April 27, 1954 M. BINGENHEIMER 2,677,026

CIRCUIT BREAKER

Original Filed May 9, 1945

Fig. 1.

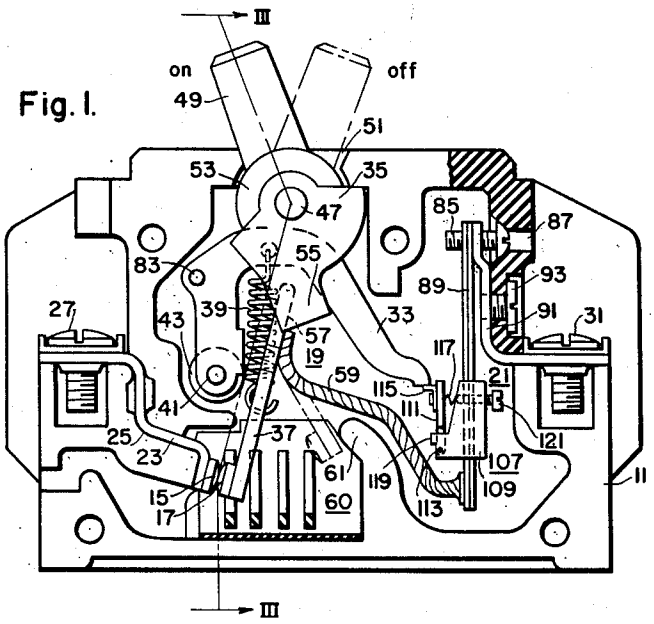


Fig. 2.

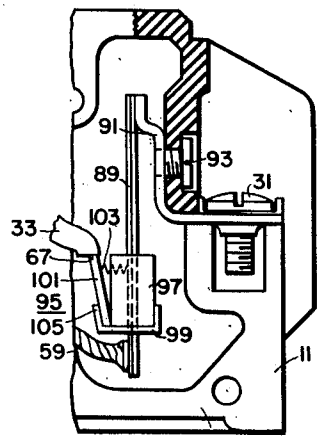
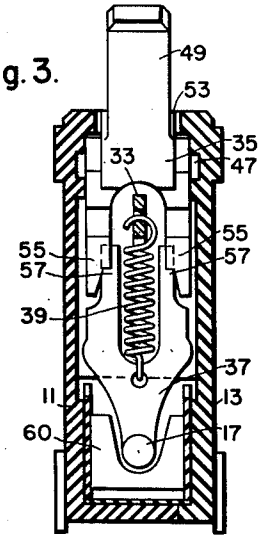


Fig. 3.



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UNITED STATES PATENT OFFICE

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CIRCUIT BREAKER

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Original application May 9, 1945, Serial No. 592,804, now Patent No. 2,624,816, dated January 6, 1953. Divided and this application May 9, 1952, Serial No. 287,018

16 Claims. (Cl. 200—88)

1

This invention relates to circuit breakers, and more particularly to circuit breakers for controlling lighting and moderate power circuits. This application is a division of my copending application Serial No. 592,804 filed May 9, 1945, now Patent No. 2,624,816, issued January 6, 1953.

An object of the invention is to provide a circuit breaker embodying an improved thermally and magnetically responsive trip device wherein the magnetically responsive means is supported entirely by the thermally responsive means.

Another object of the invention is to provide an improved thermally and magnetically responsive trip device wherein operation of the magnetic element applies no bending stress to the thermal element and avoids the possibility of the thermal element taking a permanent set due to its being bent when in heated condition.

Another object is to provide a trip device having an armature movable against the bias of a spring other than the thermal element, so that a stiffer thermal element may be used without requiring a large magnetic force for magnetic tripping.

A further object is to improve the accuracy of calibration of the trip device and to insure that accuracy is maintained even after interrupting heavy short-circuit currents.

Another object of the invention is to provide a circuit breaker embodying an improved thermally and magnetically responsive trip device having the magnetically responsive means mounted on the thermally responsive means in a manner to permit adjustment of the thermally responsive means without changing the magnetic airgap.

Another object of the invention is to provide a circuit breaker embodying a thermally and magnetically responsive trip device wherein the magnetically responsive means comprises a core member and a movable armature both mounted on the thermally responsive means to permit altering the set of the thermally responsive means without disturbing the adjustment of the magnetic airgap of the movable armature.

