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R. N. ROWE ET AL
ELECTRIC CIRCUIT BREAKER

2,640,127

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Fig. 1.

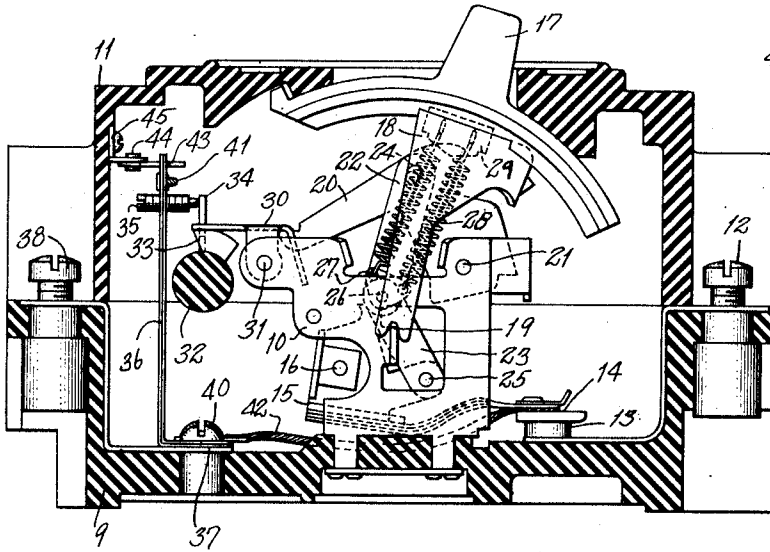


Fig. 2.

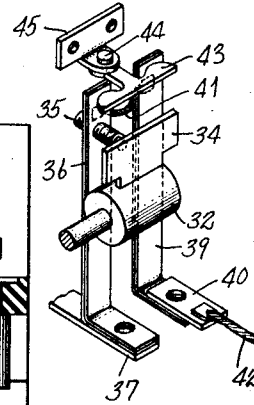


Fig. 3.

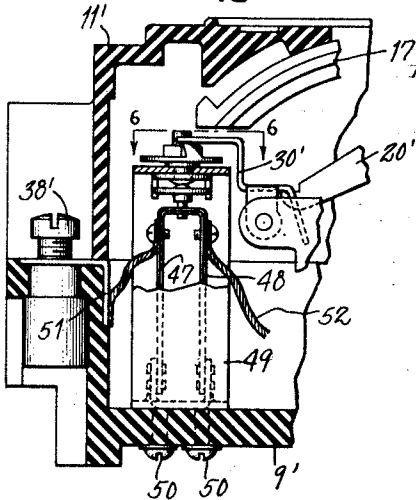


Fig. 4.

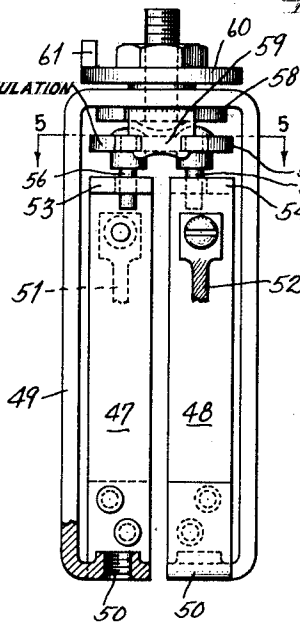


Fig. 5.

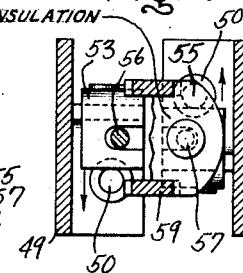
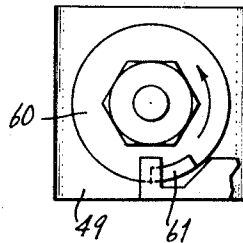


Fig. 6.



Inventors:
Raymond N. Rowe,
Robert G. Page,

by 
Their Attorney.

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ELECTRIC CIRCUIT BREAKER

Raymond N. Rowe, Plainville, and Robert G. Page,
New Britain, Conn., assignors, by mesne as-
signments, to General Electric Company, a cor-
poration of New York

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6 Claims. (Cl. 200—116)

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Our invention relates to circuit breakers of the type in which the mechanism is so constructed that the circuit may be opened and closed by manual operation and the circuit will be automatically broken in case of an overload.

It is important that the mechanism be sufficiently sensitive to ensure proper operation and yet sufficiently rugged so that it will not accidentally open the circuit. This is particularly important when the mechanism is subjected to sudden severe shocks as when used in connection with naval gunnery. It is customary in such circuit breakers to employ thermostatic devices which control the tripping action of the switch and serve to release toggle action for opening the circuit in case of an overload.

