Nov. 9, 1954 R. C. INGWERSEN 2,694,122

ELECTRIC CIRCUIT BREAKER

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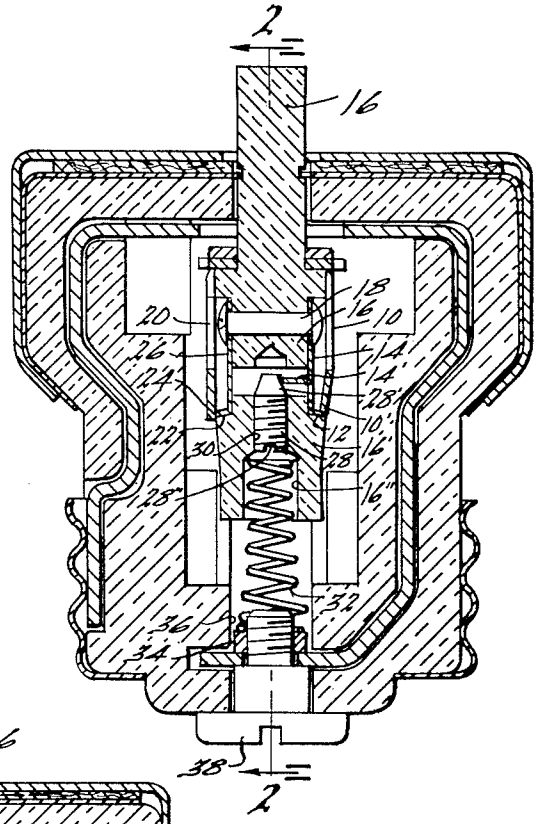
Fig. 1.



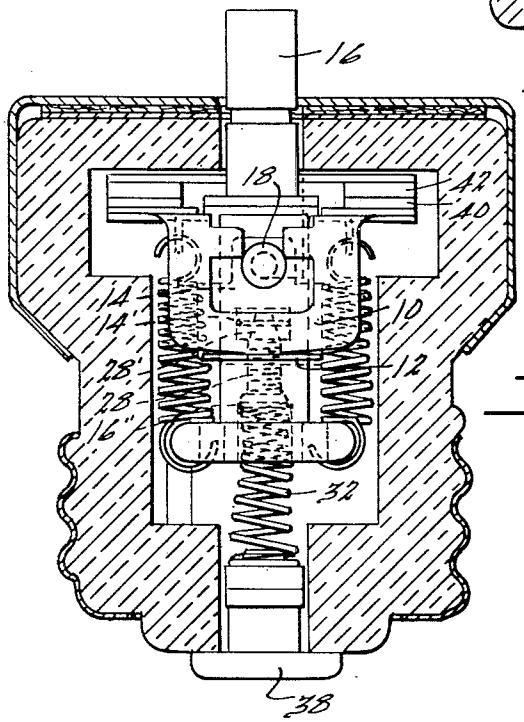


Fig. 2.

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Fig. 3.

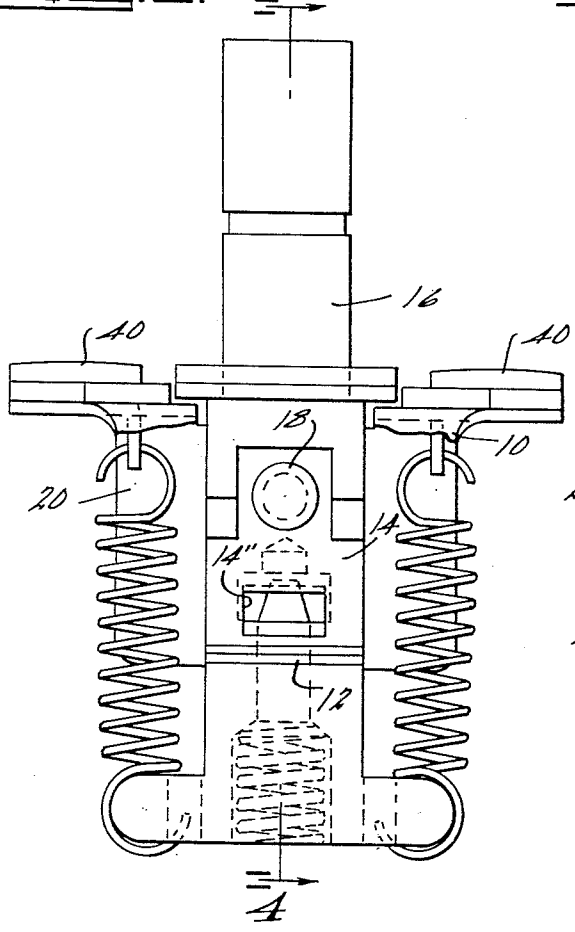
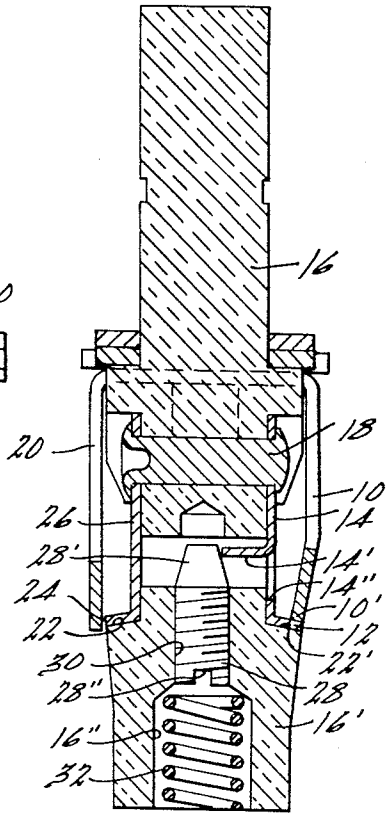


