April 24, 1945. P. M. CHRISTENSEN 2,374,273

MULTIPOLE AUTOMATIC CIRCUIT BREAKER

Filed March 21, 1944

Fig. 1

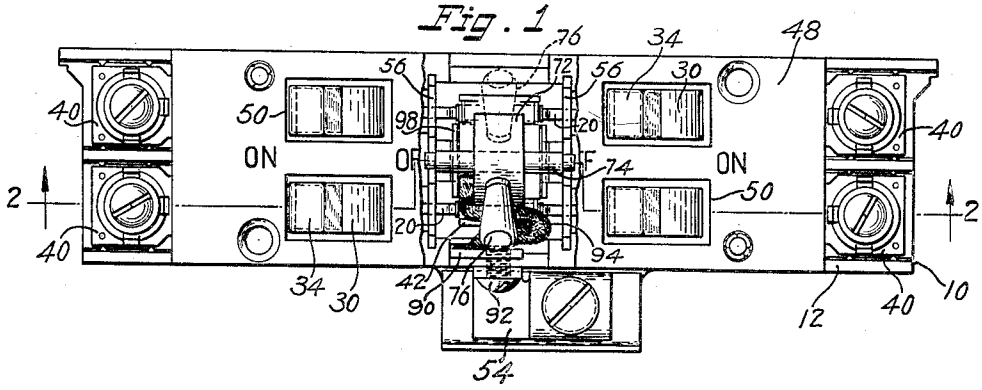


Fig. 2

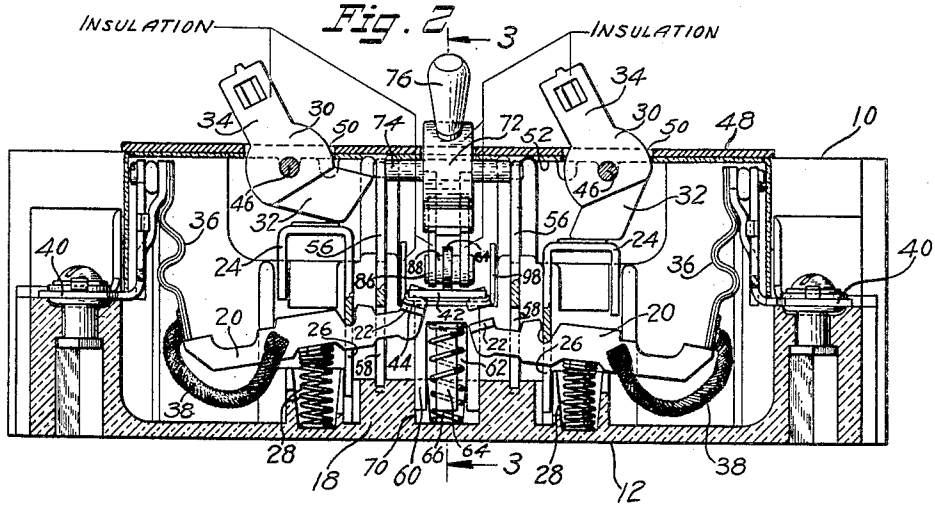


Fig. 3

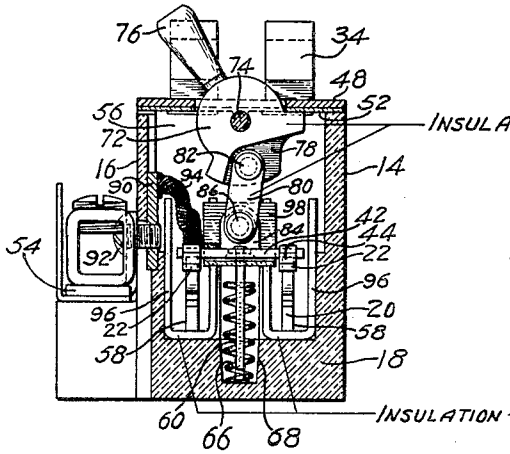
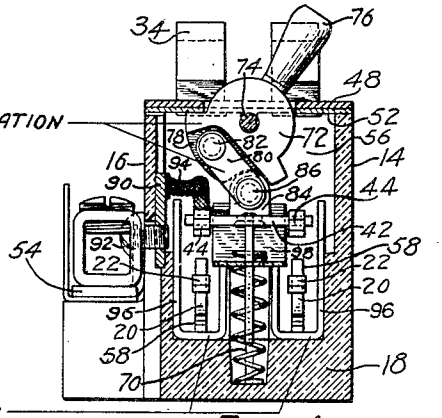


