this is the only handle interconnection which is required since it is plain that with this the cooperating contacts of the switching pole can never be open while the cooperating contacts of the circuit breaker pole are closed. However, to aid in the operation of the switching only pole to the contacts disengaged position should the operator 21 only be engaged, there is provided a pin 35 received within recesses 36 at the sides of the operators 21 and 32 to provide for only limited relative movement therebetween by which if the operator 21 is moved to full "off" position the operator 32 must be moved therewith. This pin is not an essential feature of the invention, since the concurrent switching will normally occur anyway and the

primary requirement is that the contacts of the circuit breaker may never be closed while the contacts of the switch are open.

The operation of the circuit breaker of Figure 2 is as follows:

Upon movement of the operator 21 in a counterclockwise direction, the abutment 24 engages spring 12 and causes movement of the spring and armature 11 downwardly to first stress the resilient switching arm at the loop 8 and then snap the movable contact 9 past the latch 13 to disengaged position under the biasing action of the force stored in the switch arm. The operation of the switch only pole shown in Figure 4 is identical but, due to the spacing of the abutment 24 from the spring 12 in that pole, occurs slightly after the operation of the contacts in the circuit breaker. Insofar as the invention is concerned, this switch only contact operation may occur simultaneously with the breaker contact operation and is usually set to be substantially simultaneous; the critical requirement being that breaker contact operation shall never be after. A reverse movement of the handles 21 and 32 from contacts disengaged position permits engagement of the contacts under the bias of strips 6 and 27 into their engaged position. In this operation it is seen that the spring 12 of the switching pole will slip into its recess 23 at or prior to a similar movement in the circuit breaker pole and that, therefore, the circuit breaker pole cannot be closed prior to closing of the switching only pole.

Upon automatic operation, the occurrence of a current overload causes overheating of the bimetal strip 6 with consequent flexing thereof to first store energy in the loop 8 and then snap contact 9 to the disengaged position under the resilient bias stored in the loop. Upon this automatic opening, the operator 21 is released by the spring 12 and rotates in a counterclockwise direction after the bias of spring 25. It is seen that the bar 33 provides no opposition to this movement of the operator 21 and in the absence of the pin 35, the operator 21 will move freely to contacts disengaged position. With the pin 35, this movement will be limited to a position intermediate contacts engaged and disengaged positions. To again engage the contacts of the circuit breaker after an automatic operation, the handle is simply moved to its contacts engaged position whereupon the parts shall again return to the position shown in Figure 2.

It will be seen from the above description that applicants' circuit controlling device provides for common switching manually by the two poles thereof while providing for automatic switching of only one pole thereof and in which the opening of the switch only pole cannot occur earlier than the opening of the automatic pole, nor its closing later than the automatic pole. It is therefore provided not only that a disconnect occurs in both poles, but that a circuit through the automatic pole cannot be accomplished while the switching or disconnecting only pole is open.

While certain preferred embodiments of the invention have been specifically disclosed, it is understood that the invention is not limited thereto, as many variations will be readily apparent to those skilled in the art and the invention is to be given its broadest possible interpretation within the terms of the following claims.

What is claimed is:

1. In an electric circuit controlling device, a first pair of cooperating contacts, manual means only for effecting operation of said contacts to engaged and disengaged positions and including a first manual operator, a second pair of cooperating contacts, manual means for effecting operation of said second pair of contacts to engaged and disengaged positions and including a second manual operator, automatic means responsive to current overload for operating only said second pair of contacts to disengaged position, means connecting said manual operators for common movement tward contacts disengaged position, and means insuring a disengagement of said second pair of contacts not later than disengagement of said first pair of contacts, said operator connecting means providing for independent movement of said second operator toward contacts disengaged position in response to automatic disengagement of said second pair of contacts on the occurrence of a current overload.

2. In an electric circuit controlling device, a first pair of cooperating contacts, manual means only for effecting operation of said contacts to engaged and disengaged positions and including a first manual operator, a second pair of cooperating contacts, manual means for effecting operation of said second pair of contacts to engaged and disengaged positions and including a second manual operator, automatic means responsive to current overload for operating only said second pair of contacts to disengaged position, means connecting said manual operators for common movement toward contacts disengaged position, said operator connecting means providing for independent automatic movement of said manual means for said second pair of contacts toward contacts disengaged position without coincident movement of said manual operator for said first pair of contacts, means insuring a disengagement of said second pair of contacts not later than disengagement of said first pair of contacts, a pair of load terminals for said pairs of contacts, a line terminal for said second pair of contacts, and a permanent flexible lead electrically connected to one of said first pair of contacts and adapted for circuit connection remote of said device.

