Oct. 11, 1938. J. G. JACKSON 2,132,629

CIRCUIT BREAKER

Filed April 5, 1937 2 Sheets-Sheet 1

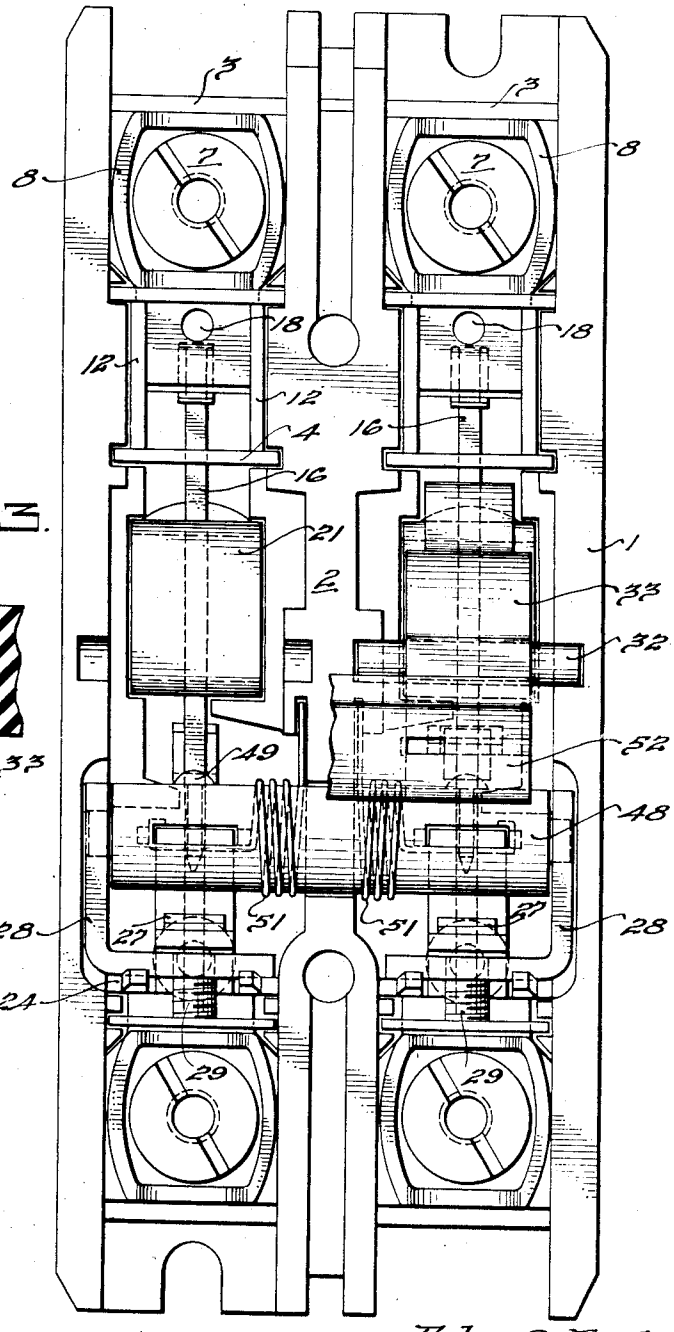


FIG. 1.

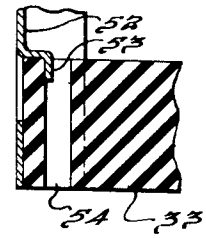


FIG. 3.

Inventor

John G. Jackson.

