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2,961,513

TRIP-FREE CIRCUIT BREAKER

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Fig.1

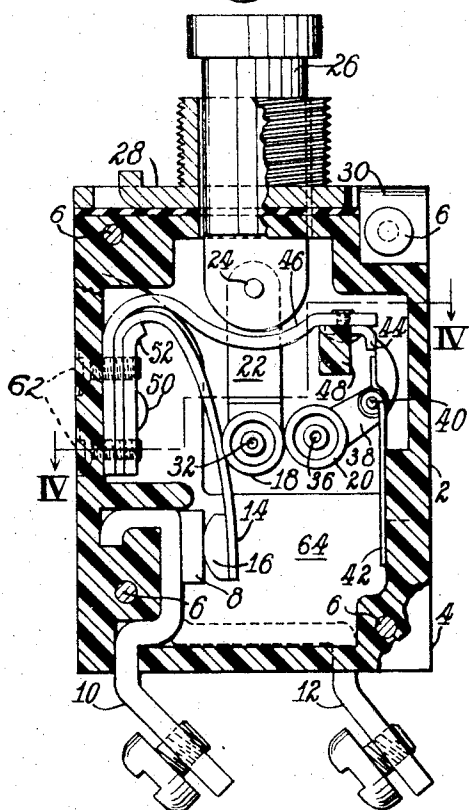


Fig. 2

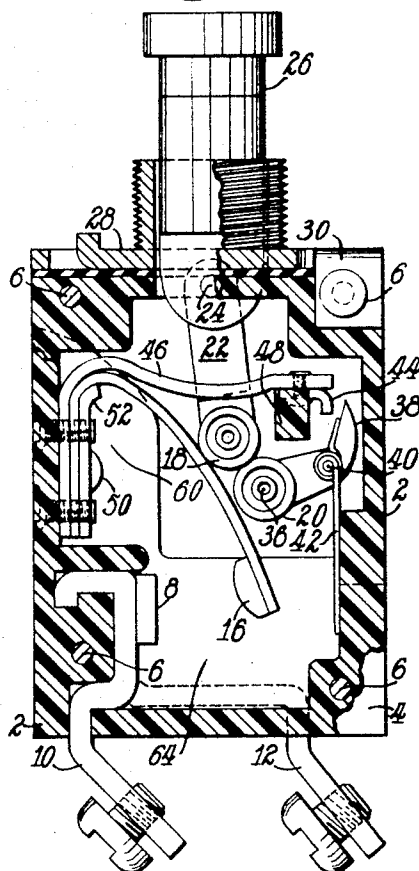


Fig. 3

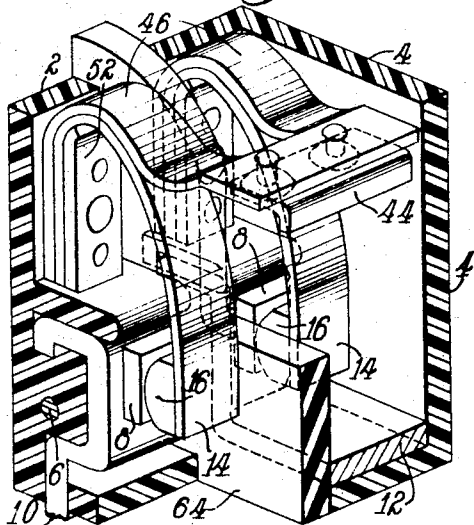
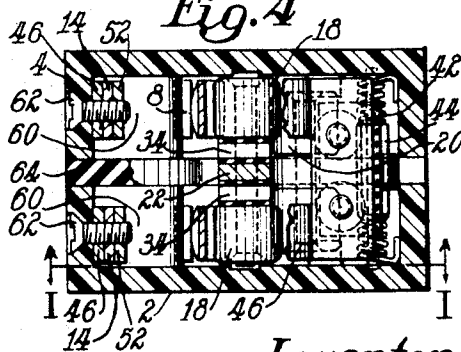


Fig. 4



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2,961,513

TRIP-FREE CIRCUIT BREAKER

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6 Claims. (Cl. 200—116)

The present invention relates to improvements in electrical circuit breakers, particularly of the trip-free type which also are automatically reset, so that the operating position is always indicated by an operating handle or button regardless of whether it is tripped by hand or by an overload in the circuit passing through it. More particularly the invention relates to improvements in a breaker disclosed in an application for United States patent, Ser. No. 721,134, filed March 13, 1958 in the name of Lawrence W. Brackett.