Fig. 4



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MULTIPOLE AUTOMATIC CIRCUIT BREAKER

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10 Claims. (Cl. 175—298)

This invention relates to multipole automatic circuit breakers and more particularly to conventional multipole circuit breakers which are contained in unitary insulating casings adapted to be mounted singly or nested with other casings within switch boxes. Said conventional type of multipole circuit breaker comprises a plurality of switching units each composed of a movable and a stationary contact as well as current responsive means for effecting separation of said contacts and a manually operable member for effecting separation thereof and for resetting said current responsive means after an automatic contact separation. The stationary contacts of said units are all secured to and supported by a bus bar positioned substantially medially of the casing and projecting at one end through one side wall thereof for connection to a line terminal. The movable contacts are respectively electrically connected to separate service terminals.

Conventional types of multipole circuit breakers to which the present invention pertains are illustrated in U. S. Patents Nos. 2,096,545, 2,096,547 and 2,132,627 to Jackson. In disconnecting all of the service circuits from a line connected to a multipole circuit breaker of this type, it is now necessary to manually move each of the operating members for each switching unit to "off" position. Such duplicate manipulation of said operating members is time consuming.

The National Electric Code presently allows only a maximum of six separate units or subdivisions of this type of multipole circuit breaker for any single dwelling or similar installation. If more than six units are required, it is then necessary to install a separate disconnect switch in the line to one or more of the multipole assemblies, whereby there will be no more than six operations required to totally disconnect all service circuits from the main line.

It is an object of the present invention to include with a multipole circuit breaker assembly in a unitary casing a supplementary switch mechanism by which the circuit may be disconnected between the line terminal and the bus bar which commonly supports all of the stationary switch contacts, whereby the total number of service circuits permissible under Code requirements when using supplementary switch construction will be greatly increased over the number of service circuits now permitted when using conventional multipole circuit breakers.

It is another object of the invention to confine the supplementary switch and all its operating parts within the confines of the side walls of the casing of a conventional multipole circuit breaker, whereby said casing may be readily substituted for another conventional multipole circuit breaker mounted within a switch box and no additional space will be required to accommodate the first-mentioned casing.

It is a still further object of the invention to provide a pivotally mounted operating member for the supplementary switch, the axis of said pivot extending transversely to the axes of the parallel pivots about which the individual operating members of the conventional circuit breaker units oscillate, whereby confusion between the operating member for the supplementary switch and the operating members for the circuit breaker units will be prevented.

Details of the foregoing objects and of the invention, as well as other objects thereof, are described in the following specification and illustrated in the accompanying drawing comprising a part thereof.

The accompanying drawing shows the embodiment of the invention which is deemed preferable, but it will be understood that the drawing is intended for illustrative purposes only and are not to be construed as defining or limiting the scope of the invention, the claims forming a part of this specification being relied upon for that purpose.

In the drawing,

Fig. 1 is a top plan view of a multipole circuit breaker embodying details of the present invention, the cover for the insulating casing thereof being partially broken away to better illustrate certain features of the invention.

Fig. 2 is a sectional side elevation taken on the line 2—2 of Fig. 1 and illustrates one of the circuit breaker units in "on" position and another unit in manual "off" position, the supplementary switch being "on" in said view.

Fig. 3 is a sectional end elevation taken on the line 3—3 of Fig. 2 and illustrates the supplementary switch in "on" position.

Fig. 4 is a view similar to Fig. 3 but illustrates the supplementary switch in "off" position, wherein none of the individual circuit breaker units may be connected in circuit with the line terminal.

The present drawing illustrates a multipole circuit breaker assembly containing, for example and without restriction, four circuit breaker units. It is to be understood that the present invention is equally applicable to multipole circuit breakers

having a different number of circuit breaker units in the assembly within the casing and in which all of the stationary contacts of said units are electrically connected to each other and to the line terminal.

Referring to the drawing, the multipole automatic circuit breaker assembly 10 comprises a molded insulating casing 12 including opposed side walls 14 and 16 which extend upward from a base 18. Said casing is provided with numerous cavities, recesses, grooves, and projecting ribs which will be described in detail hereinafter.

