Oct. 15, 1957 P. M. CHRISTENSEN 2,810,048

DUPLEX CIRCUIT BREAKER

Filed Aug. 12, 1952 3 Sheets-Sheet 1

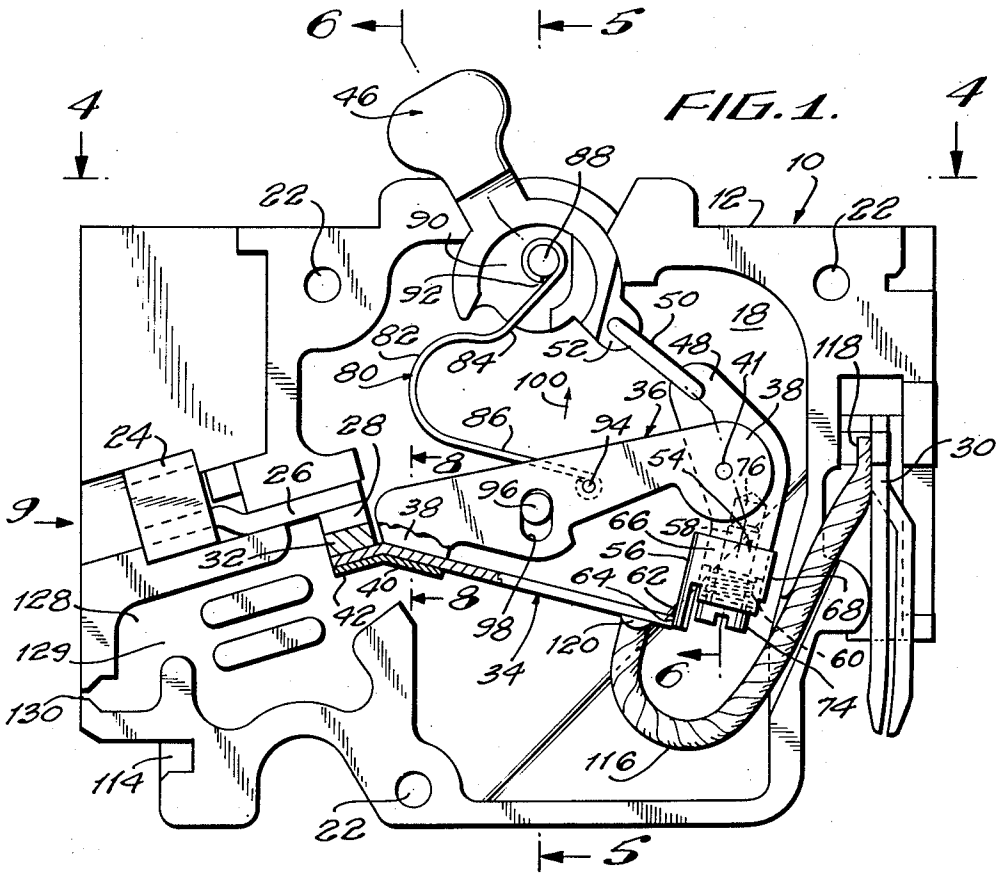

FIG. 1.

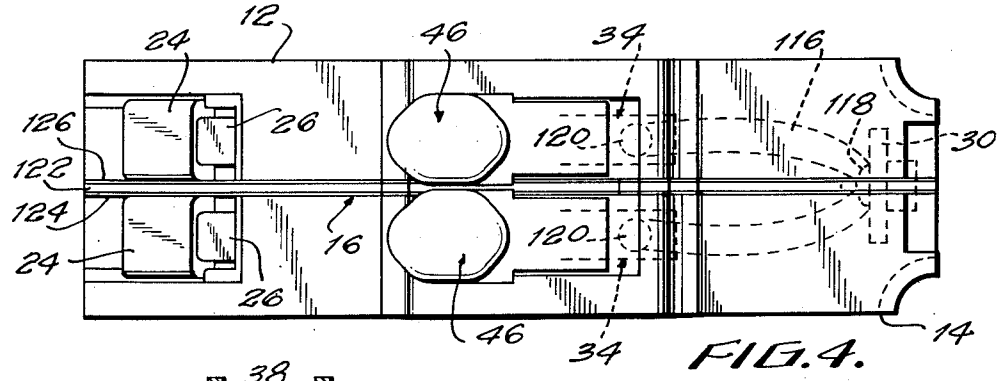

FIG. 4.

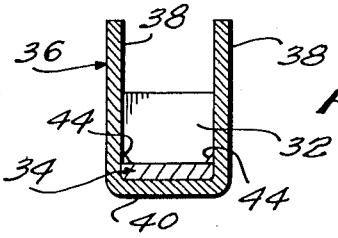

FIG. 8.

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DUPLEX CIRCUIT BREAKER

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FIG. 2.

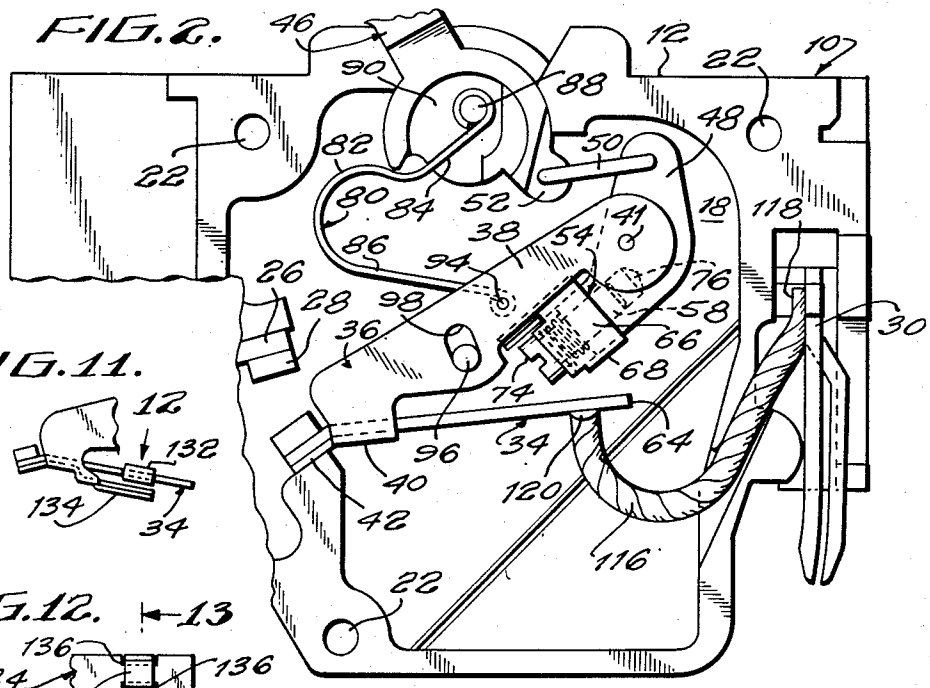

FIG. 11.

FIG. 12.

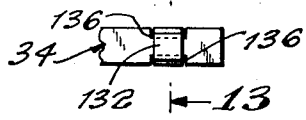

FIG. 13.