Another object of the invention is to provide a circuit breaker which is simple, safe and reliable in operation, and which is inexpensive to manufacture.

The novel features that are considered characteristic of the invention 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 which:

2

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

Fig. 2 is a fragmentary elevational view showing a modification of the trip device; and

Fig. 3 is a sectional view taken substantially on line III—III of Fig. 1, and looking in the direction of the arrows.

Referring to Fig. 1 of the drawing, the circuit breaker comprises a housing 11 and a cover plate 13 therefor, both constructed of molded insulating material, stationary contact means 15, movable contact means 17, an operating mechanism 19 and a trip device 21.

The stationary contact 15 is rigidly secured to the inner end of a multi-angular terminal member 23 which is seated in an angular slot 25 in the molded housing 11. The outer end of the terminal 23 is provided with a connecting means 27 for connecting the terminal 23 in an electric circuit. At the opposite end of the housing 11 is disposed a terminal 91 which at its inner end supports the trip device (to be later described) and which is provided with a connector 31 at its outer end for connecting the terminal in an electric circuit.

The movable contact 17 is rigidly secured on the free end of a U-shaped switch arm 37 having its legs 57 supported in recesses in the legs 55 of a U-shaped operating lever 35. The operating lever 35 is pivotally supported on a pivot pin 47 mounted in a suitable opening in the housing 11 and a matching opening in the cover 13. An operating spring 39 is connected under tension between the switch arm 37 and a releasable carrier 33 pivoted on a pin 41 supported in companion openings in the housing 11 and the cover 13. Spacers 43 are provided to maintain the carrier 33 properly spaced from the walls of the housing and the cover plate.

The operating lever 35 is provided with an operating handle 49 molded integral therewith and extending through an opening 51 in the housing 11. The operating lever is also provided with an arcuate member 53 molded integral therewith cooperating with the housing 11 to substantially close the opening 51 in any position of the handle 49. The switch arm 37 is electrically connected by means of a flexible connection 59 to one end of a bimetal element 89 forming a part of the trip device 21 and which is suitably secured at its upper end, preferably by welding, to the inner end of the terminal 91.

The switch arm 37 is operated to manually open and close the contacts by manipulation of the handle 49. Movement of the handle in a clockwise direction from the full line position carries the legs 57 of the switch arm 37 across to the left of the line of action of the operating spring 39 which then biases the switch arm to the open position and causes movement of the switch arm to open position with a snap action. The operating mechanism and switch arm are shown in the manually open position by dot and dash lines in Fig. 1.

The contacts are manually closed by reverse operation of the handle. Counterclockwise movement of the handle 49 from the dot and dash position (Fig. 1) to the full line position moves the legs 57 of the switch arm 37 across to the right of the line of action of the spring 39 which thereupon acts to close the contacts with a snap action.

An arc extinguisher 60 is provided to quickly extinguish the arc drawn when the circuit is interrupted. The arc extinguisher may be of any suitable type, the one illustrated comprising a series of slotted plates into which the arc is drawn and extinguished.

The circuit breaker is adapted to be tripped open instantaneously in response to overloads above a predetermined value, or a short circuit, and after a time delay on lesser overloads by means of the trip device 21. Operation of the trip device 21 releases the carrier 33 whereupon the overcenter spring moves the carrier clockwise moving the line of action of the overcenter spring 39 to the right of the center line of the switch arm 37. Thereafter the spring 39 acts to move the switch arm to open position with a snap action. The movement of the carrier 33 is arrested by engagement with a projection 61 of the housing 11.

The operating mechanism is more fully described and claimed in application Serial No. 592,446, filed May 7, 1945, by H. S. Gano and G. J. Freese, now Patent No. 2,624,815 issued January 6, 1953, and assigned to the assignee of this invention.

The current responsive means or trip device 21 comprises the bimetal element 89 connected by means of the flexible conductor 59 to the switch arm 37, an electromagnet 107 including a channel-shaped core member 109 and a movable armature 111, a latch element 115 and a resilient spring 117. The terminal 91 is secured to the end wall of the casing 11 by means of a screw 93 and the bimetal element 89 is rigidly secured by suitable means such as welding to the upper inner end of the terminal 91.

