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AUTOMATIC CIRCUIT BREAKER MECHANISM

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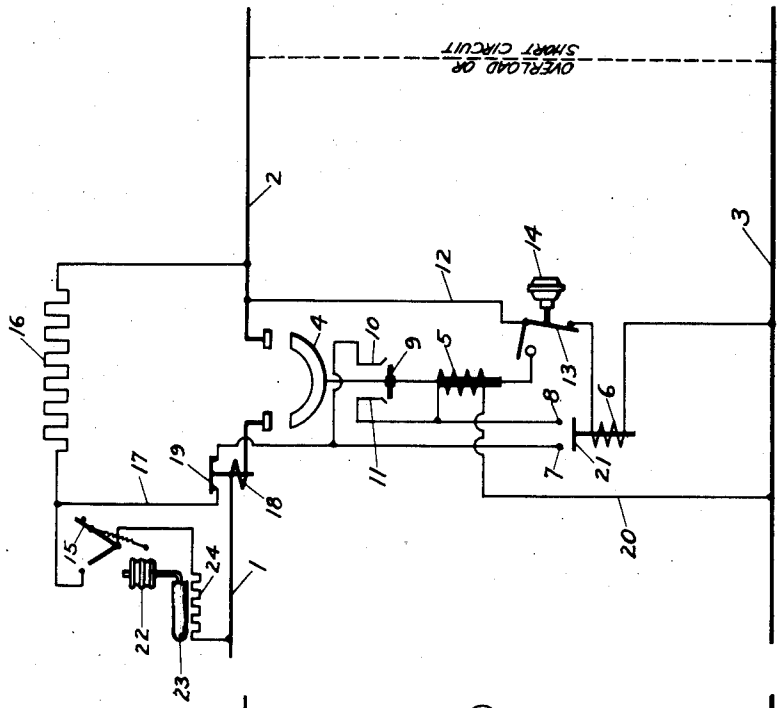


Fig. 2

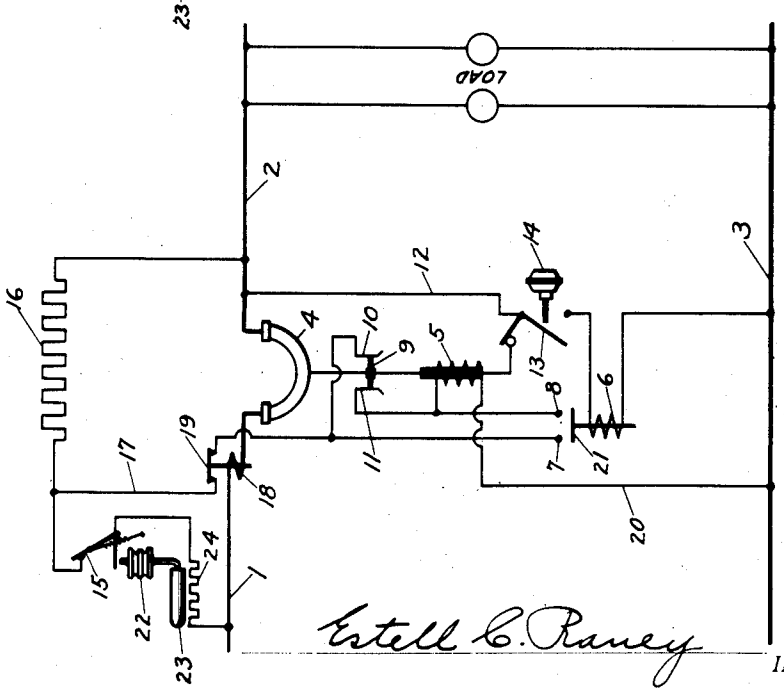


Fig. 1

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UNITED STATES PATENT OFFICE

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AUTOMATIC CIRCUIT-BREAKER MECHANISM

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My invention relates to an automatic circuit breaker mechanism of the type which opens automatically in response to overload, and recloses automatically at the expiration of a short time interval.

In circuit breaker mechanism of this type, where a limited amount of current is shunted around the main contacts when the breaker is open to serve as a resistance measuring current, there may be an undue waste of power in the event of a short circuit which is permitted to exist for several hours before being discovered or corrected.

The object of this invention is to provide an automatic means for completely interrupting the flow of current to the short circuted section at the expiration of a definite and regulable time interval, after the short circuit occurs, provided the short circuit is sustained for this time interval.

