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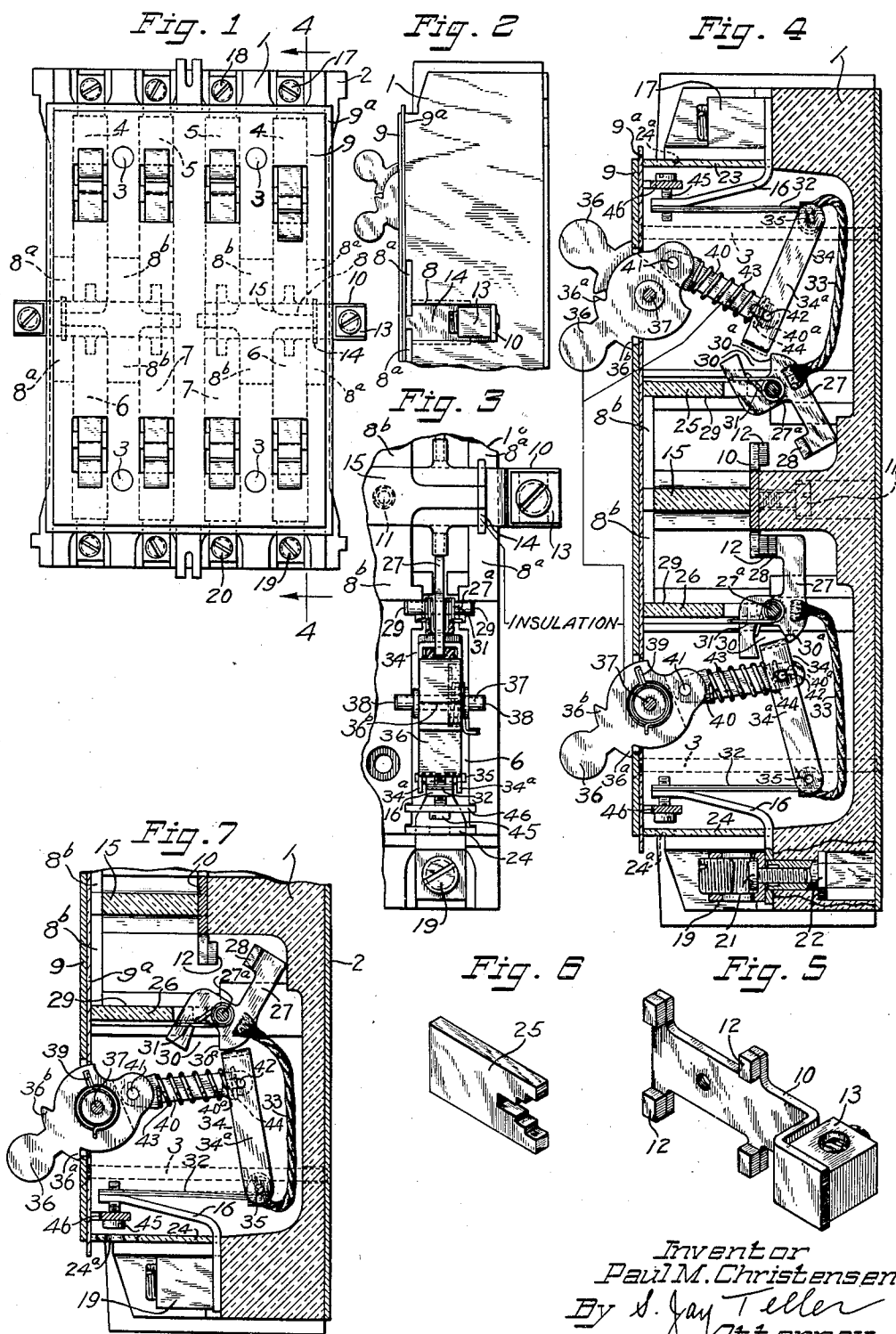
P. M. CHRISTENSEN

