Sept. 10, 1963 E. J. WALKER ET AL 3,103,565

ELECTROMAGNETIC CIRCUIT BREAKER

Filed Sept. 20, 1960 3 Sheets-Sheet 1

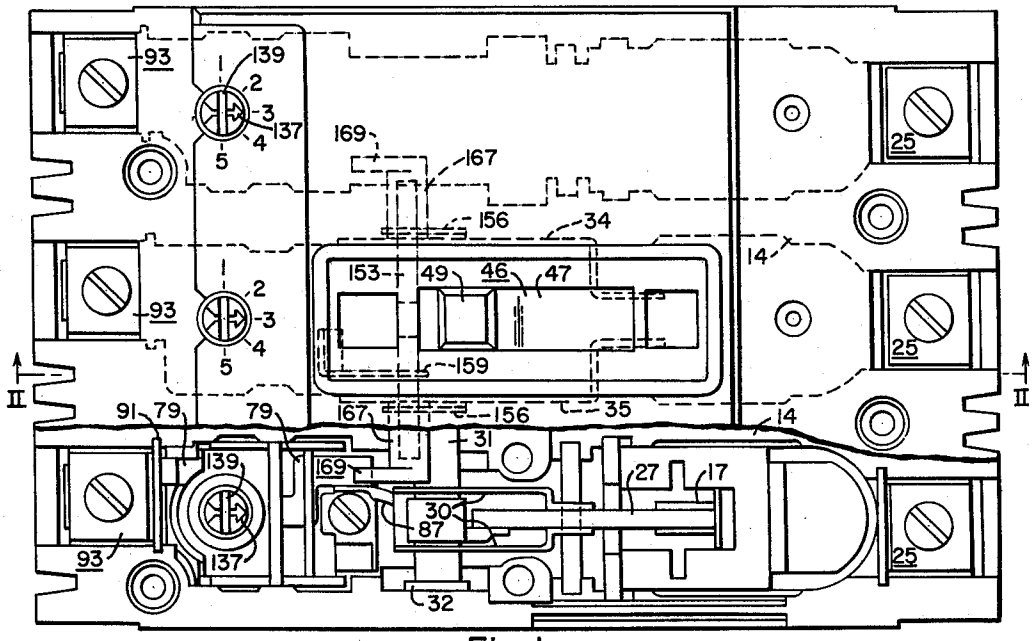



Fig. 1.

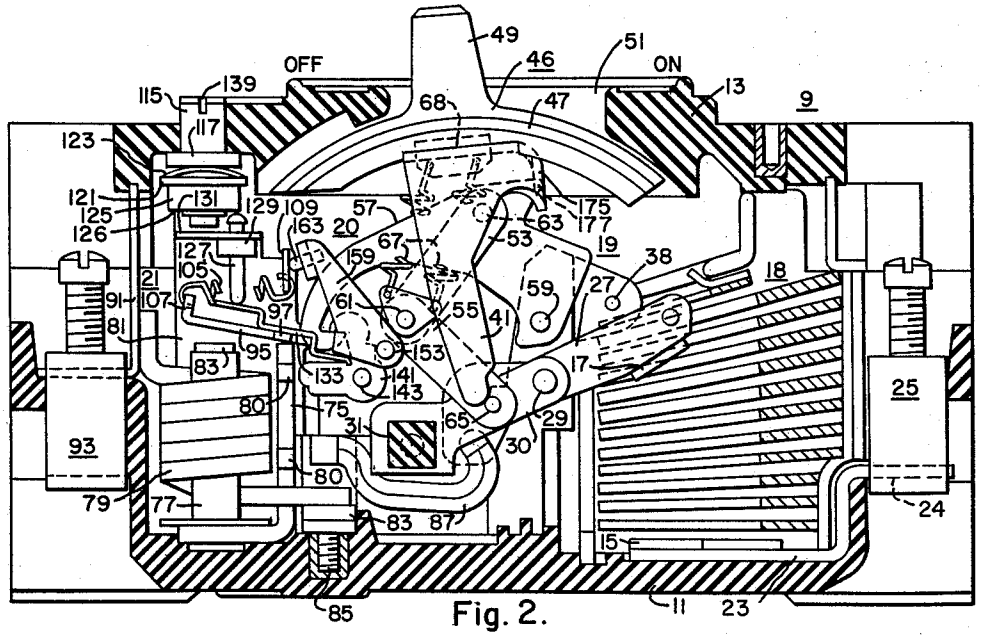



Fig. 2.