As stated in the foregoing, the casing illustrated in the drawing contains four circuit breaker units each comprising a movable contact bar 20 supporting at one end a movable contact 22.

Movement of each contact bar is controlled by a U-shaped slidably mounted member 24 which is provided in one end with a vertical slot 26 which receives the contact bar 20. Contact bar 20 is normally biased upward into said slot 26 by a coil spring 28. Movement of the U-shaped member 24 is effected and controlled by an insulating member 30 provided with a cam 32 which directly engages U-shaped member 24. Each member 30 is also provided with a manually engageable handle 34.

The end of the contact bar 20 opposite that which supports the movable contact 22 is engageable with one end of a thermally responsive bimetallic member 36 which is electrically connected to said contact bar by a braided metallic conductor 38. The bimetallic member 36 is directly connected to a service terminal 40.

A bus bar 42 commonly supports the stationary contacts 44 of all units, said stationary contacts being respectively engageable by one of the movable contacts 22.

When the cam 32 of one of the members 30 is in the position shown at the right hand side in Fig. 2, the U-shaped member 24 will hold the movable and stationary contacts of that particular unit in manually "off" position. When the cam 32 is positioned as illustrated at the left-hand side in Fig. 2, the spring 28 will bias the movable contact 22 upward into engagement with the stationary contact 44 to establish said unit in "on" position.

While not illustrated in the present drawing, it will be understood by anyone familiar with this art that in the event of an overload occurring in any particular line circuit in this type of circuit breaker, the bimetallic member 36 of the circuit breaker unit controlling said circuit will be distorted so that its free end moves from engagement with the outer end of the contact bar 20, permitting the spring 28 to bias said disengaged end of the contact bar upward and disengage the movable contact 22 from the stationary contact 44. The member 30 may subsequently be manipulated to reset the contact bar into proper engagement with the bimetallic member 36 after said member has cooled sufficiently to be restored to its normal position. These functions are clearly illustrated in one or more of the aforementioned patents.

The insulating members 30 by which the U-shaped members 24 are manipulated are mounted on a plurality of rods 46 which extend transversely to the longitudinal axis of the casing 12. Said rods 46 are parallel to each other and the ends of said rods are received in suitable positioning notches provided in the side walls 14 and 16 of the casing as is clearly illustrated in Fig. 2. A cover plate 48, bearing appropriate legends of "on" and "off" is provided with suitable openings 50 to accommodate the members 30. Said cover plate and the parallel sheet of insulating material 52 thereunder will serve to maintain the rods 46 within the supporting notches in the walls of the casing.

The construction thus far described is conventional in this type of multipole circuit breakers. In said conventional construction, the bus bar 42 extends through a suitable opening in one side wall of the casing and is directly connected to a line terminal 54. The members 30 respectively control service circuits connected to the line terminal 54. The code referred to in the foregoing will only permit a maximum of six circuit breaker units of this type in any particular installation. If more circuits are desired, additional switches must be included between the line and the line terminal 54, whereby a maximum of six switches only will have to be opened in order to disconnect all circuits in the installation.

The present invention overcomes the necessity of an additional switch between the line and the line terminal 54 in installations where a reasonable number of service circuits in excess of six are desired. To this end, the bus bar 42 is mounted so as to be vertically movable upward from its position shown in Figs. 2 and 3 to that shown in Fig. 4. When the bus bar is elevated to the position shown in Fig. 4, the movable contacts 22 may not be moved into engagement with the stationary contacts 44. The construction by which the bus bar is actuated and maintained in a desired position is as follows:

A pair of parallel insulating sheets or plates 56 are mounted in suitable vertical positioning slots provided in the side walls of the casing 12, the lower ends of the insulating plates 56 being vertically slotted from their lower edge, the slots 58 respectively slidably accommodating one of the contact bars 20. The upper end of the slots 58 limit the upward movement of the contact bars, whereby when the bus bar 42 is elevated to the position shown in Fig. 4, said limiting of the upward movement of the bus bars will prevent engagement between the movable and stationary contacts.

The bus bar 42 is secured to the upper end of a vertical stem 60 provided with a pair of vertical slots 62 extending upward from the lower edge thereof. Said slots provide a central tongue 64 about which a coil spring 66 is disposed.