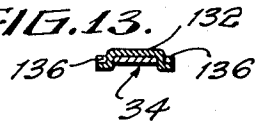

FIG. 3

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DUPLEX CIRCUIT BREAKER

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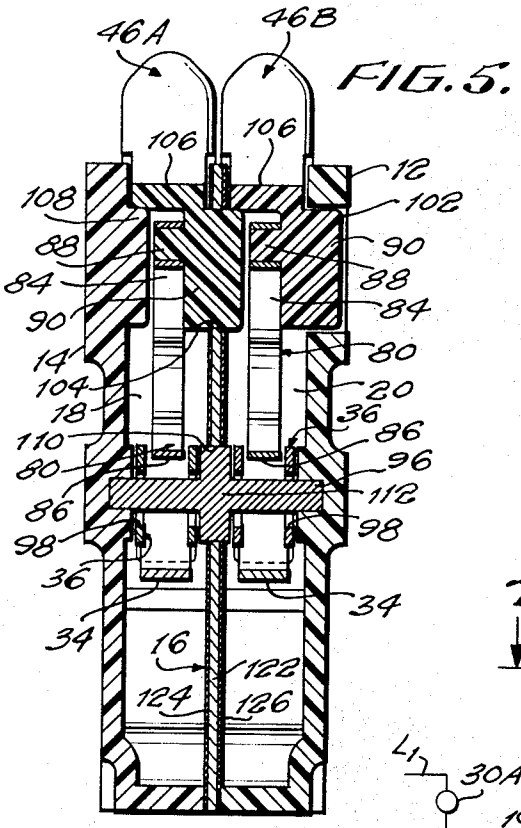

FIG. 5.

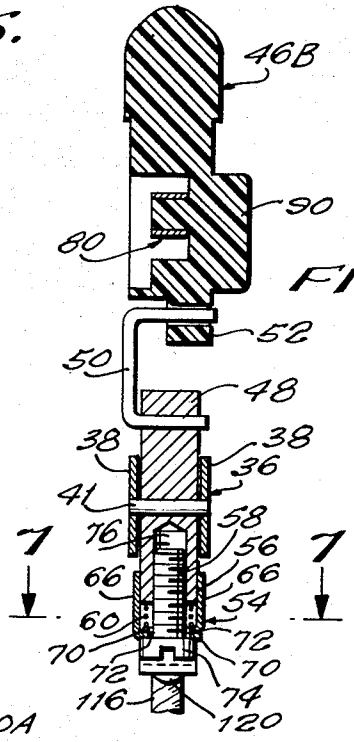

FIG. 6.

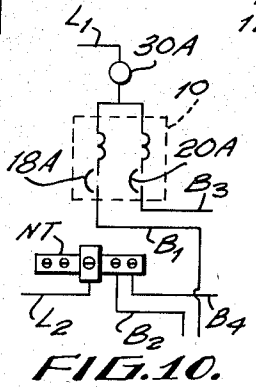

FIG. 10.

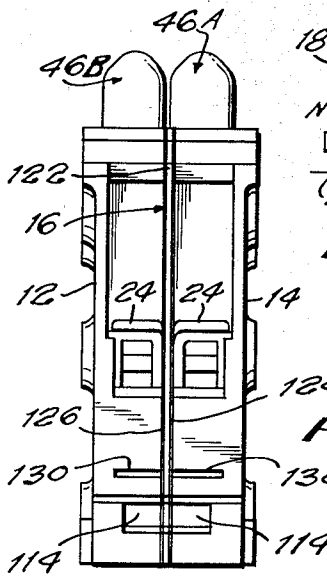

FIG. 9.

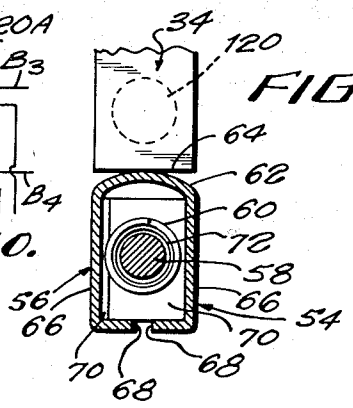

FIG. 7.

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United States Patent Office 2,810,048
Patented Oct. 15, 1957

2,810,048

DUPLEX CIRCUIT BREAKER

Paul M. Christensen, West Orange, N. J., assignor to Federal Electric Products Company, Newark, N. J., a corporation of Delaware

Application August 12, 1952, Serial No. 303,886

45 Claims. (Cl. 200—168)

My present invention relates, in general, to automatic circuit breakers and more particularly to a duplex circuit breaker having a pair of independently operable circuit breaker mechanisms, each of the type in which an actuator is pivotally carried by a movable switch member and is latched thereto, under the control of the current-responsive device, for the manual operation of the circuit breaker mechanism to open and close the latter.

Circuit breaker mechanisms of the general type to which the present invention relates are shown in Patent No. Re. 23,188, issued on an application filed in the name of Harold A. Humpage, as well as by several pending applications assigned to the assignee of my present application, one or more of which applications will be subsequently referred to as the description proceeds.

In the co-pending application Serial No. 127,432, filed November 15, 1949 by Thomas M. Cole and myself, issued July 28, 1953, as Patent No. 2,647,225, there is disclosed a construction wherein a circuit breaker is securely and removably disposed on a panelboard by having one end of the circuit breaker casing mechanically releasably locked with a retaining element or holding formation provided on the panelboard, and by providing a prong or stab type terminal at the other end of the casing, said terminal having provision for both electrically engaging and mechanically releasably locking with a terminal portion of a bus bar provided on the panelboard. Each retaining element and its cooperating terminal portion are aligned in paired relation on the panelboard to provide a pair of cooperating retaining means between which the circuit breaker is disposed. Provision is made for carrying a plurality of circuit breakers in side-by-side disposition on the panelboard, the pairs of retaining means being relatively displaced to accommodate circuit breaker casings of predetermined width, said casings, as now constructed, being substantially one inch wide.

The primary object of the present invention is the provision of means to substantially increase the circuit breaker capacity of such a panelboard without increasing the number of pairs of retaining means, without rearranging or modifying said pairs of retaining means, and without in any manner altering the panelboard.

In this connection, it is another object to provide a duplex circuit breaker having a pair of independently operable circuit breaker mechanisms provided within a casing having overall dimensions which are substantially no greater than those of a casing heretofore provided with a single circuit breaker mechanism, whereby each pair of retaining means provided on a panelboard for said single mechanism casings can mount therebetween two separately operable circuit breaker mechanisms in place of a single circuit breaker mechanism.

Another object is the provision of a pair of circuit breaker mechanisms contained within a single casing wherein the casing holds in position both mechanisms, as well as the terminals and handles for each mechanism,

without the necessity of fastening the circuit breaker mechanisms to the casing.

Another object is the provision of a duplex circuit breaker having a pair of independently operable circuit breaker mechanisms which are provided with a common line terminal and having individual branch terminals, the movable switch members of said mechanisms being mounted for movement on a common pivot.

Another object is the provision of a duplex circuit breaker having a two-part casing provided with a partition between the individual circuit breaker mechanisms, each of which has a separate handle, one of said handles having bearing engagement in the partition and on one casing part, the other of said handles having bearing engagement in the other casing part and nesting on said first mentioned handle.

Another object is the provision, in a circuit breaker of the previously described type, of means provided on the actuator for calibrating the circuit breaker mechanism.

