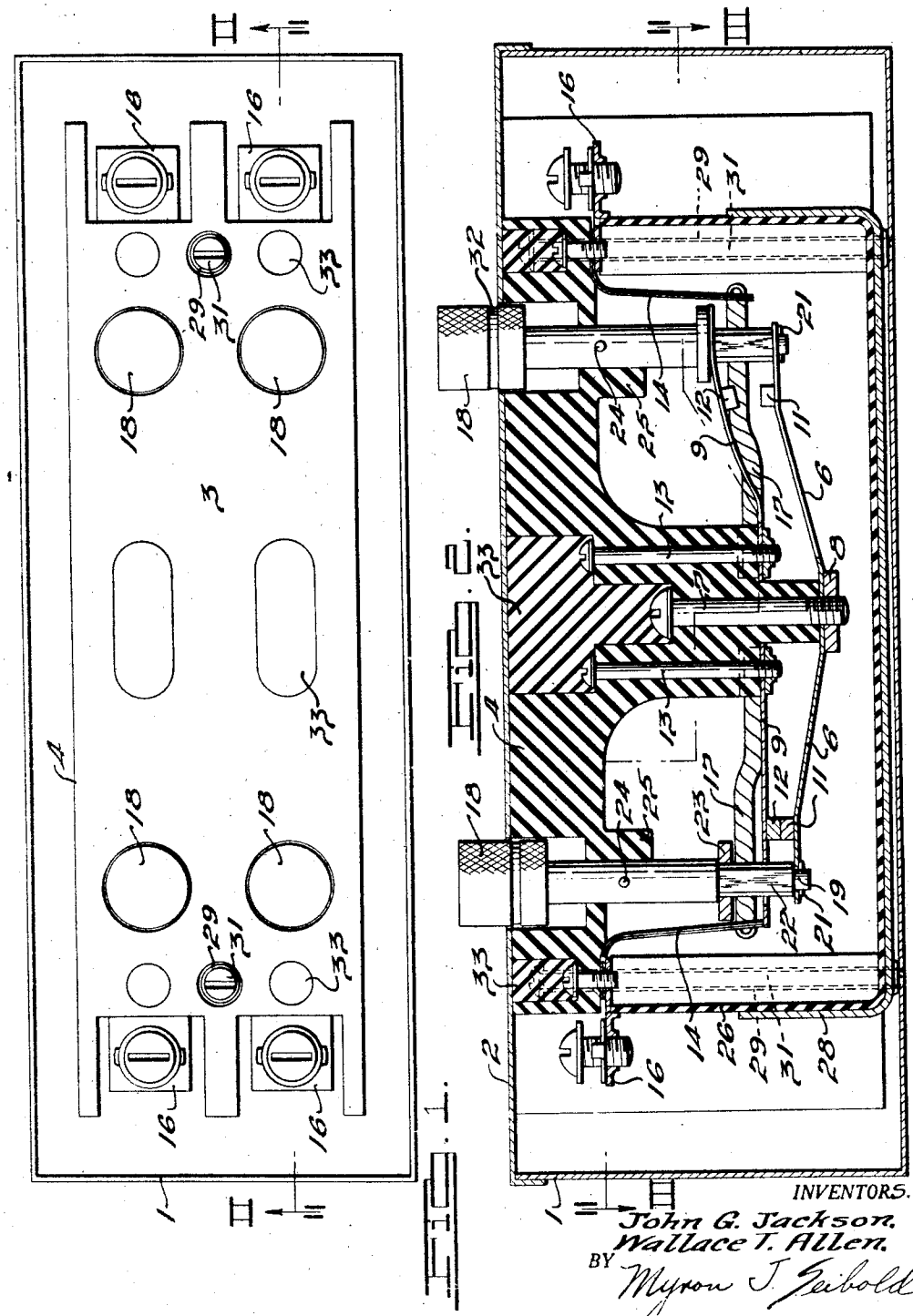
Jan. 27, 19 2. J. G. JACKSON ET AL 2,270,950