Fig. 4.



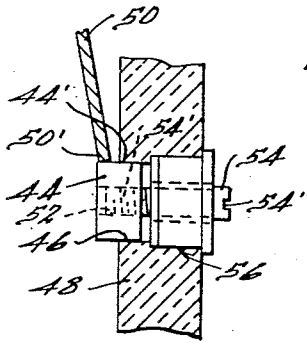


Fig. 5.

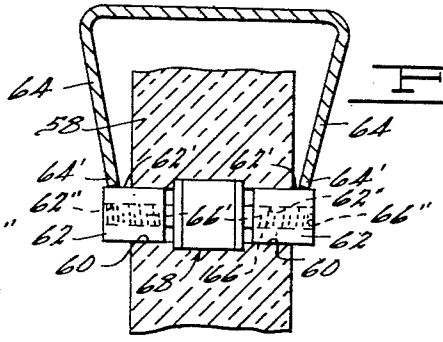


Fig. 6.

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ELECTRIC CIRCUIT BREAKER

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Application April 22, 1953, Serial No. 350,455

7 Claims. (Cl. 200—116)

This invention relates to electric circuit breakers having current overload protection and in which such protection is provided by the action of a bi-metallic thermal latch element arranged so as automatically to disengage an abutment upon the occurrence of an overload current above that of a predetermined value. In particular, the invention relates to improvements in the electric circuit breakers as disclosed in the prior U. S. Patents No. 2,485,736 issued October 29, 1949, No. 2,514,545, prior U. S. Patents No. 2,639,349 issued May 19, 1953, No. 2,642,510, issued June 6, 1953, No. 2,665,347, issued January 5, 1954, and application Ser. No. 331,769 filed January 19, 1953.

In connection with these electric circuit breakers it is necessary, in practice, to provide some means by which the position of engagement of the thermal latch element with its abutment can be finely adjusted after the circuit breaker has been assembled and subjected to test. It may happen, for instance, that the thermal latch element leaves its abutment too soon, or too late, thereby giving a premature or delayed automatic circuit breaking action.

In the aforesaid U. S. Patent No. 2,639,349, this adjustment was effected by means of a screw connected to engage the thermal latch element so as to adjust the latch with respect to its position of engagement with the abutment. This mode of adjustment, while effective, necessitates positive and mechanical flexing of the thermal latch element, whereby attention must be given to constructing the latch element so that it is capable of taking care of such flexing movement without having any deleterious effect upon the ability of the latch element to deflect, under the heat of the conveyed electric current, and disengage the abutment upon the occurrence of the predetermined current overload. The construction of the thermal latch element itself permits the latch to be kept to finely calibrated limits to provide the desired automatic and instant circuit breaking operation and it becomes desirable, therefore, that the latch element should not be subjected to positive mechanical deflection in order to adjust its position of contact with the abutment surface, as disclosed in the said U. S. Patent No. 2,639,349.

It is an important object of the present invention to provide an improved thermal latch and abutment assembly in which adjustment of the position of contact of the thermal latch element with its abutment is readily possible without the necessity of subjecting the thermal element itself to mechanical flexure.

Another object of the invention is to provide an improved thermal latch and abutment assembly in which the abutment is capable of being readily adjusted to adjust the position of contact of the thermal element with respect to the abutment.

The above, and further objects and advantages of the invention, residing in the construction, arrangement and combination of parts, will appear clear from consideration of the following detail description with reference to the accompanying drawings and the appended claims.