By Myron J. Seibold

Attorney

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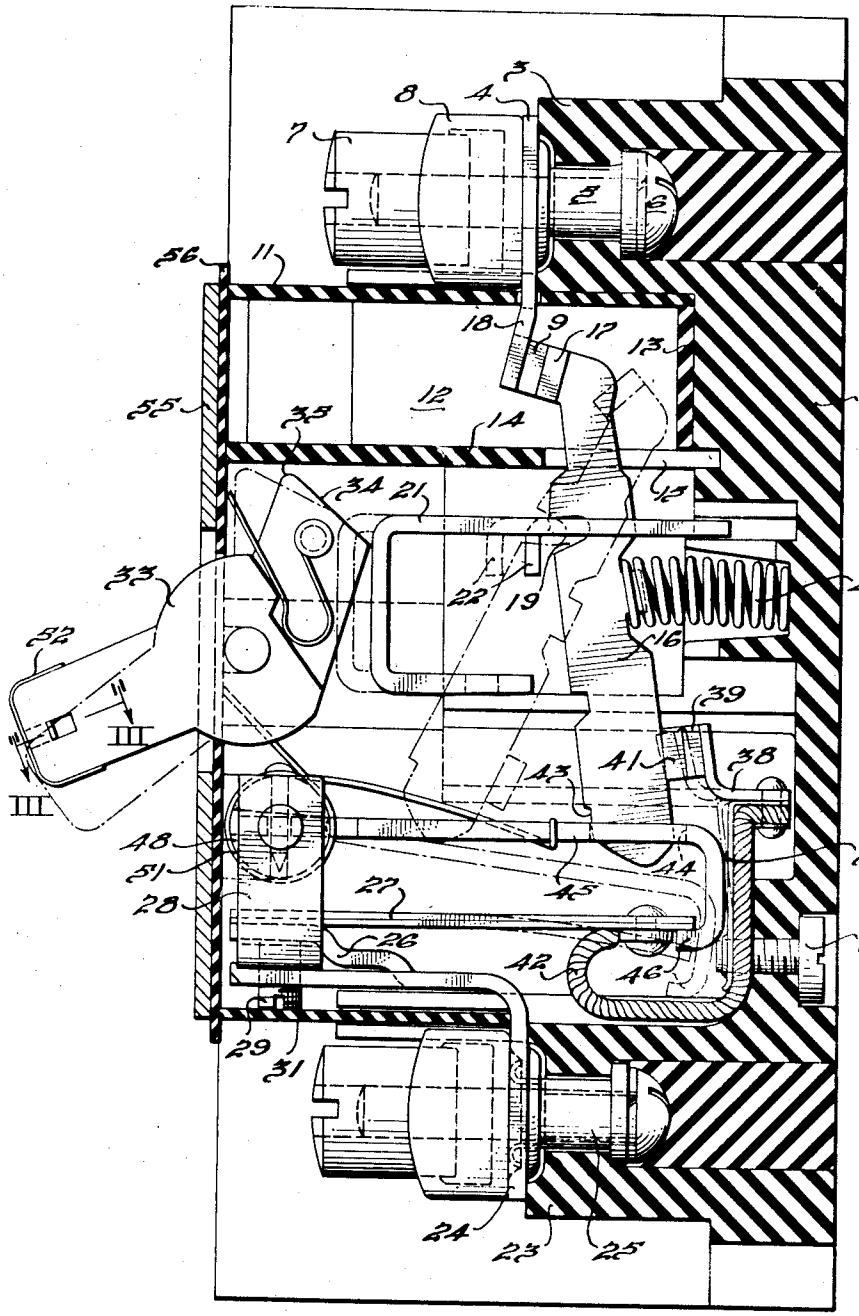


Fig. 2.

Inventor

John G. Jackson.

By Myron J. Zeibold

Attorney

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UNITED STATES PATENT OFFICE

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CIRCUIT BREAKER

John G. Jackson, Detroit, Mich., assignor to Square D Company, Detroit, Mich., a corporation of Michigan

Application April 5, 1937, Serial No. 134,981

20 Claims. (Cl. 200—116)

This invention relates to electric circuit controlling instrumentalities and more particularly to electric circuit breakers automatically operable in response to current overload.

One object of the present invention is to provide an improved form of double break electric circuit breaker.

Another object of the invention is to provide an electric circuit breaker having a floating contact member provided with a pivotal axis and carrying contact surfaces on opposite sides of the axis with the member rotatable when released in response to current overload to effect interruption of the circuit at both the contact surfaces.