CIRCUIT BREAKER

Original Filed Sept. 3, 1935 2 Sheets-Sheet 1



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CIRCUIT BREAKER

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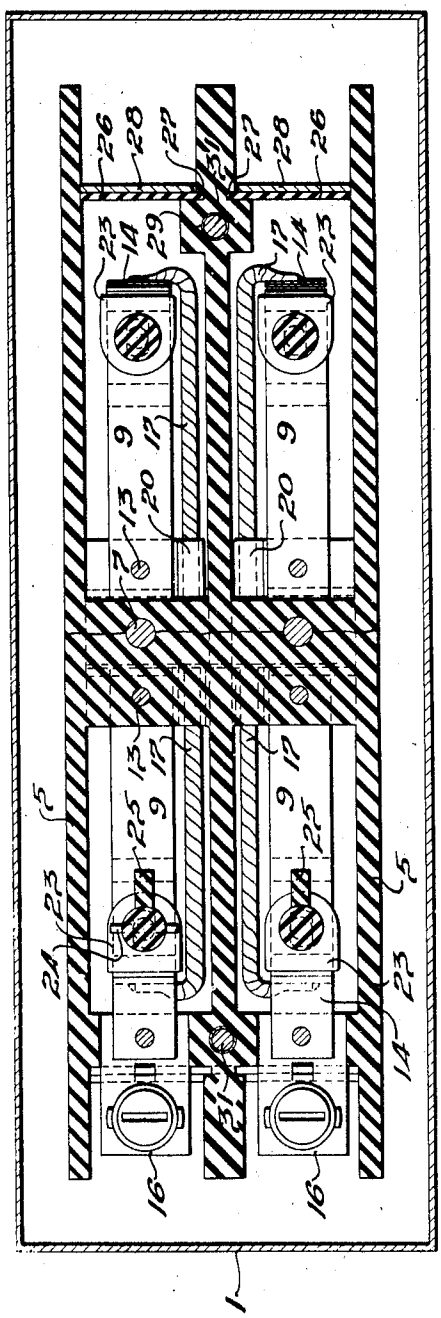


Fig. 3.

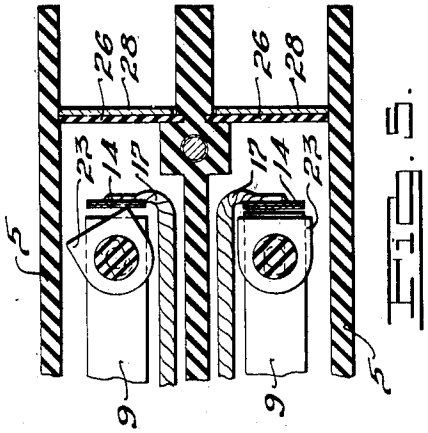


Fig. 5.

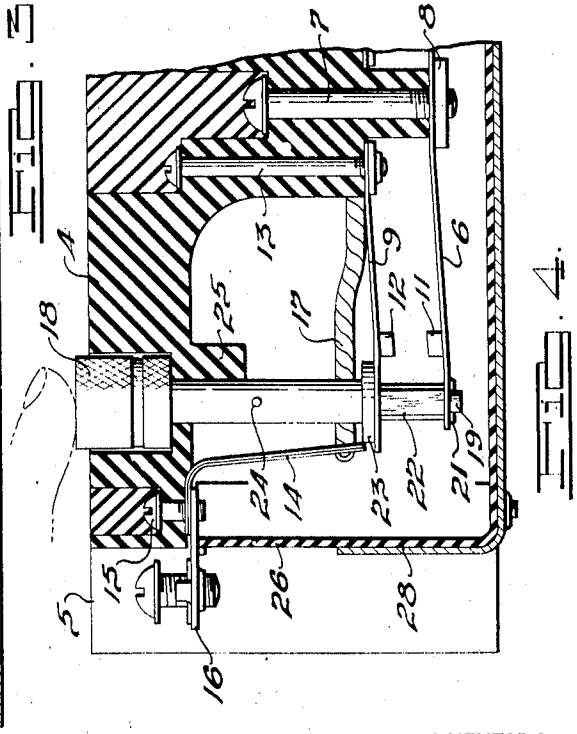


Fig. 4.

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2,270,950

CIRCUIT BREAKER

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Application September 3, 1935, Serial No. 38,908
Renewed February 17, 1938

32 Claims. (Cl. 200—116)

This invention relates to automatic electric circuit breakers and has for its object the provision of a simple and economical circuit breaker mechanism.

Another object of this invention is to provide an automatic electric circuit breaker which shall be tripped manually and automatically and in which the automatic trip shall be free of the operating member, the construction having a minimum of parts.

