

Aug. 17, 1965

L. L. BAIRD

3,201,556

SELF-ALIGNING DISCONNECT ASSEMBLY

Filed July 19, 1963

FIG. 1.

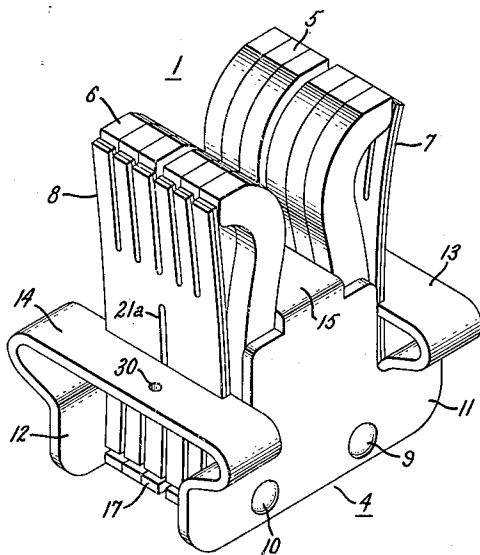


FIG. 2.

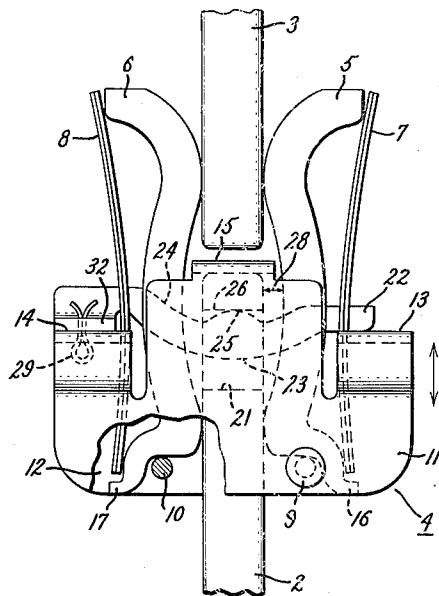


FIG. 3.

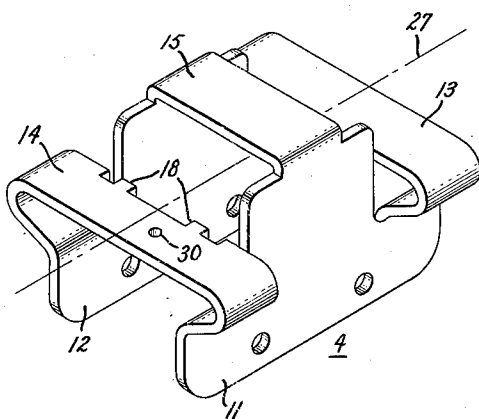
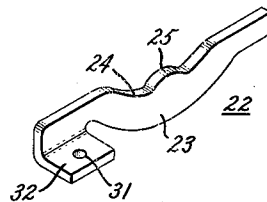


FIG. 4.



INVENTOR:
LESLIE L. BAIRD,
BY Albert S. Richardson Jr.
ATTORNEY.

1

2

3,201,556

SELF-ALIGNING DISCONNECT ASSEMBLY
Leslie L. Baird, Swarthmore, Pa., assignor to General
Electric Company, a corporation of New York
Filed July 19, 1963, Ser. No. 296,332
12 Claims. (Cl. 200-166)

This invention relates to electric power distribution apparatus and, more particularly, to an electric disconnect assembly suitable for use with current carrying devices.

In the art of electric power distribution it is common practice to arrange individual switches, contactors and other circuit interrupting and controlling devices so as to be conveniently removable from the power apparatus or installation of which they are part. The current-conducting parts of such devices are electrically connected to associated supply and load circuits in the apparatus by means of cooperating, separable "disconnect" members or assemblies, with suitable means being provided for moving the disconnect assemblies between connected and disconnected positions. In this way the circuit controlling devices can be completely deenergized and readily withdrawn or removed from the apparatus for purposes of repair, maintenance or replacement.

In conventional disconnect designs a plurality of parallel conducting elements or fingers are mounted on a conductor or stud in slidable engagement with a mating conductor or blade. One of these conductors is an integral part of a power circuit of the apparatus, and the other is part of a removable circuit controlling device associated therewith, the two parts being disposed for relative movement out of and into proximity with respect to each other. The parallel fingers of such a disconnect assembly are arranged to resiliently embrace both conductors to form a high-pressure, low-resistance yet readily separated electrical interconnection therebetween. It is an object of my invention to provide an improved disconnect assembly of this general kind capable of safely conducting 800 amperes, which assembly is relatively inexpensive to fabricate and easy to install.