The base 18 of the casing is provided with a cylindrical cavity 68 which accommodates the lower end of spring 66 and opposed slots 70 extend outward from said cavity to respectively slidably receive the lower ends of the opposite sides of the stem 60 and thus guide the vertical movement of said stem and the bus bar 42.

Bus bar 42 is actuated by means of a toggle mechanism comprising a rotatable member 72 supported on a horizontal shaft 74, the opposite ends of which are mounted in suitable bearing notches provided in the upper ends of plates 56. It will be observed that the axis of shaft 74, while substantially planar with the axes of rods 46, is transverse thereto. Thus member 72 oscillates in a plane transverse to those in which members 30 oscillate. A manually operable handle 76 projects upward from the member 72 and is adapted to oscillate said member. An integral web 78 depends from the lower end of member 72 and a pair of spaced links 80 are pivotally secured at one end to opposite sides of web 78 by a suitable

headed pin 82. The bus bar is provided with an apertured ear 84 which extends upward from the top surface thereof, said ear being pivotally connected between and to the lower ends of links 80 by means of another headed pin 86. Suitable spacing washers 88 are also mounted on said pin 86 between the links and ear.

In the present construction, the line terminal 54 is mounted on the exterior of wall 16 of the casing and is directly connected to a conducting plate 90 by means of a screw 92. A braided flexible conductor 94 electrically connects the conducting plate 90 with the bus bar 42 and permits relative movement between the same. Arcing between the fixed and movable contacts 22 and 44 is confined within the casing and is prevented from contacting certain metallic parts projecting into the casing by means of U-shaped fiber members 96 and 98.

When the handle 76 is disposed in the position shown in full lines in Figs. 1 through 3, the pin 82 will be past the dead center extending between shaft 74 and pin 86, whereby the toggle mechanism will maintain the bus bar 42 in its normally operative position. In this position of the bus bar, the contacts 44 are normally stationary. When the handle 76 is moved to the position shown in Fig. 4, and in dotted lines in Fig. 1, the toggle links 80 will be moved so as to permit the spring 66 to elevate the bus bar to its inoperative position and, inasmuch as the bus bar commonly supports all of the normally stationary contacts, said contacts will be moved to a position wherein the movable contacts 22 may not engage the same due to the limitation of the vertical movement of contact bars 20 within slots 58.

Thus a single supplementary switch mechanism including a single operating member 76 and a toggle mechanism connecting it to the bus bar 42 will serve to control a plurality of circuit breaker units mounted within a unitary casing. Further, inasmuch as the axis of rotation of the single operating member for the supplementary switch is transverse to the axes about which the operating members for the individual circuit breaker units oscillate, there will be no confusion between said circuit breaker operating members and said supplementary switch operating member. An operator will develop the habit of moving the circuit breaker controlling handles in a certain direction and, should he accidentally engage the handle 76 of the supplementary switch and endeavor to move it in the direction in which the handles 34 are habitually moved, the handle 76 will not be pivotally movable in that direction. This will serve to indicate to the operator that he has engaged the wrong operating member or handle for purposes of manipulating a particular circuit breaker unit. Conversely, the handles 34 will not oscillate in the same plane as the handle 76 should the operator desire to operate the supplementary switch to simultaneously disconnect all circuit breaker units and accidentally engage one of the handles 34.

Inasmuch as the supplementary switch mechanism described above is mounted within the confines of the walls 14 and 16 of a conventional casing, an assembly embodying said supplementary switch may be readily substituted in any installation containing a conventional assembly in a unitary casing which does not include such a supplementary switch. Thus, no modification of the wiring or change in position of the other multibreaker assembly or assemblies mounted within a switch box need be made to effect a substitution of the circuit breaker assembly described above for a conventional assembly.

While the invention has been illustrated and described in its preferred embodiment and has included certain details, it should be understood that the invention is not to be limited to the precise details herein illustrated and described since the same may be carried out in other ways, falling within the scope of the invention as claimed.

What I claim is:

1. A multipole automatic circuit breaker comprising a casing enclosing a plurality of movable and normally stationary contacts and also enclosing current responsive means for effecting separation of said contacts, means engageable by said movable contacts to limit the movement thereof in stationary contact engaging direction, manually operable means for effecting separation of said contacts and for resetting said current responsive means after an automatic contact separation, a line terminal on said casing, and a plurality of service terminals respectively connected to said movable contacts, in combination with a bus bar connected to and directly supporting said stationary contacts, said bus bar being connected to said line terminal and mounted in said casing for movement between one position wherein the stationary contacts are normally engageable by said movable contacts and another position wherein said stationary contacts are located beyond the limit of movement of said movable contacts, and manually actuated means connected to said bus bar and operable to move said bus bar from said one position to said another position to interrupt all circuits between said contacts and prevent engagement between said contacts until said bus bar is restored to said one position.