2,210,280

AUTOMATIC CIRCUIT BREAKER

Filed Jan. 18, 1939

2 Sheets-Sheet 1



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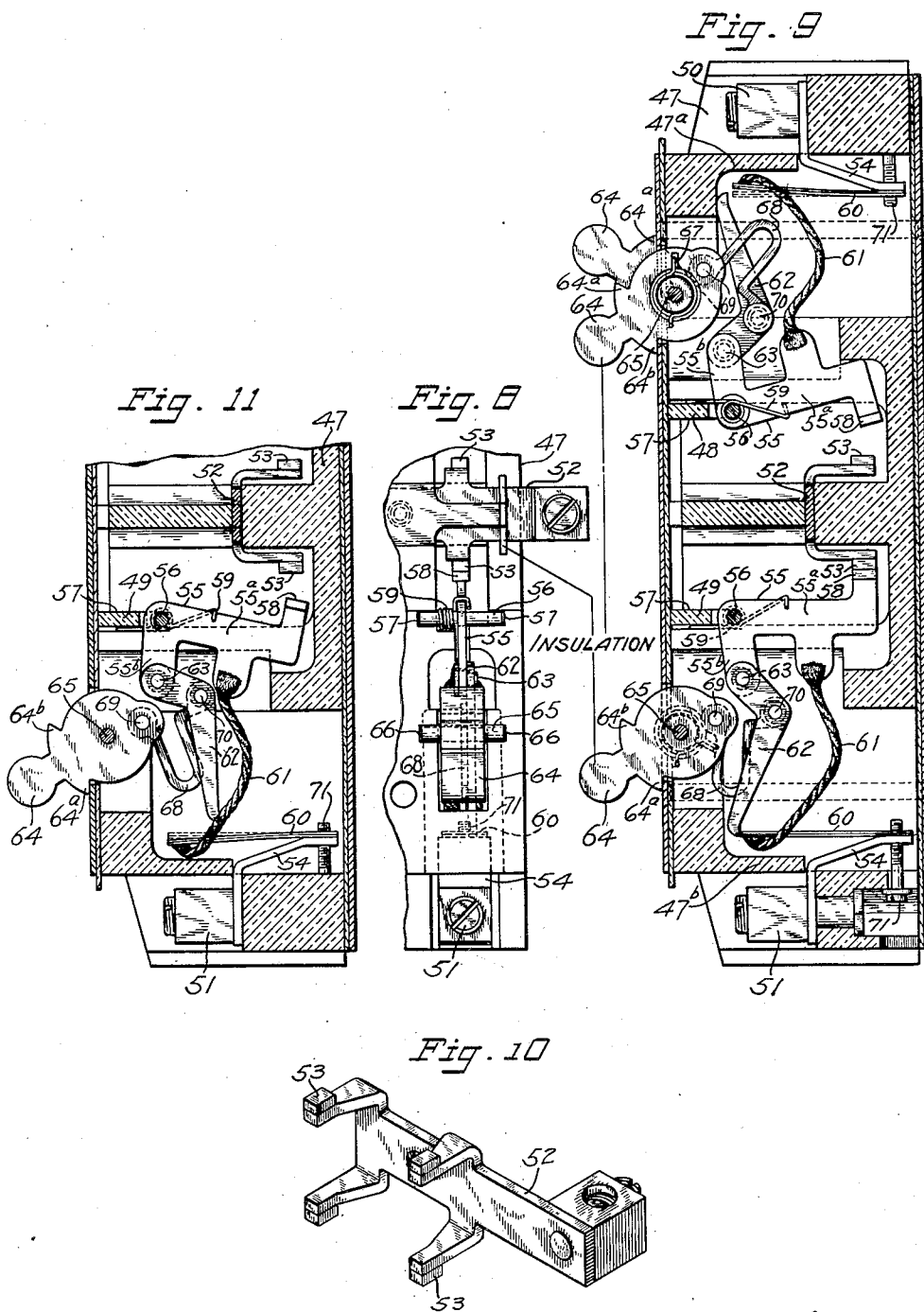
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UNITED STATES PATENT OFFICE

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AUTOMATIC CIRCUIT BREAKER

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Application January 18, 1939, Serial No. 251,585

9 Claims. (Cl. 200-116)

The general object of the invention is to provide a simple and inexpensive circuit breaker mechanism, wherein a substantially stationary thermally responsive bi-metallic element or strip is utilized to break the mechanical connection between an operating member and a contact carrying member which is biased for circuit-opening movement. In accordance with the invention there is provided an intermediate control member which is normally pivotally engaged with both the bi-metallic strip and the contact member and which upon overload is automatically disengaged from one of them.