Another object of this invention is to provide an improved disconnect assembly of unitary construction which facilitates mounting and dismounting of the assembly.

It is known that a certain amount of flexibility or play is needed to accommodate misalignment between the conductor on which a disconnect assembly is mounted and the conductor with which it is to be electrically connected. Misalignment may be caused by inaccuracies of manufacturing and assembly as well as wear or other unforeseen causes, and it can result in unequal pressure distribution among the contact surfaces of the disconnect fingers or, possibly prevention of the completion of the desired connection. Accordingly, it is a still further object of this invention to provide an improved disconnect assembly having a relatively high degree of misalignment accommodation.

Further objects and advantages of this invention will be better understood from the following description referring to the accompanying drawing, and the features of novelty which characterize this invention will be pointed out with particularity in the claims annexed to and forming part of this specification.

In accordance with one embodiment of this invention, a unitary disconnect assembly is formed from a one-piece frame which resiliently supports a plurality of contact fingers. The contact fingers are grouped in two spaced apart generally parallel sets or members which are biased towards one another, with a transverse portion of the frame being disposed therebetween, and opposite ends of each finger extend longitudinally from opposite sides of the transverse portion of the frame. The two sets of contact fingers are adapted to receive two different male

conductors, a relatively stationary conductor on one side of the transverse portion and a movable conductor on the other side, and the transverse portion of the frame serves as a force transmission means upon interconnection of the conductors. The frame and contact fingers form a unitary structure available for installation as a unit on either one of the two conductors whereon it is floatingly retained by means of a removable key. The key, in addition to fastening the disconnect assembly to the conductor, permits self-alignment of the assembly thereby accommodating misalignment of the conductors.

In the drawing, FIGURE 1 is a perspective view showing a unitary disconnect assembly embodying the present invention.

FIGURE 2 is a side elevational view of the disconnect assembly in use.

FIGURE 3 is a perspective view showing the one-piece frame of the disconnect assembly.

FIGURE 4 is a perspective view showing the removable key used for retaining the disconnect assembly on a conductor.

With reference to the figures, and particularly FIGURES 1 and 2, there is shown a unitary disconnect assembly 1 adapted to be floatingly mounted on a breaker stud 2 of rectangular cross section and adapted to receive a companion conductor or primary disconnect bar 3 projecting from the opposite direction. The assembly 1 is intended for use with a low voltage drawout circuit breaker (not shown) to serve as a multiple point disconnecting means for separably interconnecting the primary disconnect bar 3 and the relatively movable breaker stud 2, but it is not limited to such a use.

The unitary disconnect assembly 1 comprises a one-piece frame 4, a pair of contact members 5, 6, a pair of resilient means 7, 8 and a pair of restraining means or cross pins 9, 10. The frame 4 is fabricated from a single metal blank as illustrated in FIGURE 3 and is shaped to have a pair of sidewalls 11 and 12, a pair of cross members 13, 14, and a transverse central or stop member 15. The first cross member 13 is integrally attached to one end of the near sidewall 11 and to a corresponding end of the far sidewall 12 while the second cross member 14 is integrally attached to the other end of the sidewall 11 and to the other corresponding end of the sidewall 12. The central or stop member 15 is similarly integrally attached to the sidewalls and is disposed between and spaced from the first and second cross members as may be seen in FIGURES 2 and 3.

A pair of restraining means such as cross pins 9, 10 span the gap between sidewalls 11 and 12 of the frame 4 and are attached thereto near the lower edges of these walls, as viewed in the drawing. For convenience in description, the term "lower" is used in a sense relative to the location of a point with respect to the stop member 15 considering the disconnect assembly to be vertically oriented as illustrated in FIGURE 1, i.e., the pins 9 and 10 are considered to be at the lower or rear end of the disconnect assembly 1.

The pair of contact members 5, 6, comprising two sets of six parallel discrete fingers each, are mounted by, but are not fixedly attached to, the frame 4 and pins 9, 10. The contact members are disposed on opposite sides of the stop member 15 and extend longitudinally (as viewed in the drawing) above and below the stop member, the portion above being adapted to slidably embrace the bar 3 and the portion below receiving the relatively movable stud 2 as illustrated in FIGURE 2. Feet 16, 17 are formed at the lower ends of the fingers comprising contact members 5, 6, respectively, with the heels of these feet abutting the restraining pins 9, 10 to prevent the contact members from sliding rearwardly with respect to the frame when forced into engagement with the bar 3.