In my copending application, Serial No. 221,420, filed April 17, 1951, issued April 16, 1957, as Patent No. 2,789,179, I have disclosed and claimed a circuit breaker having a single spring which is operable (1) to bias the movable switch member to open circuit position and to move the movable switch member quickly to open circuit position when the actuator is unlatched pursuant to the operation of the current-responsive latched device, (2) to resiliently oppose movement of the movable switch member from circuit-open position to circuit-closed position, (3) to resiliently hold the handle in the "on" position thereof when the circuit breaker is closed and to move the handle to its "off" position when the circuit breaker is tripped, and (4) to bias the movable switch member to resiliently press the movable contact which is bodily movable therewith against the stationary contact for proper contact pressure when the circuit breaker is closed, to compensate for wear of the contact or for other inequalities. In the embodiment disclosed in said application, said spring is a coil spring and the movable switch member is provided with a floating pivot.

In the present invention, and pursuant to another object thereof, said spring is not of the coiled type, and in conjunction therewith, the construction of each circuit breaker mechanism is such that provision is made for limited bodily movement of the movable switch member relative to a fixed pivot therefor to provide for the above mentioned action of the spring while the circuit breaker is closed, that is to provide the required resilient pressure between the companion contacts of the circuit breaker to compensate for wear or other inequalities. Further in this connection, the movable contact is carried by the current-responsive latch, which, in turn, is carried by the movable switch member, the latter being provided with a portion which underlies the contact portion of the latch to mechanically support the latter portion so as to retain the movable contact rigid relative to the movable switch member whereby, even though provision is made for a rigid link between the handle and the actuator and even though both the stationary contact and the movable contact are rigidly mounted relative to their respective supports, said spring will be effective to provide the desired contact pressure when the circuit breaker is closed.

The above and other objects, features and advantages of the present invention will be more fully understood from the following description considered in connection with the accompanying illustrative drawings.

In the drawings:

Fig. 1 is a side view of a duplex circuit breaker embodying the present invention, one of the casing parts, the partition member and one circuit breaker mechanism all being removed for the purpose of illustration, the

remaining circuit breaker mechanism being shown in the closed position thereof, and a portion thereof being broken away for purposes of illustration;

Fig. 2 is a view similar to Fig. 1, with portions omitted, showing an intermediate position of the circuit breaker upon tripping thereof;

Fig. 3 is a view similar to Figs. 1 and 2, with portions omitted, showing the circuit breaker mechanism in the open condition thereof;

Fig. 4 is a top plan view of the circuit breaker;

Fig. 5 is a sectional view taken on the line 5—5 of Fig. 1, through both circuit breaker sections of the duplex circuit breaker;

Fig. 6 is a sectional view taken on the line 6—6 of Fig. 1;

Fig. 7 is a sectional view taken on the line 7—7 of Fig. 6;

Fig. 8 is a sectional view taken on the line 8—8 of Fig. 1;

Fig. 9 is an end view of the duplex circuit breaker taken in the direction of the arrow 9 in Fig. 1;

Fig. 10 is a schematic wiring diagram illustrating a wiring arrangement for the duplex circuit breaker;

Fig. 11 is a fragmentary view illustrating a modification of the circuit breaker mechanism;

Fig. 12 is a view taken in the direction of the arrow 12 in Fig. 11; and

Fig. 13 is a sectional view taken on the line 13—13 of Fig. 12.

Referring now to the drawings in detail the duplex circuit breaker 10 embodying the present invention comprises a two-part insulation casing having the complementary molded parts 12 and 14 which are separated by a partition member 16 so as to define the separate chambers 18 and 20 (Fig. 5) in each of which there is disposed a circuit breaker mechanism. It will be understood that the two casing parts and the partition member are held together by bolts or other suitable means passing through openings 22 in the casing part 12 and similar openings both in the casing part 14 and in the partition 16 which register with the said openings 22 when the two casing parts and the partition member are in assembled relation. Each casing part mounts a suitable branch terminal 24 for the associated circuit breaker mechanism and each terminal is provided with an extending terminal element 26 which rigidly mounts a stationary contact 28. The circuit breaker 10 is provided with a single line terminal member 30 which is suitably connected to each of the separate circuit breaker mechanisms in the chambers 18 and 20, respectively, as hereinafter described in detail. While as here shown, member 30 is preferably in the form of a prong or stab of the plug-in type, as described in the above mentioned application Serial No. 127,432, now Patent No. 2,647,225, it will be understood that this is not essential to the present invention but on the contrary another type of terminal member can be provided instead.

The stationary contact 28 is disposed on its support 26 in a position within each casing chamber to be engaged by a companion movable contact 32 which is carried by the current-responsive latch device 34. More specifically, provision is made for a circuit breaker operating mechanism which includes the movable switch member or carrier 36 for the current-responsive bimetallic strip 34. As best illustrated in Fig. 8, the movable member 36 is constituted by the opposing upstanding arms 38, 38 which are interconnected at one end thereof by the integral base portion 40 so as to be U-shaped in cross section. Said base portion is provided with an integral and angularly related outwardly extending portion 42 (Fig. 1). The current-responsive device 34 is disposed in face-to-face disposition on the upper surface of said base portion 40 and each of the arms 38 is punched inwardly as at 44, 44 in Fig. 8 to rigidly secure the bi-metallic control device 34 in position thereon. It will be noted that when so secured in position the projecting portion 42 of the movable switch member 36 provides an underlying mechanical support and rigid backing for the overlying angular end portion of the bi-metal 34 which end portion is provided with the movable contact 32 on the upper side surface thereof. Consequently it will be apparent that the contact 32 is rigidly mounted relative to the movable member 36.

Each movable member 36 is mounted for pivotal movement between the adjacent casing part 12 or 14, as the case may be, and the partition member 16, to and from the circuit-closed position illustrated in Fig. 1, in which contact 32 engages the stationary contact 28, and to and from the circuit-open position illustrated in Fig. 3, in which said movable contact 32 is shown disengaged from said stationary contact 28. This movement may be accomplished manually for each member 36 by its associated handle 46 which is connected to a companion actuator or lever 48 by a U-shaped link 50, as best illustrated in Fig. 6. Said link is pivotally connected at one end thereof to an extending lug portion 52 provided on the handle and its opposite end to the actuator 48. The actuator is pivotally mounted between the arms 38, 38 of the movable member 36 by means of a pivot pin 41 which extends between said arms. The actuator is also provided, at the end thereof remote from the link 50, with a calibration device 54, hereinafter described in detail, by means of which the actuator is operatively connected to the movable member 36, under the control of the current-responsive bi-metallic strip 34, by which said actuator 48 is releasably latched to the movable member 36, as described in the above mentioned Patent Re. 23,188.