In the accompanying drawings, I have shown two alternative embodiments of the invention. It will be understood, however, that the drawings are intended for illustrative purposes only and are not to be construed as defining or limiting the scope of the invention, the claims forming a part of this specification being relied upon for that purpose.

Of the drawings:

Fig. 1 is a front view of a circuit breaker assembly embodying the invention.

Fig. 2 is a fragmentary side view of the assembly shown in Fig. 1.

Fig. 3 is an enlarged fragmentary front view of the lower right hand unit and associated parts as shown in Fig. 1. In this view the front cover plate is omitted and also the partition plate which holds one of the pivot pins.

Fig. 4 is an enlarged vertical sectional view taken along the line 4-4 of Fig. 1.

Fig. 5 is an enlarged perspective view of a conductor with stationary contacts carried thereby.

Fig. 6 is an enlarged perspective view of a partition plate.

Fig. 7 is a view similar to the lower portion of Fig. 4, but showing the parts in the positions which they assume upon automatic opening while the handle is held in closed-circuit position.

Figs. 8 and 9 are views similar respectively to Figs. 3 and 4 but showing an alternative embodiment of the invention.

Fig. 10 is an enlarged perspective view of a conductor with stationary contacts carried thereby, this conductor being incorporated in the construction shown in Figs. 8 and 9.

Fig. 11 is a view similar to the lower portion of Fig. 9 but showing the parts in the positions which they assume upon automatic opening while the handle is held in closed-circuit position.

As to most of the features of the invention, I do not narrowly limit myself as concerns the

character of the housing in which the circuit breaker mechanism is mounted. As to another feature, however, the housing is important and I will describe one suitable housing which co-operates with the mechanism in an advantageous manner.

Referring first to Figs. 1 and 2, the main insulating housing is represented at 1. The housing, as shown, is adapted for holding or containing eight separate circuit breaker mechanisms but I do not necessarily limit myself as to the exact number. The housing 1 is secured to a supporting plate 2, by means of screws or rivets 3, 3.

It will be understood that the housing and the mechanism contained therein are ordinarily enclosed in a suitable casing, but the casing is omitted from the drawings as it forms no part of the present invention. The co-pending application of Joseph Sachs for Automatic circuit breaker assembly, Serial No. 202,297, filed April 15, 1938, shows a suitable casing, and also shows suitable means whereby a supporting plate such as 2 can be detachably mounted in the casing.

As shown, the housing 1 is an integral structure molded from a suitable insulating material. It has four mechanism containing chambers 4, 5, 6 and 7 therein at each side of the vertical central plane all initially open at the front. The upper chambers 4 and 5 are initially open at the top and the lower chambers 6 and 7 are initially open at the bottom and all of the chambers are initially in communication with a main central chamber 8.

The housing 1 has a front cover 9 which may be of metal, an insulating sheet 9^a being interposed between the cover and the housing. The cover 9 and the sheet 9^a will be referred to collectively as constituting the front cover plate. The front cover plate is held in place by the aforesaid screws or rivets 3, 3, and the cover plate has suitable openings therein through which the operating members of the circuit breaker mechanisms can extend.

Mounted within the central chamber 8 is a conductor 10 held in place by a screw 11 extending forward from the rear housing. The conductor 10 carries on its rear face four rearward facing stationary contacts 12, 12 positioned respectively at the lower ends of the chambers 4 and 5 and at the upper ends of the chambers 6 and 7. The conductor 10 extends to the exterior of the housing at the right and is there provided with a suitable wire terminal 13. A partition plate 14 of insulating material is fitted within grooves near

the open right end of the chamber 8 so as to partly close the said open end after the conductor 10 has been put in place.

A partition block 15 may be provided which is at the front of the conductor 10 and which partly fills the chamber 8 and prevents communication between the upper chambers 4 and 5 and the lower chambers 6 and 7. The block 15 is held in place by the front cover plate.

In addition to the stationary contact 12 which is provided for each mechanism there is also provided a stationary conductor 16 which is at the opposite end of the chamber. Each of these conductors is provided with a suitable wire terminal.

The wire terminals for the mechanisms in the chambers 4 and 5 are at the top, being marked 17 and 18 and the wire terminals for the chambers 6 and 7 are at the bottom, being marked 19 and 20. Each of the conductors 16 with its corresponding wire terminal is held in place by a screw 21 extending into a threaded bushing 22 seated in a suitable aperture in the housing, this construction being clearly illustrated in Fig. 4.