Another object of the invention is to provide an electric circuit breaker having a floating contact bar carrying contact surfaces adjacent both its ends and adapted to be rotated when released in response to current overload to effect interruption of the circuit at both the contact surfaces carried thereon.

Another object of the invention is to provide an improved form of current responsive latching means for a multi-pole automatic electric circuit breaker.

Other objects and features of the invention will be readily apparent to those skilled in the art from the following specification and appended drawings illustrating certain preferred embodiments of the invention in which:

Figure 1 is a front elevational view of a circuit breaker according to the present invention with the cover and certain parts removed to show internal parts.

Figure 2 is a vertical sectional view of the circuit breaker shown in Figure 1.

Figure 3 is a detail sectional view on the line III—III of Figure 2.

The circuit breaker illustrated herein comprises a generally cup shaped insulating base 1 having a generally central dividing wall 2 insulating the separate poles of the breaker. Upon an end ledge 3 at the top of the circuit breaker is mounted a connector 4 as by means of a spun over portion of a metallic insert 5 through which extends a stud 6 upon which is threaded a conductor retaining nut 7 and about which is received a terminal connector 8. The connector 4 extends into the interior of the breaker and there carries a stationary contact surface 9. The top portion of the base is sealed off by means of an insulating barrier wall 11 of fibre or other material and the arc chamber surrounding the contact 9 is provided with further lining walls formed by side walls 12 and bottom wall 13 also preferably of fibre and which may be of integral construction, and with a barrier wall 14 also of fibre and serving to separate the arc chamber from the circuit breaker mechanism and which is provided adjacent its back portion with a slot 15 closely receiving a flat contact bar 16 which extends through the slot into the arcing chamber and there carries a movable contact surface 17. The connector 4 above the contact surface 9 is provided with an opening 18 to facilitate passage of arc gases into the front portion of the arc chamber. The front edge of the bar 16 is provided with a notch 19 interengaged with the forward end of a slot within the longer leg of a U-shaped member 21 guided for rectilinear movement at right angles to the back of the base by formations within the base. In front of the end of the slot which engages with the notch 19 is provided a flange portion 22 rigid with the member 21 and providing an auxiliary pivot for rotation of the blade 16 upon automatic operation in a manner to be hereinafter described. The shorter leg of the U-shaped member 21, as shown, comprises a stop for the blade in its automatically operated position. At the bottom end of the circuit breaker upon a ledge 23 is mounted a connector 24 as by means of a spun over portion of a metallic insert 25 and having a stud, socket and nut arrangement similar to that at the top of the breaker to provide for terminal connection. The connector 24 extends within the interior of the breaker and has its central interior end pressed out as at 26 and to this end is rigidly secured, as by welding, a current responsive bimetallic strip 27. An angle bracket 28 has one leg disposed between the pressed out portion 26 and the main body of the connector 24. Within this leg of the bracket is threaded a stud 29 bearing against the pressed out portion 26 and serving to adjust the position of the bimetal and hence the current rating to which the breaker is responsive. An insulating wall 31 serves to seal off the bottom of the breaker from the exterior. Upon a shaft 32 received within notches in the side wall of the base and the central wall 2 is mounted a rotary handle 33 having an interior camming surface adapted to cooperate with the front surface of the rectilinearly movable member 21 and including a stable manual "off" flat surface 34 and a resetting tip 35. Upon a stud 36 is mounted a relatively stiff resilient connector portion 37 to which is riveted or otherwise secured a conducting portion 38 upon which is mounted a relatively stationary contact surface 39. The back edge of the bar 16

remote from the contact surface 17 is provided with a second contact surface 41 adapted to cooperate with the contact surface 39. A flexible lead 42 connects the free end of the bimetallic member 27 to the joint between the resilient connector 37 and the conducting portion 38. The front edge of the bar 16 adjacent the contact surface 41 is provided with a latching surface designated generally as 43 adapted to engage within the front edge of a slot 44 within a latching element 45 which has a spaced abutment portion 46 adapted to be engaged by the free end of the bimetallic member 27. A compression spring 47 biases the bar 16 against the stationary contact surface 9 and the latching surface on the element 45 and also biases the bar for rotation about its pivotal engagement with the member 21.