In the drawings:

Fig. 1 is a vertical sectional view of an electric circuit breaker embodying the present invention, with the thermal latch shown engaged with its abutment,

Fig. 2 is a section on the line 2—2 of Fig. 1,

Fig. 3 is an enlarged elevational view of the thermal latch and abutment assembly looking upon the front of Fig. 2,

Fig. 4 is a vertical section on the line 4—4 of Fig. 3, and

Figs. 5 and 6 are diagrammatic views of alternative adjustable abutments and latch assemblies.

Referring to the drawings, in Figs. 1 to 4 there is disclosed an electrical circuit breaker constructed and arranged to operate substantially as disclosed in the above mentioned patents and co-pending applications, but in which the thermal latch element **10** is arranged to engage an abutment surface **12** defined at the lower end of a plate member **14** secured upon the actuator plunger **16** (constituting support structure for the abutment) at its opposite end, as by the cross rivet **18**.

In the particular example illustrated in these figures there is only one thermal latch element arranged to engage on one side of the actuator plunger, this latch element being connected with a guide plate **20** slidably and guidedly engaged with respect to the opposite side of the actuator plunger. It is to be understood, however, that the construction may be modified to provide a thermal latch element and abutment upon opposite sides of the actuator plunger, with the adjustable abutment construction being, for instance, as disclosed in Fig. 6, to be described later.

The actuator plunger **16** is formed with opposite ledge surfaces **22**, **22'** with which the outwardly directed abutment surface **12**, and a similar surface **24** on a wear plate **26**, engage, the plate **26** providing a wear surface, at **24**, for the slidable engagement of the guide plate **20**.

For adjusting the point of engagement of the edge **10'** of the thermal latch element with the abutment surface **12**, the plate **14**, which is deflectable in its lower portion, containing the abutment surface, is formed with an inturned tongue **14'**, the free end edge of which is engaged by the conical end **28'** of an adjustment screw **28**. This screw is shown as extending vertically through a screw-threaded bore **30** in the lower end portion **16'** of the plunger **16**. The screw has its screw-driver slot **28''** exposed to an enlarged vertical cavity **16''** in the plunger, in which cavity the coil spring **32** for restoring the plunger to its released re-set position is housed.

The tongue **14'** may be pressed out of the material of the plate **14**, with the formation of a rectangular slot **14''** (Fig. 3) in the plate.

When assembled within the casing, as seen in Figs. 1 and 2, the spring **32** extends between the screw-driver end of the adjustment screw **28** and a nut **34** mounted within an opening **36** in the bottom of the casing. This opening is finally closed by a screw plug **38**, screwed through the nut **34**, but, with the screw-plug removed, it is possible to adjust the screw **28** by inserting a screw-driver through the center of the spring **32** to engage the screw-driver slot **28''**.

Rotation of the screw **28** in one direction or the other, by contact of the screw end **28'** with the tongue **14'**, will cause the abutment surface **12** to move outwards or inwards with respect to its ledge and guide surface **22'** and thereby adjust the position at which the latch edge **10'** engages the abutment surface. By this adjustment of the abutment surface, therefore, the latch edge **10'** can be made to engage the abutment surface either farther inwards or outwards, depending upon the amount of thermal distortion needed for the latch edge to disengage the abutment surface upon the occurrence of the predetermined current overload at which the circuit breaker is required to operate to automatically interrupt the circuit closed at the movable contacts **40**, **40** and the fixed contact **42**, **42**.

In Fig. 5, there is illustrated an alternative form of adjustable abutment and thermal latch assembly. In this form of the invention, the abutment is in the form of a block **44** mounted for lateral sliding and translational movement with respect to a rectilinear recess **46** formed in the abutment support structure **48**, which structure may form part of a re-set actuator plunger, as disclosed in Figs. 1–4. The thermal latch element is indicated at **50** with its free distortable edge **50'** in engagement with the abutment surface **44'** provided by the abutment block **44**. The abutment block has a central lateral screw-threaded bore **52** in which the screw-threaded end **54'** of an adjustment screw **54** engages,

this screw having its screw-driver slot 54'' exposed to the side of the support structure (or actuator plunger) remote from the abutment block 44 and being constrained against axial motion, when rotated, by the keeper plate structure 56. With this construction and arrangement, rotation of the screw 54 in one direction, or in the opposite direction, will cause the abutment block 44 to be either drawn into, or projected out, with respect to the recess 46 and thereby cause the latch edge 50' to be set at the desired position along the abutment surface 44'.

