

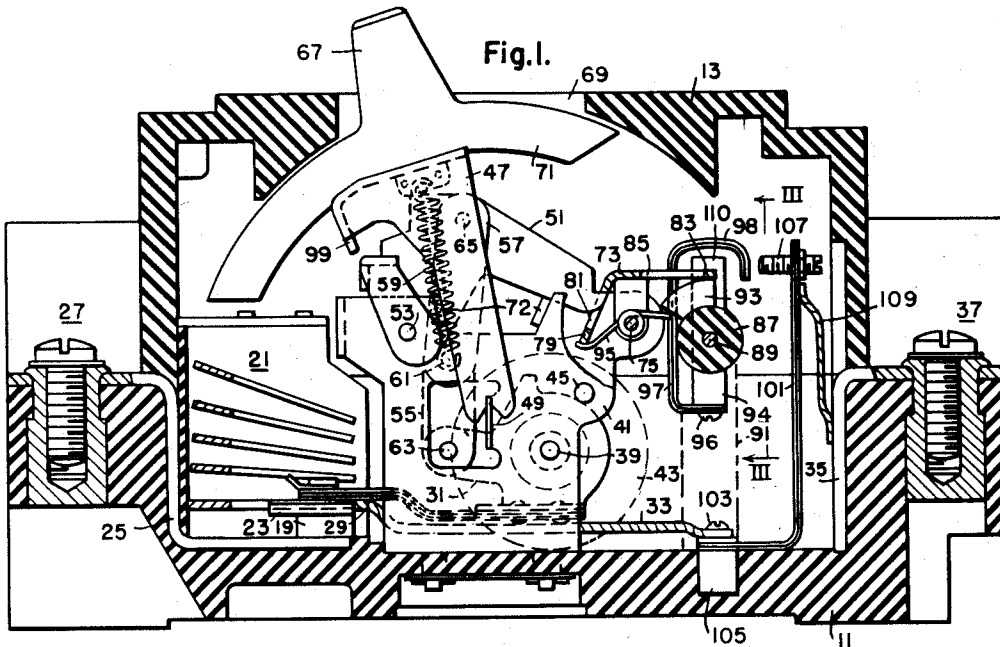
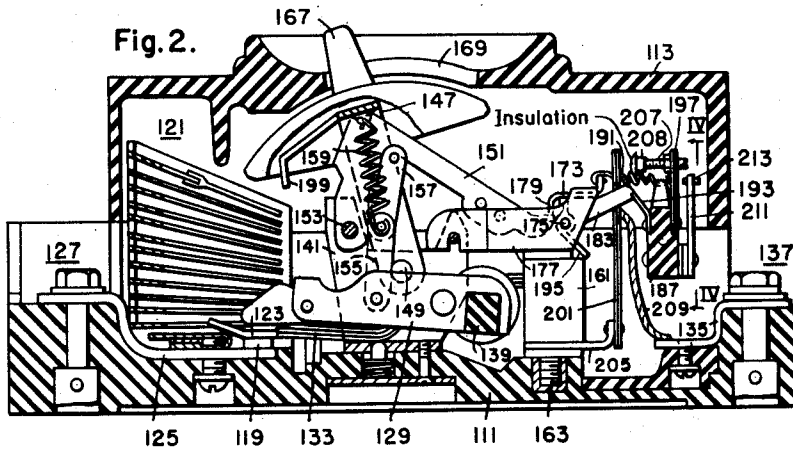
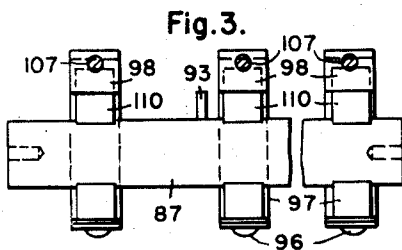
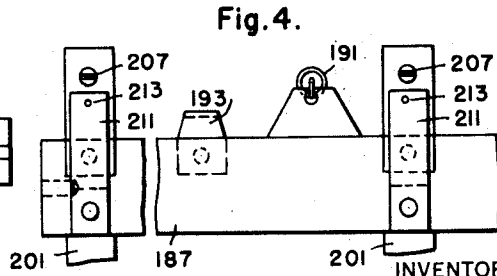
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CIRCUIT BREAKER

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## CIRCUIT BREAKER

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14 Claims. (Cl. 200—116)

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This invention relates to circuit breakers and more particularly to circuit breakers for controlling lighting and moderate power circuits.