Transverse partition plates are provided at the tops and bottoms of the several chambers 4, 5, 6 and 7, these being insulating plates fitted in suitable rearward extending grooves in the side walls of the chambers. These partition plates are held in place by the front cover plate. As shown in Figs. 3 and 4, the upper chamber 4 has a partition plate 23 which substantially closes the chamber at the top, and the lower chamber 6 has a similar partition plate 24 which substantially closes the chamber at the bottom. The chambers 4 and 6 are partly separated from the regions of the contacts by partition plates 25 and 26.

In the detailed description which follows, reference will be had chiefly to the circuit breaker mechanism contained in the lower right hand chamber 6 but reference will also be had to the mechanism contained in the upper right hand chamber 4. All of the mechanisms are identical in construction, but the upper and lower mechanisms are reversed as to positions.

A movable contact member 27 is provided which is pivotally mounted between its ends. The contact member has a transverse pivot pin 27^a which extends into grooves 29, 29 formed in the side walls of the mechanism containing chamber. These grooves are closed at their rear ends and their closed end portions therefore serve as bearings for the pivot pin. The partition plates 25 and 26 are entered in the respective grooves 29, 29 and they are formed as shown in detail in Fig. 6, so as to prevent forward movement of the pins 27^a, 27^a. The contact member 27 is preferably a single piece of sheet metal, and near one end thereof is a forward facing movable contact 28 which is adapted to engage and disengage the corresponding rearward facing stationary contact 12. At or near the other end of the contact member 27 is a notch 30 providing a sharp forward facing shoulder 30^a. A spring 31 biases the contact member for movement in the clockwise or circuit-opening direction.

Secured to the conductor 16 and electrically connected therewith is a bi-metallic element or strip 32 which extends rearward from its point of attachment. This strip is deflectible under the influence of heat, the rearward portion being deflected downward. A flexible conductor 33 is provided, one end of which is connected with the rear end portion of the bi-metallic strip 32 and

the other end of which is connected with the contact member 27.

A control member 34 is provided which is directly connected near its opposite ends respectively with the contact member 27 and with the deflectible portion of the bi-metallic strip 32. The connection at one end of the member 34 is a permanent pivotal connection and the connection at the other end thereof is normally pivotal but is automatically disengageable upon the deflection of the bi-metallic strip. As to the details of the said connections for the control member 34 there may be variation, but in the construction as shown the lower end of the member 34 has a permanent pivotal connection at 35 with the rear deflectible portion of the bi-metallic strip 32. The upper end of the control member 34 is entered in the before mentioned notch 30 of the contact member 27 and is normally engaged with the shoulder 30^a thereof. As shown, the control member 34 comprises a U-shaped strip of metal having parallel legs 34^a, 34^a.

A handle or operating member 36 is provided, this being formed of insulating material and having a transverse pivot pin 37 which is entered in registering bearing notches 38, 38 formed in the front face of the housing 1. The front cover plate cooperates with the pivot pin 37 to hold it in place in the bearing notches. A portion of the operating member 36 projects forward through the corresponding opening in the front cover plate so as to be accessible for convenient manual operation. At the front of the front cover plate the operating member is provided with integral stop portions 36^a and 36^b which are adapted to contact with the front cover plate to limit the movement of the operating member in both directions. The operating member 36 is biased for movement toward its open-circuit position by means of a spring 39.

The operating member 36 is connected with the control member 34 by means of a link 40. The link is pivotally connected with the operating member at 41 and it is connected with the control member 34 by means of a pin 42 which extends transversely between the legs 34^a, 34^a and through a slot 40^a in the link. A spring 43 surrounds the link 40 abutting at its front end against a shoulder of the link and abutting at its rear end against a washer 44 which rests against the pin 42.

With the parts in the closed-circuit positions as shown in the lower portion of Fig. 4, the operating member 36 and the link 40 co-operate to form an overset toggle, the spring 43 applying pressure which holds the operating member in the position shown. The position of the operating member is determined by the stop portion 36^a thereof. The spring 43 also tends to move the control member rearward or in the clockwise direction, and the control member by reason of its engagement with the contact member at the shoulder 30^a, tends to move the contact member in the counterclockwise direction so as to hold the movable contact 28 in firm engagement with the corresponding stationary contact 12. The provision of a resilient connection between the operating member and the contact member is in accordance with the invention set forth in the co-pending application of Joseph Sachs and Paul M. Christensen for Automatic circuit breaker, Serial No. 202,295 filed April 15, 1938.

