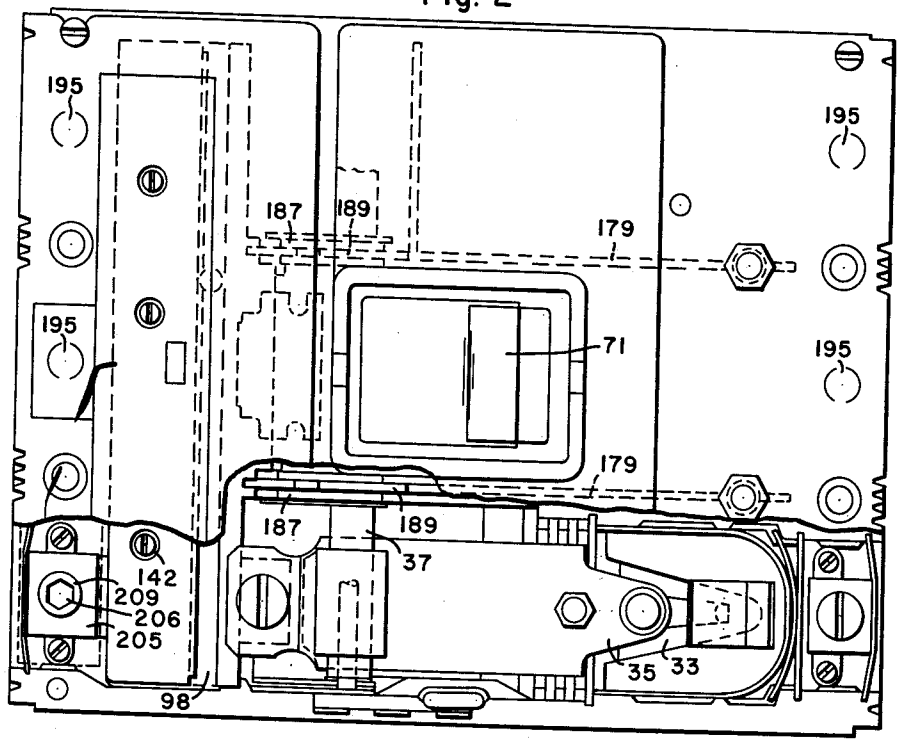
Jan. 15, 1963 R. H. HILL ETAL 3,073,927

CIRCUIT BREAKERS

Filed Oct. 16, 1959

3 Sheets-Sheet 1

Fig. 2



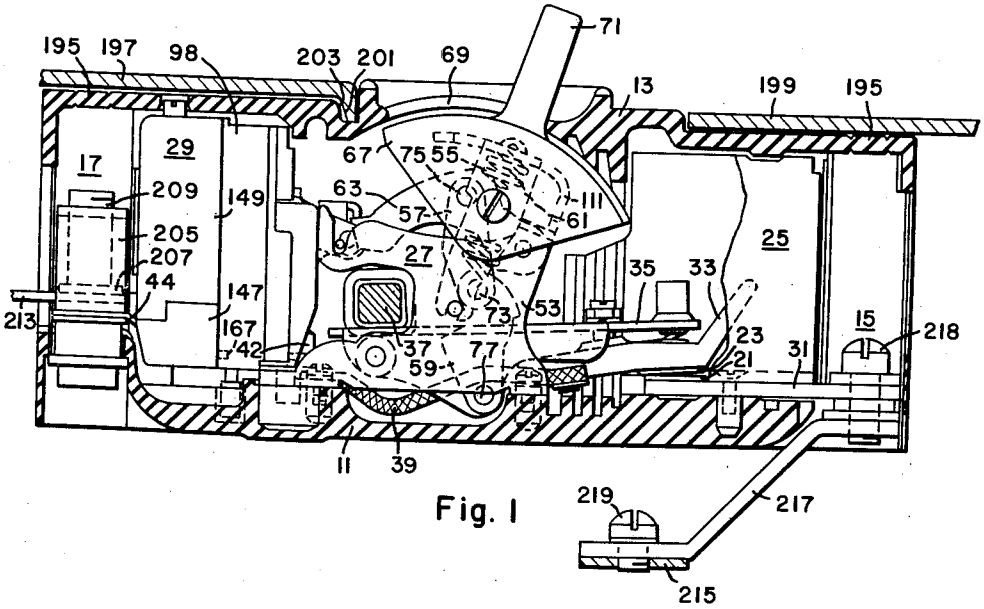


Fig. 1

Jan. 15, 1963 R. H. HILL ETAL 3,073,927

CIRCUIT BREAKERS

Filed Oct. 16, 1959

3 Sheets-Sheet 2

Fig. 7

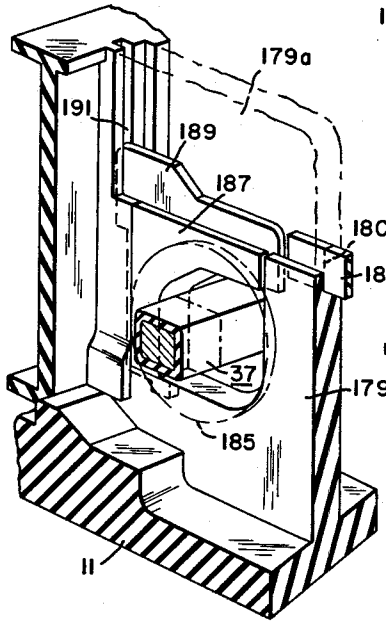
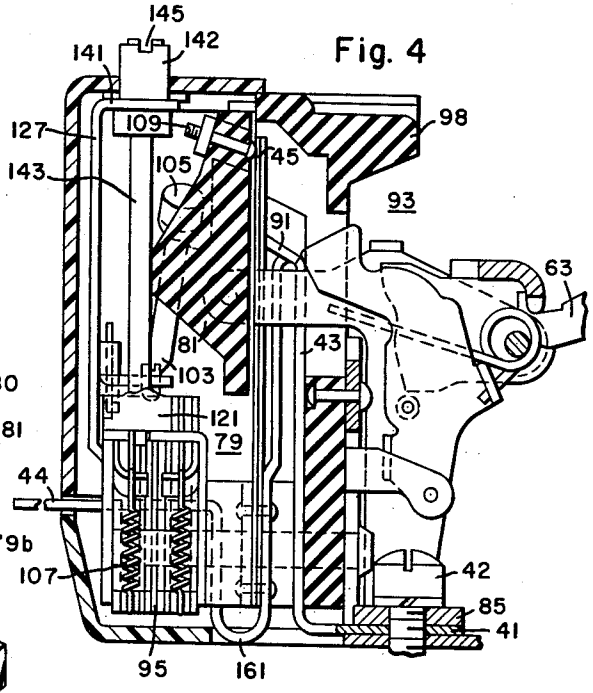