In Fig. 5, as in Figs. 1 to 4, the adjustment abutment is disclosed as applied to a one-side latch assembly.

An alternative adaptation of the invention for a two-side latch assembly is disclosed in Fig. 6. In this form of the invention the support structure 58, which may constitute a re-set actuator plunger, has recesses 60, 60, formed in its opposite sides, and similar abutment blocks 62, 62 are slidably mounted in each said recess, these blocks presenting abutment surfaces 62', 62' to the thermally distortable free end edges 64', 64' of a pair of bi-metallic thermal latch plates 64, 64. The blocks 62 have axially aligned screw-threaded bores 62'', 62'' which are of opposite direction (i. e. right and left-hand threads) and receive the corresponding screw-threaded portions 66', 66' of an adjustment screw 66. This screw inter-connects the two abutment blocks through the medium of a keeper plate structure 68 which constrains the screw against axial movement, when rotated, so that its rotary motion, in either direction, produces lateral displacement of the abutment blocks 62, 62 with respect to their recesses 60, 60. One end of the screw 66 exposes a screw-driver slot 66'' by which the screw can be adjusted, as desired. It will be self understood, with such a construction and arrangement of parts as illustrated in Fig. 6, that rotation of the screw 66 in either direction will produce simultaneous displacement of the abutment blocks towards or away from each other, whereby the ends 64', 64' of the thermal latch plates can be adjustably and similarly set with respect to their abutment surfaces 62', 62'.

Having thus disclosed my invention, what I claim as novel and wish to secure by Letters Patent is as follows:

1. In an electric circuit breaker having current overload protection and including fixed and movable contact means, a bi-metallic latch in electrical connection with said movable contact means, and an abutment with which an edge of said latch engages to hold the contacts closed, support structure for said abutment, means mounting said abutment upon said support structure for translational movement with respect to said latch edge, adjustable means connected with said abutment for imparting said translational movement to the abutment to adjust the position of contact of the latch edge with said abutment, and spring means connected with said latch for holding said edge firmly engaged against said abutment.

2. An electric circuit breaker as claimed in claim 1, said abutment including a plate member defining an abutment surface at one end, means mounting one end of said plate member upon said support structure, said end with the abutment surface being deflectable, an adjustment screw on said support structure, and means on said plate member in engagement with said adjustment screw for deflecting said plate end, by adjustment of said screw, to vary the position of engagement of the latch edge with said abutment surface.

3. An electric circuit breaker as claimed in claim 1, said support structure including a guide surface and said abutment including a block slidably supported with respect to said guide surface, an adjustment screw on said support structure and engaged with said abutment block, and means constraining said block to partake of sliding movement with respect to said guide surface upon rotation of said adjustment screw.

4. An electric circuit breaker as claimed in claim 1, said support structure defining opposite sides with a guide surface on each side, and said abutment including a block slidably supported with respect to each said guide surface, whereby there is an abutment block on opposite sides of the support structure, an adjustment screw inter-connecting said abutment blocks, and means constraining said blocks to partake of sliding movement with respect to said guide surface in opposite directions, and to a similar extent, upon rotation of said adjustment screw.

5. An electric circuit breaker as claimed in claim 4, said adjustment blocks having axially aligned screw-threaded bores of opposite direction and said adjustment screw having oppositely directed screw-threaded portions engaged in said bores.

6. In a thermal latch and abutment assembly for an electrical circuit breaker, said assembly including support structure, a thermal latch movably mounted with respect to said support structure and an abutment on said support structure for engagement by an end edge of said latch to hold the latch in the latched position, a guide surface on said structure, means mounting said abutment on said structure for movement with respect to said guide surface, and adjustment means on said support structure and connected with said abutment to adjust the abutment with respect to said guide surface, whereby to vary the point of engagement of said latch edge with said abutment, and spring means connected with said latch for holding said edge firmly engaged against said abutment

7. In an electric circuit breaker having overload protection, fixed contact means, movable contact means in opposed relation to said fixed contact means, a bi-metallic latch in electrical connection with said movable contact means, guide structure including an abutment surface, means mounting said movable contact means and said bi-metallic latch for movement as a unit relatively to said guide structure for engaging an edge of said latch with said abutment surface, said latch edge being deflectable from engagement with said abutment surface under the influence of the heat of the conducted current, means mounting said abutment for adjustment upon said support structure in the direction of said deflection, and spring means connected with said unit for holding said latch firmly engaged with said abutment, said spring means being operative to move said movable contact means sharply away from the movable contact means when said latch disengages said abutment.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
2,388,617	Link	Nov. 6, 1945
2,573,306	Casey	Oct. 30, 1951