The parts described heretofore have all pertained to a single pole of the circuit breaker and may indeed be formed as such as an independent circuit breaker. However, as specifically shown herein, the circuit breaker is of the multi-pole form in which each pole duplicates the parts previously described. Pivotally mounted in the brackets 28 adjacent the opposite side walls of the breaker is a rotary insulating member 48 in which are mounted as by means of the pins 49 within slots in the member 48 the ends of the latching elements 45. The slots within the members 48 are provided with clearance portions as is also the pinning of the ends of the latching elements so as to provide for limited relative movement between the latching elements 45 and the rotary member 48. The springs 51 independently bias each of the latching elements 45 into latching position or counter-clockwise as viewed in Figure 2. The handles for the two poles of the circuit breaker are joined together by means of a metallic channel portion 52 which is provided with pressed out portions 53 received within openings 54 within the handles and serving to securely bind together the handles by means of the channel member 52 as the parts are assembled. A metallic cover 55 is preferably sealably attached to the base 1 by means of spun over portions of rivets or in any other manner and an insulating sheet 56 of fibre or other material is disposed in back of the metallic cover 55.

The operation of the circuit breaker will now be described. In the parts shown in full line in Figure 2 the circuit breaker pole therein illustrated is in the closed circuit position. To place the parts in manual "off" position, the handle 33 is rotated in a clockwise direction until surface 34 thereon engages the top surface of the rectilinearly movable member 21 which by this movement has been moved toward the bottom of the base. In this movement of member 21 the bar 16 pivots about the latching surface 45 and moves the contact surface 17 to a position separated from the stationary contact surface 9. To again place the parts in closed circuit position the handle is rotated in a counter-clockwise direction. As the handles of the two poles are rigidly connected by means of the channel portion 52 they will be moved together as a unit to effect manual opening and closing of both the breaker poles. Upon the occurrence of an overload through any one of the bimetals 27 it will become heated and bend downwardly as shown in dotted lines in Figure 2. In this movement it pulls upon its associated abutment 46 to move the corresponding latching element 45 out of engagement with the latching surface 43 on the end of the associated bar 16. When unlatched the bar rotates in a clockwise direction, under the bias of the compression spring 47, about the pivotal engagement of the notch 19 with the front edge of the slot in the longer leg of the rectilinearly movable member 21. Near the end of its rotary movement the upper edge of the bar 16 engages with the flange portion 22 on the member 21 and the bar 16 thereafter rotates about this engagement to effect a slightly greater movement of the contact surface 17 than would be effected by simple rotation of the bar within the notch 19. However, this additional rotation is not sufficient to remove the member 21 entirely out of the notch so that disarrangement of the parts is not endangered. In this rotary movement of the contact bar 16 not only will the contact surface 17 have been moved to a disengaged position as shown but also the contact surface 41 will be moved out of engagement with the contact surface 39. This contact surface 39 is mounted on the resilient connector 37 and the contact pressure between the contact surfaces 39 and 41 is obtained by the force exerted by this resilient connector. Hence as the contact surface 41 moves forwardly the contact surface 39 will have a small forward movement until the connector 37 has reached its stable position. However, as the end of the bar 16 carrying the contact surface 41 has a relatively large movement, the slight movement of the contact surface 39 therewith is not material. This resilient mounting for the contact surface 39 is necessary in the specific form illustrated in order to permit the latching end of the bar to move beyond the front edge of the slot 44 within the latching element 45 during the resetting operation while still providing for contact pressure after the bar is released into engagement with the slot edge in latched position.