ELECTROMAGNETIC CIRCUIT BREAKER

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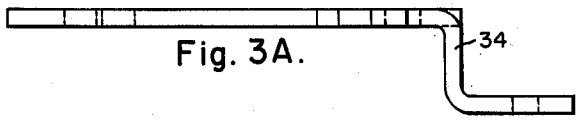



Fig. 3A.

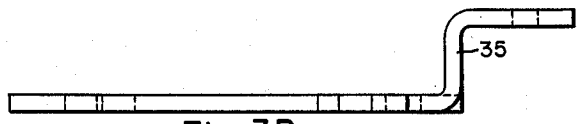



Fig. 3B.

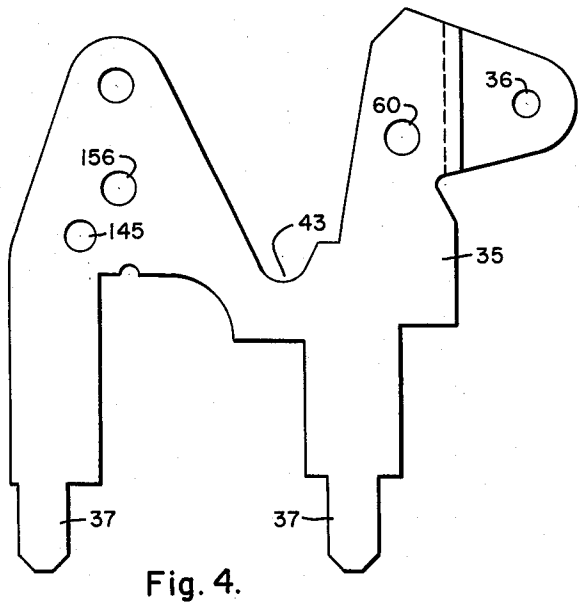



Fig. 4.

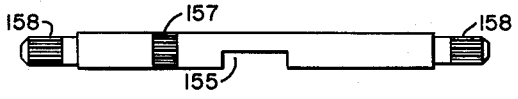



Fig. 5.

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ELECTROMAGNETIC CIRCUIT BREAKER

Filed Sept. 20, 1960 3 Sheets-Sheet 3

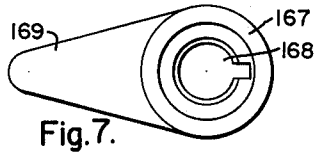



Fig. 7.

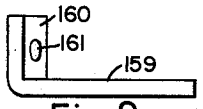



Fig. 9.

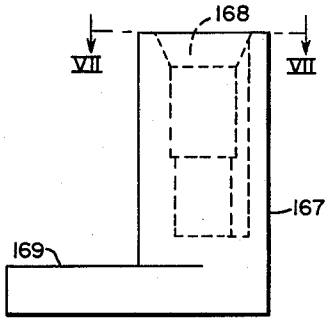



Fig. 6.

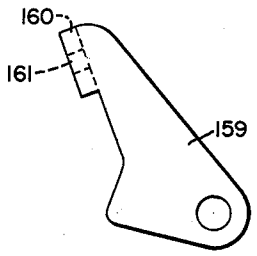



Fig. 8.

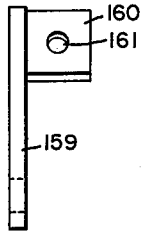



Fig. 10.

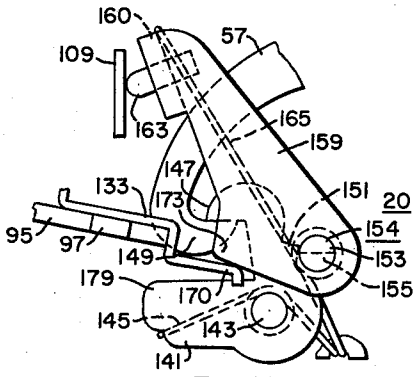



Fig. 11.