With the circuit breaker mechanism in closed-circuit position as shown in the lower portion of Fig. 4, it will be observed that electrical connec-

tion is established from the conductor 10 and the stationary contact 12 to the movable contact 28, thence through the contact member 27 and the flexible conductor 33 to the bi-metallic strip 32, and thence through the conductor 16 to the wire terminal 19 at the bottom.

Movement of the handle or operating member 36 serves to move the control member 34 and this in turn causes the movement of the contact member for ordinary circuit-opening and circuit-closing purposes.

If the operating member be held in its closed-circuit position as shown in the lower portion of Fig. 4, and if an abnormal current condition such as an overload is attained, the bi-metallic strip 32 is automatically deflected downward, this deflection occurring as the result of the heating of the bi-metallic strip by the current flowing therein. Inasmuch as the control member 34 is directly pivoted to the strip 32 it moves downward with the strip, the result being that the control member becomes disconnected from the shoulder 30^a of the contact member. The contact member then moves in the clockwise direction under the influence of the spring 31 to the open-circuit position as shown in Fig. 7. If the operating member be released after the parts have moved to the relative positions shown in Fig. 7, the spring 39 moves the operating member to the position shown in the upper portion of Fig. 4, this in turn moving the link 40 and the control member 34 to the positions there shown. The control member is thus restored to engaged or engageable relationship with the shoulder 30^a of the contact member 27.

The operation has been described as it occurs when the handle is first held and then released. Ordinarily, however, the operating member is not held and it starts to move to its open-circuit position as soon as the control member disengages the contact member and thus releases the pressure normally applied by the spring 43. All of the parts thus move practically instantaneously to the positions shown in the upper portion of Fig. 4, the control member being immediately restored to engaging relationship with the shoulder 30^a of the contact member. As soon as the strip has cooled sufficiently to move the control member downward to its normal position, the operating member can be moved to again close the circuit. It will be observed that in the open-circuit position as shown in the upper portion of Fig. 4, the stop portion 36^b engages the front cover plate to limit movement of the operating member.

When any one of the movable contacts 28 is separated from the corresponding stationary contact 12, either manually or by automatic action, any gases that may be formed by the resultant arc pass into the corresponding arcing region or zone between the partition block 15 and the corresponding partition plate 25 or 26. In order that these gases may escape to the exterior of the housing, the housing 1 is provided at each side with notches 8^a, 8^b as shown in Figs. 1 and 2. It is also provided with notches 8^b, 8^c providing communication from the arcing zones of the chambers 5 and 7 to the arcing zones of the chambers 4 and 5. It will be observed that the partition plates 25 and 26 prevent any considerable portion of these arc formed gases from passing upward or downward into contact with the circuit breaker mechanism.

It is ordinarily preferable to provide a means for effecting fine adjustments of the bi-metallic

element or strip for calibration purposes. In the construction as shown, a screw 45 is provided which extends through a transverse plate 46 seated in notches in the housing. The screw 45 extends through a threaded hole in the conductor 16 and the bi-metallic strip 32. By turning the screw the conductor 16 can be bent or deflected downward thus moving the strip 32 and the control member 34. The partition plate 24 is provided with an opening 24^a which permits access to the screw 45.

The construction shown in Figs. 8 to 11 is in many respects similar to that shown in Figs. 1 to 7 but there are certain important differences.

The housing 47 is generally similar to the housing 1 already described, differing only in details of shape so as to accommodate mechanisms which are somewhat different. The housing 47 is mounted similarly to the housing 1 and is similarly provided with a front cover plate. The mechanism chambers are substantially closed at the top and bottom respectively by integral walls 47^a and 47^b, these being provided in lieu of the separate partition plates 23 and 24. Partition plates 48 and 49 are provided which correspond in function to the partition plates 25 and 26. A conductor 52 is provided which corresponds to the conductor 10, this being provided with rearward extensions which carry stationary contacts 53, 53, the upper contacts facing upward and the lower contacts facing downward. Wire terminals 50 and 51 are provided at the top and bottom, these corresponding respectively to the wire terminals 17 and 19. Connected with these wire terminals are conductors 54, 54 corresponding to the conductors 16, 16 but extending rearward instead of forward.

