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R. T. CASEY

2,573,306

ELECTRIC CIRCUIT BREAKER

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Fig. 1.

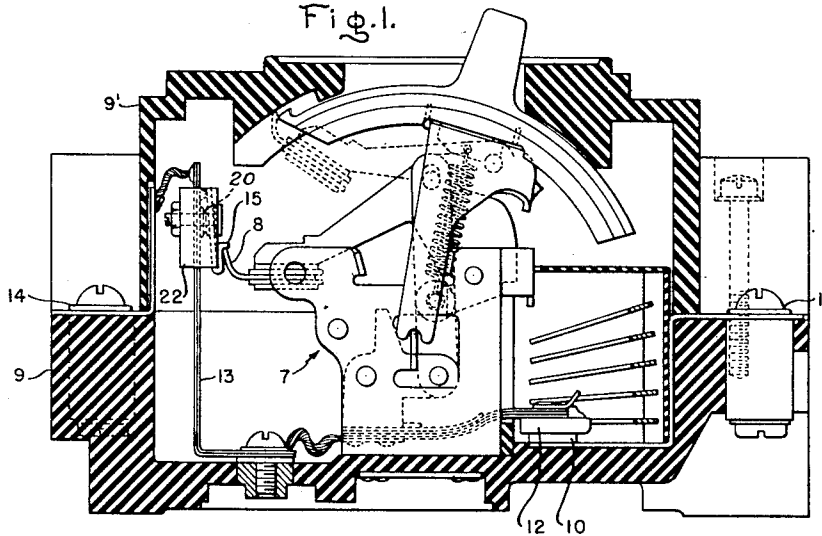


Fig. 2.

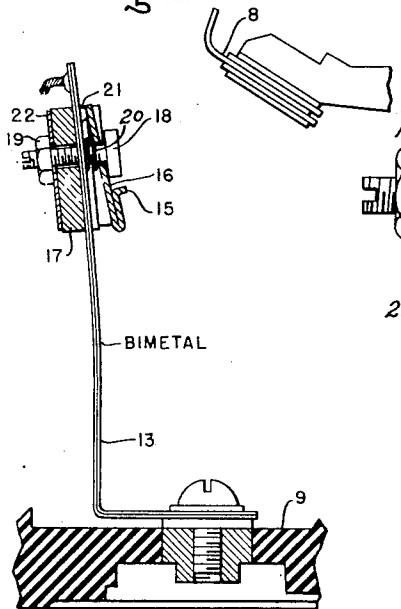


Fig. 3.

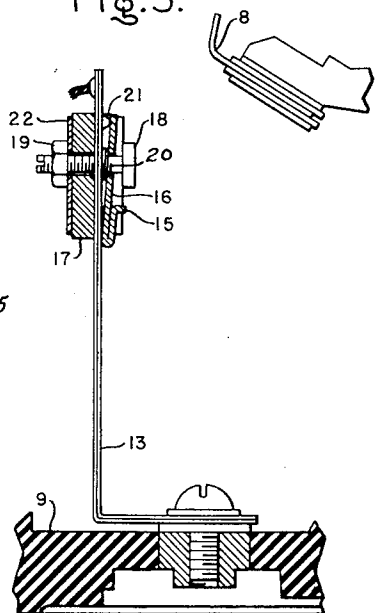


Fig. 6.

Fig. 5.

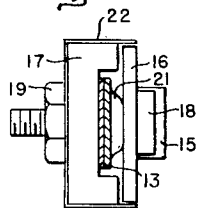
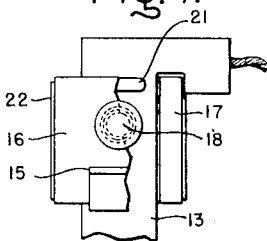


Fig. 4.



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UNITED STATES PATENT OFFICE

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ELECTRIC CIRCUIT BREAKER

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7 Claims. (Cl. 200—88)

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My invention relates to electric switches commonly called circuit breakers of the type which automatically opens the circuit upon a continued slight overload or upon a sudden heavy overload and which can be operated to open or close a circuit manually or to reset it manually in case of an automatic opening in the circuit.

The principal object is to greatly simplify the automatic protective mechanism and to provide a magnetic release that can be readily added to a conventional thermal release mechanism and thus convert it to a combination trip device.

It will be seen that the invention relates principally to the automatic release mechanism in which a magnetic release device is mounted on the thermal release device and thus forms a combination applicable to many circuit breaker switching mechanisms.

Fig. 1 is a side view and section showing a conventional switch in a casing and embodying my thermal and magnetic circuit breaking devices, the parts being shown in the circuit closed position.

Fig. 2 is an enlarged fragmentary side and partially sectional view showing the effect of the thermal release action, the armature being shown in its position at the instant of release of the breaker action.

Fig. 3 is a view of the same parts as those in Fig. 2 but with the armature in the position at the instant of tripping due to magnetic release.

Fig. 4 is a fragmentary view showing the magnetic release member and the end of the thermal member looked at from the right of Figs. 2 and 3.

Fig. 5 is a plan view of the parts of Fig. 4 but showing the thermal strip in section.

Fig. 6 is a fragmentary sectional view of the release parts in the position they occupy after complete release of the breaker.

The switch mechanism per se 7 may be of any suitable type having a spring pressed trip arm 8 releasable to cause automatic opening and may be mounted in a casing 9 with a cover 9' of suitable construction.