The U-shaped core member 109 is suitably secured, preferably by welding, to the bimetal element to form a unitary assembly. The armature member 111 is pivotally mounted on a pivot pin 113 supported in extensions of the legs or flanges of the U-shaped magnet core 109 at its lower end near the free or movable end of the bimetal element. The latch member 115 is rigid with the magnetic armature 111 adjacent its upper end for normally engaging and restraining the releasable carrier 33 in operative position. The force of the bias on the releasable member 33 is transmitted through the two magnetic members, which are pivoted together, and applied to the bimetal element 89 in tension.

The armature 111 is biased by means of spring 117 against a fixed stop 119 formed inwardly from one leg of the core member 109 thus providing a fixed magnetic airgap. The stop 119 is carried by the bimetal and magnetic core assembly and opposes the force of the releasable member 33 which tends to rotate the armature about its pivot. The stop 119 limits the airgap to a predetermined size which is independent of the position to which the bimetal and magnetic core assembly may have moved. A screw 121 threadedly engaging the core member 109 and the bimetal element 89 is provided for varying the tension of the armature spring 117 to thereby vary the minimum overload current required to instantaneously trip the breaker.

The latch element 115 normally engages and restrains the carrier 33 in operative position as shown in Fig. 1. Upon the occurrence of an overload current below a predetermined value of, for instance, 1000% of normal rated current, the bimetal element 89 deflects moving its free lower end toward the right (Fig. 1). The bimetal element 89 moves the core member 109, armature member 111 and its actuating or latch portion 115 in unison in the same direction, since the armature is held against the stop portion 119 which moves in fixed relation with the bimetal and core assembly, and causes the latch 115 to release the carrier 33 whereupon the operating mechanism functions in the previously described manner to automatically open the contacts.

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 clockwise to the full open position during which movement the leg 55 of the operating lever 35 engages a pin 63 in the carrier 33 and moves the carrier counterclockwise about its pivot 41. Near the end of its counterclockwise movement, the free end of the carrier 33 wipes by the latch portion 115, slightly flexing the spring 117 against its bias without substantially bending the bimetal element 89. Thereafter the switch arm is moved to close the contacts 15—17 in the previously described manner by movement of the handle 49 counterclockwise to the closed position.

Upon the occurrence of a heavy overload or short circuit, such for example as 1000% of rated current or over, the current flowing through the bimetal element 89 energizes the core member 109 a sufficient amount to instantaneously attract and operate the armature 111 toward the side portions or flanges of the channel-shaped core 109, releasing the carrier 33 and effecting instantaneous opening of the contacts.

The invention provides a circuit breaker of few parts and simple and inexpensive construction having an improved trip device wherein all of the elements are mounted at a single point on one of the terminals of the breaker, the electromagnetic trip device being mounted entirely on the bimetal trip element. By this construction the magnetic trip values are not affected by adjustment of the thermal trip element. The bimetal element can be made stiffer without affecting the relatching effort thereby providing a more positive thermal trip action. Another advantage of the invention is that the magnetic airgap remains constant regardless of changes in ambient temperature.

Means is provided whereby the trip device may be adjusted to vary the tripping time of the time delay trip means. The adjusting means comprises a screw 95 threadedly engaging the upper end of the terminal 91 and having its rounded head bearing against a concave recess in the housing 11. An opening 87 in the casing permits the

insertion of a suitable tool for turning the screw 85 to thereby adjust the trip device without removing the cover 13. This opening may be sealed to prevent tampering.