A movable contact member 55 is provided which is of generally bell-crank shape, having a rearward extending arm 55^a and a downward extending arm 55^b. The contact member is mounted on a pivot pin 56 which extends into grooves 57, 57 formed in the side walls of the mechanism containing chamber and corresponding to the grooves 29, 29. The pivot pins for the two contact members are held in place by the partition plates 48 and 49. The contact member 55 is preferably a piece of sheet metal and near the rear end of the arm 55^a thereof is a movable contact 58 which faces upward so as to be adapted to engage or disengage the corresponding stationary contact 53. A spring 59 biases the contact member for movement in the clockwise or circuit-opening direction.

Secured to the conductor 54 and electrically connected therewith is a bi-metallic strip 60 which extends forward from its point of attachment. This strip is deflectible under the influence of heat, the forward portion being deflected downward. A flexible conductor 61 is provided, one end of which is connected with the forward end portion of the bi-metallic strip 60 and the other end of which is connected with the arm 55^a of the contact member.

A control member 62 is provided which is directly connected near its opposite ends respectively with the contact member 55 and with the deflectible portion of the bi-metallic strip 60. The manner of connection is different from that shown in Figs. 3, 4 and 7 in that the permanent pivotal connection is with the contact member and the disengageable pivotal connection is with the bi-metallic strip. As shown, the control member is pivotally connected at its upper end with the arm 55^b of the contact member, the

pivotal connection being indicated at 63. The lower end of the control member 62 normally engages the front end of the bi-metallic strip 60 and is pivotally movable about the point of engagement. A handle or operating member 64 is provided, this being formed of insulating material and having a transverse pivot pin 65 which is entered in registering bearing notches 66, 66 formed in the front face of the housing 47. A portion of the operating member 64 projects through the corresponding opening in the front cover plate so as to be accessible for convenient manual operation. At the front of the front cover plate, the operating member is provided with integral stop portions 64^a and 64^b which are adapted to contact with the front cover plate to limit movement of the operating member in both directions. The operating member 64 is biased for movement toward its open-circuit position by means of a spring 67.

The operating member 64 is connected with the control member 62 by means of a resilient link 68. The link is pivotally connected with the operating member at 69 and it is pivotally connected with the control member at 70. The link 68 is preferably U-shaped to provide the desired resiliency. With the parts in the closed-circuit positions as shown in the lower portion of Fig. 9, the operating member 64 and the link 68 cooperate to form an overset toggle, the resilient link applying pressure which holds the operating member in the position shown. The position of the operating member is determined by the stop portion 64^a thereof. The resilient link 68 also tends to move the control member rearward or in the clockwise direction about its point of engagement with the bi-metallic strip 60, and the control member, by reason of its pivotal connection with the contact member 55, tends to move the contact member in the counterclockwise direction so as to hold the movable contact member 58 in firm engagement with the corresponding stationary contact 53.

With the circuit breaker mechanism in closed-circuit position as shown in the lower portion of Fig. 9, it will be observed that electrical connection is established from the conductor 52 and the stationary contact 53 to the movable contact 58, thence through the contact member 55 and the flexible conductor 61 to the bi-metallic strip 60, and thence through the conductor 54 to the wire terminal 51 at the bottom.

Movement of the handle or operating member 64 serves to move the control member 62 and this in turn causes the movement of the contact member for ordinary circuit-opening and circuit-closing purposes. The control member moves approximately pivotally about the front end of the bi-metallic strip 60.

If the handle or operating member be held in its closed-circuit position as shown in the lower portion of Fig. 9, and if an abnormal current condition such as an overload is attained, the bi-metallic strip 60 is automatically deflected downward, this deflection occurring as the result of the heating of the bi-metallic strip by the current flowing therein. Downward deflection of the bi-metallic strip releases the control member 62, and this in turn releases the contact member so that it is free to move in the circuit-opening direction under the influence of the spring 59. The several parts are moved to the relative positions shown in Fig. 11. If the operating member be released after the parts have moved as described to the relative positions

shown in Fig. 11, the spring 67 moves the operating member to the position shown in the upper portion of Fig. 9, this in turn moving the link 68 and the control member 62 to the positions there shown. The control member is thus restored to engaged or engageable relationship with the bi-metallic strip 60.