An object of the invention is to provide a circuit breaker having a thermally responsive trip device with means for compensating the trip device for changes in ambient temperature and means for limiting the amount of compensation.

Another object of the invention is to provide a circuit breaker embodying thermally responsive trip means with means for compensating the trip device for changes in ambient temperature and means for limiting the amount of compensation wherein the compensating means is mounted separate from the thermally responsive trip means.

Another object of the invention is to provide a circuit breaker embodying thermally responsive trip means and a trip member operable by the trip means to effect opening of the breaker with means mounted on said trip member for compensating said thermally responsive trip means for changes in ambient temperatures and means also mounted on said trip member for limiting the amount of compensation.

Another object of the invention is to provide a circuit breaker embodying thermally responsive trip means and a trip member with compensating means mounted on the trip member and engageable by the thermally responsive means to effect operation of the breaker, said compensating means compensating said thermally responsive means for changes in ambient temperatures and means also mounted on the trip member for limiting the amount of compensation provided by the compensating means.

Another object of the invention is to provide a circuit breaker according to the preceding paragraphs characterized by the provision of means for calibrating the compensation limiting means.

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

In said drawing:

Figure 1 is a side elevational view, partly in section, of a circuit breaker embodying the principles of the invention,

Fig. 2 is a view similar to Fig. 1 showing a modification of the trip device applied to a somewhat different type of circuit breaker,

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Fig. 3 is a sectional view taken on line III—III of Fig. 1 of the trip member associated with the circuit breaker illustrated in Fig. 1,

Fig. 4 is a sectional view taken on line IV—IV of Fig. 2 of the trip member associated with the circuit breaker illustrated in Fig. 2.

Referring to Fig. 1 of the drawing, the circuit breaker is of the three-pole type and is mounted in a housing comprising a base 11 and a removable cover 13, both of molded insulating material. Each pole of the breaker (only the center pole being shown) includes a stationary contact 19, an arc extinguisher 21, and a movable contact 23. The stationary contact 19 is mounted on the inner end of a strip 25 of conducting material, the other end of which is secured to a terminal 27.

The movable contact 23 is carried on the free end of a spring contact arm 29 which is secured to a U-shaped switch member 31. The movable contact 23 is electrically connected by means of a flexible conductor 33, to the current responsive trip means of the trip device which will be hereinafter described. The current responsive trip means is, in turn, connected to a conducting strip 35 having a terminal 37 secured to the outer end thereof. The contacts, switch members and trip means for the three poles of this breaker are of substantially identical construction; hence only one pole has been shown and described.

The three movable switch members 31 are mounted for simultaneous movement about a common axis by means of a sectional pivot shaft 39, the center section of which is supported in the side walls of a U-shaped frame 41 secured to the base 11 of the breaker. The switch members 31 of the outer poles (not shown) are secured to the outer sections of the pivot shaft 39, and are mechanically connected to the center pole switch members, but insulated therefrom, by insulating connecting hubs 43 (only one being shown) which connect the three separate sections of the pivot shaft together. A stop pin 45 extending through the frame 41 cooperates with projections formed on the center pole switch member 31 to limit the opening movement of the assemblage of switch members.