The preferred embodiment of my invention is shown in the accompanying drawings wherein similar characters of reference designate corresponding parts, and wherein

Figure 1 is a diagrammatic representation of one form of device for accomplishing the results above described, the parts being shown in normal closed position.

Figure 2 is a similar diagrammatic representation, the parts being shown in open position after the short circuit has existed long enough to effect complete interruption of the current.

In the drawings, numeral 1 represents a supply wire and 2 represents a feed wire carrying current to a load. 3 is a return wire of opposite polarity. A main contact member 4 serves to connect 1 and 2 under normal conditions, and is operated by means of coil 5. A controlling coil 6 effects the initial closing of the circuit of coil 5 by temporarily bridging the points 7 and 8. A maintaining contact 9 engages the contacts 10 and 11 after the main contact 4 is partially closed.

The circuit of coil 6 is controlled by a switch 13, which is opened against a spring tension by the action of coil 5, when the main contact 4 is closed. Switch 13 is also retarded in closing, after contact 4 opens, by the action of dashpot 14.

Switch 15 completes the circuit from supply wire 1 to resistance 16 and wire 17. Overload coil 18 controls the contact 19.

The switch 15 is operable by the action of expansion member 22 which in turn is connected to a bulb 23 containing a volatile liquid. A resistance 24 is so arranged that its heat is transmitted to bulb 23.

Operation

In normal operation the parts are in position as shown in Figure 1, and the circuit of coil 5 is maintained thru resistance 24, contact 15, wire 17, contact 19, contact 9, coil 5, thru wire 20 to wire 3.

Action due to momentary overload or short circuit.—In the event of a momentary overload or short circuit the coil 18 causes contact 19 to open the circuit of coil 5, which results in the opening of main contact 4.

The maintaining contact 9 passes out of engagement with contacts 10 and 11, so that the circuit of coil 5 is completely open and is closed only by action of coil 6, at the expiration of a short time interval, as determined by the action of dashpot 14, the contact 13 closes and completes the circuit of controlling coil 6, which is now in parallel with the load circuit. A limited current flows thru resistance 16. This current produces a potential between wires 2 and 3, which varies with the load resistance, so that when the load resistance is of normal value the potential thus set up is sufficient to cause coil 6 to operate contact 21 and complete the circuit of coil 5 at points 7 and 8. After the contact 4 is partially closed contact 9 engages points 10 and 11, thus maintaining the circuit of coil 5. An extension of the core of coil 5 opens contact 13, so that contact 21 will again disengage points 7 and 8.

Action due to prolonged overload or short circuit.—Should an overload or short circuit of a permanent nature occur, the opening of the breaker would result as explained above. The potential set up between wires 2 and 3 will be so low while a short circuit exists that coil 6 will not be energized sufficiently to op-

erate. The current which passes thru the heating element 24 and resistance 16 will be of maximum value due to the low resistance offered by the short circuit and after this condition continues a sufficient length of time, the heat from element 24 causes the liquid in bulb 23 to boil, thus generating a pressure which is transmitted to the expansion member 22, with the result that contact 15 will be opened, thus stopping the flow of current to the circuit breaker mechanism and the short circuit. Contact 15 is preferably so designed as to remain open after being thus opened, until manually reset.

From the foregoing, it is apparent that I have provided a circuit breaker which will open in response to overload or short circuit, and which will reclose automatically, except when a short circuit or overload exists for a predetermined prolonged time interval, and which will automatically render all circuits inoperative after a short circuit exists more than this given time interval.

Having thus described my invention, what I claim is:

1. In combination with an automatic reclosing mechanism having a main movable contact member and main fixed contacts, a closing coil, a controlling coil, a resistance in shunt to said main contacts, switch mechanism in series with said resistance, means operable by the heat effect of current in said resistance to cause said switch mechanism to open at the expiration of a predetermined time interval after one opening of the breaker, provided the overload is of predetermined value, to produce a current in said resistance to effect the operation of the said means.

2. In combination with an automatic reclosing mechanism having a main contact member, a closing coil, a controlling coil, a resistance in shunt to main contacts, switch mechanism in series with said resistance, means operable by the heat effect of current in said resistance to cause said switch mechanism to open at the expiration of a predetermined time interval, after one opening of the breaker, provided the overload is of predetermined value, to produce a current in said resistance to effect the operation of the said means, and means for varying said time interval.

3. In combination with automatic reclosing circuit breaker mechanism having a circuit breaker, operating mechanism for closing said circuit breaker, controlling means governing said closing means, means operative at the expiration of a definite time interval after one opening of the breaker, provided the overload is of a predetermined value to effect the operation of the last named means to render said operating and controlling means permanently inoperative, and means for varying said time interval.