The operation has been described as it occurs when the handle is first held and then released. Ordinarily, however, the operating member is not held and it starts to move to its open-circuit position as soon as the bi-metallic strip disengages the control member and thus releases the pressure normally applied by the spring link 58. All of the parts thus move practically instantaneously to the positions shown in the upper portion of Fig. 9, the control member being immediately restored to engaging relationship with the bi-metallic strip. As soon as the strip has cooled so as to be in its normal position, the operating member can be moved to again close the circuit. It will be observed that in the open-circuit position as shown in the upper portion of Fig. 9, the stop portion 64^b engages the front cover plate to limit movement of the operating member.

A screw 71 is provided for effecting fine adjustments of the bi-metallic element or strip for calibration purposes. The screw extends through a hole or notch in the end wall of the housing, and it extends through a threaded hole in the conductor 54 and the bi-metallic strip 60. By turning the screw the conductor 54 can be bent or deflected downward thus moving the strip 60.

What I claim is:

1. In an automatic circuit breaker, the combination of an insulating housing comprising two spaced side walls having opposite similar closed-end grooves extending rearward from the front of the housing, a stationary contact in the housing, a contact member including a contact adapted to engage and disengage the stationary contact, the said contact member having a pivot pin entered in the rear closed ends of the aforesaid grooves, an operating member pivotally mounted in the housing, a front cover plate for the housing having an opening through which a portion of the operating member extends, a holding plate entered in the closed-end grooves and held in place by the cover plate, the said holding plate serving to prevent forward movement of the pivot pin for the contact member, and an electro-responsively releasable mechanical connection between the operating member and the contact member normally enabling the operating member to move the contact member.

2. In an automatic circuit breaker, the combination of an insulating housing comprising two spaced side walls having opposite similar closed-end grooves extending rearward from the front of the housing and also having two transverse registering bearing notches additional to the said rearward extending grooves, a stationary contact in the housing, a contact member including a contact adapted to engage and disengage the stationary contact, the said contact member having a pivot pin entered in the rear closed ends of the aforesaid grooves, an operating member having a pivot pin entered in the aforesaid bearing notches, a front cover plate for the housing having an opening through which a portion of the operating member extends, the said cover plate engaging the pivot pin for the operating member to hold it in place, a holding plate entered in the closed-end grooves and held in place by the cover plate, the said holding plate serving

to prevent forward movement of the pivot pin for the contact member, and an electro-responsively releasable mechanical connection between the operating member and the contact member normally enabling the operating member to move the contact member.

3. The combination in an automatic circuit breaker, of a stationary contact, a contact member movable about a fixed axis and having a contact movable into and out of engagement with the stationary contact, the said contact member being biased for circuit-opening movement, a bi-metallic element fixedly mounted at one end and having a portion deflectible under the influence of heat, means for causing the heating and deflection of the bi-metallic element upon the attainment of excess current conditions in the circuit, a control member directly connected near its opposite ends respectively with the contact member and with the deflectible portion of the bi-metallic element, the connection at one end being permanently pivotal and the connection at the other end being normally pivotal but being automatically disengageable upon the deflection of the bi-metallic element so as to thereby permit free independent circuit-opening movement of the contact member, and operating means pivotally engaging the control member and normally serving to move it and thus move the contact member to open or close the circuit.

4. The combination in an automatic circuit breaker, of a stationary contact, a contact member movable about a fixed axis and having a contact movable into and out of engagement with the stationary contact, the said contact member being biased for circuit-opening movement, a bi-metallic element fixedly mounted at one end and having a portion deflectible under the influence of heat, means for causing the heating and deflection of the bi-metallic element upon the attainment of excess current conditions in the circuit, a control member directly connected near its opposite ends respectively with the contact member and with the deflectible portion of the bi-metallic element, the connection at one end being permanently pivotal and the connection at the other end being normally pivotal but being automatically disengageable upon the deflection of the bi-metallic element so as to thereby permit free independent circuit-opening movement of the contact member, a pivoted operating member, and a link pivotally connected between the operating and control members and normally serving to enable the operating member to move the control member and thus move the contact member to open or close the circuit, the said link co-operating with the operating member to form a toggle which when in overset position holds the control and contact members in closed-circuit positions.