A single operating mechanism is provided for simultaneously actuating the switch members of all three poles of the breaker to open and closed positions. The operating mechanism is mounted in the frame 41, and comprises a U-shaped operating member 47 having its legs pivoted on pivot members 49 struck out from the frame 41, a releasable carrier lever 51 pivoted on a pivot pin 53 in the frame 41, a pair of toggle links 55

and 57, and overcenter springs 59 (only one being shown). The toggle links 55 and 57 are pivotally connected together by means of a knee pivot pin 61. The inner toggle link 55 is pivotally connected by a pivot pin 63 to the center pole switch member 31. The toggle link 57 is pivotally connected at its outer end by a pivot pin 65 to the releasable carrier lever 51. The overcenter springs 59 have their outer ends connected to the bight portion of the U-shaped operating member 47, and their inner ends are connected to the knee pivot pin 61 of the toggle 55-57. An operating handle 67 of molded insulating material is secured to the outer end of the operating member 47. The operating handle 67 is provided with a handle portion which extends through an opening 69 in the cover 12. The operating handle is also provided with an arcuate portion 71 which serves to substantially close the opening 69 in all positions of the handle. Lugs 72 are struck out from the sides of the frame 41 to limit the opening and closing movements of the operating member 47.

The breaker contacts are manually opened by clockwise movement of the operating handle from the position in which it is shown in Fig. 1. This movement carries the line of action of the overcenter springs 59 across to the right of the pivot pin 65 whereupon the force of the springs causes collapse of the toggle 55-57 thereby moving the movable contacts to the open position with a snap action. The contacts are closed by counterclockwise movement of the handle back to the Fig. 1 position. This moves the line of action of the springs 59 across to the left of the pivot pin 65, at which time the springs actuate the toggle 55-57 to its extended overset position shown, thereby moving the movable contacts to the closed position with a snap action.

The trip device of the circuit breaker includes a latch 73 pivotally mounted on a pivot pin 75 supported in the frame 41. An extension 79 of the latch is provided with an opening 81, one edge of which engages the free end of the carrier lever 51 and releasably restrains the carrier in normal position. The latch 73 is also provided with an extension 83 having an opening 85 thereon. A trip bar 87 of molded insulating material, and common to all of the poles of the breaker, is mounted for rotation by means of a shaft 89 molded therein, the ends of which are mounted in brackets 91 (only one being shown) secured to the base 11 of the housing. An arcuate latch member 93 is molded into the trip bar in alignment with the opening 85 in the latch member 73. In the latching position of the parts, the carrier 51 is latched by the main latch 73 which, in turn, is held in latching position by the latch member 93. A spring 95 coiled about the pivot pin 75 biases the latch member 73 in unlatching direction and also biases the trip bar 87 to latching position. The trip bar 87 is provided with a plurality of compensating bimetal elements 97, one for each pole of the breaker.

Each of the compensating bimetals 97 is secured to a projection 94 on the lower side of the trip bar by means of a screw 96 and extend upwardly around and across the trip bar 87 and is provided with an integral extension 98 which forms a loop portion above the trip bar 87.

Each pole of the breaker is provided with an overload trip device including a tripping bimetal element 101 having a mounting foot formed at right angles thereto by which the bimetal ele-

ment is secured to the base 11 of the breaker, the mounting foot being secured by means of a screw 103 to a metal insert 105. At its free end, the bimetal element 101 carries an adjusting screw 107 having a rounded inner end for engaging the extension 98 of the compensating bimetal element 97 and operating the trip bar 87 upon deflection of the tripping bimetal element. The free end of the tripping bimetal element is connected to the conducting strip 35 by a flexible conductor 109, and the flexible conductor 33 connects the foot of the tripping bimetal element to the movable contact 23 as shown in Fig. 1.

By securing the compensating bimetal element 97 to the trip bar 87 and spacing it a substantial distance from the current responsive bimetal element 101 which is heated by the current of the circuit, the compensating bimetal element is unaffected by the heat of the current responsive bimetal element, thus providing more accurate compensation for changes in ambient temperatures.