The circuit breaker of the application above noted is an improvement over that disclosed in United States Patent No. 2,613,296, granted June 24, 1949, upon application of the present inventor. In the patent a single fixed and a single movable contact are provided for cooperation in opening and closing a circuit and a thermostatic latch is arranged to release a contact retaining member whenever an excessive current flows for a sufficient period of time to heat the latch above a releasing temperature. The circuit breaker of the application is an improvement over the construction of the prior patent because it provides a double break instead of a single break, as in the patent, thus increasing the durability of the breaker and the factor of safety under which it operates without adversely affecting the external dimensions or the reliability of the constructional features.

The purpose of the present invention is to simplify the constructional features of the breaker disclosed in the application by reducing the external dimensions, increasing the ease of assembly and improving the insulating values while maintaining the double break, trip free and automatic reset features of the prior application. These features are embodied in the provision of a trip free overload breaker having a split rectangular frame formed with a pair of opposed hollow insulating shells, a fixed contact secured in each shell, a releasable lever extending between the shells, an abutment on the releasable lever, two resilient arms, one end of each arm being secured within one of the shells and the other end of each arm being disposed opposite to and biased in spaced relation from the fixed contact in the corresponding shell, a movable contact secured to the spaced end of each resilient arm and a manually operable wedging abutment arranged to act between the abutment on the releasable lever and both resilient arms, simultaneously to open and to close the contacts, in combination with a U-shaped bimetallic plate, each side of which is secured to each shell and to one of the resilient arms and the base of which U-plate forms a latch for retaining the releasable lever. By this construction the entire assemblage is contained between the shells of the frame and each shell forms a mounting for each fixed contact to maintain alignment of the corresponding movable contact therewith. Such construction facilitates assembly and improves reliability in subsequent use. Preferably, the two pairs of contacts are compartmentized by an insulating sheet extending between the sides of the bimetallic latch.

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These and other features of the invention, as hereinafter described and claimed, will readily be apparent to those skilled in the art from the following detailed specification, taken in connection with the accompanying drawings, in which:

Fig. 1 is a sectional side view taken along the line I—I of Fig. 4, illustrating a circuit breaker embodying the features of the present invention with the contacts in circuit closing positions;

Fig. 2 is a similar view of the circuit breaker shown in Fig. 1 with the contacts thereof in open circuit positions;

Fig. 3 is a perspective detail view of the breaker with the contacts and a U-shaped bimetallic plate contained in the circuit breaker; and

Fig. 4 is a sectional plan view of the breaker taken along the line IV—IV of Fig. 1.

The trip-free overload circuit breaker illustrated in the drawings is manually operated to close or open a circuit to be controlled and is actuated automatically to open and to prevent holding the circuit closed under conditions of overload until the conditions are corrected. The mechanism for actuating the breaker is the same in many respects as that of the prior patent and application, in that a locked releasable member and a contact actuating member are separated from each other to close the circuit to be controlled by a wedging member connected to a manually operable button, projecting from the breaker.

For convenience in manufacture and assembly the breaker has a split rectangular frame formed with a pair of opposed hollow insulating similar shells 2 and 4 riveted or bolted at 6 with open sides together. Within each shell 2 there is located a fixed contact 8. To hold the two fixed contacts in place terminal strips 10 and 12 have the contacts 8 welded to them. The terminal strip 10 is bent into a C-shape at one end to surround a similar shaped cavity in the wall of the shells 2 and the terminal strip 12 is bent correspondingly to surround a C-shaped cavity in the shell 4. The terminal strip 12 is longer than the strip 10 to enable it to run along the inside base of the shell 4, so that both strips may pass through slots in the bases of the shells at positions arranged in staggered relation to each other, and may protrude from the bottom of each shell in that relation, thus offering greater spacing for connecting wires.