3

In order to provide high contact pressure between the contact members 5, 6 and the conductors 2, 3, resilient means or, more particularly, strong leaf springs 7, 8 are mounted to the frame 4 between the contact members 5, 6 and the cross members 13, 14, respectively. The leaf springs are interlocked with a plurality of projections 18 which extend inwardly from the inner edges of the cross members 13, 14 and which fit within recesses or slots (not shown) in the leaf springs. Serrated lower ends of the leaf springs 7 and 8 press against the feet 16, 17 of the fingers comprising contact members 5 and 6, and up-standing toes on these feet overlap the springs thereby preventing forward sliding movement of the contact members relative to the frame 4 during disengagement of the bar 3 and contact members. The pins 9, 10 and stop member 15 serve to limit the motion of the contact members towards one another and provide a definite separation therebetween. The separation between contact members 5, 6 at each end thereof is predetermined to be slightly less than the thickness of the associated conductor to be received therein.

When the pins 9, 10, contact members 5, 6 and leaf springs 7, 8 are assembled within the frame 4, a unitary disconnect device results which is adapted to be installed as a unit on the stud 2, the unit being illustrated in FIGURE 1. The stud on which the disconnect assembly is to be mounted has an aperture or hole 21 drilled through it near the distal end thereof. Aligned with the hole 21 in the stud 2 is a gap between the third and fourth fingers of each contact member and apertures in the leaf springs, one of which is shown at 21a, also register with this hole for the purpose of permitting insertion of a removable key 22 (FIGURE 2) therethrough to retain the disconnect assembly 1 on the stud 2.

As illustrated in FIGURES 2 and 4, the key 22 is formed with an arcuate central portion 23, the arcuate portion spanning the gap between the contact members 5, 6 and lying behind and being curved away from the stop member 15. The forward or concave surface 24 of the key 22 is provided with a protuberance 25. When the key is inserted so as to fasten the disconnect assembly 1 to the stud 2, the protuberance 25 is in contact with the inner surface 26 which defines the hole 21 in the stud as illustrated in FIGURE 2, and the disconnect assembly can pivot on the stud 2. The contact members 5, 6 are arched so that the distance between them immediately behind the stop member 15 of the frame 4, along a line 27 (FIGURE 3) perpendicular to the stud surfaces which they engage, is greater than the thickness of the stud 2, whereby a clearance 28 is provided between the distal end of stud 2 and the contact members 5, 6. The clearance 28 allows the disconnect assembly 1 to float or pivot on the stud 2, thus providing a self-aligning feature in the event that the conductors 2 and 3 are not precisely aligned. The limit of self-alignment is determined by the clearance 28, that is the whole assembly, including the stop member 15, can move in the direction of line 27 until the inner surface of a contact member touches an edge of the stud. The key 22 may be held in place by a cotter pin 29 which is inserted through a hole 30 in the cross member 14 and through a hole 31 in a flanged portion 32 of the key, thereby attaching the key to the frame 4 and preventing dismounting of the assembly 1.

In operation, when the bar 3 and the contact members 5, 6 are forced into engagement with each other, a considerable force is exerted on the disconnect assembly 1, the force being required to separate the forward ends of the contact members 5, 6 sufficiently to permit entry of the bar 3 therebetween and also being expended to overcome friction between the interengaging, relatively movable surfaces, against the biasing force of the leaf springs 7, 8. When the disconnect assembly is mounted on the stud 2, the distal end of the stud abuts the lower surface of the stop member 15 of the frame 4, and the force exerted on the contact members of the assembly during

4

the engaging period is therefore transmitted through the pins 9, 10, the sidewalls 11, 12 and the stop member directly to the stud. Because of the unitary formation of the assembly 1 resulting in the pins 9, 10 and stop member 15 being integral parts thereof, the force is transmitted by a structurally rugged and rigid member independently of the fastening means 22.

During the disengaging period of the bar 3 from the disconnect assembly 1, the force exerted on the assembly is relatively minor since the only force that need be overcome is that of friction existing between the interengaging surfaces of the contact members and the bar 3. Therefore, during the disengaging period force is transmitted to the stud 2 by way of the feet 16 and 17 of the contact fingers, the springs 7 and 8, the cross members 13 and 14, and the key 22. The arcuate formation of the central portion 23 on which the force is exerted increases the strength of the key to facilitate the transmission of this force.