The high-expansion side of the tripping bimetal element 101 is on the right-hand side thereof. Also, the high-expansion side of the compensating bimetal element 97 is on the right-hand side and inside the loop as viewed in Fig. 1; consequently the bimetal elements bend in the same direction in response to changes in the temperature of the surrounding medium, maintaining substantially the same distance of the rounded end of the screw 107 from the extension 98 of the compensating bimetal element 97 during changes in ambient temperature.

Means is provided for limiting the temperature compensation provided by the compensating bimetal element 97 to a predetermined portion of the range of ambient temperature. This means comprises a projection 110 on the trip bar 87 extending into the loop of the compensating bimetal element. As the compensating bimetal element 97 deflects toward the left (Fig. 1) in response to a predetermined increase in the temperature of the surrounding medium the extension 98 on the compensating bimetal element engages or is arrested by the projection 110 thus preventing further deflection of the compensating bimetal element and compensation for further increase in ambient temperature.

By way of example, the compensating bimetal element 97 may be set to deflect the distance from the position in which it is shown in Fig. 1 to the point where it engages the projection 110 in response to an increase in ambient temperature from, for instance, 25° centigrade to 75° centigrade. Therefore, the bimetal element 97 will compensate the tripping bimetal element 101 for changes in ambient temperature below 75° centigrade. After the deflection of the compensating bimetal element 97 is stopped by its engagement with the projection 110 there is no further deflection thereof and no further compensation. The tripping bimetal element 101 will, therefore, trip the breaker quicker in response to a given overload current at temperatures above 75° centigrade than it would if the limiting projection 110 were not provided. Thus the compensating bimetal element 97 is free to compensate only for ambient temperature below the temperature at which its deflection is stopped. It will be obvious that the compensating bimetal element can be set so that its deflection in response to increases in ambient temperature will be stopped at any desired temperature.

When an overload current occurs, the tripping bimetal element 101 becomes heated by the current flow and when heated a predetermined amount, bends toward the left and engages the extension 98 of the compensating bimetal element 97. Further bending of the bimetal element 101 acts through the compensating bimetal element to cause counterclockwise rotation of the trip bar 87 and effects release of the latch 73 whereupon the overcenter springs 59 rotate the carrier lever 51 counterclockwise. During this movement the pivot 65 is carried across to the left of the line of action of the overcenter springs which causes collapse of the toggle 55—57 and opening movement of the switch member 31 and opening of the breaker contacts.

Before the contacts can be closed following an automatic opening operation, the carrier lever 51 must be reset to the latched position. This is effected by clockwise movement of the handle to a position slightly beyond the "off" position. During this movement, a projection 99 on the operating member 47 engages and moves the carrier lever 51 back to the latching position. The spring 95 then rotates the trip bar 87 to its latching position as shown in Fig. 1. The circuit breaker may then be closed by movement of the handle to the "on" position in the previously described manner.

Fig. 2 illustrates a modification of the invention applied to a somewhat different circuit breaker. The circuit breaker shown in Fig. 2 comprises a base 111 and a removable cover 113, both of molded insulating material. This breaker also is of the three-pole type (only the center pole being shown) and includes a stationary contact 119, an arc extinguisher 121 and a movable contact 123. The stationary contact is mounted on the inner end of a strip 125 of conducting material, the other end of which is secured to a terminal 127. The movable contact 123 is carried on the free end of a switch arm 129 and is connected by means of a flexible conductor 133 to the current responsive trip means which will be described hereinafter. The current responsive trip means is, in turn, connected to a conducting strip 135 having a terminal 137 secured to the outer end thereof. The contacts, switch members and trip means for the three poles of this breaker are of substantially the same construction; hence only one pole has been shown and described.

The three switch members 129 are mounted for simultaneous movement about a common axis by means of an insulating pivot shaft 139 pivotally mounted in the side walls of a U-shaped frame 141 secured to the base 111 of the breaker. The switch members 129 of the outer poles (not shown) are secured to the ends of the pivot shaft 139.