The stationary contact 10 of the switch is connected to the circuit terminal 11 and the movable contact 12 is flexibly connected to the foot of the thermal strip 13. The outer end of the strip 13 is flexibly connected to the circuit terminal 14 in any suitable manner.

Near its outer end the strip 13 carries a catch 15 with which the tip of the trip arm 8 normally engages. When the catch is retracted from the trip arm, the arm flies upward as indicated in Figs. 2 and 3 and the circuit is broken in the usual manner.

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This catch 15 is connected to a part of the armature 16 of the magnet 17. The flanges of the magnet embrace the edges of the strip 13 which supports the magnet and its armature. For this purpose, a non-magnetic headed stud 18 passes through the magnet and its armature and is screwed into the non-magnetic bimetal strip 13 and held by the nut 19 screwed onto the threaded end of the stud 18 so that the action of the catch may be adjusted. A spring 20 on the stud is interposed between the strip 13 and the armature and presses the armature toward the head of the stud as shown in Figs. 1 and 2. The boss 21 projecting from the strip 13 serves to space the upper edge of the armature away from the magnet and the spring biases the armature and its catch away from the magnet, the trip member being biased to the open circuit position tilts the armature against the boss 21.

When the bimetal strip 13 is heated by prolonged moderate overload, it is warped as shown in Fig. 2 and thus releases the breaker trip arm from the catch.

In case of a sudden heavy overload passing through the strip 13, the magnet 17 is energized and draws the armature 16 into the position of Fig. 3 and releases the trip arm. To assist in positioning the magnet and its armature, I may provide a non-magnetic guide 22 which embraces the edges of the magnet and its armature.

It will be seen that such a combination of thermal and magnetic devices is extremely simple and readily installed. The magnet and its armature and the catch and guide are all secured in place on the bimetal strip by a single screw.

By reason of the fact that the magnet and its armature and catch are mounted upon and movable with the bimetal member, the air gap between the magnet and armature remain constant as the bimetal member starts to warp so that the characteristic sudden overload point is not changed by the incomplete slow warping movement as caused by a slow moderate overload.

It will also be seen that the catch for the magnetic release is exposed when the cover of the housing or casing is removed so that it is readily accessible for assembly and for inspection and adjustment.

I claim:

1. Automatic release mechanism for a circuit breaker including a trip member, a bimetal strip anchored at one end and movable at the other end when overheated, a magnet embracing at least one surface of the strip, an armature coacting with the magnet, a headed screw stud passing

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through the armature, strip and magnet, a spring on said stud between the strip and the armature and a catch carried by said armature and coacting with said trip member.

2. Automatic release mechanism for a circuit breaker comprising a bimetal strip anchored at one end and movable at the other end when overheated, a magnet embracing at least one surface of the strip, an armature coacting with the magnet, a headed stud passing through the armature, strip and magnet, a spring on said stud between the strip and the armature and a catch carried by said armature, said stud being adjustable in said strip.

3. Automatic release mechanism for a circuit breaker having a spring pressed trip arm, a thermally movable strip member, a magnet carried by and movable with said strip member upon an overload in the circuit, a stud carried by said magnet and said strip member and movable therewith, said stud having a head spaced from said strip member, an armature mounted to tilt on said stud between said strip member and said head, said strip member having an abutment for one edge of said armature at one side of said stud, said armature having a catch shoulder for holding the trip arm under normal circuit conditions and a spring on said stud between said strip member and said armature, said armature being movable independently of said strip member upon a sudden overload in the circuit.

4. Release mechanism as set forth in claim 3 in which the stud is adjustable through said magnet to modify the action of the armature.

5. In a circuit breaker having contact mechanism with a spring biased actuator, current actuated latching mechanism including a thermally warpable strip fixed at one end and movable at the other end, a magnet at the movable end of said strip, a stud passing through said strip and said magnet and having a head spaced from said strip, an armature mounted on said stud between said head and said strip, said strip having a boss projecting toward one edge of said armature at one side of said stud, said armature having a shoulder at the opposite side of said stud for holding the actuator of the circuit breaker and a spring compressed between said strip and said armature biasing said armature toward said head.

6. Automatic release mechanism for a circuit breaker having a spring-pressed trip arm, a current actuated magnet having an armature, a

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bimetal support therefor, a stud carried by said magnet and support and having a head spaced from said magnet, an abutment for one edge of said armature between said magnet and said armature, the armature being mounted on said stud to tilt at one edge on said abutment between said head and said magnet, a catch shoulder carried by an opposite edge of the armature for holding the trip arm under normal circuit conditions and a spring between said magnet and said armature for pressing said armature away from said magnet and against said head when the magnet is energized and the trip arm is released, said stud being adjustable through said support.

7. A circuit breaker including relatively movable contacts, a releasable member operable when released to effect opening of said contacts, trip means including a bimetal element electrically connected to be traversed by current, electroresponsive means comprising a pair of magnetic members on opposite sides of said bimetal element and energized by the current flow there-through, both of said magnetic members being movable, one of said magnetic members being movable magnetically relative to the other to effect release of said releasable member upon the occurrence of a heavy overload and the other magnetic member being movable upon bending of said bimetal element to effect release of said releasable member upon the occurrence of a smaller overload and a single screw stud adjustable in said bimetal element and supporting both of the magnetic members.

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