It has been found that such thermostatic devices can be accidentally actuated by severe shocks and it is our object to provide a thermostatic overload control which is immune from such accidental operation.

We have accordingly provided a thermostatic control which includes two bimetal elements so constructed and arranged that sudden vibration or movement of one will be offset by a counteraction of the other. We have shown such a construction as arranged to control tripping mechanism of conventional form.

Fig. 1 is a longitudinal section and side elevation of a circuit breaker embodying our invention.

Fig. 2 is a detached perspective view showing parts of the thermostatic overload release device of Fig. 1.

Fig. 3 is a fragmentary sectional view showing a modified form of thermostatic release device embodying our invention.

Fig. 4 is an edge view of the release device of Fig. 3 on a larger scale, part being broken away.

Fig. 5 is a sectional view on the plane of the line 5—5 of Fig. 4.

Fig. 6 is a plan view of the release device on the plane of the line 6—6 of Fig. 3.

As illustrated the base 9 of the circuit breaker supports a frame 10 on which are mounted the parts of the circuit making and breaking mechanism. Such construction will ordinarily be enclosed by a cover 11. At one end of the base is mounted a circuit terminal 12 at its exterior connected to an interior stationary switch contact 13. The movable contact 14 is carried by a switch arm 15 which is pivoted at 16 on the frame.

The circuit breaker is designed to be operated manually by a finger lever 17 which has an arm

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18 pivoted at 19. The tripping member 20 is hinged at 21 on the frame and connected to the switch arm 15 by toggle links 22, 23. Link 22 is hinged to the trip member at 24. Link 23 is hinged to the switch arm at 25 and the links are hinged together by pivot 26.

An anchor member 27 is hinged to the pin 26 and connected by a spring or springs 28 to the anchorage 29 on the inner face of the finger lever.

The latch member 30 is hinged to the frame at 31 and normally is interlocked with and restrains the movement of the trip member 20. The rocker 32 has an abutment 33 which normally supports the tip of the latch member 30. This rocker 32 has a radial projection 34 engaged by the calibrating screw 35 which is supported at the upper end of the thermally deformable bimetal arm 36. The lower end or foot of this arm is anchored to the base at 37 and the latter is connected to an external circuit terminal 38 at the end of the base opposite the terminal 12.

To prevent the possible effect of mechanical vibration of the arm 36, we provide another similar bimetal arm 39 which is anchored at 40 adjacent arm 36. The movable ends of the arms 36 and 39 are connected together by flexible lead 41 and the foot of the arm 39 is connected by a flexible lead 42 to the movable contact 14. The bimetal arms are so constructed and arranged that upon an overload in the circuit the upper end of the arm 36 will move toward the right as viewed in Figs. 1 and 2, thus pressing against the projection 34 on the rocker 32 turning the rocker clockwise and causing the projection 33 to release the latch 30 and permit the trip member 20 to release the toggle action and permit the springs 28 to move the arm 15 so as to break the circuit in the usual manner. The other bimetal arm 39 is so constructed and arranged that its movable end warps toward the left instead of toward the right. The coupling abutment member 43 is of T-shape having its stem pivoted or hinged at 44 on the bracket 45. The cross bar or arms of the coupling member project in the path of movement of the arms 36 and 39 with the pivot 44 substantially between and parallel with the arms so that upon any sudden vibration of the arms 36 and 39 due to shock in a circuit, opening movement will be prevented by the coupling member. In other words, the two bimetal arms cooperate to permit normal opening of the circuit in case of an overload but are coupled so as to prevent opening of the circuit due to shock.

In the form shown in Fig. 3, the base 9, cover

11', operating member 17', trip member 20', latch 30' and terminal 38' correspond with similar parts of Fig. 1. In this case, the bimetal arms 47 and 48 are carried by an inverted U-shaped frame 49 which is secured to the base by screws at 50, 50. The upper end of the bimetal arm 47 is connected by flexible lead 51 to terminal 38'. The upper end of the other bimetal arm 48 is connected by flexible lead 52 to the movable switch member (not shown). The upper movable ends 53 and 54 of the arms 47 and 48, respectively, are coupled together by a coupling abutment member having a disc 55 which is formed of insulating material and having pins 56 and 57 which project into slots in the ends 53 and 54, respectively, of the bimetal arms. This coupling disc is carried by a rotatable disc 58 which has depending projections 59 interlocked with the opposite edges of the coupling disc 55. This coupling member, on the inside of the frame 49, is connected to a rotatable disc 60 on the outside of the frame which has a projection 61 which coacts with the latch member 30'.

These two thermostatic arms 47 and 48 cooperate in the normal operation of the circuit breaker in the same way that the arms 35 and 39 cooperate in the form shown in Figs. 1 and 2. Inertia effect in case of shock is prevented by the cooperation of the coupling member with the arms in a manner similar to that described with respect to the form of Figs. 1 and 2.