The operating mechanism, which is similar to the operating mechanism of the circuit breaker illustrated in Fig. 1, is mounted in the U-shaped frame 141 and comprises an operating member 147 having its legs pivoted on pivot pins 149 supported in the side members of the frame 141, a releasable carrier lever 151 pivoted on a pin 153 in the frame 141, a pair of toggle links 155 and 157 and an overcenter spring 159. The toggle 155—157 interconnects the center pole switch member 129 and the carrier lever 151 in the same manner as was described for the breaker shown in Fig. 1, and the overcenter springs 159 are connected to the knee of the toggle and to the operating member 147. An operating handle 167 is secured to the outer end of the operating mem-

ber 147 and is provided with a handle portion extending through an opening 169 in the cover 113.

The breaker contacts are manually opened by clockwise movement of the handle from the position shown in Fig. 2. This movement carries the line of action of the overcenter springs 159 across to the right of the toggle link 157 whereupon the overcenter springs cause collapse of the toggle thereby moving the switch members 129 to the open position to open the contacts. The contacts are closed by reverse movement of the handle back to the position shown in Fig. 2.

The trip device shown in Fig. 2 is mounted on its own base 161 secured by means of screws 163 to the base 111 of the circuit breaker. The trip device includes a latch 173 pivotally mounted on a pin 175 supported in a U-shaped bracket 177 mounted on the base 161 of the trip device. An extension 179 of the latch 173 engages the free end of the carrier lever 151 and releasably restrains the carrier lever in normal position. The latch 173 is also provided with an extension 183 which engages a latch member 193 secured to a trip bar 187 of molded insulating material. The trip bar 187 is common to all of the poles of the breaker and is suitably mounted for rotation. In the latching positions of the parts, the carrier lever 151 is latched by the latch 173 which is, in turn, held in latching position by the latch member 193. A spring 195 coiled about the pivot pin 175 biases the latch 173 to the latching position and a spring 191 biases the trip bar and the latch member 193 to latching position. The trip bar 187 is provided with a plurality of compensating bimetal elements 197, one for each pole of the breaker, formed from a straight strip of bimetallic material and secured to the trip bar.

Each pole of the breaker is provided with an overload trip device including a tripping bimetal element 201 secured to a conducting member 205 which, in turn, is secured to the base 111 of the breaker by the screw 163 by which the base 161 of the trip device is secured. At its free end the compensating bimetal element 197 carries an adjusting screw 207 having an insulating button 208 on the end thereof which is engaged by the tripping bimetal upon thermal bending thereof to actuate the trip bar 187. The free end of the tripping bimetal element 201 is connected to the conducting strip 135 by means of a flexible conductor 209 and the conducting member 205 and flexible conductor 133 connect the tripping bimetal element to the movable contact 123.

More accurate compensation of the tripping bimetal element 201 for changes in ambient temperatures is provided by spacing the compensating bimetal element 197 an appreciable distance therefrom so that the compensating bimetal element is unaffected by the heat of the current responsive tripping bimetal element 201. The insulating button 208 also prevents transfer of heat from the current responsive bimetal element 201 to the adjusting screw 207 and to the compensating bimetal element.

The high-expansion sides of the tripping bimetal element 201 and the compensating bimetal element 197, respectively, are on the left-hand sides thereof. Consequently, both of these elements bend in the same direction in response to changes in the temperature of the surrounding medium. This maintains a substantially constant distance between the adjusting screw 207

and the tripping bimetal element 201 as the ambient temperature varies.

The ambient temperature compensation provided by the compensating bimetal element 197 (Fig. 2) is limited by means of a limit stop member 211 secured to the trip bar 187 and extending upwardly to the right of the compensating bimetal element 197. The limit stop member 211 stops the deflection of the compensating bimetal element 197 in response to an increase in ambient temperature to, for instance, 75° centigrade. The compensating bimetal element 197 will, therefore, compensate the tripping bimetal element for increases in ambient temperature up to 75° centigrade. For changes in ambient temperature above 75° centigrade, there is no further deflection of the compensating bimetal element 197 and, hence, no further compensation.

