

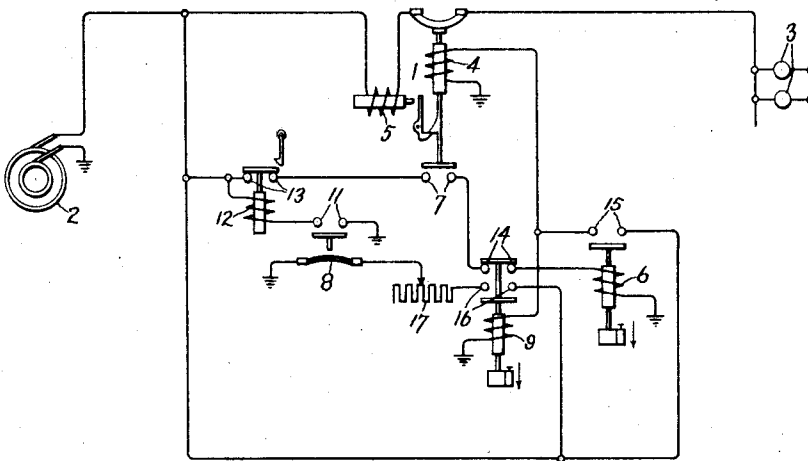
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CIRCUIT BREAKER CONTROL SYSTEM

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UNITED STATES PATENT OFFICE

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CIRCUIT BREAKER CONTROL SYSTEM

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My invention relates to an improved arrangement for controlling the number of times a circuit breaker may be closed within a predetermined time and particularly to such an arrangement employing a thermal responsive device.

In order that a sensitive thermal responsive device of a relatively low thermal capacity may be used, it has been proposed heretofore that the winding of an electrically heated thermal device be connected in series with the closing coil of the circuit breaker so that the thermal device is heated by the current through the closing coil of the circuit breaker each time it is closed. Since the duration of the closing operation varies for different types of circuit breakers and also with different operating conditions, such an arrangement as proposed heretofore requires different thermal devices for the different types of breakers. Also due to the series connection of the thermal device and the closing coil of the circuit breaker, the voltage impressed across the closing coil is decreased.

One object of the present invention is to provide an arrangement by means of which the above mentioned difficulties are eliminated. The invention consists in connecting the heating winding of the thermal device in a circuit which is independent of the closing coil of the circuit breaker in such a manner that each time the circuit breaker is closed the thermal device is heated for a definite length of time which is independent of the length of time which it takes the circuit breaker to close.

In accordance with the preferred embodiment of my invention, I provide a time relay which is energized simultaneously with the closing coil of the circuit breaker and which closes the heating circuit for the thermal relay and effects the interruption of its own heating circuit and the closing coil circuit. The relay is designed so that after it has been deenergized for a predetermined length of time, it opens the heating circuit and effects the reestablishment of its own operating circuit and the circuit of the closing coil if the circuit breaker is open. In

this manner the closing coil cannot be energized while the thermal relay is being heated and consequently the duration of the heating of the thermal device is the same for each closing operation of the circuit breaker.

My invention will be better understood from the following description when taken in connection with the accompanying drawing which diagrammatically shows one embodiment of my invention and its scope will be pointed out in the appended claims.

Referring to the accompanying drawing, 1 represents a circuit breaker which is arranged to connect a source of current 2 to a load circuit 3. The circuit breaker 1 may be of any suitable type, examples of which are well known in the art. As shown, it is of the well known latched-in type and includes a closing coil 4 and a trip coil 5 which is connected in series relation with the source 2 and the load circuit 3 when the circuit breaker 1 is closed. The circuit of the closing coil 4 is arranged to be completed across the source 2 when the circuit breaker is open. In the particular embodiment of my invention shown in the drawing, this result is accomplished by means of a control relay 6 which is arranged to be connected across the source 2 by the auxiliary contacts 7 on the circuit breaker 1 when it is open.

In order to limit the number of times the circuit breaker can reclose, I provide a suitable thermal relay such as a thermostat 8 which is arranged to be heated each time the circuit breaker closes. As shown in the drawing, the thermostat 8 is arranged to be connected across the source 2 for a definite length of time each time the circuit breaker is closed. This result is obtained by means of a suitable instantaneous pick-up time delay drop-out relay 9, the operating coil of which is connected in parallel with the closing coil 4 of the circuit breaker 1. The relay 9 also controls the circuit of the control relay 6 so that it cannot be reenergized to reclose the breaker 1 as long as the thermostat 8 is being heated. The thermostat 8 is provided with suitable contacts 11 which, when closed, complete an energizing circuit for a suitable lockout relay 12, the contacts

13 of which are in the circuit of the control relay 6.