United States Patent Office 3,103,565 Patented Sept. 10, 1963



3,103,565

# ELECTROMAGNETIC CIRCUIT BREAKER

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Filed Sept. 20, 1960, Ser. No. 57,176
9 Claims. (Cl. 200—106)

This invention relates to circuit breakers and more particularly to mechanisms for effecting automatic opening of circuit breakers.

Circuit breaker engineering specialists are constantly attempting to provide compactly constructed breakers having increased current carrying and interrupting ratings. These compact breakers are not only less expensive to manufacture; but they also save space in control centers. Thus, panelboard and control panel builders can manufacture considerably smaller and less expensive control centers. The industrial market is, therefore, provided with a less expensive installation that takes up less plant space without a sacrifice in power rating or efficiency.

Accordingly, an object of this invention is to provide an improved compactly constructed circuit breaker.

Another object of the invention is to provide a circuit breaker with an improved mechanism for effecting automatic opening of the breaker.

A further object of the invention is to provide a circuit breaker with an improved tripping mechanism that embodies a novel compactly constructed tripping and latching structure.

Other objects of the invention will be explained fully hereinafter or will be apparent to those skilled in the art.

According to one embodiment of the invention, a circuit breaker is provided having three pole units disposed side-by-side within an insulating housing. Two spaced supporting plates are disposed in the center pole unit serving to support an operating mechanism for controlling all of the pole units. The operating mechanism includes a latch member that engages and latches a member that is releasable to effect opening of the contacts in all of the pole units of the breaker. The latch member is, in turn, latched by a latching structure that includes a cylindrical metallic trip bar that is rotatably supported by the supporting plates and is common to all of the pole units. The latch member, which is latched by engagement thereof with the periphery of the trip bar, falls into a notch in the trip bar when the trip bar is rotated. This movement releases the releasable member. There is a trip member in each of the three pole units supported on the common trip bar. An electromagnetic trip device is also provided in each of the three pole units. Upon the occurrence of overload current conditions above a predetermined value in any of the pole units, an armature of the electromagnetic trip device in that pole unit moves to engage the trip member in that pole unit to thereby rotate the common trip bar to release the releasable member and effect an opening operation. The trip member in the center pole unit is adjustable to vary the amount of latch engagement between the trip bar and the latch member. The trip members for the two outer pole units are of insulating material to insulate the metallic trip bar. These outer trip members also engage the outer sides of the spaced supporting plates functioning as thrust bearings to prevent axial movement of the trip bar.

For a better understanding of the nature and objects of the invention, reference may be had to the following detailed description, taken in conjunction with the accompanying drawings in which:

FIGURE 1 is a top plan view on a reduced scale of a circuit breaker embodying the principal features of the invention, a part of the cover being broken away to more clearly show some of the parts;



FIGURE 2 is a vertical sectional view of the circuit breaker taken substantially on line II—II of FIG. 1, and looking in the direction indicated by the arrows, the circuit breaker being shown in the open circuit position;

FIGS. 3A and 3B are plan views of the two spaced mechanism-supporting plates;

FIG. 4 is an elevational view of the supporting plate shown in FIG. 3B;

FIG. 5 is an elevational view of the trip bar;

FIG. 6 is a top plan view of one of the insulating trip members for one of the outer pole units;

FIG. 7 is a view taken substantially along the line VII—VII of FIG. 6;

FIG. 8 is an elevational view of the trip member for the center pole unit;

FIG. 9 is a top plan view of the trip member shown in FIG. 8;

FIG. 10 is a side view of the trip member of FIG. 8; and,

FIG. 11 is an elevational view of part of the tripping mechanism of the invention.

Referring to FIGS. 1 and 2 of the drawings, the circuit breaker shown therein is of a three-pole type and comprises a base 11 (FIG. 2) and a cover 13 both of molded insulation material. Cooperating barriers 14 (FIG. 1) in the base and cover serve to insulate the three pole units from each other. A stationary contact 15, a movable contact 17 and an arc-extinguishing unit 18 are provided for each pole unit of the breaker. The circuit breaker also comprises an operating mechanism 19, and a latching device 20 disposed in the center pole unit. An electromagnetic strip actuating device 21 is provided in each of the pole units for effecting automatic opening of the breaker. A somewhat similar operating mechanism and latching device is shown in the patent to Walker et al. Patent No. 2,892,054, assigned to the assignee of the instant application.