According to the modification of the invention illustrated in Fig. 2 of the drawing, a straight strip of bimetal 89 is secured, preferably by welding, to the inner end of the terminal 91 which is secured to the housing by means of the screw 93. An electromagnet, indicated generally at 95 is securely mounted on the bimetal 89. The electromagnet 95 comprises two members of magnetic material, one of which is a U-shaped core member 97 having a yoke 99 each being secured, preferably by welding, to the bimetal element 89, and the other member of magnetic material is a movable armature 101 pivotally supported by the yoke member 99 at the two ends of the U-shaped core member 97 nearest to the free or movable end of the bimetal 89. A compression spring 103 biases the armature 101 to the unattracted position against a limit stop comprising a portion 105 of the yoke 99. The stop portion 105, which is carried by the bimetal and core assembly, also opposes the bias on the releasable member 33 which tends to rotate the armature about its pivot. The airgap of the magnet may be varied by bending the portion 105 of the magnet yoke thus changing the position of the stop for the armature. In the unattracted position, the armature 101 acts as a latch having a latch portion 67 for releasably restraining the releasable carrier 33 in operative position. The biasing force on the releasable carrier member 33 is exerted on the latch portion 67 and is transmitted through the pivoted member 101 to its pivoted lower end and thence to the bimetal element 89 near its free or movable end, and stresses the bimetal element in tension rather than in compression which might cause the bimetal to become bowed.

When the bimetal element 89 (Fig. 2) is heated a predetermined amount in response to overload currents below a predetermined value of, for instance 1000% of rated current, it deflects in a direction to move the free end thereof, together with the entire magnet 95, away from the operating mechanism, thereby releasing the carrier 33 and causing automatic opening of the contacts. When energized in response to overload currents above a value, such for example as 1000% of rated current, or in response to short circuits, the core member 97 attracts the armature 101 against the bias of the resilient spring 103 to effect instantaneous tripping of the breaker. It is thus seen that the latch portion 67 is a single actuating portion which is moved either magnetically when the armature 101 is attracted to the core 97, or thermally when the bimetal 89 flexes and bodily moves both the core 97 and the armature 101.

After an automatic opening operation, the mechanism may be reset and the contacts closed in the previously described manner.

From the foregoing it will be seen that there is provided an improved circuit breaker of simple and inexpensive construction, wherein all elements of the trip device including the electromagnetic trip means and movable armature are mounted on the bimetallic trip element. By this construction the bimetal element may be adjusted to vary the time delay tripping time of the breaker without changing the magnetic airgap or affecting the instantaneous trip time of the breaker.

While the invention has been specifically 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.

I claim as my invention:

1. In a circuit breaker comprising relatively movable contacts and means releasable to effect opening of said contacts, trip means operable in response to overload currents to release said releasable means, said trip means comprising a bimetal element traversed and heated by the current of the circuit, an electromagnetic core member mounted for movement by said bimetal element and extending around three sides of said bimetal element to be energized by current traversing said bimetal element, a movable armature pivotally supported on the two side portions of said electromagnetic core member, said electromagnetic core member being operable in response to overload currents above a predetermined value to attract said armature and effect instantaneous release of said releasable means, and said bimetal element flexing when heated a predetermined amount in response to overload currents below said predetermined value to move said electromagnetic core member and effect release of said releasable means.

2. A circuit breaker including relatively movable contacts, a releasable member operable when released to effect opening of said contacts, trip means including a bimetal element electrically connected to be traversed by current, electroresponsive means comprising a U-shaped core member and an armature surrounding said bimetal element and energized by the current flow therethrough, said core member being mounted for movement by said bimetal element upon heating thereof due to overloads and said movement of the bimetal element and core member causing release of said releasable member, and the ends of said U-shaped core member having thereon pivotal supporting means on which said armature is pivotally mounted on the core member for movement relative thereto magnetically upon the occurrence of heavy overloads to also cause release of said releasable member and opening of said contacts.

3. A circuit breaker including relatively movable contacts, a releasable member operable when released to effect opening of said contacts, trip means including a bimetal element electrically connected to be traversed by current, electroresponsive means comprising a pair of magnetic members on opposite sides of said bimetal element and energized by the current flow therethrough, both of said magnetic members being movable, one of said magnetic members being pivotally mounted on the other magnetic member, a spring biasing said pivotally mounted magnetic member away from the other magnetic member and said pivotally mounted magnetic member being magnetically movable about its pivot against the bias of said spring without bending said bimetal element, and the other magnetic member being movable upon bending of said bimetal member, one of said magnetic members having a latch portion engaging and normally holding said releasable member, said latch portion being movable to releasing position by magnetic attraction between the magnetic members, and said latch portion also being movable to releasing position by bending force of said bimetal element transmitted entirely through one of the magnetic members to said latch portion.