2. A multipole automatic circuit breaker comprising a casing enclosing a plurality of movable and normally stationary contacts and also enclosing current responsive means for effecting separation of said contacts, means engageable by said movable contacts to limit the movement thereof in stationary contact engaging direction, manually operable means for effecting separation of said contacts and for resetting said current responsive means after an automatic contact separation, a line terminal on said casing, and a plurality of service terminals respectively connected to said movable contacts, in combination with a bus bar connected to and directly supporting said stationary contacts, said bus bar being connected to said line terminal and mounted in said casing for movement between one position wherein the stationary contacts are normally engageable by said movable contacts and another position wherein said stationary contacts are located beyond the limit of movement of said movable contacts, means in said casing adapted to guide the movement of said bus bar between said positions thereof, and manually actuated means connected to said bus bar and operable to move said bus bar from said one position to said another position to interrupt all circuits between said contacts and prevent engagement between said contacts until said bus bar is restored to said one position.

3. A multipole automatic circuit breaker comprising a casing enclosing a plurality of movable and normally stationary contacts and also enclosing current responsive means for effecting separation of said contacts, means engageable

by said movable contacts to limit the movement thereof in stationary contact engaging direction, manually operable means for effecting separation of said contacts and for resetting said current responsive means after an automatic contact separation, a line terminal on said casing, and a plurality of service terminals respectively connected to said movable contacts, in combination with a bus bar connected to and directly supporting said stationary contacts, said bus bar being connected to said line terminal and mounted in said casing for movement between one position wherein the stationary contacts are normally engageable by said movable contacts and another position wherein said stationary contacts are located beyond the limit of movement of said movable contacts, means normally biasing said bus bar toward said another position, and manually actuated means connected to said bus bar and operable to move said bus bar from said one position to said another position to interrupt all circuits between said contacts and prevent engagement between said contacts until said bus bar is restored to said one position.

4. A multipole automatic circuit breaker comprising a casing enclosing a plurality of movable and normally stationary contacts and also enclosing current responsive means for effecting separation of said contacts, means engageable by said movable contacts to limit the movement thereof in stationary contact engaging direction, manually operable means for effecting separation of said contacts and for resetting said current responsive means after an automatic contact separation, a line terminal on said casing, and a plurality of service terminals respectively connected to said movable contacts, in combination with a bus bar connected to and directly supporting said stationary contacts, said bus bar being mounted in said casing for movement between one position wherein the stationary contacts are normally engageable by said movable contacts and another position wherein said stationary contacts are located beyond the limit of movement of said movable contacts, manually actuated means connected to said bus bar and operable to move said bus bar from said one position to said another position to interrupt all circuits between said contacts and prevent establishment of a circuit between said contacts until said bus bar is restored to said one position, and a flexible conductor connecting said bus bar and line terminal.

5. A multipole automatic circuit breaker comprising a casing enclosing a plurality of movable and normally stationary contacts and also enclosing current responsive means for effecting separation of said contacts, means engageable by said movable contacts to limit the movement thereof in stationary contact engaging direction, manually operable means for effecting separation of said contacts and for resetting said current responsive means after an automatic contact separation, a line terminal on said casing, and a plurality of service terminals respectively connected to said movable contacts, in combination with a bus bar connected to and directly supporting said stationary contacts, said bus bar being mounted in said casing for movement between one position wherein the stationary contacts are normally engageable by said movable contacts and another position wherein said stationary contacts are located beyond the limit of movement of said movable contacts, and means comprising a manually operable member movably mounted on said casing and toggle mechanism connected thereto and to said bus bar, whereby said manually operable member may be actuated to move said bus bar from said one position to said another position to interrupt all circuits between said contacts and prevent establishment of a circuit between said contacts until said bus bar is restored to said one position.