As has been explained the mounting of the latching elements 45 on the rotary member 48 is such as to provide for limited relative movement therebetween. This relative movement is so regulated that each latching element 45 moves independently of the member 48 until the latching end of the contact bar 16 is released. After release, the end of the bar extending beyond the latching surface engages with its latching element 45 and causes a further unlatching movement of this element as the bar rotates. This further movement of the element causes rotation of the member 48 and through the rotation of member 48 unlatching movement of the other latching element 45 on the other pole of the breaker and effects unlatching of the unaffected bar and hence opening of both poles of the circuit breaker in response to an overload current through any one of them. The purpose of the limited relative movement between the latching elements 45 and the rotary member 48 is to provide only the unlatching load of one element upon the heated bimetal. Thus if the elements 45 were both rigidly connected to the member 48 both poles would be opened through response to any one bimetal but the bimetal affected would have to move both the latching elements into unlatching position which would have a tendency to give erratic calibration to the breaker poles. By the arrangement herein described it is seen that any one affected bimetal only has to do the work of unlatching the pole with which it is associated and the unlatching of the latching elements associated with the other poles is effected by the mechanical engagement of the end of the contact bar with its latching element whereby the bar released effects further unlatching movement of its asso-

ciated element to move the other latching elements to unlatching position.

While the circuit breaker has been specifically shown and described as being of multi-pole form to which the latching arrangement is peculiarly adapted it is obvious that other features of applicant's invention including the double break and the pivoting of the blade about the flange 22 are equally as well adapted to single pole forms of the circuit breaker.

While certain preferred embodiments of the invention have been specifically disclosed, it is understood that the invention is not limited thereto as many variations will be readily apparent to those skilled in the art and the invention is to be given its broadest possible interpretation within the terms of the following claims.

What is claimed is:

1. An automatic electric circuit breaker comprising a floating contact member carrying contact surfaces at spaced points thereon, current responsive latching means for another point on said member, a rigidly mounted stationary contact cooperating with one of said contact surfaces, spring means biasing said member against said stationary contact and said latching means, a second and resiliently mounted stationary contact cooperating with the other contact surfaces on said member, and a pivotal axis for said member interjacent said contact surfaces about which said member rotates under the bias of said spring means when released by said latching means to effect interruption of the circuit at both said contact surfaces.

2. An automatic electric circuit breaker comprising a floating contact member carrying contact surfaces at spaced points thereon, current responsive latching means for another point on said member, a rigidly mounted stationary contact cooperating with one of said contact surfaces, spring means biasing said member against said stationary contact and said latching means, a second and resiliently mounted stationary contact cooperating with the other contact surface on said member, and a pivotal axis for said member interjacent said contact surface about which said member rotates under the bias of said spring means when released by said latching means to effect interruption of the circuit at both said contact surfaces, said pivotal axis being manually movable against the bias of said spring means to effect interruption of the circuit between said one contact surface and rigidly mounted stationary contact.

3. An automatic electric circuit breaker comprising a floating contact member carrying contact surfaces at spaced points thereon, current responsive latching means for another point on said member, a rigidly mounted stationary contact cooperating with one of said contact surfaces, spring means biasing said member against said stationary contact and said latching means, a second and resiliently mounted stationary contact cooperating with the other contact surface on said member, and a pivotal axis for said member interjacent said contact surfaces about which said member rotates under the bias of said spring means when released by said latching means to effect interruption of the circuit at both said contact surfaces, said pivotal axis being manually movable after automatic operation to effect rotation of said contact member into a position where it is again engaged by said current responsive latching means to reset the circuit breaker mechanism.

4. An automatic electric circuit breaker comprising a floating contact bar carrying a pair of spaced, oppositely directed contact faces, stationary contacts cooperating with said contact faces, a pivotal axis for said member interjacent said contact surfaces, spring means biasing said member for rotation about said axis, current responsive latching means for said contact member preventing such rotation and releasable to effect interruption of the circuit at both the contact surfaces, and manual means for moving said pivotal axis to effect interruption of the circuit at at least one of said contact faces.

5. An automatic electric circuit breaker comprising a contact member carrying a pair of spaced contact faces, a rigidly mounted stationary contact cooperating with one of said contact faces, current responsive latching means for said member, spring means biasing said member against said stationary contact and said latching means, a resiliently mounted stationary contact cooperating with the other contact face on said member, and a pivotal axis for said member about which it rotates to interrupt the circuit at both said contact faces when released by said latching means in response to a current overload.