Means is provided for calibrating the upper limit of ambient temperature compensation provided by the compensating bimetal element 197. This means comprises an adjusting screw 213 threadably mounted in the limit stop member 211 adjacent its upper end. By adjusting the screw 213, the deflection of the compensating bimetal element in response to a rise in ambient temperature may be varied thus varying the maximum temperature at which compensation is provided.

Upon the occurrence of an overload current, the tripping bimetal element 201 is heated by the flow of current therethrough, and when heated a predetermined amount bends toward the right to engage the adjusting screw 207 and actuate the trip bar 187. Actuation of the trip bar causes the latch member 193 to release the latch 173, whereupon the overcenter springs 159 rotate the carrier lever 151 counterclockwise. This movement of the carrier lever 151 carries the toggle link 157 across to the left of the line of action of the overcenter springs which immediately causes collapse of the toggle 155-157 and movement of the switch members 129 to the open position and opening of the breaker contacts.

Before the contacts can be closed following an automatic tripping operation, the carrier lever 151 must be reset to the latched position. This is accomplished by movement of the handle 167 in a clockwise direction as far as it will go. During this movement a projection 199 on the operating member 147 engages and moves the carrier lever back to the latching position. During the latter part of the resetting movement, the free end of the carrier lever wipes by the latch 173 which is then restored to its latching position by the spring 195. The circuit breaker may then be closed by movement of the handle to the "on" position in the previously described manner.

The invention provides a circuit breaker embodying a current responsive trip device and having an improved ambient temperature compensating means that is mounted away from the trip means. By this construction, the compensating bimetal element is mounted an appreciable distance from the tripping bimetal element which is heated by the current of the circuit. In this manner, the compensating bimetal element is unaffected by the heat of the tripping bimetal element. The invention provides means for limiting the amount of compensation provided by the ambient temperature compensating means and also provides calibrating means for varying the maximum ambient temperature at which compensation is provided.

While the invention has been disclosed in ac-

cordance 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.

I claim as my invention:

1. A circuit breaker having relatively movable contact means and operating means releasable to effect automatic opening of said contact means, a trip device comprising a trip member movable to release said operating means, a current responsive bimetal element heated in response to the current of the circuit, an ambient temperature responsive bimetal element mounted on said movable trip member for compensating said current responsive bimetal element for changes in ambient temperature, adjusting means on one of said bimetal elements for varying the tripping point of said trip device, said adjusting means cooperating with the other of said bimetal elements upon thermal bending of said current responsive bimetal element to move said trip member and effect release of said operating means, and stop means on said movable trip member for limiting the amount of compensation provided by said ambient temperature responsive bimetal element.

2. A circuit breaker having relatively movable contact means and operating means releasable to effect automatic opening of said contact means, a trip device comprising a trip member movable to release said operating means, a current responsive bimetal trip element heated by the current of the circuit, an ambient temperature responsive bimetal element mounted on said trip member, said ambient temperature responsive bimetal element deflecting in response to changes in ambient temperature to compensate said current responsive bimetal element for changes in ambient temperature, stop means on said movable trip member for limiting the deflection of said ambient temperature responsive bimetal to thereby limit the amount of compensation, and means on said current responsive bimetal element for engaging said ambient temperature responsive bimetal element upon thermal bending of said current responsive bimetal element to move said trip bar and effect release of said operating means.

3. A circuit breaker having relatively movable contact means and means releasable to effect automatic opening of said contact means, a pivoted trip member movable to release said releasable means, a current responsive bimetal element disposed to be heated by the current of the circuit, an ambient temperature responsive bimetal element rigidly mounted on said pivoted trip member, said ambient temperature responsive bimetal element deflecting in response to changes in ambient temperature to compensate said current responsive bimetal element, stop means on said pivoted trip member for limiting the deflection of said ambient temperature responsive bimetal element, and said current responsive bimetal element when heated a predetermined amount bending in a direction to move said ambient temperature responsive bimetal element to thereby cause pivotal movement of said pivoted trip member and release of said releasable means.