The disconnect assembly, being a unitary member, is easy to handle and simple to install since installation of only a single unit on a conductor and insertion of a key therethrough are required to retain the disconnect assembly on the conductor. Also, a relatively high degree of misalignment between the companion conductors to be electrically connected is tolerable because of the self-aligning feature of the unitary disconnect assembly, the limitation of movement of the disconnect assembly being determined by the clearance between the conductor on which the assembly is mounted and its contact members. The shape of the fastening key facilitates ease of self-alignment, since it can ride freely on the forward aperture surface 26 of the conductor on which the assembly is mounted, without binding, as the assembly pivots thereon. Another distinct advantage of the subject disconnect assembly is the application of connecting force to the conductor directly from the unitary or one-piece frame which results in an extremely rugged and reliable structure. My disconnect assembly can be used to interconnect conductors carrying A.-C. current of 800-ampere magnitude in a 600-volt power circuit, without exceeding permissible limits of temperature rise above the ambient.

While the specific forms of this invention have been shown and described, it will be apparent to those skilled in the art that numerous changes, combinations and substitutions of equivalents might be made. For example, apertures may be located in the sidewalls of the disconnect frame such that the key may be placed therethrough rather than through the leaf spring and contact members. Also, the particular means for mounting the left spring and for restraining motion of the contact members should not be considered limiting but merely illustrative of a particular arrangement. It is therefore contemplated by the claims which conclude this specification to cover all such modifications as fall within the true spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A disconnect assembly adapted separably to interconnect two proximate conductors, one of the conductors having an aperture formed therein adjacent one end, said disconnect assembly comprising:

- (a) a frame including a central member,
- (b) a pair of spaced contact members resiliently mounted in said frame and adapted to receive from opposite directions the two conductors, said contact members being disposed on opposite sides of and biased toward said central member for separably embracing the conductors therebetween,
- (c) means including a removable key for detachably fastening said frame and contact members to the apertured conductor, said key extending through gaps in said contact members and being constructed and arranged to facilitate pivoting of said disconnect

5

6

assembly with respect to the apertured conductor, and

- (d) means to removably secure said key to said frame to effect fastening of said disconnect assembly to the apertured conductor.

2. A disconnect assembly adapted to separably interconnect first and second conductors, the first conductor having an aperture formed therein adjacent one end, said disconnect assembly comprising:

- (a) a one-piece frame having a pair of spaced walls and a transverse central member therebetween integral with said walls,
- (b) a pair of contact members,
- (c) means for mounting said contact members in spaced relation in said frame on opposite sides of said central member,
- (d) resilient means connected between said frame and said contact members to bias said contact members toward one another causing said contact members to abut said central member so that said frame, said contact members, said mounting means and said resilient means form a unitary structure having a gap therethrough, said contact members adapted to receive the first conductor adjacent its apertured end as said unitary structure is mounted on the first conductor,
- (e) a removable key inserted through said gap and adapted to be received in the aperture in the first conductor, and
- (f) means for attaching said key to said frame thereby preventing dismounting of said disconnect assembly from the first conductor.

3. A disconnect assembly as defined in claim 2 wherein said key has a protuberance adapted to contact a surface of the first conductor to facilitate pivoting of said disconnect assembly with respect to the first conductor.

4. A disconnect assembly as defined in claim 2 wherein said key has an arcuate central portion and a protuberance on a concave surface of said central portion, said protuberance being adapted to contact a surface defining the aperture in the first conductor to facilitate pivoting of said disconnect assembly with respect to the first conductor.

5. A disconnect assembly adapted to be mounted on a conductor of rectangular cross section having an aperture formed therein adjacent one end comprising:

- (a) a one-piece frame formed from a single blank of material, said frame including first and second sidewalls parallel to and spaced from each other, first and second cross members spanning said sidewalls at opposite ends thereof, and a transverse central member integral with both of said sidewalls, said central member being located intermediate said first and second cross members and spaced therefrom,
- (b) a pair of contact members,
- (c) means connected to said frame supporting said contact members in spaced relation in said frame on opposite sides of said central member,
- (d) resilient means disposed between said frame and said contact members to bias said contact members toward one another to cause said contact members to abut said central member so that said frame, said contact members, said supporting means and said resilient means form a unitary structure, said unitary structure arranged for floating mounting on the conductor, and
- (e) means for detachably fastening said unitary structure to the conductor, said means extending through said unitary structure and adapted to be received in the aperture of the conductor in a manner enabling said central member and said contact members to pivot relative to the conductor.