6. An automatic electric circuit breaker comprising a contact member carrying a pair of spaced, oppositely directed contact faces, a rigidly mounted stationary contact cooperating with one of said contact faces, current responsive latching means for said member, spring means biasing said member against said stationary contact and said latching means, a resiliently mounted stationary contact cooperating with the other contact face on said member, a pivotal axis for said member about which it rotates to interrupt the circuit at both said contact faces when released by said latching means in response to a current overload, and means for effecting rectilinear movement of said axis after an automatic release to rotate said contact member back into position to be engaged by said latching means to effect resetting of the breaker mechanism.

7. An automatic electric circuit breaker comprising an elongated contact bar carrying oppositely directed contact surfaces adjacent to its ends, a latching surface at one end of the bar facing opposite to the adjacent contact surface, current responsive latching means for said latching surface, a resiliently mounted stationary contact cooperating with the contact surface adjacent to said latching surface, a rigidly mounted stationary contact cooperating with the contact surface at the opposite end of the bar, a pivotal axis interjacent the ends of the bar, and means biasing said bar for rotation about said pivotal axis when released by said current responsive latching means to effect interruption of the circuit at both said contact surfaces.

8. An automatic electric circuit breaker comprising an elongated contact bar carrying oppositely directed contact surfaces adjacent to its ends, a latching surface at one end of the bar facing opposite to the adjacent contact surface, current responsive latching means for said latching surface, a resiliently mounted stationary contact cooperating with the contact surface adjacent to said latching surface, a rigidly mounted stationary contact cooperating with the contact surface at the oppposite end of the bar, a floating pivotal axis interjacent the ends of the bar, means biasing said bar for rotation about said pivotal axis when released by said latching means in response to current overload to effect interruption

of the circuit at both said contact surfaces, and manual means operable at will for effecting rectilinear movement of said axis to separate the contact surface remote from the latching surface from its cooperating stationary contact.

9. An automatic electric circuit breaker comprising an elongated floating bar carrying oppositely facing contact surfaces adjacent to its ends, a latching surface adjacent to one end of said bar facing opposite to its adjacent stationary contact, current responsive latching means cooperating with said latching surface, a resiliently mounted stationary contact cooperating with the contact surface adjacent to said latching surface, a rigidly mounted stationary contact cooperating with the other contact surface, a movable pivotal axis for said bar interjacent its ends, and spring means interjacent said pivotal axis and latching surface biasing said contact bar against said rigidly mounted stationary contact and said latching means and for rotation about said pivotal axis when released by said latching means.

10. An automatic electric circuit breaker comprising a floating contact member carrying a contact surface at one point and latched at another point by means releasable in response to current overload, a pivotal axis for said member, means biasing said member for rotation about said pivotal axis, and an auxiliary axis about which said member rotates in its extreme released position to effect a greater separating movement of said contact surface than would be attained by rotation about said pivotal axis.

11. An automatic electric circuit breaker comprising a floating contact member carrying a contact surface at one point and latched at another point by means releasable in response to current overload, an interengaging-notch pivotal mounting for said contact member, spring means biasing said member for rotation about said pivotal mounting when released by said current responsive means and an auxiliary support about which said member rotates in its extreme released position to effect a greater opening movement of said contact surface than would be obtained by rotation about said pivotal mounting.

12. An automatic electric circuit breaker comprising a floating contact member carrying a contact surface at one point and latched at another point by means releasable in response to current overload, a rectilinearly movable support, a pivotal mounting for said member on the support, providing for movement of the member relative to the support, means biasing said member for rotation about said pivotal mounting when released by said current responsive means, and an abutment on said support about which said member rotates in its extreme released position to effect a further opening movement of said contact surface than would be obtained by rotation about said pivotal mounting.

13. An automatic electric circuit breaker comprising a floating contact member carrying a contact surface at one point and latched at another point by means releasable in response to current overload, a rectilinearly movable support, a pivotal mounting for said member on the support providing for movement of the member relative to the support, means biasing said member for rotation about said pivotal mounting when released by said current responsive means, an abutment on said support about which said member rotates in its extreme released position to effect a further opening movement of said contact surface than would be obtained by rotation about said pivotal mounting, and manual means for rectilinearly moving said support after release of said member to effect rotation of the member into position to be again engaged by said current responsive means to effect resetting of the breaker mechanism.