Another object of this invention is to provide an improved electrical circuit breaker apparatus embodying an outer sheet metal enclosure and at least one sealable circuit breaker within said enclosure, the circuit breaker mechanism having a simple, economical construction.

Another object of this invention is to provide an improved circuit breaker of multi-circuit form.

Another object of this invention is to provide an electrical circuit breaker having an improved resetting and manually tripping mechanism.

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

Figure 1 is a top plan view of the circuit breaker according to the present invention.

Figure 2 is a vertical sectional view taken on the line II—II of Figure 1.

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

Figure 4 is a fragmentary sectional view similar to Figure 2 showing the parts in the resetting position.

Figure 5 is a fragmentary sectional view similar to Figure 3 showing the manual tripping of the circuit breaker.

Referring to the drawings, the circuit breaker apparatus illustrated embodies an outer sheet metal box or cabinet 1 having an openable front cover 2. Within the box 1 is mounted at least one sealable circuit breaker 3. The circuit breaker specifically illustrated comprises a base 4 having walls 5 extending therefrom at its edges and at a substantial mid portion. On either side of the middle wall 5 is mounted a resilient contact strip 6 rigidly secured to the base by means of a stud 7 threaded into a connector 8. The connector 8 extends through the middle wall 5 and electrically connects the strips 6 on opposite sides of this wall. This middle wall is, of course, not essential to the construction and may be entirely or partially omitted as desired so long as minor clearances are preserved.

A resilient contact strip 9 is disposed generally parallel to each end of the strip 6 in spaced relation thereto. The strips 9 and the ends of strip 6 are biased in the same direction as shown in their separated position at the right of Figure 2. Cooperating contacts 11 and 12 are rigidly secured adjacent to the free ends of the strips 6 and 9 in any desired manner as, for instance, by brazing. The opposite ends of strips 9 are rigidly supported on the base 4 by means of studs 13.

A bimetallic latching member 14 is rigidly secured to the base 4 by stud 15 which stud further secures the terminal 16 extending to the exterior of the circuit breaker enclosure. The latch 14 is adapted to engage the end of contact strip 9 as shown at the left of Figure 2, thus restricting its forward movement and holding it in position for cooperation of the contacts 11 and 12 under the bias of the strip 6. A flexible lead 17 electrically connects the free end of the bimetallic strip 14 with the fixed end of the contact strip 9. This lead may be welded or otherwise attached to the bimetal 14 and, as shown, is connected to the strip 9 through the lug 26.

The resetting means for the circuit breaker comprises a push button 18 extending through the base 4. The inner end of the push button is reduced as at 19 and extends through an opening in the strip 6 where it is maintained by the pin 21. The end of the strip 6 and the push button 18 are thus connected together by means of the abutment formed from the reduction of the portion 19 and the pin 21. The portion 22 of the push button 18 immediately above the reduced portion 19 is flattened to receive the cam abutment 23 in non-rotatable relation. This cam abutment assumes the shape more particularly shown in Figures 3 and 5, having a generally flat surface disposed closely adjacent to the bimetallic latch 14. The portion 22 of the push button 18 extends through an enlarged opening in the strip 9 so as to be freely movable relative thereto. The upper portion of the stem of the push button 18 is provided with a limiting pin 24 adapted to cooperate with the under side of the base 4 to limit the outward movement of the push button and with a projection 25 on the base 4 to limit the rotary motion thereof.

The circuit breaker mechanism is adapted to be enclosed and for this purpose there is provided a fibre plate 26 of generally U-shape having a centrally cutout portion in its legs adapted to en-

gage the middle dividing wall 5 in the notches 27. For strengthening purposes, a sheet metal U-shaped member 28 is similarly disposed on the outside of the fibre plate 26. Tubular rivets 29 extend through the base 1 and rigidly connect the metal plate 28 and fibre plate 26 to the base in sealable relation. The bolts 31 extend through the tubular rivets and engage with the back of the box or cabinet to mount the circuit breaker therein. The live studs 7, 13 and 15 are sealed as by means of wax 33.