4. In combination with an automatic reclosing circuit breaker mechanism having a circuit breaker, operating mechanism for closing said circuit breaker, a controlling coil for governing the operation of said reclosing means, a resistance element connected in shunt to the circuit breaker contacts, a switch mechanism in series with said resistance element, and means operable at the expiration of a time interval after one opening of the breaker, provided the overload is of a predetermined value, to open said switch mechanism.

5. In combination with an automatic reclosing circuit breaker mechanism, a shunt circuit around said circuit breaker, a switch in the said shunt circuit and means operative by the current in said shunt circuit to open said switch at the expiration of a definite time interval after one opening of the breaker, provided the overload is of a predetermined value, to effect the operation of the said means.

6. In combination with automatic reclosing circuit breaker mechanism having a circuit breaker, a switch mechanism for controlling the current of said circuit breaker operating mechanism, means operative by current shunted around the open breaker to open the circuit to said switch mechanism at the expiration of a time interval after one opening of the breaker, provided the overload is of a predetermined value, to effect the operation of the means and render the said switch mechanism inoperative.

7. In combination with an automatic reclosing circuit breaker mechanism, a switch mechanism for controlling the current of said circuit breaker operating mechanism, a resistance for bridging the terminals of the said circuit breaker, and means operative by the current through the resistance at the expiration of a time interval after one opening of the breaker, provided the overload is of a predetermined value, to effect the operation of the said means and to render the closing means permanently inoperative.

8. In combination with an automatic reclosing circuit breaker mechanism for connecting two sections of a circuit, a switch mechanism connected to the circuit for controlling the circuit of the said circuit breaker operating mechanism, means operative at the expiration of a time interval after one opening of the breaker, provided the overload is of a predetermined value, to effect the operation of the said means to open the said switch mechanism and prevent the closing of the breaker.

9. In combination with a circuit breaker for normally connecting sections of a circuit together, one of which is the load section when the breaker is open, means for opening the breaker, and means for automatically reclosing the circuit breaker according to the load resistance of the load section, and means for rendering said last named means perma-

nently inoperative after the breaker has remained open for a definite time interval.

10. The combination of a circuit breaker for connecting two sections of a circuit together, one of which is the load section when the breaker is open, means for opening the breaker and means for reclosing the circuit breaker according to the load resistance of the load section, and means for rendering said last named means permanently inoperative after the breaker has remained open for a definite time interval, said last named means being effective to insure such inoperativeness until manual adjustment is made.

11. In combination with an automatic reclosing circuit breaker mechanism for normally connecting sections of a circuit together, one of which is the load section when the breaker is open, a circuit shunting the terminals of the breaker and interconnecting the sections, means operative according to the load resistance of the load section after opening of the breaker to close the breaker, and means for automatically disconnecting the said closing means after the expiration of a definite time interval during which the breaker is open.

12. In combination with an automatic reclosing circuit breaker mechanism for connecting sections of a main circuit together, means operative according to the resistance of the load of the main circuit for closing the breaker, and means for discontinuing the operation of the said closing means on the expiration of a definite breaker open period after one opening of the breaker, provided the overload is of a predetermined value, to effect the operation of the said means.

13. In combination with an automatic reclosing circuit breaker mechanism for connecting sections of a main circuit, a switch mechanism for controlling the current of the said circuit breaker operating mechanism, a circuit for shunting the circuit breaker, and means operative by the current through the shunt around said circuit breaker to permanently open said switch mechanism according to the load resistance of the main circuit at the expiration of the time interval after one opening of the breaker, provided the overload is of a predetermined value, to effect the operation of the said means.

14. In combination with an automatic reclosing circuit breaker mechanism for connecting sections of the main circuit, a shunt circuit around the said circuit breaker, a switch in the said shunt circuit, and means operated by the current in the said shunt circuit to open the said switch at the expiration of a definite time interval after one opening of the breaker, provided the overload is of a predetermined value, to effect the operation of the said means.

15. In combination with an electrically operated overload circuit breaker, means for automatically reclosing the said breaker, means for rendering said reclosing means inoperative and comprising a switch, a resistance element and a thermostat element located in operative relation to the resistance element, the resistance element energized when the breaker is open to heat the thermostat element to cause the thermostat element after one opening of the breaker, provided the overload is of a predetermined value, to effect the operation of the thermostat element to operate the switch to render said reclosing means permanently inoperative.

In testimony whereof I hereby affix my signature.

ESTELL C. RANEY.