Fig. 4



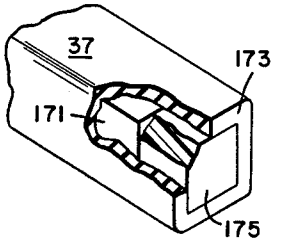


Fig. 8

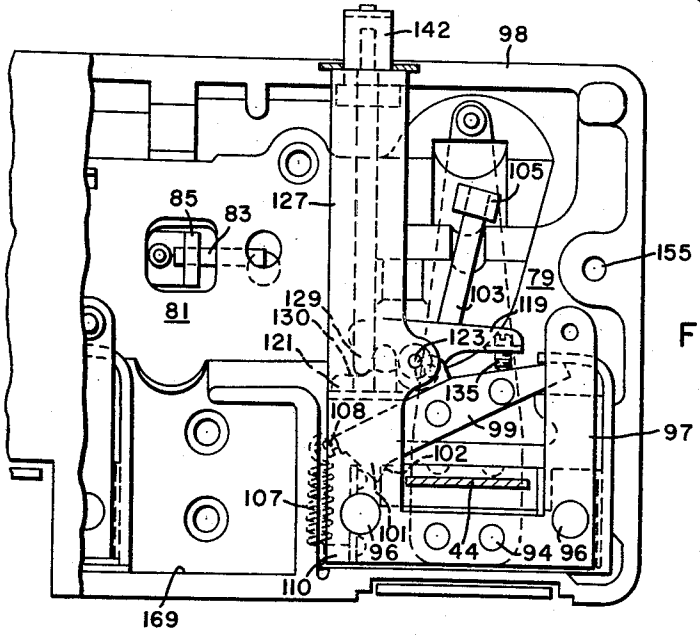


Fig. 3

Jan. 15, 1963 R. H. HILL ETAL 3,073,927

CIRCUIT BREAKERS

Filed Oct. 16, 1959

3 Sheets-Sheet 3

Fig. 5

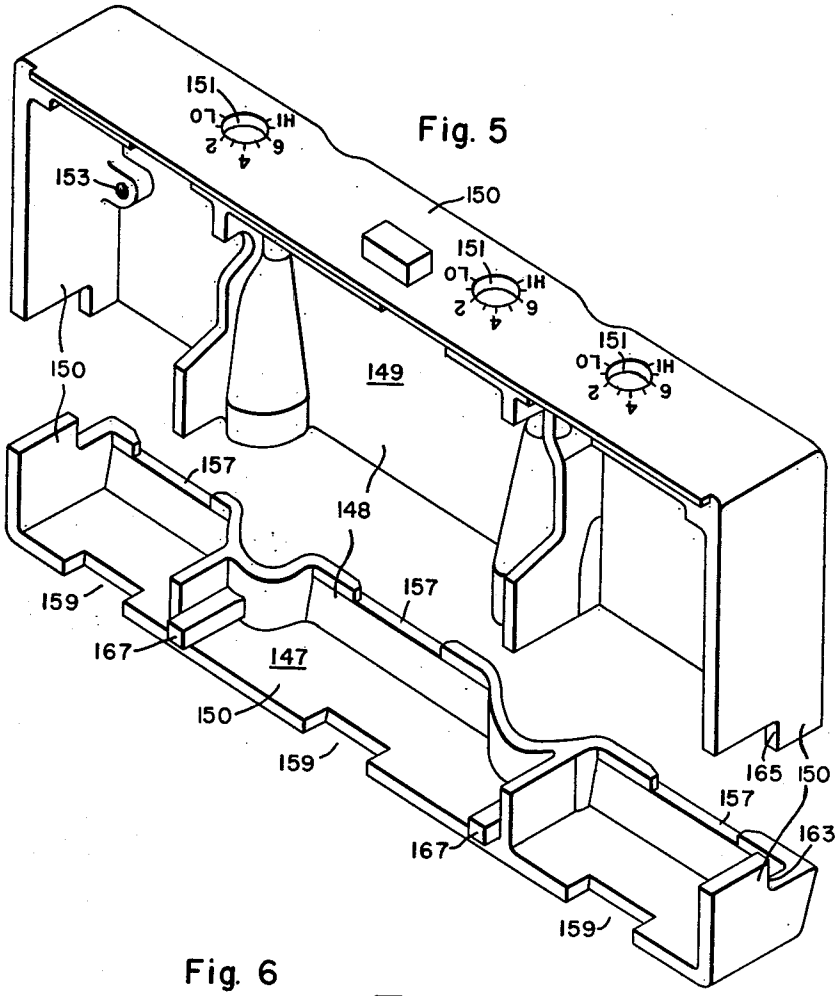
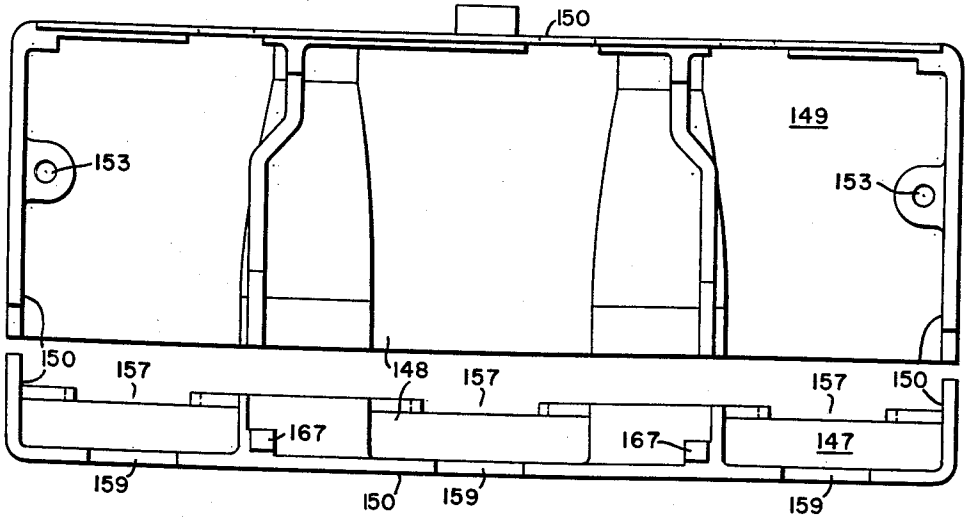


Fig. 6



United States Patent Office

3,073,927

Patented Jan. 15, 1963

3,073,927

CIRCUIT BREAKERS

Robert H. Hill, South Beaver Township, Beaver County, Pa., and John C. Hetzler, Jr., Laurel, Md., assignors to Westinghouse Electric Corporation, East Pittsburgh, Pa., a corporation of Pennsylvania

Filed Oct. 16, 1959, Ser. No. 846,980

9 Claims. (Cl. 200—88)

This invention relates, generally, to circuit breakers and, more particularly to enclosed circuit breakers with automatic tripping means.

In a circuit breaker embodying a thermal time-delay and magnetic instantaneous tripping mechanism, it is important that the trip unit be free from tampering that could disturb the thermal and magnetic calibrations. The one-piece trip unit covers that have been used in the past have not sufficiently enclosed the tripping mechanisms to avoid possible tampering. This has been especially true wherein the tripping mechanism was adjustable from outside of the unit. If a trip unit cover were molded in one piece to completely enclose an adjustable tripping mechanism, it could not be assembled over the adjusting knobs which must protrude through the top of the cover.

Accordingly, it is an object of this invention to provide a circuit breaker embodying a safely enclosed automatic tripping mechanism.

Another object is to provide a circuit breaker embodying an automatic tripping mechanism with a base and a two-part interlocking cover cooperating with said base to safely enclose said tripping mechanism.