The circuit breaker mechanism shown at the left in Figure 2 is in the normal "on" position with the strip 9 latched in position by the bimetallic member 14 and the contact 11 is pressed against the contact 12 by the resiliency of the strip 6. The position of the parts in the tripped position is indicated at the right in Figure 2. Here the latch 14 no longer engages the end of strip 9 and this strip has moved upwardly under its bias to separate the contacts. The end of strip 6 is then free to move also but is restricted due to its engagement with the abutment defining the boundary between the portions 19 and 22 on the push button 18 and the engagement of the pin 24 on the push button with the under side of the base 4. This results in the contacts assuming the separated position shown. It is noted from a comparison of the breaker mechanisms in Figure 2 that the push button has a further movement in its tripped position due to the fact that in the normal "on" position the pin 24 does not engage the base. This results in a desired indication of the tripped position of the breaker and a ring 32 or other means may be placed on the push button to more clearly indicate its outward position. This outward movement of the push button is under the influence of both resilient strips 6 and 9 as strip 9 engages abutment 23 to aid in the outward movement.

Figure 4 shows the resetting position of the circuit breaker mechanism. The push button 18 is pressed inwardly whereupon strips 6 and 9 are moved away from the base 4 by the abutment 23 and the lower abutment between the portions 19 and 22. It is noted that these two abutments are spaced apart a distance greater than the normal spacing between the strips when the contacts are engaged, this resulting in the contacts being held separated while the push button is depressed. Release of the push button from the position shown in Figure 4 will permit strip 9 to move upwardly until it engages latch 14, thus holding it in position, while the strip 6 will be free to move upwardly with the push button to the position shown at the left in Figure 2 with the contact 11 pressed against the contact 12 by the resilient bias of the strip 6.

The manual tripping of the circuit breaker is illustrated at the top of Figure 5. Upon rotation of the push button 18 the cam abutment 23 engages the bimetallic latch 14 and moves it out of engaging position with the strip 9 whereupon the parts are free to move to the separated position shown at the right in Figure 2. The push button 18 is then automatically rotated back to its normal position by the reaction of the bimetal 14 upon the cam abutment 23. In the manual tripping movement the pin 24 and stop 25 limit the amount of rotation to prevent damage to the parts.

The multi-circuit circuit breaker specifically illustrated has four individual circuit breaker mechanisms, one contact of each mechanism being made electrically common with the others through the strips 6 and connector 8. It can be readily understood that any number of breaker mechanisms may be used within the spirit of the invention as applicants' invention resides not only in the single breaker mechanism but also in the circuit breaker apparatus including the multi-circuit arrangement of a breaker. In the breaker as illustrated it is intended that one circuit breaker mechanism shall serve as a main or lead-in circuit breaker and that the other three circuit breaker mechanisms shall serve as branch circuit breakers. This results in two current responsive circuit breaker mechanisms being in series with any short circuit which may occur.

While the contact strip 6 has been shown as a single member biased upwardly at its opposite ends, it is obvious that this strip may be divided into two parts electrically joined by the connection with the connector 8. Although the box or cabinet has been shown with a single multi-circuit circuit breaker therein, it is obvious that any number of individual breakers may be mounted within the box or cabinet if desired.

In the following claims the terms "box" and "cover" are intended to be construed to mean cabinet and door respectively as well.

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. In an electric circuit breaker, separable contacts, means biasing said contacts in the same direction, one contact having a released position beyond the released position of the cooperating contact, a current responsive latch for said one contact holding it in a position to be engaged by the cooperating contact, and a manually operable member for releasing said latch to permit manual separation of said contacts, said member moving said one contact into relatching position after release, and means on said member for maintaining said contacts separated during the relatching operation.

2. In an electric circuit breaker, separable contacts, means biasing said contacts in the same direction, one contact having a released position beyond the released position of the cooperating contact, a current responsive latch for said one contact holding it in a position to be engaged by the cooperating contact, a manually operable plunger having abutments for moving both contacts, said abutments being spaced apart so as to maintain said contacts separated while they are being moved against their bias to latch said one contact, release of said plunger permitting said cooperating contact to move to engage said one contact, and a surface on said plunger adapted to release said latch upon manual rotation of said plunger to provide for manual trip.

3. In an electric circuit breaker, separable contacts, means biasing said contacts in the same direction, one contact having a released position beyond the released position of the cooperating contact, a current responsive latch for said one contact holding it in a position to be engaged by the cooperating contact, and a manually operable plunger having a longitudinal movement to reset said breaker mechanism after automatic trip and a rotary movement to effect manual trip.

4. In an electric circuit breaker, separable

contacts, means biasing said contacts in the same direction, one contact having a released position beyond the released position of the cooperating contact, a current responsive latch for said one contact holding it in a position to be engaged by the cooperating contact, and a manually operable plunger having a longitudinal manual movement to reset said breaker mechanism after automatic trip and a rotary manual movement to release said latch and effect separation of said contacts.