14. A multipole automatic electric circuit breaker comprising a plurality of sets of separable contacts and elements individual to each set movable to effect separation of said contacts, latching surfaces engaging said elements and restraining them from contact separating movement, individual current responsive means for moving each of said latching surfaces, said latching surfaces being joined together by means providing for limited lost motion connection between them, said lost motion providing for independent unlatching movement of each latching means until its associated element is released, the released element thereafter moving its latching surface further in the unlatching direction a distance sufficient to take up the lost motion and effect movement of the other latching surfaces to effect release of all the elements and opening of all the breaker poles in response to an overload through any one of them.

15. A multipole automatic electric circuit breaker comprising a plurality of sets of separable contacts and elements individual to each set movable to effect separation of said contacts, latching means for said elements, individual current responsive means for moving each of said latching means, means joining said latching means and providing for limited lost motion between said joining means and latching means, said lost motion providing for independent movement of each latching means by its current responsive means to effect release of its associated element, the released element thereafter engaging and moving its latching means in the unlatching direction to effect movement of said joining means and of the other latching means to effect release of all the elements and opening of all the breaker poles in response to an overload through any one of them.

16. A multipole automatic electric circuit breaker comprising a plurality of sets of separable contacts and elements individual to each set movable to effect separation of said contacts, latching means for said elements, individual current responsive means for moving each of said latching means, a common movable member to which said latching means are connected by means providing for limited lost motion between each of the latching means and said member, said lost motion providing for independent movement of each latching means by its current responsive means to effect release of its associated element, the released element thereafter engaging and moving its latching means in the unlatching direction a sufficient distance to effect movement of said common member and through this member of the other latching means into unlatching position to effect release of all the elements and opening of all the breaker poles in response to an overload in any one of them.

17. A multipole automatic electric circuit breaker comprising a plurality of sets of separable contacts and elements individual to each set movable to effect separation of said contacts, latching means for said elements, individual current responsive means for moving each of said latching means, a common rotatable shaft to which said latching means are connected by

means providing for limited lost motion between each of the latching means and said shaft, said lost motion providing for independent movement of each latching means by its current responsive means to effect release of its associated element, the released element thereafter engaging and moving its latching means in the unlatching direction a sufficient distance to effect rotation of said shaft and through this shaft of the other latching means into unlatching position to effect release of all the elements and opening of all the breaker poles in response to an overload in any one of them.

18. A multipole automatic electric circuit breaker comprising a plurality of individual pole mechanisms mounted within a common enclosure and insulated from each other, each mechanism including separable contacts and current responsive means for initiating separation of said contacts, means effecting operation of all said mechanisms to separate all the contacts in response to actuation of any one current responsive means, individual operating handles for each of the pole mechanisms projecting through and accessible at the exterior of the enclosure, and means at the exterior of the enclosure for joining said handles for common movement as a unit.

19. A multipole automatic electric circuit breaker comprising a plurality of individual pole mechanisms mounted within a common enclosure and insulated from each other, each mechanism including separable contacts and current responsive means for initiating separation of said contacts, means effecting operation of all said mechanisms to separate all the contacts in response to actuation of any one current responsive means, individual operating handles for each of the pole mechanisms projecting through and accessible at the exterior of the enclosure, and means at the exterior of the enclosure for joining said handles for common movement as a unit, said joining means including portions interfitting with the handles to prevent removal of the joining means after assembly.

20. A multipole automatic electric circuit breaker comprising a plurality of sets of separable contacts and elements individual to each set movable to effect separation of said contacts, individual current responsive latching means for said elements, means providing for release of all said latching means in the event of an overload through any one set of contacts, individual operating handles for effecting manual separation of each set of contacts, and means rigidly joining said handles for common movement as a unit.

JOHN G. JACKSON.