The calibration device 54 is constituted by the preferably metallic member 56, the bolt or screw 58 which extends through said member 56, and the coil spring 60 which is disposed within the member 56. At one side thereof, the member 56 is provided with a depending latch element 62 which is preferably arcuate in cross section, as best shown in Fig. 7, for latching engagement with the marginal edge 64 of the bi-metal 34. Integral with said latch, the member 56 is provided with the forwardly extending arms 66—66 which are provided with the confronting edges 68, 68. Said arms are also provided with the underlying superimposed portions 70—70, respectively in which are defined the registering openings 72—72, respectively. The threaded bolt 58 extends through said openings 72—72 and is threaded into a bore 76 defined in the lower end of the actuator 48. It will be understood, as illustrated in Fig. 6, that the openings 72—72 are larger than the diameter of the bolt 58, whereby the calibration member 56 is movable relative to the bolt. The coil spring 60 is mounted on the shaft of the bolt 58, being disposed between the end of the actuator 48 and the superimposed underlying portions 70—70 of the member 56, whereby to bias said member into abutment with the enlarged head 74 of the bolt 58. Therefore, it will be understood that by threading the bolt 58 further into the actuator 48, the depending latch part 62 will be raised relative to the marginal edge 64 of the control strip 34 whereby to decrease the degree or extent of overlap of said latch part and said marginal edge. By withdrawing the bolt from the actuator, the degree of said overlap may be increased. Therefore, in this manner, the desired degree of overlap may be obtained to predetermine the amount of flexing of the bimetallic strip 34 in actuator-releasing direction, in response to load conditions, for tripping the circuit breaker.

It will be understood that, as illustrated in Fig.1, when the handle 46 is in the "on" or circuit closed position thereof, and the actuator 48 is latched to the movable switch member 36 by engagement with the outer edge 64 of the bi-metallic strip, as shown, relative pivotal movement between the actuator and the movable switch member is prevented and contact 32 is in engagement with

contact 28. In this position, the link 50, which pursuant to the present invention may be a rigid link, and the actuator 48 are in overset toggle condition, and in order for each circuit breaker mechanism to open automatically pursuant to the flexing of the bi-metallic strip 34 upon heating thereof, the toggle must be broken, and this can take place by movement of the handle 46 to its circuit open position (Fig. 3) either manually or by release of the latch part 62 of the calibration device 54 by the bi-metallic strip 34 when the circuit breaker trips upon overload or other predetermined load conditions. The opening of the circuit breaker when the strip 34 releases the latch element 62 is effected by the spring 80. As here shown, said spring is formed of flat spring metal and is provided with the central arcuate portion 82 having the opposing arms 84 and 86. The arm 84 is connected to the handle part 88, which part extends from the pivot portion 90 of the handle and is offset from the center of said pivot portion, which said center is indicated at 92 in Figure 1. The arm 86 of the spring 80 is engaged with the movable member 36, as at 94, between the pivot 96 of said movable switch member and the end portion of said movable member on which the actuator 48 is pivotally mounted. It will be observed that a line drawn between the center of the part 88, to which the spring arm is secured and the center of the part 94 to which the spring arm 86 is secured would lie in a direction to the right of the point 92 which, is previously indicated, is at the center of the pivot portion 90 of the handle 46. It will be further observed that the spring 80 is a tension spring and when so connected will bias the movable switch member 36 to the circuit open position thereof and will move the latter to said position when the strip 34 disengages the latch element 62. Also, it will be noted that the spring 80 is effective to move the handle 46 to its "off" or circuit open position when the circuit breaker is tripped, that is when the movable member 36 moves to a circuit open position pursuant to the release of the latch element 62 by the strip 34. Further, it will be observed that even though the handle 46 is held in "on" position, said spring is effective to open the circuit breaker when the latter is tripped, that is, when the strip 34 disengages the latch 62.

A feature of the present invention is the provision of means for bodily moving the movable switch member 36 relative to its pivot 96 in conjunction with the spring 80 for permitting a limited bodily movement of the movable switch member and for biasing the movable contact 32 toward the stationary contact 28, in the closed circuit position of said movable member 36 in order to provide the proper pressure between said contacts when they are engaged, or to compensate for wear or other inequalities in the various cooperating parts of the circuit breaker. For this purpose, the movable member 36 is provided with an elongated closed slot 98 through which the pivot 96 extends. It will be observed that in the closed condition of the circuit breaker mechanism, as illustrated in Fig. 1, i. e., with the link 50 and actuator 48 in overset toggle condition, the spring 80 being in tension, the switch member 36 will be urged by said spring in the direction of the arrow 100 in Fig. 1, whereby to pivot about the pin 41 in a direction to resiliently press the movable contact 32 against the stationary contact 28, the slot 98 permitting for the necessary bodily movement of the switch member relative to the pivot 96. In this connection, it will be understood further that while spring 80 is thus effective in this manner to press the contact 32, against the contact 28, it is also potentially effective to move the movable switch member 36 in a counter-clockwise direction about the pivot 96 to circuit opening position the instant that the strip 34 operates to disengage or release the latch 62 carried by the actuator 48. More specifically, it will be understood that upon said release of the latch element 62 the toggle constituted by the handle 46 and the link 50 will collapse, as illustrated in Fig.2 and the spring 80 will thereupon be effective to bodily move the movable member 36 in an upward direction until the bottom of the slot 98 engages the pivot 96 whereupon said spring is effective to pivot the movable switch member 36 about its pivot 96 to the position thereof illustrated in Fig. 3 It will be noted from Fig. 1 that there is a clearance between the upper end of slot 98 and the pivot 96, in the closed condition of the circuit breaker, to allow for the closing operation of the circuit breaker mechanism without said upper end hitting said pivot when said mechanism is moved from the open condition thereof illustrated in Fig. 3 to said closed condition thereof.

Referring now more specifically to the casing parts 12 and 14, and the partition 16, it will be noted that the casing part 12 is provided with an aperture 102 (Fig. 5) in which the handle 46 for the circuit breaker mechanism in the chamber 20 has rotary bearing engagement. More specifically, the pivot portion 90 of said handle extends into said aperture 102. The pivot portion 90 of the handle for the circuit breaker mechanism in chamber 18 has rotary bearing engagement in an aperture 104 defined in the partition memer 16. Each of the handles is also provided with a laterally extending arcuate portion 106—106 associated with the pivot portion thereof. Referring now to Fig. 5, it will be noted that said portion 106, of the handle 46A for the mechanism in chamber 18, has bearing engagement on the thickened wall part 108 provided on the inner surface of the casing part 14. The arcuate portion 106, of the handle 46B associated with the mechanism in chamber 20, has bearing engagement on that part of the pivot portion 90 of the companion handle 46A which extends through the aperture 104 in the partition member, the upper end of said partition member serving to separte said handle portions. Consequently, it will be readily apparent that the handle 46A for the circuit breaker mechanism in chamber 18 has bearing support on the casing part 14 and in the partition member 16, and the companion handle 46B for the circuit breaker mechanism in chamber 20 has bearing support in the casing part 12 and nests on the pivot portion of the handle 46A for additional bearing support. The partition member 16 also serves to mount the common pivot 96 for both of the circuit breaker mechanisms. More particularly, it will be noted that the partition member is provided with an additional aperture 110 in which the central portion 112, of enlarged diameter, of the pivot 96 is mounted, the opposite ends of said pivot being carried by the casing parts 12 and 14, respectively. Therefore, it will be readily apparent that the circuit breaker mechanism, constituted by the movable switch member 36, the bi-metallic strip 34, the actuator 48 and the spring 80, in each of the chambers 18 and 20, respectively, is not carried or supported by the casing parts which serve only to mount the pivot 96 and provide bearing support for the handle.