Another object is to provide a circuit breaker embodying an automatic tripping mechanism with a base and a two-part cover cooperating with said base to enclose said tripping mechanism wherein said tripping mechanism is adjustable from outside of said cover.

Another object of this invention is to provide a multi-pole circuit breaker having a completely insulated tie bar to insure against internal flashover between the poles of the breaker.

Another object of this invention is to provide complete interpole barriers to insure against internal flashover on faults in a multi-pole circuit breaker.

Another object is to provide a multi-pole circuit breaker divided into compartments by a partition wall with an opening therein through which a movable tie bar passes, wherein a barrier movable with the tie bar and a stationary L-shaped barrier cooperate to close said opening.

Another object is to provide a multi-pole circuit breaker embodying a stationary barrier that interlocks with a trip unit base and a partition wall to isolate the poles of the breaker.

Another object of this invention is to provide a circuit breaker including a housing with knockouts over the terminal connectors removable to provide easy accessibility for front connecting the terminal connectors to power conductors.

The novel features that are considered characteristic of the invention are set forth in particular in the appended claims. The invention itself, however, both as to structure and operation, together with additional advantages thereof, will be best understood from the following detailed description when read in conjunction with the accompanying drawings.

In said drawings:

FIGURE 1 is a vertical sectional view of a panelboard mounted circuit breaker embodying the principal features of the invention;

FIG. 2 is a top plan view of the circuit breaker of FIG. 1, the panelboard plates being removed and part of the cover being broken away to more clearly illustrate the invention;

FIG. 3 is an enlarged elevational view of part of the trip device with the cover broken away to better show the device;

FIG. 4 is a sectional view on an enlarged scale of the trip device;

FIG. 5 is an enlarged perspective view of the two part interlocking trip unit cover;

FIG. 6 is an enlarged elevational view of the trip unit cover shown in FIG. 5;

FIG. 7 is an enlarged perspective view illustrating the interlocking stationary barrier; the movable barrier being shown in circular dot-dash lines; and

FIG. 8 is an enlarged perspective view illustrating an insulating end of the tie bar.

Referring to FIG. 1 of the drawings, the circuit breaker shown therein comprises, generally, a base **11** and a removable cover **13** both of which may be molded from a suitable insulating material. The breaker is of the three-pole type, each pole being provided with a line terminal indicated generally at **15** and a load terminal indicated generally at **17** at opposite ends of the base **11**.

The circuit breaker includes a stationary contact **21**, a movable contact **23** and an arc extinguisher indicated generally at **25** for each pole. A common operating mechanism indicated generally at **27** is provided for simultaneously actuating the three movable contacts to open and closed positions. A trip device indicated generally at **29** serves to effect automatic opening of the breaker contacts in response to predetermined overload conditions in the circuit through any pole of the breaker.

The line terminal **15** is at the outer end of a conducting strip **31** which extends into the housing and rigidly supports the stationary contact **21**. The movable contact **23** for each pole is mounted on a rigid contact arm **33** supported on a switch arm **35** secured to a tie bar **37** which extends across all of the poles of the breaker and supports the switch arms for the several poles of the breaker for unitary movement to open and closed positions. The contact arm **33** is connected by means of a flexible conductor **39** to an intermediate or trip unit terminal **41** (FIG. 4) secured to the base **11** by a screw **42**. The trip unit terminal **41** is electrically integral with a looped heater element **43**. A bimetal element **45** constituting a part of the trip device **29** is mounted on the other leg of the heater element **43** which is electrically integral with a load terminal conductor **44**.

The operating mechanism **27** (FIG. 1) is disposed in the center compartment of the housing and is supported by a pair of spaced frame members **53** (only one being shown) secured to the base **11**. The operating mechanism comprises a pivoted forked operating lever **55**, a toggle comprising toggle links **57** and **59**, an overcenter spring means **61** and a pivoted releasable cradle **63** controlled by the trip device **29**. An arcuate insulating shield **67** for substantially closing an opening **69** in the cover **13** is mounted on the end of the operating lever **55** and has an integral handle portion **71** extending out through the opening **69** to permit manual operation of the breaker.

The toggle links **57** and **59** are pivotally connected together by a knee pivot pin **73**. The toggle link **57** is pivotally connected to the cradle **63** by a pin **75** and the toggle link **59** is pivotally connected to the switch arm **35** for the center pole by a pin **77**. The overcenter spring means **61** is connected under tension between the knee pin **73** of the toggle **57, 59** and the outer end of the operating lever **55**.

The circuit breaker is manually operated to the open position by movement of the handle **71** (FIG. 1) in a counter-clockwise direction to the "off" position, which movement actuates the overcenter spring **61** to cause collapse of the toggle **57, 59** and opening movement of the

switch arms 35 for all of the poles of the breaker in a well-known manner.

The circuit breaker is manually closed by reverse movement of the handle 71 from the "off" to the "on" position which movement causes the spring 61 to move overcenter and straighten the toggle 57, 59, thereby moving the switch arms 35 for all of the poles to the closed position.