The stationary contact 15 for each pole unit is rigidly mounted on the inner end of a conducting strip 23, to the outer end 24 of which is attached to a solderless terminal connector 25 of a type well known in the art. The movable contact 17 for each of the pole units is mounted on a contact arm 27 that is pivotally mounted by means of a pin 29 on a switch arm 30. The switch arms 30 for the several pole units of the breaker are all secured to an insulating tie bar 31 that is rotatably supported in brackets 32 (FIG. 1) that are supported in the side walls of the circuit breaker housing. Torsion spring members (not shown) bias the contact arms 27 clockwise about their pins 29 to provide contact pressure in the closed circuit position of the switch arms 30.

The operating mechanism 19 is disposed in the center pole unit and is supported by means of two supporting plates 34 and 35 (FIGS. 3*a*, 3*b* and 4) that are connected by means of a pin (not shown) that extends through openings 36 in the plates. Each of the supporting plates 34 and 35 has two leg portions 37 that extend into openings in the base 11 of the insulating housing to receive securing members (not shown) that are fastened over these leg portions to rigidly support the plates 34 and 35 on the base 11. The operating mechanism 19 (FIG. 2) comprises an inverted U-shaped operating lever 41 having its inner ends pivoted in generally V-shaped notches 43 (FIG. 4) in the supporting plates 34 and 35. An operating member 46, including an arcuate shield 47, is mounted on the outer end of the operating lever 41. A handle portion 49 of the operating member 46 extends out through an opening 51 in the cover 13. The switch arm 30 for the center pole unit is operatively connected

by means of a toggle, comprising toggle links 53 and 55, to a releasable member or cradle 57 that is pivotally mounted on a pin 59 supported in openings 60 (FIG. 4) in the side plates 34 and 35. The toggle links 53 and 55 are pivotally connected together by a knee pivot pin 61. The toggle link 53 is pivotally connected to the releasable member 57 by means of a pivot pin 63, and the toggle link 55 is pivotally connected to the switch arm 30 for the center pole unit by means of a pivot pin 65. Overcenter springs 67 are connected under tension between the knee pivot pin 61 of the toggle 53, 55, and a yoke portion 68 of the operating lever 41.

The contacts are manually opened by movement of the handle 49, in a counterclockwise direction, from the "on" to the "off" position (FIG. 2). This movement carries the line of action of the overcenter spring 67 to the left of the pivot pin 63 causing collapse of the toggle 53, 55 and counterclockwise movement of the tie bar 31 to open the contacts for all of the pole units of the breaker. The latching mechanism 20 latches the releasable member 57 in a manner to be hereinafter specifically described.

As best seen in FIG. 1, the switch arm 30, for each of the pole units, comprises a pair of spaced members. The contact arm 27 is disposed between the spaced members of the switch arm 30. The toggle link 55 comprises a pair of spaced links, only one being shown in FIG. 2, disposed on opposite sides of the switch arm 30 for the center pole unit. The pivot pin 65 extends through the double toggle link 55, the double switch arm 30 and through an elongated slot (not shown) in the inner end of the contact arm 27 for the center pole unit, which slot permits movement of the contact arm 27 relative to the switch arm 30, so that the torsion spring (not shown) can bias the contact arm 27 downward to provide contact pressure. The above-mentioned slot also permits a wiping action between the contacts during the opening and closing operations.

The contacts are manually closed by reverse movement of the operating handle 49 from the "off" to the "on" position, which movement moves the line of action of the overcenter springs 67 to the right of the pivot 63, whereupon the springs operate to straighten the toggle 53, 55 and close the contacts with a snap action.