It will be understood that the overall widthwise dimension from the outer surface of the casing part 12 to the outer surface of the case part 14, of the duplex circuit breaker 10, as now constructed, is substantially only one inch whereby to replace a single circuit breaker casing of the same width on a panel board construction of the type illustrated and described in said co-pending application Ser. No. 127,432, so as to provide two circuit breaker mechanisms in the same space occupied by one circuit breaker mechanism on said panel board. In this connection, it will be noted that the casing parts 12 and 14 are provided below the branch terminals 24—24 thereof, with a recessed portion or holding formation 114 adapted to receive a retaining element provided on the panel board, as described in said co-pending application. At the other end thereof, as previously indicated, the casing parts are provided with a single stab terminal 30, preferably of the type illustrated and described in said co-pending application, for engagement in a terminal portion of a bus bar carried by the panel board. Said stab

terminal 30 is connected to each of the strips 34 by means of a flexible conductor loop 116, the central portion of which is secured to the terminal 30, as at 118, and each end of said loop is secured to a strip 34 as at 120.

Fig. 10 is a wiring diagram illustrating the manner in which the duplex circuit breaker 10 of the present invention may be utilized to control two branch circuits, each of which is independent of the other. One wire of the supply line is indicated at L1, to which the stab member 30 is electrically connected, as at 30A. The other lead L2 of the supply line is connected to a common neutral terminal NT. One of the circuit breaker mechanisms is indicated at 18A and the other is indicated at 20A. One lead B1 from the branch circuit is connected to the mechanism 18A and the companion lead B2 is connected to the neutral terminal NT. A second branch circuit is constituted by the lead B3 connected to the mechanism 20A and the lead B4 connected to the neutral terminal. Therefore, it will be readily apparent that each branch circuit is independently controlled by one of the circuit breaker mechanisms. In this connection, it will be noted that since the load terminals 24—24 are of the same polarity, they may be placed close together as illustrated in Figs. 4 and 9.

Referring now to the partition member 16, said member 16, said member is preferably of laminated construction of the type shown in Patent No. 2,005,684 to Sachs, having a central layer 122 and the outer layers or faces 124 and 126, as best illustrated in Fig. 5. Said central layer is a relatively thick sheet which is preferably formed of a suitable insulation material which is resistant to breakage or deformation, such as Bakelite or other suitable phenolic condensation compound, and the facing sheets or outer layers 124 and 126 are formed of a material having arc resisting characteristics superior to those of the sheet 122, said facing sheets being preferably formed of vulcanized fiber or other material suitable for this purpose. It will be noted that vulcanized fiber has the highly important advantages that in the presence of excessive arcing it gives out gases in relatively large quantities which assist in dissipating the arc. In this connection, it will be understood that an arcing chamber or chute 129 is formed for each of the circuit breaker mechanisms by the casing part 128, which is provided with an arc vent 130, and that portion of the barrier 16 which is disposed in opposition to the portion 128 of said casing part. Further in this connection, it will be understood that, if desired, said barrier member 16 need not be laminated throughout the entire extent thereof, but that the outer layers of fiber may be provided only on those surface portions of the partition member which extend into the respective arcing chambers.

In addition to operating under the control of the bi-metallic strip 34, each of the circuit breaker mechanisms, may, if desired, additionally operate under the control of an electro-magnetic device 132 and 134, as illustrated in Figs. 11, 12 and 13, in the manner described in said Patent No. Re. 23,188. However, it will be noted that the electro-magnetic member 134 is an integral extension from the base portion 40 of the movable switch member, and constitutes a substantially rigid armature for the companion electro-magnetic member 132 provided on the bi-metallic strip 34. In order to mount said member 132 within the marginal side edges of the strip 34, the latter is notched in the opposite side edges thereof, as at 136—136, in Fig. 12 so that no portion of the electro-magnetic member 132 extends outwardly of said strip, as best shown in Fig. 13. However, it will be understood that under certain circumstances, the member 132 may be omitted, for example where the electro-magnetic tripping action is to operate only in response to excessive high current flow, in which case the strip 34 need not be notched.

The movable member 36 is preferably formed of steel so as to carry no current, all of the current flowing through the bi-metallic strip 34. In this connection, the actuator 48 is preferably formed of an insulating material since it is not required to conduct any current.

While I have shown and described the preferred embodiments of my invention, it will be understood that various changes may be made in the present invention without departing from the underlying idea or principles of the invention within the scope of the appended claims.

Having thus described my invention, what I claim and desire to secure by Letters Patent, is:

1. A duplex circuit breaker comprising complementary casing parts defining a single housing, and a pair of circuit breaker mechanisms disposed in said housing and retained in position by said parts, each of said mechanisms being provided with a pivotally mounted handle, each of said parts providing bearing support for one of said handles, said handles being in nested engagement with each other.

2. A duplex circuit breaker comprising complementary casing parts mutually secured in housing-defining relation, a partition member intermediate said parts to define companion chambers therewith, and a pair of circuit breaker mechanisms each disposed in one of said chambers, respectively, each of said mechanisms being mounted and retained in position in its related chamber by the casing part thereof and by said partition member.

3. A duplex circuit breaker comprising complementary casing parts mutually secured in housing-defining relation, a partition member intermediate said parts to define companion chambers therewith, and a pair of circuit breaker mechanisms each disposed in one of said chambers, respectively, each of said mechanisms being retained in position in its related chamber by the casing part thereof and by said partition member, and a common pivot for said mechanisms extending transversely of said chambers, said pivot being carried by said partition member and extending outwardly from the opposite sides, respectively, thereof for bearing engagement by said casing parts, respectively.

4. A duplex circuit breaker comprising complementary casing parts mutually secured in housing-defining relation, a partition member intermediate said parts to define companion chambers therewith, and a pair of circuit breaker mechanisms each disposed in one of said chambers, respectively, each of said mechanisms being retained in position in its related chamber by the casing part thereof and by said partition member, each of said mechanisms being provided with a pivotally mounted handle, each of said parts providing bearing support for one of said handles.

5. A duplex circuit breaker comprising complementary casing parts mutually secured in housing-defining relation, a partition member intermediate said parts to define companion chambers therewith, and a pair of circuit breaker mechanisms each disposed in one of said chambers, respectively, each of said mechanisms being retained in position in its related chamber by the casing part thereof and by said partition member, each of said mechanisms being provided with a pivotally mounted handle, each of said parts providing bearing support for one of said handles, said handles being in nested engagement with each other.

6. A duplex circuit breaker comprising complementary casing parts mutually secured in housing-defining relation, a partition member intermediate said parts to define companion chambers therewith, and a pair of circuit breaker mechanisms each disposed in one of said chambers, respectively, each of said mechanisms being retained in position in its related chamber by the casing part thereof and by said partition member, each of said mechanisms being provided with a pivotally mounted handle, one of said casing parts and said partition member providing rotary bearing engagement for one of said handles, said one handle and the other of said casing parts providing rotary bearing engagement for the other of said handles.

7. A duplex circuit breaker comprising complementary

casing parts mutually secured in housing-defining relation, a partition member intermediate said parts to define companion chambers therewith, and a pair of circuit breaker mechanisms each disposed in one of said chambers, respectively, each of said mechanisms being retained in position in its related chamber by the casing part thereof and by said partition member, each of said mechanisms being provided with a pivotally mounted handle, one of said casing parts and said partition member providing rotary bearing engagement for one of said handles, said one handle and the other of said casing parts providing rotary bearing engagement for the other of said handles, said one handle being nested within said other handle.