In addition to the bimetal element 45 (FIG. 4) the trip device includes a series overload tripping electromagnet 79 (FIGS. 3 and 4) for each pole and a trip bar 81 common to all of the poles and biased to the latching position by a spring (not shown). The trip bar 81 is made of insulating material and is pivotally supported by means of pins 83 (only one being shown in FIG. 3) supported in a bracket 85 secured to the base 11 by the screw 42 for the center pole of the breaker.

A latch 91 on the trip bar 81 normally engages a latch mechanism, indicated generally at 93, which, in turn, engages and releasably restrains the cradle 63 to releasably hold the operating mechanism in the closed position.

The tripping electromagnet indicated generally at 79 comprises a fixed, laminated, U-shaped magnet yoke 95, the laminations being secured together by rivets 94 (FIG. 3). The magnet yoke 95 is supported by means of rivets 96 on a bracket 97 which is rigidly supported on an insulating base 98 for the trip device. As is best seen in FIG. 2, the insulating base 98 divides the circuit breaker housing longitudinally into two compartments, and serves to prevent passage of gases back into the tripping mechanism. A movable armature 99 (FIG. 3) is pivotally supported by means of a knife-edge pivot 101 in a V-shaped notch 102 in the fixed yoke 95. The armature 99 has a rod 103 pivotally connected thereto which, at its outer end, has a head 105 for engaging and operating the trip bar 81 upon energization of the magnet. Springs 107 are connected under tension between inwardly extending ears 108 on the outer laminations of the armature 99 and inwardly extending ears 110 on the outer laminations of the magnet yoke. The tripping magnet is energized by the load terminal conductor 44 which extends between the legs of the U-shaped magnet yoke 95.

When a low overload current occurs, the bimetal element 45 is heated, and when heated a predetermined amount, bends toward the left (FIG. 4) to engage the end of a calibrating screw 109 in the trip bar 81, and actuates the latter to effect release of the cradle 63 and opening of the breaker contacts after a time delay in a manner well known in the art.

When a high overload occurs, the circuit breaker is tripped open instantaneously by operation of the tripping magnet 79. When the magnet is energized by overload currents of, for instance, 1000% or more of normal rated current, or by a short-circuit current, the armature 99 is attracted toward the yoke 95 causing the head 105 of the rod 103 to engage and actuate the trip bar 81, thereby effecting instantaneous release of the cradle 63. This effects automatic opening of the contacts for all of the poles of the breaker.

It is necessary to reset and relatch the breaker mechanism following an automatic opening operation before the contacts can be closed. Resetting and relatching is effected by moving the handle 71 counterclockwise (FIG. 1) as far as it will go. During this movement, a projection 111 on the operating lever 55 engages a shoulder on the cradle 63 and moves the latter in a counterclockwise direction. Near the end of this movement, the free or latching end of the cradle 63 is reengaged with the latch mechanism 93 in a well-known manner. The breaker contacts are then closed in the previously described manner by movement of the handle to the "on" position.

Means are provided to selectively adjust within a predetermined range, the minimum overload current required to instantaneously trip the breaker. This is accomplished by adjusting the position of the armature relative to the magnet yoke to thereby vary the magnetic air gap.

The armature 99 is adjusted by means of a lever 119 (FIG. 3) which is controlled by a manually set cam 121. The lever 119 is pivotally mounted by a pivot pin 123 on the bracket 97 that is secured to the magnet yoke 95 and has a portion 127 extending upwardly therefrom. The lever 119 at one end is provided with a nose portion 129 which engages a stepped cam surface 130 of the cam 121. The other end of the lever 119 is provided with a calibrating screw 135 which bears against the armature 99. By turning the calibrating screw 135, the calibration of the magnetic trip may be set at the factory, and the setting of the screw 135 may then be sealed.

The upwardly extending portion 127 of the bracket 97 (FIG. 4) is bent over at right angles as at 141, and an adjusting knob 142 is rotatably mounted therein. A shaft 143 is keyed to the adjusting knob 142 and rotates with it. The cam 121 is connected to the bottom of the shaft 143. A slot 145 is provided in the top of the knob 142 for receiving a screwdriver which is inserted to rotate the shaft 143 and vary the position of the armature 99. When the shaft 143 is rotated, due to the action of the cam surface 130 on the nose 129 of the lever 119 (FIG. 3) the latter is pivoted about its pivot 123 causing the adjusting screw 135 to move the armature 99 and thereby vary the distance between the armature and the magnetic yoke 95. This tripping mechanism is more fully described in a patent application of Glen R. Thomas et al., Serial No. 819,268, filed June 10, 1959, and assigned to the assignee of the instant application.

Means are provided to safely enclose the tripping mechanism to prevent tampering once the calibration has been set. This is achieved by a two-part interlocking cover that will prevent passage, into the trip unit, of a wire 1/32 of an inch, or greater, in diameter.