4. A circuit breaker including relatively mov-

able contacts, a releasable member operable when released to effect opening of said contacts, thermal trip means including a conductor electrically connected to be traversed by current, magnetic responsive means including a pair of magnetic members pivoted together, both of said magnetic members being movable and having said current traversed conductor extending therebetween to create magnetic flux therein, a latch portion rigid with one of said magnetic members and normally engaging and holding said releasable member, one of said magnetic members being movable upon movement of the thermal trip means to move said latch portion and cause release of the releasable member, and said latch portion also being moved upon the magnetic flux causing attraction of said magnetic members relative to each other about the point where they are pivoted together.

5. A circuit breaker including relatively movable contacts, a releasable member operable when released to effect opening of said contacts, a terminal strip, a bimetal element mounted and electrically connected at its upper end to said terminal strip, a flexible conductor connected to the lower end of the bimetal element and electrically connecting it in series with said contacts, a pair of magnetic members comprising a core member having a U-shaped section of magnetic material extending around the bimetal element and an armature extending across and pivoted on the ends of the U of the core member, said core member being movable upon bending of the bimetal element due to the flow of a predetermined current through the bimetal element, a spring biasing said armature against pivotal movement toward the ends of the U of the core member, and said armature being movable about its pivot against the bias of said spring by the magnetic flux caused in the U-shaped core member and armature by the current flow in the bimetal element upon the flow of a higher predetermined current through the bimetal element, a latch portion rigid with one of said magnetic members and engaging and normally holding said releasable member, and said latch portion being movable to releasing position upon movement of the core member by the bimetal element and being movable to releasing position upon magnetic attraction between the magnetic members.

6. In a circuit breaker comprising relatively movable contacts and means releasable to effect opening of said contacts, trip means operable in response to overload currents to release said releasable means, said trip means including a bimetal element traversed and heated by the current of the circuit, a movably mounted electromagnetic core member movable by said bimetal element, side portions on said electromagnetic core member whereby it extends around three sides of said bimetal element to be energized by current traversing said bimetal element, extensions providing a pivot support on each of the two side portions of said electromagnetic core member, a movable armature pivotally supported on said two extensions, said electromagnetic core member being operable in response to overload currents above a predetermined value to attract said armature and effect instantaneous release of said releasable means, and said bimetal element flexing when heated a predetermined amount in response to overload currents below said predetermined value to move said electromagnetic core member and effect release of said releasable means.

7. A circuit breaker including relatively movable contacts, a releasable member biased to move and effect opening of said contacts, trip means including a bimetal element electrically connected to be traversed by current, means mounting said bimetal element adjacent one end and leaving it free to move at the other end, electroresponsive means comprising a movably mounted channel-shaped core member and a movable armature surrounding said bimetal element and energized by the current flow therethrough, said movable channel-shaped core member being operatively connected to be moved upon movement of said bimetal element upon heating thereof due to overloads, said movement of the bimetal element and movable channel-shaped core member causing release of said releasable member, and the flanges of said movable channel-shaped core member having at the end thereof nearest the free end of said bimetal element pivotal supporting means by which said movable armature is pivotally mounted on the channel-shaped core member for movement relative thereto magnetically upon the occurrence of heavy overloads to also cause release of said releasable member and opening of said contacts.

8. A circuit breaker including relatively movable contacts, a releasable member operable when released to effect opening of said contacts, trip means including a bimetal element electrically connected to be traversed by current, electroresponsive means comprising a pair of magnetic members on opposite sides of said bimetal element and energized by the current flow therethrough, both of said magnetic members being movable, one of said magnetic members being mounted on the other magnetic member for movement theretoward when magnetically attracted thereto, and the other magnetic member being mounted for movement upon bending of said bimetal member, a spring positioned between said magnetic members and biasing said one movable magnetic member away from the other magnetic member, stop means carried entirely by and movable with the two magnetic members for limiting the airgap between the two magnetic members, said one movable magnetic member being magnetically movable away from its position determined by said stop means against the bias of said spring without bending said bimetal element, said one movable magnetic member having rigid therewith an actuating portion movable to a position for effecting release of said releasable member, said actuating portion being movable to releasing position by the magnetic attraction between the magnetic members, and said actuating portion also being movable to releasing position by bending force of said bimetal element transmitted to said actuating portion through said movable stop means.