8. A duplex circuit breaker comprising complementary casing parts mutually secured in housing-defining relation, a partition member intermediate said parts to define companion chambers therewith, and a pair of independently operable circuit breaker mechanisms each disposed in one of said chambers, respectively, each of said mechanisms being retained in position in its related chamber by the casing part thereof and by said partition member, each of said mechanisms being provided with a pivotally mounted handle, said partition member being provided with an aperture in which one of said handles has rotary bearing engagement, and one of said casing parts being provided with an aperture in which the other of said handles has rotary bearing engagement.

9. A duplex circuit breaker comprising complementary casing parts mutually secured in housing-defining relation, a partition member intermediate said parts to define companion chambers therewith, and a pair of independently operable circuit breaker mechanisms each disposed in one of said chambers, respectively, each of said mechanisms being retained in position in its related chamber by the casing part thereof and by said partition member, each of said mechanisms being provided with a pivotally mounted handle, said partition member being provided with an aperture in which one of said handles has rotary bearing engagement, and one of said casing parts being provided with an aperture in which the other of said handles has rotary bearing engagement, the other of said casing parts having a portion providing additional bearing support for said one handle, and said other handle nesting on said one handle for additional bearing support.

10. A duplex circuit breaker comprising complementary casing parts mutually secured in housing-defining relation, a partition member intermediate said parts to define companion chambers therewith, and a pair of circuit breaker mechanisms each disposed in one of said chambers, respectively, each of said mechanisms being mounted and retained in position in its related chamber by the casing part thereof and by said partition member, each of said chambers being provided with an arcing chute defined by said partition member and an opposing portion of said casing parts, respectively.

11. A duplex circuit breaker comprising complementary casing parts mutually secured in housing-defining relation, a partition member intermediate said parts to define companion chambers therewith, and a pair of circuit breaker mechanisms each disposed in one of said chambers, respectively, each of said mechanisms being mounted and retained in position in its related chamber by the casing part thereof and by said partition member, each of said chambers being provided with an arcing chute defined by said partition member and an opposing portion of said casing parts, respectively, said partition member being a composite insulating plate comprising a sheet of insulating material resistant to breakage or deformation and sheets of different insulating material serving as facings for the first sheet, at least at the surface portions thereof disposed in said arcing chutes, respectively, said facing sheets having arc resisting characteristics superior to those of the first said material.

12. A duplex circuit breaker comprising complementary casing parts mutually secured in housing-defining relation, a partition member intermediate said parts to define companion chambers therewith, and a pair of circuit breaker mechanisms each disposed in one of said chambers, respectively, each of said mechanisms being mounted and retained in position in its related chamber by the casing part thereof and by said partition member, each of said chambers being provided with an arcing chute defined by said partition member and an opposing portion of said casing parts, respectively, said partition member being a composite insulating plate comprising a sheet of insulating material resistant to breakage or deformation and sheets of different insulating material serving as facings for the first sheet, at least at the surface portions thereof disposed in said arcing chutes, respectively, said facing sheets having arc resisting characteristics superior to those of the first said material, said first sheet being formed of material including artificial resin and said facing sheets being formed of vulcanized fiber.

13. In a circuit breaker having a stationary contact, a pivotally movable switch member having a contact engageable with and disengageable from said stationary contact, a current responsive latch carried by said movable member, and actuator means pivotally mounted on said movable member and operatively connected thereto, under the control of said latch, for closing the circuit breaker; that improvement which comprises the provision on said actuator means of a calibration device which is in normal overlapping engagement with said latch, said calibration device being mounted for relative movement on said actuator means whereby to vary the degree of overlap of said latch and said calibration device.

14. In a circuit breaker having a stationary contact, a pivotally movable switch member having a contact engageable with and disengageable from said stationary contact, a current responsive latch carried by said movable member, and actuator means pivotally mounted on said movable member and operatively connected thereto, under the control of said latch, for closing the circuit breaker; that improvement which comprises a releasable connection between said actuator means and said latch for calibrating the circuit breaker said connection comprising means mounted for relative adjustable movement on said actuator means and in normal overlapping engagement with said latch.

15. In a circuit breaker having a stationary contact, a pivotally movable switch member having a contact engageable with and disengageable from said stationary contact, a current responsive latch carried by said movable member, and actuator means pivotally mounted on said movable member and operatively connected thereto, under the control of said latch, for closing the circuit breaker; that improvement which comprises a releasable connection between said actuator means and said latch for calibrating the circuit breaker, said connection comprising a part mounted for relative adjustable movement on said actuator and having a portion adapted for latching engagement with said latch.

16. In a circuit breaker having a stationary contact, a pivotally movable switch member having a contact engageable with and disengageable from said stationary contact, a current responsive latch carried by said movable member, and actuator means pivotally mounted on said movable member and operatively connected thereto, under the control of said latch, for closing the circuit breaker; that improvement which comprises a connection between said actuator means and said latch which is operable to vary the degree of overlap of said latch and said actuator means for calibrating the circuit breaker, said connection having a portion adapted for latching engagement with said latch, and means biasing said portion in a direction to increase the degree of said overlap.

17. In a circuit breaker having a stationary contact, a pivotally movable switch member having a contact engage-

able with and disengageable from said stationary contact, a current responsive latch carried by said movable member, and actuator means pivotally mounted on said movable member and operatively connected thereto, under the control of said latch, for closing the circuit breaker, that improvement which comprises a connection between said actuator means and said latch which is operable to vary the degree of overlap of said latch and said actuator means for calibrating the circuit breaker, said connection having a portion adapted for latching engagement with said latch, means biasing said portion in a direction to increase the degree of said overlap, and means for adjustably moving said portion in a direction opposite to said first mentioned direction.

18. In a circuit breaker having a stationary contact, a pivotally movable switch member having a contact engageable with and disengageable from said stationary contact, and a current responsive latch carried by said movable member; actuating means pivotally mounted on said movable member and operatively connected thereto, under the control of said latch for closing the circuit breaker, said actuating means comprising lever means, a calibration device adjustably carried by said lever means, and said device having a portion for latching engagement with said latch, whereby the adjustment of said calibration device on said lever means will vary said latching engagement thereof with said latch for calibrating the circuit breaker.

19. In a circuit breaker having a stationary contact, a pivotally movable switch member having a contact engageable with and disengageable from said stationary contact, and a current responsive latch carried by said movable member; actuating means pivotally mounted on said movable member and operatively connected thereto, under the control of said latch for closing the circuit breaker, said actuating means comprising lever means, a member threaded into said lever and provided with an enlarged head, a latch element movable on said latter member between said lever and said head and provided with a portion in latching engagement with said latch, and resilient means provided on said latter member for biasing said latch element toward said head in a direction to increase the degree of overlap of said portion and said latch, whereby, when said latter member is threaded into said lever in a direction opposite said first mentioned direction, said degree of overlap is decreased.

20. In a circuit breaker having a stationary contact, a pivotally movable switch member having a contact engageable with and disengageable from said stationary contact, and a current responsive latch carried by said movable member; actuating means pivotally mounted on said movable member and operatively connected thereto, under the control of said latch for closing the circuit breaker, said actuating means comprising an actuator element provided with a latch element in latched engagement with said latch, means biasing said latch element in a direction to increase its overlap relative to said latch, and means for adjusting said latch element in an opposite direction to reduce said degree of overlap.