The tripping mechanism is supported on the molded insulating trip-unit base 98 (FIG. 3). A molded insulating cover (FIGS. 5 and 6), comprising a bottom part 147 and a top part 149, is provided to cooperate with the base 98 to enclose the tripping mechanism. The parts 147 and 149 form a main panel 148 and four sidewalls 150. There are three openings 151 in the top sidewall 150 of the top part 149 to allow passage of the three adjusting knobs 142 (FIG. 4). Two openings 153 (FIGS. 5 and 6) are provided on opposite sides at the front of the top part of the main panel 148 through which screws (not shown) pass to engage internally threaded openings 155 (only one being shown in FIG. 3) in the trip unit base 98 in order to mount the top part 149 to the base 98.

The bottom part 147 of the trip-unit cover, has three notches 157 therein for allowing passage of the three load terminal conductors 44, and three notches 159 therein which fit around a bottom loop 161 (FIG. 4) of each of the conductors 44. The bottom part 147 (FIG. 5) has a step portion 163, at each side, which interlocks with a mating step portion 165 at each side of the top part 149. Two supporting projections 167 are molded integral with the bottom part 147 of the trip-unit cover.

When the tripping mechanism is to be covered, the bottom part 147 is set in place first with the supporting projections 167 resting on a lower ledge 169 (FIGS. 1 and 3) of the trip-unit base 98. The upper part 149 is then set in place, over the adjusting knobs 142. Two mounting screws are then placed through the openings 153 (FIG. 6) in the top part 149, and threaded into the openings 155 (only one being shown in FIG. 3) in the trip-unit base 98 firmly securing the trip-unit cover 147, 149 to the base 98. The supporting projections 167 keep the lower part 147 from moving downwards and sidewards, and the interlocking portions 163, 165 keep the lower part from moving outwards and upwards so that there is no need for any additional mounting screws to connect the lower part 147 to the trip-unit base 98.

Another safety feature of this invention is the provision of a completely insulated tie bar to prevent flashover between the poles of the breaker. As was previously described, the tie bar **37** supports and moves all three of the movable contacts. Referring to FIG. 8, the tie bar **37** comprises a metal bar **171** having a square cross section, and an insulating cover **173** which extends out over the ends of the tie bar creating a pocket at each end. Each of these pockets is filled with a fluid composition **175** which is hardenable in place to insulate the ends of the tie bar, thereby preventing flashover between the ends of the bar and the outer poles. This composition may be either a wax or an epoxy resin, but preferably is a glycidyl polyether of a polyhydric phenol having a 1,2-epoxy equivalency between 1 and 2. The preferred composition has a high dielectric strength, and is particularly suitable for this application because it is adapted to be cured homogeneously to a solid state without undergoing substantial volume shrinkage. The preferred composition is more specifically described and claimed in Patent No. 2,768,992 to Florian J. Zukas, and assigned to the assignee of the instant application.

Another safety feature of this invention is the provision of improved means for isolating the poles in the multi-pole circuit breaker. As is shown in FIG. 2, the trip-unit base **98** extends transversely across the breaker dividing it longitudinally into two portions. There are two partition walls dividing the portion to the right into three compartments, each of which houses the contacts for one pole of the breaker. As is illustrated in FIG. 7, each of the partition walls **179** comprises a top part **179***a* that is molded integral with the cover **13**, and has a slot **180** that interlocks with an insulating projection **181** on a bottom part **179***b* which bottom part is molded integral with the casing base **11**. There is an opening in the bottom part **179***b* through which the tie bar **37** passes. This opening is partially closed by a circular barrier **185** (shown in dot-dash lines in FIG. 7) that is attached to, and movable with, the tie bar **37**. If the movable barrier **185** were large enough to completely close the opening in the partition wall, the trip-unit base **98** would restrict rotational movement of this barrier. Therefore, a molded insulating stationary barrier **187**, has been provided to cooperate with the movable barrier **185** in order to completely close this opening.

The stationary barrier **187** is substantially L-shaped, and has a projection **189** extending around its outer edge. The projection **189** fits into a slot **191** in the trip-unit base, and into slots in the bottom part **179***b* and top part **179***a* of the partition wall. As can be seen in FIG. 7, the stationary barrier **187** interlocks with the trip-unit base **98**, and with the partition wall **179** when the parts are in place, and it cooperates with the movable barrier **185** to close the tie bar opening in the partition wall to prevent passage of gases between the poles of the breaker.

A further safety feature of this invention is the provision of knockouts **195** over the terminals **15** and **17** (FIGS. 1 and 2). In FIG. 1, the circuit breaker is shown as it would be mounted in a panelboard in a manner well known in the art.

