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CIRCUIT BREAKER WITH SHUNT FOR CHANGING CURRENT RATING

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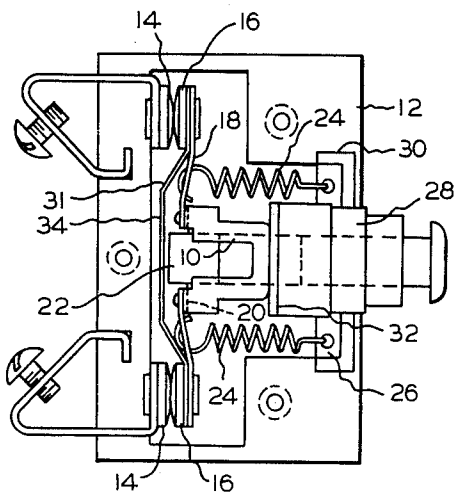


FIG. I.

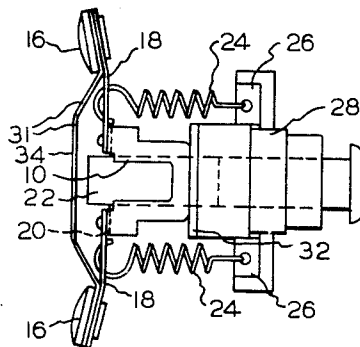


FIG. II.

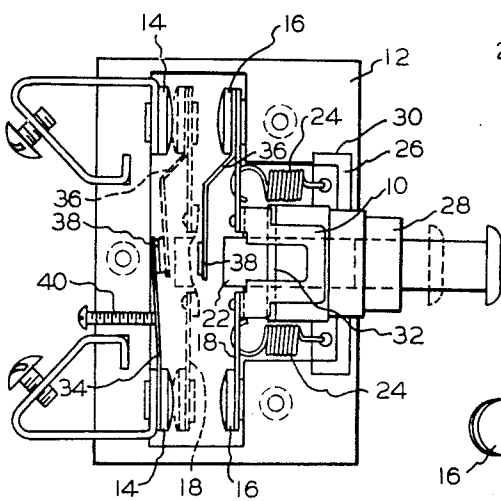


FIG. IV.

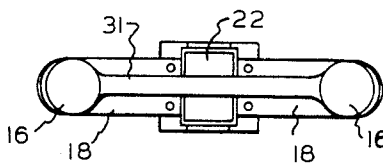


FIG. III.

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## UNITED STATES PATENT OFFICE

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CIRCUIT BREAKER WITH SHUNT FOR  
CHANGING CURRENT RATING

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This invention relates to re-settable electric circuit breakers of the type which employ a thermal latch device adapted to hold the breaker contacts in closed position until a predetermined overload condition is reached, when the latch is effective to disengage the contacts.

An object of the invention is to provide an improved thermal latch type circuit breaker which is able to handle high currents yet employs a thermal latch which is adaptable for operating at a much lower current rating. In other words, the invention has for its object to enable the extremely flexible and finely calibrated thermal latch plates of a low amperage rating (5 amps. for example) to be retained and employed in a circuit breaker assembly which is adapted to operate under a much higher current rating or amperage (50 amps. for example).

The invention also has for its object to provide an improved thermal latch type circuit breaker in which the thermal latch employed is capable of operating at an elevated current rating with the same (or greater) rapidity as that employed for a much lower current rated circuit breaker.

Thus, an object of the invention is to enable standard thermal latch plates to be employed in connection with circuit breakers having a wide range of current ratings and which latch plates are capable of being calibrated within fine and flexible limits.

Another object of the invention is to provide a circuit breaker having a thermal latch which is capable of operating at a high current rating with the same or greater rapidity of a thermal latch employed in a circuit breaker of a much lower current rating.

The above and other objects and advantages of the invention will appear clear from a consideration of the following detailed description with reference to the drawings and from the following claims.

In the drawings:

Figure I is an elevational view of a circuit breaker embodying one form of electrical shunt in accordance with the invention and by the inclusion of which shunt in the thermal latch circuit the circuit breaker is given a much higher current rating than that for which the thermal latch was originally designed.

Figure II is an elevational view of the thermal latch, shunt and actuator mechanism of Figure I separated from the casing and fixed contacts.

Figure III is a plan view of Figure II, and

Figure IV is a view similar to Figure I but illustrating a modified form of shunt, which is

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of divided form and involves make and break contacts, the full line position of the divided shunt corresponding to the shunt contact opened position and the dotted line position corresponding to the shunt contact closed position.

Referring to the drawings, the general construction, arrangement and operation of the circuit breaker is substantially the same as disclosed in the prior patent application, Serial No. 599,806, filed June 16, 1945, now U. S. Patent No. 2,485,736, dated October 25, 1949, but involves an electrical shunt associated with the thermal latch plate circuit and adapted to permit the same latch plate 10 as is employed for a low current rating (5 amps., for example) to be employed to constitute the thermal latch of a circuit breaker adapted to function at a much higher current rating (50 amps., for example).

As in the prior case, the circuit breaker comprises a two part casing of insulating material, one part of which is indicated at 12 and is shown as having the fixed electrical contacts 14 mounted therein for operative association with a pair of movable contacts 16 carried upon flexible arms 18 mounted upon the end portions 20 of a pair of substantially U-shape bi-metallic plates 10 piloted upon opposite sides of a block 22 of insulating material, with the interposition of coil springs 24 connected between the flexible arms 18 and ear portions 26 integral with an insulator block 28 fixedly mounted in a recess 30 in the casing 12.