5. In an electric circuit breaker, separable contacts, a bimetallic current responsive element for normally latching said contacts in engaged position, said element releasing said contacts in response to an overload, a plunger for resetting said contacts in latched position, said plunger having a cam surface engaging said element to release said contacts upon manual rotation thereof.

6. In an electric circuit breaker, separable contacts, a bimetallic current responsive element for normally latching said contacts in engaged position, said element releasing said contacts in response to an overload, a push button for resetting said contacts in latched position, said push button having a cam surface engaging said element to release said contacts upon manual rotation thereof, said element rotating said push button back into normal position when the manual rotary force is released.

7. In an electric circuit breaker, separable contacts, a current responsive latch for maintaining said contacts in cooperating relation, a resetting push button, said push button having a longitudinal movement to separate said contacts and move them into latching position, a reverse longitudinal movement to engage said contacts, and a rotary movement to release said latch and manually trip said contacts.

8. In an electric circuit breaker, contact arms biased in the same direction, a current responsive latch for the forward arm, cooperating contacts on said arms, a plunger connected to the rear arm, an abutment on said plunger for engaging the forward surface of said forward arm, said abutment and connection having a spacing greater than the engaged spacing of said arms, the forward movement of said plunger being restricted, whereby said contacts will remain separated when released by said latch.

9. An electric circuit breaker comprising a sealable enclosure including a base, contact arms supported by said base within said enclosure and biased in the same direction, cooperating contacts on said arms, a current responsive latch for the forward arm, the forward movement of the rear arm being less than the forward movement of the forward arm when said arms are released by said latch, and resetting means for said arms projecting through said enclosure, said resetting means having a longitudinal movement to engage said forward arm with said latch and a rotary movement to disengage said latch from said forward arm to provide for manual trip.

10. An electric circuit breaker comprising an enclosure including a base, resilient contact arms supported by said base within the enclosure and biased in the same direction, cooperating contacts on said arms, a current responsive latch for the forward arm, a plunger loosely engaging the forward arm and connected to the rearward arm, an abutment on said plunger limiting the movement of the forward arm relative thereto, and means for limiting the forward movement of said plunger.

11. A multi-circuit circuit breaker comprising a sealable enclosure including a base, a plurality of electrically common contact arms supported by said base and biased in one direction, a plurality of electrically separate contact arms supported by said base and biased in the same direction, said electrically common and electrically separate arms being arranged in pairs, the arms in each pair being generally parallel and superposed in said direction, and a separate current responsive latch for the forward arm in each pair, the forward movement of the rear arm being less than the forward movement of the forward arm when released by said latch.

12. A multi-circuit circuit breaker comprising a sealable enclosure including a base, a plurality of electrically common contact arms supported by said base and biased in one direction, a plurality of electrically separate contact arms supported by said base and biased in the same direction, said electrically common and electrically separate arms being arranged in pairs, the arms in each pair being generally parallel and superposed in said direction, a separate current responsive latch for the forward arm in each pair, a resetting push button positively engaging the rear arm and having an abutment for engaging said forward arm, and means for limiting the forward movement of said push button.

13. A multi-circuit circuit breaker comprising a sealable enclosure including a base, a plurality of electrically common contact arms supported by said base and biased in one direction, a plurality of electrically separate contact arms supported by said base and biased in the same direction, said electrically common and electrically separate arms being arranged in pairs, the arms in each pair being generally parallel and superposed in said direction, a separate current responsive latch for the forward arm in each pair, a resetting push button positively engaging the rear arm and having an abutment for engaging said forward arm, means for limiting the forward movement of said push button, and a surface on said push button adapted to be rotated against said latch to provide for manual separation of said contacts.

14. In a multi-circuit circuit breaker, a base, a resilient, substantially bow-shaped contact strip supported on said base adjacent to a midportion, contacts mounted on said strip adjacent to the ends thereof, electrically separate contact strips supported by said base and extending generally parallel to the end portions of said first mentioned strip, said separate strips carrying contacts adjacent to their ends cooperating with the contacts on said first mentioned strip, said strips being biased in the same direction, and current responsive latches engaging the forward strip ends to maintain said contacts in cooperating position.