3. In an electric circuit controlling device, a first pair of cooperating contacts, manual means only for effecting operation of said contacts to engaged and disengaged positions and including a first manual operator, a second pair of cooperating contacts, manual means for effecting operation of said second pair of contacts to engaged and disengaged positions and including a second manual operator, automatic means responsive to current overload for operating only said second pair of contacts to disengaged position, means connecting said manual operators for common movement toward contacts disengaged position, said operator connecting means providing for independent automatic movement of said manual means for said second pair of contacts toward contacts disengaged position without coincident movement of said manual operator for said first pair of contacts, and means insuring a disengagement of said second pair of contacts not later than disengagement of said first pair of contacts, said contacts, operating means and operators being disposed in side by side relation with the operators moving in the same direction to perform the same switching operation of the pairs of contacts.

4. In an electric circuit controlling device, a first pair of cooperating contacts, manual means only for effecting operation of said contacts to engaged and disengaged positions and including a first manual operator, a second pair of cooperating contacts, manual means for effecting operation of said second pair of contacts to engaged and disengaged positions and including a second manual operator, automatic means responsive to current overload for operating only said second pair of contacts to disengaged position, means connecting said manual operators for common movement toward contacts disengaged position, said operator connecting means providing for independent automatic movement of said manual means for said second pair of contacts toward contacts disengaged position without coincident movement of said manual operator for said first pair of contacts, and means insuring a disengagement of said second pair of contacts not later than disengagement of said first pair of contacts, said operator connecting means comprising a bar mounted on said first operator and positioned to engage and move said second operator when the

first operator and bar are moved toward contacts disengaged position.

5. In an electric circuit controlling device, a first pair of cooperating contacts, manual means only for effecting operation of said contacts to engaged and disengaged positions and including a first manual operator, a second pair of cooperating contacts, manual means for effecting operation of said second pair of contacts to engaged and disengaged positions and including a second manual operator, automatic means responsive to current overload for operating only said second pair of contacts to disengaged position, means connecting said manual operators for common movement toward contacts disengaged position, and means insuring a disengagement of said second pair of contacts not later than disengagement of said first pair of contacts, said operator connecting means comprising a bar mounted on said first operator and positioned to engage and move said second operator when the first operator and bar are moved toward contacts disengaged position, while permitting independent movement of the second operator toward contacts disengaged position both manually and automatically.

6. In an electric circuit controlling device, a first pair of cooperating contacts, manual means for effecting operation of said contacts to engaged and disengaged positions and including a first manual operator, a second pair of cooperating contacts, manual means for effecting operation of said second pair of contacts to engaged and disengaged positions and including a second manual operator, automatic means responsive to current overload for operating only said second pair of contacts to disengaged position, means connecting said manual operators for common movement toward contacts disengaged position, means insuring a disengagement of said second pair of contacts not later than disengagement of said first pair of contacts, said operator connecting means comprising a bar mounted on said first operator and positioned to engage and move said second operator when the first operator and bar are moved toward contacts disengaged position, and a pin interconnecting said operators with a lost motion connection restricting relative movement therebetween to less than their full movement to contacts engaged and disengaged positions.

7. In an electric circuit controlling device, a first pair of cooperating contacts, manual means only for effecting operation of said contacts to engaged and disengaged positions and including a first manual operator, a second pair of cooperating contacts, manual means for effecting operation of said second pair of contacts to engaged

and disengaged positions and including a second manual operator, automatic means responsive to current overload for operating only said second pair of contacts to disengaged position, means connecting said manual operators for common movement toward contacts disengaged position, said operator connecting means providing for independent automatic movement of said manual means for said second pair of contacts toward contacts disengaged position without coincident movement of said manual operator for said first pair of contacts, means insuring a disengagement of said second pair of contacts not later than disengagement of said first pair of contacts, a pair of load terminals for said pairs of contacts, a resilient line terminal for said second pair of contacts adapted for pressure-frictional engagement with a stationary line terminal, and a permanent flexible lead electrically connected to one of said first pair of contacts adapted for connection as desired to a circuit terminal remote of said device.

8. In an electric circuit controlling device, a first pair of cooperating contacts, manual means only for effecting operation of said contacts to engaged and disengaged positions and including a first manual operator, a second pair of cooperating contacts, manual means for effecting operation of said second pair of contacts to engaged and disengaged positions and including a second manual operator, automatic means responsive to current overload for operating only said second pair of contacts to disengaged position, means connecting said manual operators for common movement toward contacts disengaged position, said operator connecting means providing for independent automatic movement of said manual means for said second pair of contacts toward contacts disengaged position without coincident movement of said manual operator for said first pair of contacts and means insuring a disengagement of said second pair of contacts not later than disengagement of said first pair of contacts, said last means and operator connection also insuring engagement of said first pair of contacts not later than engagement of said second pair of contacts as said manual operators are moved toward contacts engaged position.

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