4. A circuit breaker having relatively movable contact means and means releasable to effect automatic opening of said contact means, a pivoted trip member movable to release said re-

leasable means, a current responsive bimetal element disposed to be heated by the current of the circuit, an ambient temperature responsive bimetal element rigidly mounted on said pivoted trip member, said ambient temperature responsive bimetal element deflecting in response to changes in ambient temperature to compensate said current responsive bimetal element, stop means on said pivoted trip member for limiting the deflection of said ambient temperature responsive bimetal element, calibrating means adjustable to vary the limiting point of said stop means, and said current responsive bimetal element when heated a predetermined amount bending in a direction to move said ambient temperature responsive bimetal element to thereby cause pivotal movement of said pivoted trip member and release of said releasable means.

5. A circuit breaker having relatively movable contact means and means releasable to effect automatic opening of said contact means, a trip device comprising a trip member movable to release said releasable means, a current responsive bimetal element heated by the current of the circuit, an ambient temperature responsive bimetal element mounted on said trip member, said ambient temperature responsive bimetal element deflecting in response to changes in ambient temperature to compensate said current responsive bimetal element for changes in ambient temperature, means comprising a stop member on said trip member for limiting the deflection of said ambient temperature responsive bimetal element in response to an increase in ambient temperature, adjusting means on said stop means for varying the point at which said stop means limits the deflection of said ambient temperature responsive bimetal element, and an adjusting screw on said ambient temperature responsive bimetal element for varying the tripping point of said current responsive bimetal element, said adjusting screw being engageable by said current responsive bimetal element upon thermal bending of the latter to actuate said trip member and release said releasable means.

6. A circuit breaker having relatively movable contact means and means releasable to effect automatic opening of said contact means, a trip device comprising a trip member rotatable to release said releasable means, a current responsive bimetal element heated by the current of the circuit, said bimetal element having one end supported and the other end free, an ambient temperature bimetal element having one end secured to said trip member and having its free end disposed adjacent said free end of the current responsive bimetal, said ambient temperature responsive bimetal element deflecting in response to changes in ambient temperature to compensate said current responsive bimetal element, limiting means on said trip member for limiting the deflection of said ambient temperature bimetal element, and thermal bending of said current responsive bimetal element causing its free end to move said ambient temperature responsive bimetal element and rotate said trip member to effect release of said releasable means.

7. A circuit breaker having relatively movable contact means and means releasable to effect automatic opening of said contact means, a trip member operable to release said releasable means, a current responsive bimetal element heated by the current of the circuit, said bimetal element

having one end supported and the other end free, an ambient temperature bimetal element having one end supported on said trip member on the side thereof away from said current responsive bimetal element, said ambient temperature responsive bimetal element extending to the opposite side of said trip member and having a reverse bend so that the free end thereof is disposed adjacent the free end of said current responsive bimetal element, said ambient temperature responsive bimetal element deflecting in response to changes in ambient temperature to compensate said current responsive bimetal element, a projection on said trip member for limiting the deflection of said ambient temperature responsive bimetal element, and thermal bending of said current responsive bimetal element causing its free end to move said ambient temperature responsive bimetal element and operate said trip member to release said releasable means.

8. A circuit breaker having relatively movable contact means and means releasable to effect opening of said contact means, a trip member operable to release said releasable means, a current responsive bimetal element having one end supported and the other end free and extending along one side of said trip member, an ambient temperature responsive bimetal element having one end supported on said trip member on the side thereof away from said current responsive bimetal element, said ambient temperature responsive bimetal element deflecting in response to changes in ambient temperature to compensate said current responsive bimetal element, a stop member on said trip member for limiting the deflection of said ambient temperature responsive bimetal element, and one of said bimetal elements having its free end cooperating with the free end of the other of said bimetal elements upon thermal bending of said current responsive bimetal element to actuate said trip member and release said releasable means.