One advantage of the present construction which characterizes it from other breakers is in its unitized movable contact assembly. For this purpose there are two similar resilient reversely bent arms 14 with one end of each secured within one of the shells and the other free end of each disposed opposite to and biased in spaced relation from the fixed contact 8 in the same shell. Secured to the spaced free end of each resilient strip is a movable contact 16. The movable contacts and the resilient arms are connected together so that when one end of one arm is made fast to a shell inner wall the corresponding end of the other one projects out of the shell in a position where it will line up with the corresponding wall of the other shell when brought into assembled relation. Thus, if a resilient arm is made fast to the inner wall of the shell 2 the other resilient arm will line up with the inner wall of the shell 4 when brought into assembled relation therewith.

To actuate the movable contacts the wedging abutment comprises a pair of insulating rolls 18 acting between the releasable abutment, in the form of a pair of insulating rolls 20, and the resilient arms 14. The rolls 18 are rotatably mounted at the free end of a link 22 pivoted by a pin 24 at its other end on a manually operable plunger button 26. The plunger button 26 has

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an enlarged head for convenient manipulation and is slidably mounted in a threaded sleeve portion of a cover plate 28. The cover plate 28 has four corner flanges, one of which is shown at 30, bent at right angles to its main body into contact with the outer faces of the shells 2 and 4, the rivets 6 entering the flanges of the shells opposite the terminal strips 10 and 12.

The wedging rolls 18 are secured to opposite ends of a pin 32, passing through spacers 34 (see Fig. 4) and being made fast along its central portion to the link 22. The lengths of the spacers 34 are such as to bring the rolls 18 into line with the resilient arms 14 and the rolls 20, which are released through the flow of an overload or other excessive current flow through the contacts.

To mount the abutment rolls 20 releasably they are secured to the opposite ends of a pin 36 having its central portion made fast to one arm of a lever 38 fulcrumed on a pin 40 supported, in turn, at its ends in recesses in opposite shells 2 and 4. Surrounding the pin 40 at both sides of the lever 38 are the coils of a torsion spring 42 having terminal arms engaging the inner sides of the shells and a reversely bent central part engaging the lever to swing it against the sides of the shell walls. When the wedging abutment rolls are pressed between the rolls 20 and the arms 14 the lever is swung away from the sides of the shells, as shown in Fig. 1 and the contacts are closed. To hold the releasable abutment rolls from movement while the contacts are being closed and to release the abutment rolls an upstanding arm of the lever 38 is brought into engagement with a ledge on an angle bar 44 secured to the base of a U-shaped bimetallic plate 46 of which it forms a part. The U-shaped angle plate also forms a latch for the releasable lever and is arranged to move away from the upper arm of the lever whenever an excessive or overload current flows through the contacts 8 and 16.

When an overload current flows through the contacts 8 and 16 and the latch bar 44 releases the lever 38 the resilient forces of the arms 14 move the abutment rolls 20 to positions below the level of the wedging rolls 18. The contacts 8 and 16 are immediately allowed to open and the wedging rolls 18 are forced upwardly to cause the button to be raised from the position of Fig. 1 to that of Fig. 2. As soon as the button is raised the pressure on the abutment rolls is released and the spring 42 swings the lever in a clockwise direction to bring its upstanding arm against the right side walls of the shells 2 and 4. In the corresponding position of the abutment rolls the contacts may be immediately closed by downward pressure of the button but if the overload conditions still persist the circuit may not be held closed even if the button is held depressed because the U-shaped bimetallic latch plate releases the lever 38 and enables the contacts to be opened regardless of the position of the button. It is, therefore, necessary to release the button from its depressed position before the contacts may again be closed. This is the structural distinction identifying the breaker as one of the trip-free automatically reset type.

To prevent excessive downward movement of the latch bar 44 so that it will not engage the upper end of the spring 42 to cause the lever to be latched in an improper position, the shells 2 and 4 have inwardly projecting lugs 48, one of which is shown in Figs. 1 and 2. These lugs also prevent the U-shaped bimetallic plate from moving downwardly to such an extent as to interfere with the upward movement of the wedging rolls 18.

For convenience in assembly of the breaker parts within the shells 2 and 4 the resilient movable contact carrying arms 14 and the arms of the U-shaped plate 46 are joined together at their ends, as has been stated, each with one of the others and are held together by a rivet 50 passing through each of two retainers 52, one end of each resilient arm 14 and the corresponding arm of the U-shaped bimetallic plate 46. The spacing between the

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arms of the U-shaped plate then holds the three parts, the arms 14, the arms of the plate 46 and the retainers 52 at exactly the correct relation to become readily aligned with mountings on the shell walls. In this way the entire movable contact assembly is unitized before introducing it within the covering shells, so that much of the assembly work is completed outside of the shells, thus facilitating manufacture by production methods.