9. A circuit breaker including relatively movable contacts, a releasable member biased to move and effect opening of said contacts, thermal trip means including a conductor electrically connected to be traversed by current, magnetic responsive means including a pair of magnetic members, each of said magnetic members being movably mounted, said current traversed conductor extending between said magnetic members to create magnetic flux therein, one of said magnetic members having two side portions each opposite one edge of said current traversed conductor, an extension on each side portion having a pivot bearing, the other of said magnetic members having a pair of pivot portions through which

it is supported on said extensions on said side portions, a latch portion rigid with one of said magnetic members, said latch portion normally engaging and holding said releasable member against its bias, one of said magnetic members being movable upon movement of the thermal trip means to move said latch portion and cause release of the releasable member, and said latch portion also being moved upon the magnetic flux causing attraction of said magnetic members relative to each other about said pivot bearings on the extensions of the side portions.

10. A circuit breaker including relatively movable contacts, a releasable member biased to move when released to effect opening of said contacts, a terminal strip, a bimetal element mounted and electrically connected at its upper end to said terminal strip and being movable at its lower end, a flexible conductor connected to the lower end of the bimetal element and electrically connecting it in series with said contacts, a pair of magnetic members comprising a movably mounted channel-shaped core member of magnetic material extending around the bimetal element and an armature pivoted adjacent its lower end on the flanges of the channel-shaped core member adjacent the end thereof nearest the lower movable end of the bimetal element, said channel-shaped core member being movable upon bending of the bimetal element due to the flow of a predetermined current through the bimetal element, a spring biasing said armature against pivotal movement toward the flanges of the channel-shaped core member, and said armature being movable about its pivot adjacent its lower end against the bias of said spring by the magentic flux caused in the channel-shaped core member and armature by the current flow in the bimetal element upon the flow of a higher predetermined current through the bimetal element, a latch portion rigid with one of said magnetic members and engaging and normally holding said releasable member against its bias, and said latch portion being movable to releasing position upon movement of the channel-shaped core member by the bimetal element and being movable to releasing position upon magnetic attraction between the magnetic members.

11. In a circuit breaker comprising relatively movable contacts and means releasable to effect opening of said contacts, trip means operable to release said releasable means in response to overload currents including an electromagnet having a core member and an armature member, a current responsive bimetal element mounted at one end and having its other end free to flex when heated, said core member and armature member being positioned on opposite sides of said bimetal element and both being carried and solely supported by said bimetal element adjacent its free end, a pivot axis adjacent the end of the armature member nearest the free end of the bimetal element about which the armature member pivots when attracted to said core member, a single actuating portion carried on said armature member adjacent the end thereof farthest from the free end of the bimetal element for initiating operation of said releasing means both thermally upon movement of the bimetal element and magnetically upon attraction of the armature member to the core member, a stop portion movable with said bimetal element limiting separation of said armature member from said core member so that the core and armature members are both moved upon flexing of the bimetal element while the core and armature members remain in substantially fixed relation to each other to thereby cause movement of said single actuating portion carried on the armature member and operation of the releasing means upon the occurrence of overloads of relatively low values, resilient means opposing movement of said armature member toward said core member, and said armature member being magnetically movable toward said core member against the bias of said resilient means about the pivot axis adjacent the end of the armature member nearest the free end of the bimetal element without substantially moving the bimetal element to thereby cause movement of said single actuating portion carried on the other end of the armature member and operation of the releasing means upon the occurrence of heavy overloads or short circuits.