15. A multi-circuit circuit breaker comprising an enclosure including a base, a main circuit breaker and at least one branch circuit breaker mounted on said base within said enclosure, each of said main and branch breakers comprising contacts biased in the same direction, a current responsive latch for the forward contact and means for limiting the released movement of the rear contact, the load contact of the main breaker and the line contact of the branch breaker being at least electrically common.

16. An electric circuit breaker comprising an

enclosure including a base, a plurality of pairs of cooperating contacts supported by said base within said enclosure, said contacts being biased in the same direction, a current responsive latch normally retaining the forward contact of each pair in position to be engaged by its cooperating contact, and a manually operable member for resetting each pair of contacts after an automatic release.

17. An electric circuit breaker comprising an enclosure including a base, a plurality of pairs of cooperating contacts supported by said base within said enclosure, said contacts being biased in the same direction, a current responsive latch normally retaining the forward contact of each pair in position to be engaged by its cooperating contact, and a manually operable member for resetting each pair of contacts after an automatic release, said member being rotatable to engage said latch and manually release the respective cooperating contacts.

18. An electric circuit breaker comprising an enclosure including a base, a plurality of pairs of superposed contact arms supported by said base within said enclosure, said arms being biased in the same direction, cooperating contacts on each pair of arms, one arm of each pair being at least electrically common with one arm of each of the other pairs, a current responsive latch for the forward arm in each pair, and a manually operable member for resetting each pair of contacts from the released to the engaged position.

19. An electric circuit breaker comprising an enclosure including a base, a plurality of pairs of superposed contact arms supported by said base within said enclosure, said arms being biased in the same direction, cooperating contacts on each pair of arms, one arm of each pair being at least electrically common with one arm of each of the other pairs, a current responsive latch for the forward arm in each pair, and a manually operable member for resetting each pair of contacts from the released to the engaged position, said member having spaced abutments engaging said arms and maintaining the cooperating contacts separated until said member is released after reset.

20. An electric circuit breaker comprising an enclosure including a base, a plurality of pairs of superposed contact arms supported by said base within said enclosure, said arms being biased in the same direction, cooperating contacts on each pair of arms, one arm of each pair being at least electrically common with one arm of each of the other pairs, a current responsive latch for the forward arm in each pair, and a manually operable member for resetting each pair of contacts from the released to the engaged position, said member carrying a cam surface adapted to be rotated into engagement with said latch to effect manual release of the respective cooperating contacts.

21. In an automatic electric circuit breaker, contact arms biased in the same direction, cooperating contacts on said arms, a bimetallic latching member having relatively fixed and free ends with its free end normally holding the forward arm in position where the contacts will engage, said member flexing under a current overload to release said forward arm, the released position of the forward arm being beyond the released position of the cooperating arm to effect separation of the contacts, a flexible lead interconnecting the free end of said member and one of said arms, and a manually operable member for relatching said forward arm with said member after release including means for maintaining said contacts separated during the relatching operation.

22. In an automatic electric circuit breaker, a pair of resilient conducting strips biased in the same direction, opposed, cooperating contacts mounted on said strips, the released position of the forward strip being beyond the released position of the cooperating strip to effect separation of said contacts, current responsive latching means normally retaining said forward strip in position where said contacts will engage, an operating plunger, a clearance opening in said forward strip through which said plunger extends, an abutment on said plunger engaging said forward strip, and a part on said plunger engaging said cooperating strip, the distance between said abutment and part being greater than the distance between said strips when the contacts are engaged, whereby the contacts will be separated when the plunger is depressed.

23. In a multi-circuit electric circuit breaker, a base, a plurality of pairs of cooperating contacts supported by said base, said contacts being biased in the same direction and one contact in each pair being electrically common with one contact in each of the other pairs, and a current responsive latch for the forward contact in each pair for normally retaining it in position to be engaged by its cooperating contact.

24. In a multi-circuit electric circuit breaker, a base, a plurality of pairs of cooperating contacts supported by said base, said contacts being biased in the same direction and one contact in each pair being electrically common with one contact in each of the other pairs, and a current responsive latch for the forward contact in each pair for normally retaining it in position to be engaged by its cooperating contact, the forward positions of said forward contacts when released by their latches being beyond the forward limit of movement of their cooperating contacts.