In assembling the breaker a cover plate 28 having a button 26 with a link 22 and wedging rolls 18 attached is presented to the opening with the U of the U-shaped plate 46. The proper orientation is obtained by twisting the button to bring the rolls 18 and the plate 46 into the relation of Fig. 2. The plate 28 is slid on the button to contact its head and the two shells 2 and 4 having their terminal strips 10 and 12 assembled thereon are applied to either side of the parts thus arranged. In order to introduce the abutment lever 38 between the shells with the pin 40 in a position of alignment with the supporting recesses the shells are cut out along their lower edges and along a portion of either side of each. Thus, by using a long nosed plier the pin 40 can be inserted into its recesses in the shells as they are brought together. To hold the shells together the plate 28 is slid along the button away from its head until the four flanges 30 which extend at right angles to the plate overlap in embracing relation the two upper corners of the shells. When this has been done it will be found that the riveted ends of the arms 14 and of the U-shaped plates 46 are confined in cavities 60 formed in the shells 2 and 4, as can best be seen in Fig. 4. The walls of the cavities 60 so confine the arms 14 and the plates 46 that two threaded openings in each arm end come into sufficiently close alignment with a pair of holes in the adjacent side walls of the shells that screws 62 may be inserted from the outside without difficulty. When the screws 62 are tightened the movable contact unit is secured permanently in place. All that remains to be done to complete the assembly of the switch is to insert an L-shaped insulating barrier sheet 64 from the left side of the breaker, as shown in Fig. 1 and to apply the rivets 6 to the openings near the corners of the shells. The barrier sheet 64 not only fills the edge cut outs but avoids the possibility of arcing between pairs of fixed and movable contacts by separating them and preventing ionizing of the air within the confines of the shells. When the rivets 6 are driven in the lower corners they secure the barrier sheet in place, holes being formed therein to accept the rivets.

The nature and scope of the invention having been indicated and a particular embodiment having been described, what is claimed is:

1. A double break trip-free overload circuit breaker having a split rectangular frame formed with a pair of opposed hollow insulating shells, a fixed contact secured in each shell, a releasable lever between the shells, an abutment on the releasable lever, two resilient arms, one end of each being secured within one of the shells and the other end of each being disposed opposite to and biased in spaced relation from the fixed contact in the corresponding shells, a movable contact secured to the spaced end of each resilient arm and a manually operable wedging abutment arranged to act between the releasable abutment and the resilient arms to open and close the contacts, in combination with a U-shaped bimetallic plate, each arm of which is secured to each shell and to one of the resilient arms, and the base of which plate forms a latch for the releasable lever.

2. A double break trip-free overload circuit breaker as in claim 1, in which an insulating sheet is secured between the shells and between the fixed and movable contact pairs therein.

3. A double break trip-free overload circuit breaker as in claim 1, in which terminals connected to the respective fixed contacts in the shells protrude, one from each shell

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in staggered relation to each other along one face of the frame.

4. A double break trip-free overload circuit breaker as in claim 2, in which the edges of the insulating sheet are exposed along at least two adjacent sides of the frame and a corner of the frame defined by the sides has a fastening rivet passing through both shells.

5. A double break trip-free overload circuit breaker as in claim 4, in which terminals having C-shaped ends, each are connected to the respective fixed contacts in the shells and protrude from each shell and the shells each have a similarly shaped recess surrounding said corner fastening rivet, the terminals being separated by the insulating sheet at that corner.

6. A trip-free overload circuit breaker having a split rectangular frame formed with opposed shells, a fixed contact in each shell, a releasable lever between the shells, an abutment on the releasable lever, resilient arms having one end of each secured to and within one of the shells

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and the other end disposed opposite to and biased in spaced relation from the fixed contact in that shell, a movable contact secured to the spaced end of each resilient arm and a manually operable wedging member arranged to act between the abutment on the releasable lever and the resilient arms to open and close the contacts, in combination with a U-shaped bimetallic plate having spaced arms, each secured to one shell and to a corresponding resilient arm, the base of the bimetallic plate forming a latch for the releasable arm and being disposed at substantially right angles to the ends thereof which are secured to the shells.

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