There is an electromagnetic trip device 21 in each pole unit of the breaker. Only the trip device 21 in the center pole unit will be specifically described, it being understood that the description applies to the trip device 21 of all of the pole units. The trip device 21 comprises a fixed angular magnet yoke 75 having a fixed core 77 rigidly secured thereto about which is wound an energizing coil 79. Two projections 80 on each of the two opposite sides of the yoke 75, engage in openings in two side plates 81, only one of which is seen in FIG. 2, to support the yoke 75 on the side plates 81. The side plates 81 are rigidly secured to the insulating base 11 in a suitable manner. The upper end of the fixed core 77 forms a pole piece 83. The lower end of the coil 79 is connected to a terminal 83 by a screw member 85. Flexible conductors 87 are connected, at one end, to the terminal 83 and, at the other end, to the tail portion of the movable contact member 27. The upper end of the coil 79 is rigidly secured to the inner end of a conductor 91, at the other end of which is mounted a terminal connector 93. An armature, indicated generally at 95, is pivotally supported by means of projections 97 extending from opposite sides thereof, which projections engage in suitable openings in the side plates 81 to pivotally support the armature in the unit. The armature 95 is biased in a counterclockwise direction about its pivot 97 by means of a spring 105 which is attached, at one end, to a bent-over portion 107 of the armature 95, and, at the other end, to a cross plate 109 that is rigidly supported between the side plates 81.

An adjustable knob 115 having a flange 117 thereon, is supported by a cross member 121 that is supported by the side plates 81. A spring washer 123 biases the adjusting knob 115 upward which movement is limited by engagement of the flange 117 against the inner portion of the housing cover 13. A cam member 125, having a cam surface 126 on its lower side, is connected to a shaft which extends from the adjusting knob 115 through the plate 121. The cam surface 126 of the cam member 125 engages the upper end of an adjusting pin 127 that is slidably supported within a sleeve member 129. The sleeve member 129 is supported by a plate 131 that is supported between the trip device side plates 81. The lower end of the pin 127 engages a member 133 that is welded or otherwise attached to the armature 95. The under surface 126 of the cam 125 is shaped so that, upon rotation of the cam, the pin 127 is moved up or down depending on the direction of rotation. This movement of the pin 127, through the member 133 attached to the armature 95, moves the armature 95 about its pivot 97 varying the position of the armature relative to the magnet pole piece 83.

The top of the knob 115 is provided with a pointer 137 (FIG. 1) and the cover 13 is provided with index points, thereby providing a visual indication of the adjusted position of the armature member 95. Adjustment of the armature is effected by inserting a screwdriver in a slot 139, and rotating the screwdriver to bring the pointer 137 (FIG. 1) to the desired position. This movement rotates the cam member 125 (FIG. 2) and varies the position of the armature member 95 in the manner previously described.

The latching mechanism 20 (FIGS. 2 and 11), comprises a main latch member 141 pivoted on a pin 143 that is rotatably supported in openings 145 (FIG. 4) in the side plates 34 and 35. The latch member 141 is biased by means of a torsion spring 145 (FIG. 11) in a clockwise or unlatching direction. The latch member 141 has a latching portion 147 that engages and releasably restrains a latch tip 149 of the releasable member 57 to hold the trip releasable member in the latched position. The latch tip 149 is turned in and faces generally in the direction toward the pivot 59 (FIG. 2) about which the releasable member 57 moves during a tripping operation. The latch member 141 is of the slip-off type and is releasably held in latching position by engagement of a shoulder portion 151 thereof with the periphery of a cylindrical trip bar 153 that is part of a trip structure indicated generally at 154. As will be hereinafter described, the trip structure 154 is common to all of the pole units of the breaker. The trip bar 153 has a notch 155 (FIGS. 5 and 11) therein, the purpose of which will be hereinafter explained. The trip bar 153 extends through openings 156 (FIG. 4) in the supporting plates 34 and 35, which plates rotatably support the trip structure 154 in the breaker. The trip bar 153 also extends through suitable openings in the barriers 14 (FIG. 1), and additional barrier members 156 cooperate with the trip bar 153 to close those openings.

The trip bar 153 (FIG. 5) has a knurled portion 157 intermediate its ends, and knurled portions 158 at each of its opposite ends. A trip member 159 (FIGS. 2 and 8–11) is brazed or otherwise attached to the knurled portion 157 of the trip bar 153. The trip member 159 has an extension 160 (FIGS. 8–11) having an opening 161 therein through which an adjusting screw 163 (FIGS. 1 and 11) is threaded. The trip member 159 and the trip bar 153 to which it is attached, are biased in a counterclockwise or latching direction by means of a torsion spring 165 (FIG. 11).