21. In a circuit breaker having a stationary contact, a pivotally movable switch member having a contact engageable with and disengageable from said stationary contact, a current-responsive latch member carried by said movable member and an actuating member pivotally mounted on said movable member; that improvement which comprises the provision on one of said members of a relatively movable element releasably engaged with the other of said members to operatively connect said actuating member to said movable switch element under the control of said latch member for closing the circuit breaker and operable by said relative movement thereof to vary the calibration of the circuit breaker.

22. A duplex circuit breaker comprising complementary casing parts mutually secured in housing-defining relation, a partition member intermediate said parts to define companion chambers therewith, and a pair of circuit breaker mechanisms each disposed in one of said chambers, respectively, each of said mechanisms being mounted and retained in position in its related chamber by the casing part thereof and by said partition member, said housing having a maximum widthwise dimension of substantially one inch, and terminal means for said breaker mechanisms provided within said widthwise dimension.

23. In a circuit breaker having a stationary contact, a pivotally movable switch member having a contact engageable with and disengageable from said stationary contact, a current responsive latch carried by said movable switch member, and an actuator pivotally mounted on said movable member and operatively connected thereto, under the control of said latch, for closing the circuit breaker; that improvement which comprises the provision of a fixed pivot for said movable member for said pivotal movement thereof and means providing for limited bodily movement of said movable member relative to said pivot while the actuator is latched theerto, and in a direction to provide for proper contact pressure between said contacts in the closed condition of the circuit breaker.

24. In a circuit breaker having a stationary contact, a pivotally movable switch member having a contact engageable with and disengageable from said stationary contact, a current responsive latch carried by said movable switch member, and an actuator pivotally mounted on said movable member and operatively connected thereto, under the control of said latch, for closing the circuit breaker; that improvement which comprises the provision of a fixed pivot for said movable member for said pivotal movement thereof and means providing for limited bodily movement of said movable member relative to said pivot, while the actuator is latched thereto, and in a direction to provide for proper contact pressure between said contacts in the closed condition of the circuit breaker, said means comprising a slot defined in said movable switch member, said pivot extending through said slot.

25. In a circuit breaker having a stationary contact, a pivotally movable switch member having a contact engageable with and disengageable from said stationary contact, a current responsive latch carried by said movable switch member, and an actuator pivotally mounted on said movable member and operatively connected thereto, under the control of said latch, for closing the circuit breaker; that improvement which comprises the provision of a fixed pivot for said movable member for said pivotal movement thereof and means providing for limited bodily movement of said movable member relative to said pivot while the actuator is latched thereto, whereby to provide for proper contact pressure between said contacts in the closed condition of the circuit breaker, a manually operable handle movable to different positions for operating the movable switch member to open and close the circuit breaker in the manual operation thereof, a connection between said handle and said actuator which prevents relative pivotal movement between said actuator and the movable switch member when the handle is in circuit-closing position and the actuator is latched to said movable switch member, and spring means operatively connected to said movable switch member to resiliently bias the movable member toward said stationary contact when the circuit breaker is closed.

26. In a circuit breaker having a stationary contact, a pivotally movable switch member having a contact engageable with and disengageable from said stationary contact, a current responsive latch carried by said movable switch member, and an actuator pivotally mounted on said movable member and operatively connected thereto, under the control of said latch, for closing the circuit breaker; that improvement which comprises the provision of a fixed pivot for said movable member for said pivotal movement thereof and means providing for limited bodily movement of said movable member relative to said pivot while the actuator is latched thereto, whereby to provide for proper contact pressure between

said contacts in the closed condition of the circuit breaker, a manually operable handle movable to different positions for operating the movable switch member to open and close the circuit breaker in the manual operation thereof, a connection between said handle and said actuator which prevents relative pivotal movement between said actuator and the movable switch member when the handle is in circuit-closing position and the actuator is latched to said movable switch member, and spring means operatively connected to said movable switch member to resiliently bias the movable member toward said stationary contact when the circuit breaker is closed, said spring means being effective to move the movable member to circuit-open position when said latch disengages said actuator.

27. In a circuit breaker having a stationary contact, a pivotally movable switch member having a contact engageable with and disengageable from said stationary contact, a current responsive latch carried by said movable switch member, and an actuator pivotally mounted on said movable member and operatively connected thereto, under the control of said latch, for closing the circuit breaker; that improvement which comprises the provision of a fixed pivot for said movable member for said pivotal movement thereof and means providing for limited bodily movement of said movable member relative to said pivot while the actuator is latched thereto, whereby to provide for proper contact pressure between said contacts in the closed condition of the circuit breaker, a manually operable handle movable to different positions for operating the movable switch member to open and close the circuit breaker in the manual operation thereof, a connection between said handle and said actuator which prevents relative pivotal movement between said actuator and the movable switch member when the handle is in circuit-closing position and the actuator is latched to said movable switch member, and spring means operatively connected to said movable switch member to resiliently bias the movable member toward said stationary contact when the circuit breaker is closed, said spring means being effective to move the movable member and said handle to their respective circuit-open position when said latch disengages said actuator.

28. In a circuit breaker having a stationary contact, a pivotally movable switch member having a contact engageable with and disengageable from said stationary contact, a current responsive latch carried by said movable switch member, and an actuator pivotally mounted on said movable member and operatively connected thereto, under the control of said latch, for closing the circuit breaker; that improvement which comprises the provision of a fixed pivot for said movable member for said pivotal movement thereof and means providing for limited bodily movement of said movable member relative to said pivot while the actuator is latched thereto, whereby to provide for proper contact pressure between said contacts in the closed condition of the circuit breaker, said means comprising a slot defined in said movable switch member, said pivot extending through said slot, and spring means operatively connected to said movable switch member for biasing the same for movement transversely of said pivot in contact-engaging direction while the contacts are engaged in the latched condition of the circuit breaker.

29. A circuit breaker, as defined in claim 28, further characterized in that said spring means is operable to move said movable contact member to open-circuit position when said actuator is released by said latch.

30. A circuit breaker comprising relatively movable companion contacts engageable with and disengageable from each other for closing and opening the circuit breaker, a movable member provided with one of said contacts, means for actuating said movable member to engage and disengage said companion contacts, said actuating means including latching means, spring means for disengaging said contacts in the unlatched condition thereof, a fixed pivot for said movable member, means providing for limited bodily movement of said movable member relative to said pivot, and an operative connection of said spring means to said movable member operable in conjunction with said limited bodily movement means for exerting contact pressure between said companion contacts in the engaged condition thereof.

31. In an automatic circuit breaker, a stationary contact, and a movable contact mechanism, said mechanism comprising a switch member mounted for pivotal movement and a flexible control element provided on said member for bodily movement therewith, said control element being flexible in a direction transversely of its opposite sides and being provided with a contact making portion on one of said sides for engagement with and disengagement from said stationary contact to close and to open the breaker, respectively, said switch member having a portion underlying said contact making portion to provide a rigid backing and mechanical support therefor.

32. In an automatic circuit breaker, a stationary contact, and a movable contact mechanism, said mechanism comprising a member mounted for pivotal movement and having opposed arms and an interconnecting portion, and a flexible control element mounted on said interconnecting portion for bodily movement with said member, said control element having a contact making portion for engagement with and disengagement from said stationary contact to close and to open the breaker, respectively, and said interconnecting portion underlying said contact making portion to provide a rigid backing and mechanical support therefor.