The latch plates are adapted to have latching engagement with ledges 32 on opposite sides of the block 28, which ledges may both be electrically conductive and both of which may be effective as holding ledges for the thermal latch plates, as in the said prior Patent No. 2,485,736, or only one of which ledges may be so effective to provide a one-sided latching engagement, as disclosed in pending application, Serial No. 97,356, filed June 6, 1949.

In either form, and as shown in the drawings, the thermal latch is associated with an electrical shunt, the arrangement and effect of which is substantially to increase the current rating over that for which the latch plates are themselves designed.

In Figures I, II and III the electrical shunt is shown in the form of a single conductor strip 31 connected at its ends to the movable contacts 16 and bow-shaped, as indicated at 34, to pass clear over the end of the block 22. This shunt strip, therefore, is electrically connected in parallel with the latch plates so that with the circuit

breaker set with its contacts closed, a portion of the electric current passes in part through the latch plates and in part through the shunt. The result is that the latch plates are slower to act for release and the current rating is, in addition, increased, while enabling the employment of a relatively low current rated thermal latch plate. Thus, by proper selection of the shunt strip 31, as to its conductive capacity and resistance, the circuit breaker may be adapted to have an overload current safety characteristic of, say 50 amps., compared with, say a 5 amp. current rating of the thermal latch plates if these were employed separately.

In Figure IV the shunt is shown composed of two separate conductor strips 34 and 36 of which the strip 34 is electrically connected with one of the fixed contacts while the strip 36 is electrically connected with one of the movable contacts. Both shunt strips have contacts 38 and whereas the shunt strip 36 is bi-metallic and has its low expanding side exposed to the side remote from the other shunt strip 34, this strip 34 is optionally bi-metallic and if bi-metallic has its low expansion side exposed to the side remote from the shunt strip 36.

The location of the shunt strips is such that they are capable of being set with their contacts 38 closed when the circuit breaker is set with its circuit control contacts closed and the latch plates are held latched. In this condition, a portion of the current will flow through the shunt and a portion through the latch plates until a pre-determined overload is reached, this being that for which the shunt was designed and calibrated to handle and being of much higher current rating than that which the thermal latch plates themselves are capable of handling. When this overload is reached the shunt contacts will open, thereby instantly cutting off the current flow through the shunt and leaving the entire current flow to be handled by the latch plates. This, however, is not possible due to the low current rating of the latch plates and as a result the latch plates will instantly disengage and free the movable circuit breaker contacts to move to the open position. Thus, with this shunt arrangement the advantage is obtained that the thermal latch is able to operate at an elevated amperage but at the same, or even greater, speed than if the shunt were not present. The arrangement gives high speed operation on high amperage with the employment of low amperage latch plates.

In Figure IV there is shown an adjustment screw 40 in contact with the shunt strip 34. This constitutes one means by which this shunt strip may be pre-loaded or calibrated (by increasing or decreasing the tension on the shunt strip by adjustment of the screw 40) to vary the time lag between the attaining of the overload current rating and the breaking of the shunt contacts.

Having thus described my invention, what I consider to be novel and wish to cover by Letters Patent is as follows:

1. In an electric circuit breaker having overload protection and comprising a pair of fixed contacts, a pair of movable contacts in opposed relationship to said fixed contacts, structure supporting said movable contacts for movement to-

ward and from said fixed contacts, said structure including bimetallic latch structure in electrical series with said movable contacts, fixed guide structure on which said first structure is supported and guided for movement toward and from said fixed contacts, and an abutment on said fixed structure with which said latch structure engages to hold the movable contacts closed against the fixed contacts with the latch structure operative to automatically disengage said abutment upon the occurrence of a predetermined electrical overload, the provision of electrical shunt means carried at least in part by said movable contacts and arranged in electrical parallel relationship with respect to the current conducted by said movable contacts, said electrical shunt means including a metal conductor strip carried by one of said movable contacts and connected to conduct current between said movable contact and its corresponding fixed contact in parallel electric flow relationship to said one movable contact, said shunt conductor strip having a higher current rating than that of the said latch structure, said higher current rating corresponding to maximum current overload.

2. An electric circuit breaker as claimed in claim 1, said shunt means comprising a pair of conductor strips, one said strip being electrically connected with one of the fixed contacts and the other conductor strip being electrically connected with the said one movable contact, said fixed contact being that remote from the fixed contact with which said movable contact engages, and contacts on said pair of conductor strips for holding the strips in current carrying relationship up to the maximum current overload and disengageable upon the occurrence of said overload, whereby to break the shunt circuit.

3. An electric circuit breaker as claimed in claim 1, said shunt means comprising a pair of conductor strips, one said strip being electrically connected with one of the fixed contacts and the other conductor strip being electrically connected with the said one movable contact, said fixed contact being that remote from the fixed contact with which said movable contact engages, and contacts on said pair of conductor strips for holding the strips in current carrying relationship up to the maximum current overload and disengageable upon the occurrence of said overload, whereby to break the shunt circuit, said shunt strip connected with said one movable contact being bi-metallic, the low expansion side being remotely located with respect to the other shunt strip so that the bi-metallic shunt strip moves apart from the other shunt strip with temperature increase.

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