In addition to the trip bar 153 and the trip member 159, the trip structure 154 includes two trip members 167 (FIGS. 6 and 7) or an insulating material such, for example, as polyamide (nylon). The members 167 have openings 168 therein that receive the knurled portions 158 at the opposite ends of the trip bar 153. The trip members 167 are press fitted to the trip bar 153. Each

of the trip members 167 has an arm 169 integral therewith for engagement of a tail portion 170 (FIGS. 2 and 11) of the member 133 that is attached to the armature 95 in the particular outer pole unit (FIG. 1) in which the arm 169 is positioned.

The trip bar 153 extends, as was previously described, through the openings 145 (FIG. 4) in the supporting brackets 34 and 35, and the insulating members 167 engage the outer sides of the supporting plates adjacent the openings 145 thereby functioning as thrust bearings to prevent axial movement of the rod 153. For this reason, the insulating material forming the trip members 167 comprises a material such, for example, as polyamide (nylon) that can slide against the surfaces of the metallic supporting plates 34 and 35 without much friction.

When the circuit breaker 9 is in the closed circuit position, a circuit extends, through each pole unit, from the terminal strip 91, through the coil 79, terminal 83, flexible shunts 87, movable contact arm 27, movable contact 17, stationary contact 15, to the conducting strip 23. When an overload current above a predetermined value occurs in, for example, the center pole unit (FIG. 2) of the breaker, the armature 95 is attracted to the pole piece 83 and it rotates counterclockwise about its pivot 97. During this movement, the tail portion 170 of the member 133 that is attached to the armature 95, engages a part 173 of the trip member 159, rotating the trip member 159, and the trip bar 153 to which the trip member is secured, in a clockwise direction against the bias of the torsion spring 165 (FIG. 11). The latch tip 149 of the releasable member 57, and the latch portion 147 of the latch member 141 are to the left of the pivot 143 of the latch member 141; hence, the latch member 141 is biased in unlatching direction by a component of the force exerted by the overcenter springs 67 as well as by the torsion spring 145. When the trip bar 153, therefore, rotates in a clockwise direction, the projection 151 of the latch member 141 snaps into the notch 155 in the trip bar 153. This clockwise movement of the latch member 141 about its pivot 143, releases the member 57. When released, the member 57 rotates clockwise about its pivot 59 (FIG. 2) under the influence of the overcenter springs 67, causing collapse of the toggle 53, 55, and opening movement of the switch arms 30 for all of the pole units. During this movement, the handle 49 is moved, in a manner well known in the art, to a tripped position intermediate the "off" and "on" positions, thereby giving a visual indication that a tripping operation has occurred.

Before the contacts can be closed following an automatic opening operation, it is necessary to reset and relatch the mechanism. This is accomplished by moving the handle 49 counterclockwise from the intermediate "tripped" position to the extreme "off" position. During this movement, a projection 175 on the operating lever 41 engages a shoulder 177 on the releasable member 57 moving the releasable member 57 counterclockwise about its pivot 59. Near the end of this movement, the lower rounded portion of the latch point 149 of the releasable member 57, engages an outwardly extending arm 179 of the latch member 141 and moves this member to the latching position. As soon as the projection 151 of the latch member 141 clears the corner of the notch 154 of the trip bar 153, the torsion spring 165 restores the arm 159 and trip bar 153 to the latched position. The latch portion 147 is then in position engaging the latch portion 149 of the releasable member 57 so that the contacts can be closed in the previously described manner by movement of the handle 49 to the "on" position.

When an overload current exists in one of the outer pole units energizing the electromagnetic trip device 21 in that pole unit, the armature device 95, 133, 170 in that pole unit is actuated in the same manner previously described, whereupon the tail portion 170 of the member



133 which is attached to the armature 95, engages the arm 169 (FIG. 1) in that pole unit rotating the trip member 167 and the trip bar 153 to which it is attached in a clockwise direction to effect release of the latch 141 and releasable member 57 in the same manner hereinbefore described to thereby effect an opening operation of the circuit breaker.

The compactly constructed trip structure 154, which includes the trip bar 153, and the trip members 159 and 167, serves to latch the mechanism 20. This trip structure 154, which is common to all of the pole units, is also disposed to be actuated by means of the electromagnetic trip actuating device 21 in any of the pole units to effect automatic opening of the breaker. It is to be noted that the members 167 serve not only as trip members; but they insulate the ends of the metallic trip bar 153, and they also serve as thrust bearings preventing axial movement of the trip bar.