25. In a multi-circuit electric circuit breaker, a base, a plurality of pairs of cooperating contacts supported by said base, said contacts being biased in the same direction and one contact in each pair being electrically common with one contact in each of the other pairs, and a current responsive latch for the forward contact in each pair for normally retaining it in position to be engaged by its cooperating contact, the forward positions of said forward contacts when released by their latches being beyond the forward limit of movement of their cooperating contacts, and a manually operable member for resetting each pair of contacts after such release including means for maintaining the cooperating contacts separated during the resetting operation.

26. A circuit breaker comprising cooperating contact members biased to non-contacting positions, one of said members including a slot, thermally-responsive locking means holding said members in contacting relation, said means being adapted to release said members from said locked position at a predetermined temperature, and an operating member for resetting said contact members to contacting relation including a handle, a heel for positively moving said slotted member, and a second heel adapted to extend through said slot to positively engage and move said other member, whereby said contact members cannot be normally held in contacting position by said handle.

27. A circuit breaker comprising a base, a movable terminal member mounted on the base, a movable contact member having a slot therethrough mounted on the base, said members being biased to non-engaging positions, thermally-responsive locking means for holding said members in positions for engaging relation adapted to release the same at a predetermined temperature, and a trip-free operating member for resetting said members to engaging position after a release, said operating member including means adapted to pass through the slot of the contact member to engage the terminal member, and means adapted to engage the contact member after the first means has passed through and cleared the same, whereby the terminal member will be positively maintained out of engagement with the contact member during resetting of the contact member.

28. In an automatic electric circuit breaker, cooperating contacts, means biasing said contacts in the same direction, one of said contacts having a released position beyond the released position of the cooperating contact, current responsive latching means for said one contact holding it in position to be engaged by the cooperating contact, and manual means for resetting said contacts after release by said latch, said contacts being maintained separated during the resetting operation, said manual means being manipulable to effect manual separation of the contacts at will, said manual separation being maintained when the manual means is released.

29. In an automatic electric circuit breaker, cooperating contacts, means biasing said contacts in the same direction, one of said contacts having a released position beyond the released position of the cooperating contact, current responsive latching means for said one contact holding it in position to be engaged by the cooperating contact, said means including a current traversed, bimetallic element adapted to flex upon the passage of an overload current therethrough, and manual means for resetting said contacts after release by said latch, said contacts being maintained separated during the resetting operation, said manual means being manipulable to effect manual separation of the contacts at will, said manual separation being maintained when the manual means is released.

30. In an automatic electric circuit breaker, cooperating contacts, means biasing said contacts in the same direction, one of said contacts having a released position beyond the released position of the cooperating contact, current responsive latching means for said one contact holding it in position to be engaged by the cooperating contact, and operating means having a manually manipulable portion at the exterior of the circuit breaker enclosure, said operating means being manually manipulable both to reset said contacts in latched position after a release and to manually separate said contacts, said contacts being maintained separated during the resetting operation and having a stable, separated condition of manual separation after being manipulated thereto.

31. A thermally operated current responsive switch of the class described, comprising, in combination, a support, a first spring contact blade having one of its ends fixedly secured thereto, a second spring contact blade also having one of its ends fixedly secured to said support near the fixed end of said first spring contact blade and extending substantially parallel to said first blade, said spring contact blades being normally biased to open circuit position, locking means to hold said contact blades in closed circuit position including a thermally responsive means which if removed renders said locking means ineffective to hold said contact blade in closed circuit position, said locking means being adapted to release said contact bades for movement to open circuit position at a predetermined temperature, and manual means for moving said contact blades to locking position after they have been released, said manual means maintaining said contact blades in open circuit relation during the locking operation, said manual means being also manipulable to effect a stable separation of the contacts at will with the manual separation maintained when the means is released.

32. A thermally operated current responsive switch of the class described comprising a pair of electrical contact carrying blades each anchored at one end and biased away from each other to normally open the contacts, a bimetal strip thermal element and means for operatively associating the thermal bimetal strip element with the contacts to normally afford endwise resistance by the bimetal strip to opening movement of the contacts, warping movement of the bimetal strip under influence of heat shifting the end of said bimetal strip to permit the contacts to open under their normal bias, the parts being so arranged that upon removal or breakage of the bimetal strip the contacts will separate, and means for resetting said contacts to closed position comprising a movable member separately moving each of said contact blades to retain them separated until the thermal bimetal strip has been endwise engaged to retain one of said contact blades in its reset position before the other contact blade is permitted to engage therewith, said means being manipulable to effect a stable separation of the contacts at will with the manual separation maintained when the means is released.

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