9. A multi-pole circuit breaker having relatively movable contacts for each pole, operating mechanism releasable to effect automatic opening of said contacts, a trip member common to all of said poles operable to effect release of said operating mechanism, a thermally responsive bimetal element for each pole disposed to be heated in response to the current of the circuit of the associated pole, an ambient temperature responsive bimetal element for each pole, each of said ambient temperature responsive bimetal elements being mounted on said trip member, stop means for each of said ambient temperature responsive bimetal elements for limiting the deflection of said ambient temperature responsive bimetal elements, adjusting means on one of said bimetal elements in each pole, said adjusting means upon thermal bending of the current responsive bimetal element cooperating with the other bimetal element in its associated pole to operate said trip member and effect release of said operating mechanism.

10. A multi-pole circuit breaker having relatively movable contacts for each pole, operating means releasable to effect automatic opening of said contacts, a trip member common to all of said poles operable to effect release of said operating means, a thermally responsive bimetal element for each pole disposed to be heated in response to the current of the circuit of the associated pole, an ambient temperature responsive bimetal element for each pole, said ambient temperature bimetal elements being rigidly mounted on said trip member, means on said trip member

for limiting the deflection of the ambient temperature responsive bimetal element for each pole, means on each of said current responsive bimetal elements engageable with the ambient temperature responsive bimetal element for the associated pole upon thermal bending of said thermally responsive bimetal element to operate said trip member and effect release of said operating means.

11. A multi-pole circuit breaker having relatively movable contacts for each pole, operating mechanism releasable to effect automatic opening of said contacts, a trip member common to all of said poles operable to effect release of said operating mechanism, a thermally responsive bimetal element for each pole disposed to be heated by the current of the circuit of the associated pole, an ambient temperature responsive bimetal element for each pole rigidly mounted on said common trip member, limiting means on said common trip member for limiting the deflection of said ambient temperature responsive bimetal element for each pole, means on said ambient temperature responsive bimetal element for each pole engageable by the thermally responsive bimetal element of the associated pole upon thermal bending of said thermally responsive bimetal element to operate said trip member and effect release of said operating means.

12. A circuit breaker having relatively movable contact means and means releasable to effect automatic opening of said contact means, a trip device comprising a trip member movable to release said releasable means, a current responsive bimetal trip element heated in response to the current of the circuit, an ambient temperature responsive bimetal element mounted on said trip member, a stop member on said trip member for limiting the deflection of said ambient temperature responsive bimetal element, an insulating member on one of said bimetal elements, and said insulating member cooperating with the other of said bimetal elements upon thermal bending of said current responsive bimetal element to move said trip member and effect release of said releasable means.

13. A circuit breaker having relatively movable

contact means and means releasable to effect automatic opening of said contact means, a trip device comprising a trip member movable to effect release of said releasable means, a current responsive bimetal element heated by the current of the circuit, an ambient temperature responsive bimetal element rigidly mounted on said trip member, means comprising a projection on said trip member for limiting the deflection of said ambient temperature responsive bimetal element, adjusting means mounted on said ambient temperature responsive bimetal element, and insulating means on said adjusting means engageable by said current responsive bimetal element upon thermal bending of the latter to move said trip member and cause release of said releasable means.

14. A circuit breaker having relatively movable contact means and means releasable to effect automatic opening of said contact means, a trip member operable to release said releasable means, a current responsive bimetal element having one end supported and the other end free and extending along one side of said trip member, an ambient temperature responsive bimetal element having one end rigidly supported on said trip member on the side thereof away from said current responsive bimetal element, stop means on said trip member for limiting the deflection of said ambient temperature responsive bimetal element, and adjusting means mounted at the free end of one of said bimetal elements having an insulating member thereon cooperating with the free end of the other of said bimetal elements upon thermal bending of said current responsive bimetal element to operate said trip member and cause release of said releasable means.

HILLER D. DORFMAN.

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