The operation of the arrangement shown in the drawing is as follows:

- 5 When the circuit breaker 1 is closed and a fault occurs on the load circuit 3, the trip coil 5 becomes sufficiently energized to effect the opening of the circuit breaker 1 to disconnect the load circuit 3 from the source 2.
- 10 When the circuit breaker 1 opens, its auxiliary contacts 7 complete through the contacts 13 of the lockout relay 12 and the normally closed contacts 14 of the time relay 9 an energizing circuit for the control relay 6. When
- 15 the control relay 6 closes its contacts 15, they connect the closing coil 4 of the circuit breaker 1 and the coil of the time relay 9 across the source 2. The energization of the closing coil 4 closes the circuit breaker 1 so as to
- 20 reconnect the source 2 to the load circuit 3. The energization of the time relay 9 effects the opening of its contacts 14 so as to open the above traced circuit for the control relay 6. The energization of the control relay
- 25 9 also closes its contacts 16 so that the thermostat 8 and an adjustable resistor 17 are connected in series across the source 2. Since the relay 9 is of the time delay drop-out type, it maintains the circuit of the control
- 30 relay 6 open and the heating circuit of the thermostat 8 closed for a definite time which is independent of the time it requires the circuit breaker to close. Therefore, if the
- 35 overload is still connected to the circuit breaker at the time it recloses, the subsequent opening of the circuit breaker does not effect the reenergization of the control
- 40 relay 6 until after the thermostat 8 has been heated for a predetermined length of time. If the fault connected to the lead circuit
- 45 is of a permanent character so that the circuit breaker does not remain closed after each reclosure, the thermostat 8 will be sufficiently heated after the circuit breaker had opened a
- 50 predetermined number of times to close its contacts 11 and thereby connect the operating coil of the lockout relay across the source 2. The energization of the lockout relay 12 permanently opens the contacts 13 in the
- 55 energizing circuit for the control relay 6 so that further automatic reclosing of the circuit breaker is prevented until the contacts of the lockout relay are manually reset.

While I have, in accordance with the patent statutes, shown and described my invention as applied to a particular system and as embodying various devices diagrammatically indicated, changes and modifications will be obvious to those skilled in the art and I, therefore, aim in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States, is,—

1. In combination, a circuit breaker, closing means therefor, means including electrically heated means for limiting the number of times said closing means can close said circuit breaker, and means responsive to each operation of said closing means for completing while said circuit breaker is open, a heating circuit for said electrically heated means and for maintaining said heating circuit completed for a definite time which is independent of the reclosing time of the circuit breaker.

2. In combination, a circuit breaker, electroresponsive means for effecting the closing of said circuit breaker, means for energizing said electroresponsive means, a thermal relay, means controlled by said thermal relay for rendering said closing means inoperative to close said circuit breaker, and means for completing while said circuit breaker is open and said electroresponsive means is energized a circuit for said thermal relay for a definite length of time which is independent of the reclosing time of the circuit breaker.

3. In combination, a circuit breaker, closing means therefor including a winding, a time relay having its winding connected in parallel with said first mentioned winding, means for completing an energizing circuit for said windings, a thermal relay, means responsive to the energization of said time relay for completing a circuit for said thermal relay, and means controlled by said thermal relay for rendering said closing means inoperative to close said circuit breaker.

4. In combination, an electric circuit, a circuit breaker in said circuit, means for opening said circuit breaker, means responsive to the opening of said circuit breaker for closing said circuit breaker, and means for limiting the number of reclosures of said circuit breaker including a thermal device and means for effecting when said circuit breaker is open the heating of said device for a definite length of time which is independent of the reclosing time of the circuit breaker during each closing operation of said circuit breaker.

5. In combination, an electric circuit, a circuit breaker in said circuit, means for opening said circuit breaker, electroresponsive means for closing said circuit breaker, means for effecting the energization of said electroresponsive means to close said circuit breaker, and means for limiting the number of reclosures of said circuit breaker including a thermal device, timing means for effecting the heating of said device for a definite length of time which is independent of the reclosing time of the circuit breaker and means for effecting the operation of said timing means when said electroresponsive means is energized to close said circuit breaker.

6. In combination, an electric circuit, a
circuit breaker in said circuit, means for
opening said circuit breaker, electrorespon-
sive means for closing said circuit breaker, a
5 circuit for said electroresponsive means,
means for closing said circuit, and means for
limiting the number of reclosures of said
circuit breaker including a thermal device,
a heating circuit for said device, an instanta-
10 neous pick-up time delay dropout relay con-
trolling contacts in the circuits of said elec-
troresponsive means and said thermal device
whereby said thermal device remains ener-
gized for a predetermined time each time
15 said electromagnetic means is energized, and
a winding for said relay connected in par-
allel with said electroresponsive means.

7. In combination, an electric circuit, a
circuit breaker in said circuit, means for
20 opening said circuit breaker, means respon-
sive to the opening of said circuit breaker
for effecting the reclosing thereof and means
for limiting the number of reclosures in-
cluding a thermal device, means for heating
25 said device a definite length of time each
time said circuit breaker is reclosed and
means for preventing a subsequent reclosure
of said circuit breaker while said device is
being heated.

30 In witness whereof, I have hereunto set my
hand this 2 day of September, 1930.

ERNST BORRE.

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