6. A multipole automatic circuit breaker comprising a casing enclosing a pluraliity of movable and normally stationary contacts and also enclosing current responsive means for effecting separation of said contacts, means engageable by said movable contacts to limit the movement thereof in stationary contact engaging direction, manually operable means for effecting separation of said contacts and for resetting said current responsive means after an automatic contact separation, a line terminal on said casing, and a plurality of service terminals respectively connected to said movable contacts, in combination with a bus bar connected to and directly supporting said stationary contacts, said bus bar being mounted in said casing for movement between one position wherein the stationary contacts are normally engageable by said movable contacts and another position wherein said stationary contacts are located beyond the limit of movement of said movable contacts, and mechanism comprising a manually operable member pivotally mounted on said casing and toggle means connected to one end of said member and to said bus bar, whereby said pivoted member may be actuated to move said bus bar from said one position to said another position to interrupt all circuits between said contacts, said mechanism also including means coacting with said bus bar to yieldably maintain said bus bar in said another position to prevent establishment of a circuit between said contacts until said bus bar is restored to said one position.

7. A multipole automatic circuit breaker comprising a casing enclosing a plurality of movable and normally stationary contacts and also enclosing current responsive means for effecting separation of said contacts, means engageable by said movable contacts to limit the movement thereof in stationary contact engaging direction, manually operable means pivotally mounted on parallel axes and movable to effect separation of said contacts and to reset said current responsive means after an automatic contact separation, a line terminal on said casing, and a plurality of service terminals respectively connected to said movable contacts, in combination with a bus bar connected to and directly supporting said stationary contacts, said bus bar being mounted in said casing for movement between one position wherein the stationary contacts are normally engageable by said movable contacts and another position wherein said stationary contacts are located beyond the limit of movement of said movable contacts, a manually operable member pivotally mounted on an axis extending transversely to the axes of said manually operable means to prevent confusion between said member and said means, toggle mechanism connected to one end of said member and to said bus bar, whereby said pivoted member may be actuated to move said bus bar from said one position to said another position to interrupt all circuits between said contacts, and means coacting with said bus bar to yieldably maintain said bus bar in said another position to prevent establishment of a circuit be-

tween said contacts until said bus bar is restored to said one position.

8. A multipole automatic circuit breaker comprising a plurality of switching units, each of said switching units comprising a stationary and a movable contact and current responsive means for automatically effecting separation of said contacts independently of the other switching units and each unit also comprising manually operable means for effecting separation of said contacts and for resetting said current responsive means after an automatic contact separation, an insulating casing enclosing within its walls all of said units, a line terminal on said casing, a conducting member connected to said line terminal and to all said stationary contacts of said units, a plurality of service terminals respectively connected to said movable contacts of said units, said conducting member carrying said stationary contacts of said units and being normally stationary and mounted for movement to a retracted position whereby to disengage said stationary contacts from their companion movable contacts, respectively, independently of said manually operable and said current responsive means, and means operable independently of said manually operable and said current responsive means for moving said normally stationary conducting member to said retracted position thereof whereby to interrupt and prevent re-establishment of a circuit between said line terminal and said service terminals.

9. A multipole automatic circuit breaker comprising a plurality of switching units, each of said switching units comprising a stationary and a movable contact and current responsive means for automatically effecting separation of said contacts independently of the other switching units and each unit also comprising manually operable means for effecting separation of said contacts and for resetting said current responsive means after an automatic contact separation, a normally stationary member carrying said stationary contacts of all of said units and being mounted for movement from a position in which the stationary contacts are engageable by their companion movable contacts to a retracted position in which said stationary contacts are disengaged from their companion movable contacts and are non-engageable by the latter, and means operable independently of said manually operable and said current responsive means for moving said normally stationary member to said retracted position thereof.

10. A multipole automatic circuit breaker comprising a plurality of switching units, each of said switching units comprising a stationary and a movable contact and current responsive means for automatically effecting separation of said contacts independently of the other switching units and each unit also comprising manually operable means for effecting separation of said contacts and for resetting said current responsive means after an automatic contact separation, a normally stationary member carrying said stationary contacts of all of said units and being mounted for movement from a position in which the stationary contacts are engageable by their companion movable contacts to a retracted position in which said stationary contacts are disengaged from their companion movable contacts and are non-engageable by the latter, and means for holding said normally stationary member releasably either in said first mentioned position thereof or in said retracted position thereof and including means operable independently of said manually operable and current responsive means for moving said normally stationary member to either of said positions thereof.

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