Metallic panelboard trim plates **197** and **199** fit over the two ends of the breaker, the center portion of the breaker being open so that the operating handle **71** is accessible from outside of the panelboard. The plate **197** has a flange **201** that fits into a slot **203** molded in the breaker cover **13**. A pressure-type connector is provided at the load terminal **17** comprising a housing **205**, a pressure plate **207** and a member **209** rotatably attached to the pressure plate **207**. The member **209** is externally threaded, and fits through an internally threaded opening in the top of the housing **205**. An internal hexagonal opening **206** (FIG. 2) is provided at the outer end of the member **209** for receiving a suitable tool for turning the member **209**. The conductor **44** is attached to the inside base of the housing **205**.

In order to connect the breaker, the panelboard plates **197** and **199** are lifted and the breaker cover **13** is removed. A conductor **213** is placed within the housing **205** over the conductor **44**. A tool is then inserted into the opening **206** of the member **209**, and rotated to move the pressure plate **207** down clamping the conductors **213** and **44** together. The connection at the load terminal **17** is termed a "front connection."

The line terminal **15** is rear connected to a bus bar **215** by means of a conducting bus strap **217**. With the panelboard plates **197** and **199** lifted and the casing cover **13** removed, an elongated screw **218** is passed through an opening in the conductor **31** and threaded into an opening in the bus strap **217**. The bus strap **217** is connected to the bus bar **215** by a screw **219**.

After the circuit breaker is connected, the cover **13** and panelboard plates **197** and **199** are attached in place as shown in FIG. 1. Each of the terminals **17** and **15** is interchangeable for either a front connection or a rear connection. When the breaker is mounted in a panelboard, the knockouts **195** function as insulating means between the metallic panelboard plates **197** and the metallic terminal structure at **17**; and between the metallic panelboard plate **199** and the metallic terminal structure at **15**. It must be noted, however, that for this application, the cover **13** must be removed to provide access to the members **209** and **218**.

When it is desired to use the circuit breaker outside of a panelboard, the knockouts **195** can be removed and a screw driver or other tool can be placed through the openings left thereby so that the terminals **17** and **15** can be connected without removing the circuit breaker cover **13**. During use outside of a panelboard, there are no metallic panelboard plates **197** and **195** over the breaker so that there is no need for keeping the insulating knockouts in place.

From the foregoing description, it will be seen that the invention provides an improved, more dependable and safer circuit breaker. An adjustable tripping mechanism is supported on an insulating base and is safely enclosed by a two-part interlocking cover. Air pockets, in the ends of the tie bar, are filled with a fluid composition, hardenable in place, to insulate said ends. The opening in each partition wall, through which the tie bar extends, is closed by a movable insulating barrier attached to the tie bar and an L-shaped insulating stationary barrier which interlocks with the partition wall and a trip-unit base, and which cooperates with the movable barrier to isolate the compartments of the breaker. A further safety feature is the provision of knockouts in the insulating cover of the breaker directly over the terminals. When the circuit breaker is mounted in a panelboard, the knockouts are allowed to remain in place providing insulation between the metallic terminal structures and the metallic panelboard plates. The breaker, in this instance, is known as having a dead-front. For a panelboard mounting, the breaker cover must be removed when the breaker is connected, so that a screw driver or other tool can be inserted to fasten the terminal connections. When it is desired, however, to use the breaker outside of a panelboard, the insulating knockouts are removed permitting passage of a screw driver so that there is no need to remove the breaker cover in order to fasten the terminal connections.

While the invention has been disclosed in accordance with the provisions of the patent statutes, it is to be understood that various changes in the structural details and arrangement of parts thereof may be made without departing from some of the essential features of the invention. It is desired, therefore, that the language of the appended claims be given as reasonably broad an interpretation as the prior art permits.

We claim as our invention:

1. In a multi-pole circuit breaker, a plurality of stationary contacts and a plurality of movable contact

structures cooperable therewith to open and close said circuit breaker, a rotatable tie bar for moving said movable contact structures, an operating mechanism for rotating said tie bar, said tie bar comprising a metallic bar and an insulating cover extending past the ends of said metallic bar creating a pocket at each end of said tie bar, and said pockets being filled with a fluid composition hardenable in place to insulate said ends of said tie bar.

2. In a multi-pole circuit breaker, a plurality of stationary contacts and a plurality of movable contact structures cooperable therewith to open and close said circuit breaker, a rotatable tie bar for moving said movable contact structures, an operating mechanism for rotating said tie bar, said tie bar comprising a metallic bar and an insulating cover extending past the ends of said metallic bar creating a pocket at each end of said tie bar, and said pockets being filled with a fluid wax composition hardenable in place to insulate said ends of said tie bar.

3. In a multi-pole circuit breaker, a plurality of stationary contacts and a plurality of movable contact structures cooperable therewith to open and close said circuit breaker, a rotatable tie bar for moving said movable contact structures, an operating mechanism for rotating said tie bar, said tie bar comprising a metallic bar and an insulating cover extending past the ends of said metallic bar creating a pocket at each end of said tie bar, and said pockets being filled with a hardenable fluid insulating composition comprising a glycidyl polyether of a polyhydric phenol having a 1,2-epoxy equivalency between 1 and 2.