12. In a circuit breaker comprising relatively movable contacts and a releasable member biased to effect opening of said contacts, trip means operable to release said releasable member in response to overload currents comprising a current responsive bimetal element mounted at one end and movable at the other end and an electromagnet having a core member and an armature member, said armature member being pivotally movable toward the core member about a pivot axis adjacent its end nearest the movable end of the bimetal element, said core member and armature member being positioned on opposite sides of said bimetal element and both being carried by the movable part of said bimetal element which forms the sole support therefor, a single latch portion rigidly connected to the armature member adjacent its end farthest from the movable end of the bimetal element and movable at all times with said armature member, said single latch portion normally engaging and restraining said releasable member against its bias and transmitting the force thereof to the bimetal element in tension, said single latch portion releasing said releasable member both upon thermal movement of the bimetal element and upon magnetic attraction of the armature member to the core member, said core and armature members both being connected to be moved by flexing of the bimetal element while the said core and armature members remain in substantially fixed relation to each other to thereby cause movement of said single latch portion connected to the armature and release of said releasable member upon the occurrence of overloads of relatively low values, resilient means opposing movement of said armature member toward said core member, said armature member being magnetically movable toward said core member about its pivot axis adjacent the end thereof nearest to the movable end of the bimetal element against the bias of said resilient means without substantially moving said bimetal element to thereby cause movement of said single latch portion rigidly connected to the armature and release of the releasable member upon the occurrence of heavy overloads or short circuits, and said releasable member having an end portion engageable with said single latch portion to move it and the armature member against the bias of the resilient means opposing movement of the armature member so as to relatch with said single latch portion without substantial movement of the bimetal element.

13. In a circuit breaker, relatively movable contacts, a releasable member operable when released to effect opening of said contacts, a bi-

metal mounted at one end and free to move at the other end, conductors connecting said bimetal to be traversed by the current through the contacts, a magnetic core member assembled on the movable part of the bimetal to be moved thereby, an armature member mounted on said bimetal and magnetic core assembly, a spring biasing said armature away from said magnetic core, a stop portion carried by said bimetal and magnetic core assembly and limiting movement of the armature due to its bias away from the magnetic core to a predetermined airgap independent of movement of the bimetal and magnetic core assembly, and an actuating portion rigid with said armature member for initiating operation of said releasable member.

14. In a circuit breaker, relatively movable contacts, a releasable member operable when released to effect opening of said contacts, a bimetal mounted at one end and free to move at the other end, conductors connecting said bimetal to be traversed by the current through the contacts, a magnetic core member assembled on the movable part of the bimetal to be moved thereby, an armature member pivotally mounted adjacent its end nearest to the movable end of the bimetal, said armature member being pivotally mounted on said bimetal and magnetic core assembly, a spring biasing said armature away from said magnetic core, a stop carried by said bimetal and magnetic core assembly and limiting movement of the armature due to its bias away from the magnetic core to a predetermined airgap independent of movement of the bimetal and magnetic core assembly, and a latch portion mounted rigid with said pivoted armature adjacent the end thereof farthest from the movable end of the bimetal, said latch portion normally engaging and holding said releasable member.

15. In a circuit breaker, relatively movable contacts, a releasable member biased to move when released and effect opening of said contacts, a bimetal mounted adjacent one end and free to move at the other end, conductors connecting said bimetal in the circuit through the contacts, a magnetic core assembled on one side of the bimetal adjacent its movable end, an armature member pivotally mounted adjacent its end nearest to the movable end of the bimetal, said armature member being pivotally mounted on said bimetal and magnetic core assembly and being positioned on the side of the bimetal opposite the magnetic core, a latch portion mounted rigid with said pivoted armature member adjacent the end thereof farthest from the movable end of the bimetal, said latch portion rigid with the pivoted armature member being normally engaged by said releasable member and said armature member being biased thereby to move about its pivot in a direction away from the magnetic core, and a stop carried by said movable bimetal and magnetic core assembly limiting movement of the armature member away from the magnetic core to a predetermined airgap independent of the position to which the movable bimetal and magnetic core assembly may have moved.

16. In a circuit breaker, relatively movable contacts, a releasable member operable when released to effect opening of said contacts, a bimetal mounted at one end and free to move at the other end, conductors connecting said bimetal to be traversed by the current through the contacts, a magnetic core member assembled on the movable part of the bimetal to be moved thereby, an armature member mounted on said bimetal and magnetic core assembly, a coil spring positioned between said armature and magnetic core and biasing said armature away from said magnetic core, stop means carried entirely by said armature and magnetic core assembly and limiting movement of the armature due to its bias away from the magnetic core to an airgap which is independent of movement of the bimetal and magnetic core assembly, a screw threaded portion on said armature and magnetic core assembly for adjusting the initial calibration, and an actuating portion rigid with said armature when the breaker is in use, said actuating portion being movable in the same direction both upon magnetic attraction of the armature to the magnetic core and upon thermal bending of the bimetal due to an overload to initiate operation of said releasable member to effect opening of the contacts.

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