33. In an automatic circuit breaker provided with relatively movable contacts, a flexible circuit-controlling member provided with one of said contacts, a carrier member having a predetermined portion on which said control member is carried, said portion underlying the portion of said control member provided with said one contact to provide a rigid backing and mechanical support for said one contact, said carrier member having a part for mounting said carrier for movement for engaging and disengaging said relatively movable contacts, means for actuating said carrier member including a part movably mounted thereon and releasably engaged by said flexible circuit-controlling member, and electro-magnetic means operable in response to the current carried by said control member to flex the latter for effecting relative movement of said contacts.

34. In an automatic circuit breaker provided with relatively movable contacts, a flexible circuit-controlling member provided with one of said contacts, a carrier member having a predetermined portion on which said control member is carried, said portion underlying the portion of said control member provided with said one contact to provide a rigid backing and mechanical support for said one contact, said carrier member having a part for mounting said carrier for movement for engaging and disengaging said relatively movable contacts, means for actuating said carrier member including a part movably mounted thereon and releasably engaged by said flexible circuit-controlling member, and electro-magnetic means operable in response to the current carried by said control member to flex the latter for effecting relative movement of said contacts, said electro-magnetic means comprising a rigid armature provided on said predetermined portion of said carrier.

35. In an automatic circuit breaker provided with relatively movable contacts, a flexible circuit-controlling member provided with one of said contacts, a carrier member having a predetermined portion on which said control member is carried, said portion underlying the portion of said control member provided with said one contact to provide a rigid backing and mechanical support

for said one contact, said carrier member having a part for mounting said carrier for movement for engaging and disengaging said relatively movable contacts, means for actuating said carrier member including a part movably mounted thereon and releasably engaged by said flexible circuit-controlling member, and electro-magnetic means operable in response to the current carried by said control member to flex the latter for effecting relative movement of said contacts, said electro-magnetic means comprising a rigid armature provided on said predetermined portion of said carrier, and an electro-magnetic member provided on said control member.

36. In an automatic circuit breaker provided with relatively movable contacts, a flexible circuit-controlling member provided with one of said contacts, a carrier member having a predetermined portion on which said control member is carried, said portion underlying the portion of said control member provided with said one contact to provide a rigid backing and mechanical support for said one contact, said carrier member having a part for mounting said carrier for movement for engaging and disengaging said relatively movable contacts, means for actuating said carrier member including a part movably mounted thereon and releasably engaged by said flexible circuit-controlling member, and electro-magnetic means operable in response to the current carried by said control member to flex the latter for effecting relative movement of said contacts, said electro-magnetic means comprising a rigid armature provided on said predetermined portion of said carrier and an electro-magnetic member provided on said control member, said electro-magnetic member having a width-wise dimension which does not exceed the width-wise dimension of said control member.

37. A duplex circuit breaker comprising a pair of complementary casing parts which define a housing split along a plane intermediate the opposing side walls of the housing, pivot means extending between said side walls and mounted thereby, and a pair of independently operable breaker mechanisms mounted in side-by-side disposition between said side walls by said pivot means, each of said mechanisms being provided with an operating handle, said handles being in side-by-side relation and each casing part providing a bearing support for the handle of the adjacent breaker mechanism.

38. A duplex circuit breaker comprising opposite casing parts mutually secured in housing-defining relation and defining a cavity therebetween, insulated partition means mounted intermediate said casing parts and dividing said cavity into a pair of chambers, a circuit breaker mechanism mounted in each of said chambers with said partition means disposed therebetween, each of said mechanisms being retained in position in its related chamber by the casing part thereof and by said partition means, said circuit breaker mechanisms being independently operable and each having its own load terminal, and a line terminal common to said mechanisms.

39. A duplex circuit breaker comprising opposite casing parts mutually secured in housing-defining relation and defining a cavity therebetween, insulated partition means mounted intermediate said casing parts and dividing said cavity into a pair of chambers, a circuit breaker mechanism mounted in each of said chambers, each of said mechanisms being retained in position in its related chamber by the casing part thereof and by said partition means, said circuit breaker mechanisms being independently operable and each having its own load terminal, and an automatic disconnect line terminal common to said mechanisms.

40. A duplex circuit breaker comprising opposite casing parts mutually secured in housing-defining relation and defining a cavity therebetween, insulated partition means mounted intermediate said casing parts and dividing said cavity into a pair of chambers, a circuit breaker mechanism mounted in each of said chambers with said partition means disposed therebetween, each of said mechanisms being retained in position in its related chamber by the casing part thereof and by said partition means, said circuit breaker mechanisms being independently operable and each having its own load terminal, and a plug-in line terminal common to said mechanisms.

41. A duplex circuit breaker comprising opposite casing parts mutually secured in housing-defining relation and defining a cavity therebetween, insulated partition means mounted intermediate said casing parts and dividing said cavity into a pair of chambers, a circuit breaker mechanism mounted in each of said chambers, each of said mechanisms being retained in position in its related chamber by the casing part thereof and by said partition means, said circuit breaker mechanisms being independently operable and each having its own load terminal, an automatic disconnect line terminal common to said mechanisms, and a mechanical holding formation provided on said casing and spaced from said common line terminal.

42. A duplex circuit breaker comprising opposite casing parts mutually secured in housing-defining relation and defining a cavity therebetween, insulated partition means mounted intermediate said casing parts and dividing said cavity into a pair of chambers, a circuit breaker mechanism mounted in each of said chambers with said partition means disposed therebetween, each of said mechanisms being retained in position in its related chamber by the casing part thereof and by said partition means, said circuit breaker mechanisms being independently operable and each having its own load terminal, a plug-in line terminal common to said mechanisms, and a mechanical holding formation provided on said casing and spaced from said common line terminal.

43. A circuit breaker having a stationary contact, a rockably movable switch member having a contact engageable with and disengageable from said stationary contact, a current-responsive latch carried by said movable member, and pivotally mounted actuator means movable with and operatively connected to said movable switch member for closing the circuit breaker under control of said latch, and a connection between said actuator means and said latch which is operable to vary the degree of overlap of said latch and said actuator means for calibrating the circuit breaker.

44. A circuit breaker having a stationary contact, a rockably movable switch member having a contact engageable with and disengageable from said stationary contact, a current-responsive latch carried by said movable member, and pivotally mounted actuator means movable with and operatively connected to said movable switch member for closing the circuit breaker under control of said latch, said switch member and said latch being elongated elements joined together at one point and extending to said actuator means with the latter overlapping the latch when the circuit breaker is closed, said actuator means having a portion operable variably to project and retract and thereby determine the initial extent of said actuator means across said latch for calibrating the circuit breaker.

45. A duplex circuit breaker comprising opposite casing parts mutually secured in housing-defining relation, a partition member intermediate said parts to define companion chambers therewith, and a pair of circuit breaker mechanisms each disposed in one of said chambers, respectively, each of said mechanisms being mounted and retained in position in its related chamber by the casing part thereof and by said partition member, said circuit breaker mechanisms being independently operable and each having its own load terminal, said circuit breaker mechanisms having plug-in line terminal means disposed between said opposite casing parts at a single location to

establish plug-in connection with a single line terminal portion.

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