We claim:

1. In a circuit breaker having separable switch contacts movable between open and closed circuit positions, a tripping member movable when released to effect separation of said contacts, latch means normally engaging said tripping member to restrain its movement and movable to release said tripping member, a pair of thermally deformable bimetal arms heated in response to the current passing through said contacts and movable to actuate said latch means to release said tripping member, said arms being disposed in parallel spaced relation and having adjacent ends mounted to provide movement of their opposite free ends in opposite directions when heated, a rotatable member pivotally mounted between said free ends of said arms and engaged by said free ends on opposite sides of its pivot point thereby to be rotated in one direction by opposite thermal deformation of said bimetallic arms, said rotatable member preventing shock responsive deflection of both said free ends in a like direction.

2. In a circuit breaker having separable switch contacts movable between open and closed circuit positions, a tripping member movable when released to effect separation of said contacts, a latch member normally engaging said tripping member to restrain its movement and movable to release said tripping member, a pair of thermally deformable bimetal arms heated in response to the current passing through said contacts, said arms being disposed in parallel spaced relation and having adjacent ends mounted to provide movement of their opposite free ends in opposite directions when heated, a rotatable member pivotally mounted intermediate said free ends of said arms on a pivot pin parallel to said arms, said rotatable member being engaged by said free ends on opposite sides of said pivot pin thereby to be rotated in one direction by opposite thermal deformation of said bimetallic arms but preventing shock responsive deflection of both said free ends in a like direction, and means operable in response to thermal deflection of said free ends to actuate

said latch member to release said tripping member.

3. In a circuit breaker having separable switch contacts movable between open and closed circuit positions, a tripping member movable when released to effect separation of said contacts, latch means normally engaging said tripping member to restrain its movement and movable to release said tripping member, a pair of thermally deformable bimetal arms heated in response to the current passing through said contacts, said arms being disposed in parallel spaced relation and having adjacent ends mounted to provide movement of their opposite free ends in opposite directions when heated, a rotatable member pivotally mounted between said free ends of said arms and engaged by said free ends on opposite sides of its pivot point thereby to be rotated in one direction by opposite thermal deformation of said bimetallic arms, said rotatable member preventing shock responsive deflection of both said free ends in a like direction and being movable by thermal deflection of said free ends to move said latch means to release said tripping member.

4. In a circuit breaker having separable switch contacts movable between open and closed circuit positions, a tripping member movable when released to effect separation of said contacts, latch means normally engaging said tripping member to restrain its movement and movable to release said tripping member, a pair of thermally deformable bimetal arms heated in response to the current passing through said contacts, said arms being disposed in parallel spaced relation and having adjacent ends mounted to provide movement of their opposite free ends in opposite directions when heated, a rotatable member pivotally mounted between said free ends of said arms and engaged by said free ends on opposite sides of its pivot thereby to be rotated in one direction by opposite thermal deformation of said bimetallic arms, said rotatable member preventing shock responsive deflection of both said free ends in a like direction, one of said free ends when thermally deformed effecting movement of said latch means to release said tripping member.

5. In a circuit breaker having separable switch contacts movable between open and closed circuit positions, a tripping member movable when released to effect separation of said contacts, a latch member normally engaging said tripping member to restrain its movement and movable to release said tripping member, a pair of thermally deformable bimetal arms heated in response to the current passing through said contacts, said arms being disposed in parallel spaced relation and having adjacent ends mounted to provide movement of their opposite free ends in opposite directions when heated, a rotatable member pivotally mounted between said free ends of said arms on a pivot pin parallel to said arms, pin and slot connections between said free ends of said arms and said rotatable member on opposite sides of said pivot pin whereby said rotatable member is turned in one direction by opposite thermal deformation of said bimetallic arms, said rotatable member preventing shock responsive deflection of both said free ends in a like direction, and means operable in response to turning movement of said rotatable member to effect movement of said latch member to release said tripping member.

6. In a circuit breaker having separable switch contacts movable between open and closed circuit positions, a tripping member movable when re-

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leased to effect separation of said contacts, a latch member normally engaging said tripping member to restrain its movement and movable to release said tripping member, a pair of thermally deformable bimetal arms heated in response to the current passing through said contacts, said arms being disposed in parallel spaced relation and having adjacent ends mounted to provide movement of their opposite free ends in opposite directions when heated, a transverse bar extending across the free ends of said arms and pivotally mounted between said arms on a pivot pin parallel to said arms, said bar being turned about its pivot by opposite thermal deformation of said arms but preventing shock responsive deflection of both said free ends in at least one

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like direction, and means operable in response to thermal deformation of one said arm to effect movement of said latch member to release said tripping member.

RAYMOND N. ROWE.
ROBERT G. PAGE.

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