5. The combination in an automatic circuit breaker, of a stationary contact, a contact member movable about a fixed axis and having a contact movable into and out of engagement with the stationary contact, the said contact member being biased for circuit-opening movement, a bi-metallic element fixedly mounted at one end and having a portion deflectible under the influence of heat, means for causing the heating and deflection of the bi-metallic element upon the attainment of excess current conditions in the circuit, a control member directly connected near its opposite ends respectively with the contact member and with the deflectible portion of the bi-metallic element, the connection at one end being

permanently pivotal and the connection at the other end being normally pivotal but being automatically disengageable upon the deflection of the bi-metallic element so as to thereby permit free independent circuit-opening movement of the contact member, a pivoted operating member, a link pivotally connected between the operating and control members and normally serving to enable the operating member to move the control member and thus move the contact member to open or close the circuit, the said link co-operating with the operating member to form a toggle which when in overset position holds the control and contact members in closed-circuit positions, and means biasing the operating and contact members for movement to open-circuit positions upon release of pressure through the link resulting from the aforesaid disengagement of the control member at one end thereof.

6. In an automatic circuit breaker, the combination of a stationary contact, a contact member movable about a fixed axis and having a contact movable into and out of engagement with the stationary contact, the said contact member being biased for circuit-opening movement, a bi-metallic element fixedly mounted at one end and having a portion deflectible under the influence of heat, means for causing the heating and deflection of the bi-metallic element upon the attainment of excess current conditions in the circuit, a control member permanently pivotally connected near one end with the deflectible portion of the bi-metallic element and being normally pivotally engaged near the other end with the contact member, the said control member being bodily movable upon the deflection of the bi-metallic element so as to thereby disengage the contact member and permit free independent circuit-opening movement thereof, and operating means pivotally engaging the control member and normally serving to move it and thus move the contact member to open or close the circuit.

7. In an automatic circuit breaker, the combination of a stationary contact, a contact member movable about a fixed axis and having a contact movable into and out of engagement with the stationary contact, the said contact member being biased for circuit-opening movement, a bi-metallic element fixedly mounted at one end and having a portion deflectible under the influence of heat, means for causing the heating and deflection of the bi-metallic element upon the attainment of excess current conditions in the circuit, a control member permanently pivotally connected near one end with the deflectible portion of the bi-metallic element and being normally pivotally engaged near the other end with the contact member, the said control member being bodily movable upon the deflection of the bi-metallic element so as to thereby disengage the contact member and permit free independent circuit-opening movement thereof, a pivoted operating member, and a link pivotally connected between the operating and control members and normally serving to enable the operating member to move the control member and thus move the contact member to open or close the circuit, the said link co-operating with the operating member to form a toggle which when in overset position holds the control and contact members in closed-circuit positions.

8. An automatic circuit breaker comprising in combination, a stationary contact, a contact member movable about a fixed axis and having

a contact movable into and out of engagement with the stationary contact, the said contact member being biased for circuit-opening movement, a bi-metallic element fixedly mounted at one end and having a portion deflectible under the influence of heat, means for causing the heating and deflection of the bi-metallic element upon the attainment of excess current conditions in the circuit, a control member permanently pivotally connected near one end with the contact member and being normally pivotally engaged near the other end with the deflectible portion of the bi-metallic element, the said control member being disengaged upon the deflection of the bi-metallic element so as to thereby move and permit free independent circuit-opening movement of the contact member, and operating means pivotally engaging the control member and normally serving to move it and thus move the contact member to open or close the circuit.

9. An automatic circuit breaker comprising in combination, a stationary contact, a contact member movable about a fixed axis and having a contact movable into and out of engagement with the stationary contact, the said contact member

being biased for circuit-opening movement, a bi-metallic element fixedly mounted at one end and having a portion deflectible under the influence of heat, means for causing the heating and deflection of the bi-metallic element upon the attainment of excess current conditions in the circuit, a control member permanently pivotally connected near one end with the contact member and being normally pivotally engaged near the other end with the deflectible portion of the bi-metallic element, the said control member being disengaged upon the deflection of the bi-metallic element so as to thereby move and permit free independent circuit-opening movement of the contact member, a pivoted operating member, and a link pivotally connected between the operating and control members and normally serving to enable the operating member to move the control member and thus move the contact member to open or close the circuit, the said link co-operating with the operating member to form a toggle which when in overset position holds the control and contact members in closed-circuit positions.

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