4. In a multi-pole circuit breaker, an insulating housing, an insulating trip-unit base dividing said housing longitudinally into a first part and a second part, at least one partition wall dividing said first part transversely into at least two compartments, said partition wall having an opening therein, a movable tie bar extending through said opening into each of said compartments, an insulating barrier connected to said tie bar and movable therewith, an insulating stationary barrier interlocking with said trip-unit base and said partition wall, and said stationary barrier cooperating with said movable barrier to close said opening to prevent passage of gases between said compartments.

5. In a multi-pole circuit breaker, an insulating housing, an insulating trip-unit base dividing said housing longitudinally into a first part and a second part, said housing comprising a base and a cover, at least one partition wall in said base, at least one partition wall in said cover, said partition walls interlocking to divide said first part of said housing transversely into at least two compartments, said base partition wall having an opening therein, a movable tie bar extending through said opening into each of said compartments an insulating barrier connected to said tie bar and movable therewith, an insulating stationary barrier interlocking with said trip-unit base said base partition wall and said cover partition wall, and said stationary barrier cooperating with said movable barrier to close said opening to prevent passage of gases between said compartments.

6. A circuit breaker comprising relatively movable contacts and means releasable to effect automatic opening of said contacts, trip means operable to effect release of said releasable means, said trip means comprising an energizing member, a magnet yoke structure disposed to be energized by said member, an armature movable relative to said magnet yoke structure, adjusting means comprising an adjusting knob operable to vary the position of said armature relative to said magnet yoke structure, a trip means enclosure comprising a base and a cover mating with said base, said cover comprising two mating parts, when said parts are mated together said cover comprising a main panel and four side walls extending from said main panel, one of said parts comprising one of said side walls which one side wall has an opening therein, when said cover is in place said adjusting knob passing through said opening to permit operation of said adjusting knob from outside of said trip means enclosure.

7. A circuit breaker comprising a pair of contacts and means releasable to effect automatic opening of said contacts, trip means operable to effect release of said releasable means, said trip means comprising an energizing winding, a magnet yoke disposed to be energized by said winding, an armature movable relative to said magnet yoke, adjusting means comprising a knob operable to vary the position of said armature relative to said magnet yoke, a trip means enclosure comprising a base and a cover cooperable with said base to enclose said trip means, said cover comprising two mating parts, when said parts are mated together said cover comprising a main panel and four side walls extending from said main panel, a first of said parts comprising one of said side walls which one said side wall has an opening therein, means fastening one of said parts to said base, said base and said one part cooperating to hold the other of said parts in position to thereby enclose said trip means, when said parts are in position said adjusting knob passing through said opening to permit operation of said adjusting knob from outside of said trip means enclosure.

8. A circuit breaker comprising relatively movable contacts and means releasable to effect automatic opening of said contacts, trip means operable to effect release of said releasable means, said trip means comprising an energizing winding, a magnet yoke disposed to be energized by said winding, an armature movable relative to said magnet yoke, adjusting means including an adjusting knob operable to vary the position of said armature relative to said magnet yoke, a trip means enclosure comprising a base and a cover, said cover comprising a first part and a second part, when said parts are mated together said cover comprising a main panel and four side walls extending from said main panel, said first part comprising one of said side walls which one side wall has an opening therein, means fastening said first part to said base, when said first part is fastened to said base said first part and said base cooperating to hold said second part in position to thereby enclose said trip means, when said first part is in place said adjusting knob passing through said opening to permit operation of said adjusting knob from outside of said trip means enclosure.

9. In a multi-pole circuit breaker, a plurality of stationary contacts and a plurality of movable contact structures cooperable therewith to open and close said circuit breaker, a rotatable tie bar for moving said movable contact structures, an operating mechanism for rotating said tie bar, said tie bar comprising a metallic bar and an insulating cover extending past the ends of said metallic bar creating a pocket at each end of said tie bar, and said pockets being filled with a fluid epoxy composition hardenable in place to insulate said ends of said tie bar.

References Cited in the file of this patent

UNITED STATES PATENTS

1,955,327	Dorfman	Apr. 17, 1934
1,996,891	Van Valkenburg	Apr. 9, 1935
2,130,904	Sandin	Sept. 20, 1938
2,204,409	Gano	June 11, 1940
2,265,030	Dorfman	Dec. 2, 1941
2,491,959	Dyer	Dec. 20, 1949
2,797,277	Dorfman	June 25, 1957
2,797,278	Gelzheizer	June 25, 1957
2,863,969	Edmunds	Dec. 9, 1958
2,897,327	De Smitt	July 28, 1959
2,917,607	Sterling	Dec. 15, 1959
2,920,161	Dessert	Jan. 5, 1960
2,937,251	Cellerini	May 17, 1960
2,981,811	Steven	Apr. 24, 1961