The amount of latch engagement between the projection 151 of the latch member 141 and the periphery of the trip bar 153, can be varied by rotation of the adjusting screw 163 which is biased against the stationary cross plate 109 by means of the torsion spring 165. This rotation moves the trip member 159, and the trip bar 153 to which the trip member is attached, in either a clockwise or counterclockwise direction depending on the direction of rotation of the screw 163. Adjustment of the amount of latch engagement between the trip member 141 and the trip bar 153 is important because, if there is not enough latch engagement, the breaker will trip open accidentally under shock conditions.

The above described invention provides an improved compactly constructed circuit breaker having a novel latching and tripping mechanism for effecting automatic opening of the breaker.

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.

We claim as our invention:

1. A circuit breaker having relatively movable contacts and means releasable to effect opening of said contacts, a latch mechanism comprising a latch member engaging and releasably restraining the releasable means, a trip structure separate from the latch member and latching the latch member in latching position, electromagnetic trip means comprising a magnetic member, an armature structure operable upon sufficient energization of the electromagnetic trip means to engage and move the trip structure to effect release of the latch member, and means for adjusting the amount of latch engagement between the separate trip structure and the latch member.

2. A circuit breaker having relatively movable contacts and means releasable to effect opening of the contacts, a latch mechanism comprising a latch member engaging and releasably restraining the releasable means, a trip structure comprising a generally cylindrical trip bar having its periphery engaging and releasably restraining the latch member, a trip member connected to the trip bar, electromagnetic trip means comprising a magnetic member, an armature device operable upon sufficient energization of the electromagnetic trip means to engage the trip member to effect movement of the trip bar to release the latch member, and means for varying the position of the trip member to thereby vary the position of the trip bar to adjust the amount of latch engagement between the trip bar and the trip member.

3. A multi-pole circuit breaker having relatively movable contacts in each pole unit, an operating mechanism releasable to effect automatic opening of the contacts in all of said pole units, a latch mechanism comprising a latch member releasable to release the operating mechanism, a trip structure common to all of the pole units

comprising a generally cylindrical trip bar having its periphery engaging and releasably restraining the latch member, a trip member for each pole unit, said trip members being secured to the trip bar, electromagnetic trip means in each pole unit comprising a magnetic member and an armature device, upon sufficient energization of the electromagnetic trip means in any of the pole units the armature device in that pole unit moving to engage the trip member for that pole unit to move the common trip structure to effect release of the latch member, and means for adjusting the amount of latch engagement between the common trip bar and the latch member.

4. A circuit breaker comprising, in combination, an insulating housing, three pole units disposed side-by-side within the housing, each of the pole units comprising relatively movable contacts, two spaced supporting plates, an operating mechanism supported by the supporting plates and releasable to effect opening of the contacts in all of the pole units, a metallic trip bar extending through the supporting plates, the trip bar being rotatable to effect release of the operating mechanism, a trip member supported on the trip bar and associated with the center pole unit, an insulating trip member disposed on each of the opposite ends of the trip bar, each of said insulating trip members being associated with a different one of the two outer pole units, the insulating trip members engaging the supporting plates to prevent axial movement of the trip bar, and means in each of the three pole units operable upon the occurrence of an overload current above a predetermined value in the associated pole unit to actuate the trip member associated with the overloaded pole unit to rotate the trip bar to effect release of the operating mechanism.

5. A circuit breaker comprising an insulating housing, three pole units disposed side-by-side within the housing, relatively movable contacts in each of the pole units, two spaced supporting plates, an operating mechanism releasable to effect opening of the contacts in all of the pole units, a latch mechanism comprising a latch member latching the operating mechanism and operable to release the operating mechanism, a trip structure comprising a cylindrical trip bar having its periphery engaging and releasably restraining the latch member, the trip bar being rotatably supported by the supporting plates, a trip member supported on the trip bar and disposed within the center pole unit, an insulating trip member disposed on each of the outer ends of the trip bar, each of the insulating trip members being associated with a different one of the two outer pole units, the insulating trip members engaging the outer sides of the two spaced supporting plates to prevent axial movement of the trip bar, means in each of the three pole units operable upon the occurrence of certain abnormal current conditions in the associated pole unit to engage the trip member associated with the overloaded pole unit to rotate the trip bar to effect release of the operating mechanism.

6. A circuit breaker comprising an insulating housing, three pole units disposed side-by-side within the housing, relatively movable contacts in each of the pole units, two spaced supporting plates disposed in the center pole unit, an operating mechanism in the center pole unit releasable to effect opening of the contacts in all of the pole units, a latch mechanism in the center pole unit comprising a latch member operable to release the operating mechanism, a trip structure comprising a cylindrical trip bar separate from the latch member and having its periphery engaging and releasably restraining the latch member, the trip bar being rotatably supported by the supporting plates, a trip member supported on the trip bar and associated with the center pole unit, an insulating trip member disposed on each of the outer ends of the trip bar, each of the insulating trip members being associated with a different one of the two outer pole units, the insulating trip members engaging the outer sides of the two spaced supporting plates to prevent axial movement of the trip bar, means in each of the three pole units operable upon the occurrence of certain abnormal current conditions in the associated pole unit to engage the trip member for that pole unit to rotate the trip bar to effect release of the operating mechanism, and means for adjusting the amount of latch engagement between the trip bar and the latch member.

7. A circuit breaker comprising an insulating housing, three pole units disposed side-by-side within the housing, relatively movable contacts in each of the pole units, two spaced supporting plates disposed in the center pole unit, an operating mechanism in the center pole unit releasable to effect opening of the contacts in all of the pole units, a latch mechanism in the center pole unit comprising a latch member releasable to release the operating mechanism, a trip structure comprising a cylindrical trip bar separate from the latch mechanism and having its periphery engaging and releasably restraining the latch member, the trip bar being rotatably supported by the supporting plates, a trip member supported on the trip bar and disposed within the center pole unit, an insulating trip member disposed on each of the outer ends of the trip bar, each of the insulating trip members being associated with a different one of the two outer pole units, the insulating trip members engaging the outer sides of the two spaced supporting plates to prevent axial movement of the trip bar, electromagnetic trip means in each of the three pole units comprising a magnetic member and an armature operable upon sufficient energization of the electromagnetic trip means in the associated pole unit to engage the trip member associated with the overloaded pole unit to rotate the trip bar to effect release of the latch member to thereby release the operating mechanism.

8. A multi-pole circuit breaker having relatively movable contacts in each pole unit, a single operating mechanism comprising a releasable member pivotally supported and having a latch part, said releasable member being releasable to effect automatic opening of all of said contacts, a latch mechanism comprising a latch member engaging said latch part to latch said releasable member, a trip structure comprising a common trip bar releasably restraining said latch member, said trip bar extending transversely in said circuit breaker on a first side of said latch part, a trip member for each pole unit and secured to the common trip bar, electro-magnetic trip means in each pole unit positioned relative to the length of said circuit breaker on a side of said latch part that is opposite said first side, each of said electro-magnetic trip means comprising a magnetic member and an armature device, upon sufficient energization of the electro-magnetic trip means in any of the pole units the armature device in that pole unit moving to engage the trip member for that pole unit to move the trip structure to effect release of the latch member to thereby effect release of the releasable member.

9. A multi-pole circuit breaker having relatively movable contacts in each pole unit, a single operating mechanism comprising a pivotally supported releasable member releasable to effect automatic opening of all of said contacts, said releasable member having a latch part, a latch mechanism comprising a latch member engaging said latch part to latch said releasable member, a trip structure comprising a cylindrical common trip bar having its periphery engaging and releasably restraining the latch member, said trip bar being positioned between the latch part and the pivot of said releasable member, a trip member for each pole unit and secured to the common trip bar, electro-magnetic trip means in each pole unit comprising a magnetic member, each of said electro-magnetic trip means comprising an armature pivotally supported intermediate its ends, upon sufficient energization of the electro-magnetic trip means in any of the pole units one end of the associated armature being attracted to the associated magnetic member to pivot the armature whereupon the other end thereof moves to engage the trip member in the as-

sociated pole unit to move the trip structure to effect release of the latch member to thereby effect release of the releasable member.

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