6. In an electric disconnect assembly:

- (a) a frame comprising parallel sidewalls, first and second cross members spanning said sidewalls, and

a central stop member intermediate said first and second cross members and spaced therefrom, said stop member also spanning said sidewalls,

- (b) first and second contact members, said first contact member being mounted in said frame between said stop member and said first cross member, said second contact member being mounted in said frame between said stop member and said second cross member, each of said contact members having a gap therethrough, both gaps being located along a line parallel to said sidewalls,
- (c) a pair of resilient members biasing said contact members toward one another, one of said resilient members being mounted to said frame between said first contact member and said first cross member, the other of said resilient members being mounted to said frame between said second contact member and said second cross member, each of said resilient members having an aperture in alignment with said gaps through said contact members,
- (d) a removable key extending through said apertures and said gaps, and
- (e) means for attaching said key to said frame.

7. A disconnect assembly as defined in claim 6 adapted to be mounted on a conductor having an aperture therethrough adjacent one end, said removable key extending through said apertures in said resilient members and said gaps and being arranged to be received in the aperture in the conductor, the key having a protuberance formed thereon, said protuberance being arranged for engaging a conductor surface to facilitate pivoting of said disconnect assembly with respect to the conductor.

8. A disconnect assembly adapted to be mounted on a first conductor having an aperture formed therein adjacent one end and adapted to receive a second conductor, said disconnect assembly comprising:

- (a) a one-piece frame having
 - (i) a first sidewall,
 - (ii) a second sidewall parallel to and spaced from said first sidewall,
 - (iii) a first cross member connecting one end of said first sidewall to the corresponding end of said second sidewall, said first cross member having a hole therethrough,
 - (iv) a second cross member connecting the other end of said first sidewall to the other corresponding end of said second sidewall, both of said cross members having projections extending inwardly from the interior edges thereof,
 - (v) a central stop member disposed between said first and second cross members and spaced therefrom, said central stop member connecting said first and second sidewalls, both of said sidewalls, said first and second cross members and said stop member being fabricated from a single blank of material to form the one-piece frame,
- (b) a pair of complementary contact members, each of said contact members comprising a plurality of fingers generally parallel to said sidewalls, one of said contact members being disposed between said stop member and said first cross member, the other of said contact members being disposed between said stop member and said second cross member, each of said contact members having a gap between predetermined adjoining fingers thereof,
- (c) restraining means extending between said sidewalls of said frame supporting in spaced relation corresponding ends of said fingers,
- (d) a plurality of leaf springs biasing said contact members toward one another, one of said leaf springs being mounted to said frame between said one contact member and said first cross member, another of said leaf springs being mounted to said frame between the other contact member and said second

cross member, each of said leaf springs having means interlocking with a projection on the associated cross member, said leaf springs having apertures there-through in alignment with the gaps in said contact members so that said frame, said contact members, said restraining means and said leaf springs form a unitary structure adapted to be mounted on the first conductor,

- (e) a removable key inserted through said apertures through said leaf springs and said gaps in said contact members and adapted to hold said disconnect assembly on the first conductor when mounted thereon, said key having a flanged portion abutting said first cross member, said flanged portion having a hole therethrough aligned with the hole in said first cross member, and
- (f) means passing through said holes in said flanged portion and said first cross member for retaining said key in position to effect mounting of said disconnect assembly on the first conductor.
9. A disconnect assembly comprising:
- (a) a first conductor having an aperture therethrough,
- (b) a frame having a pair of spaced walls and a transverse central member disposed in engagement with said first conductor, said central member having a surface contiguous to an abutting end of said first conductor,
- (c) a pair of spaced contact members mounted in said frame, predetermined ends of the contact members being disposed on opposite sides of said first conductor in engagement therewith and the other ends of said contact members being adapted to receive a second conductor, each contact member having a gap in alignment with the aperture in said first conductor,

(d) resilient means for biasing said contact members towards one another causing their predetermined ends to firmly engage said first conductor, said central member of said frame serving to limit the minimum separation between said other ends of the contact members,

(e) a removable key passing through the gaps in said contact members and the aperture in said first conductor, and

(f) means for attaching said key to said frame,

10. A disconnect assembly as defined in claim 9 wherein the space between said contact members adjacent said surface of said central member is greater than the corresponding thickness of the abutting end of said first conductor, thereby permitting relative pivoting motion between the disconnect assembly and the first conductor.

11. A disconnect assembly as defined in claim 10 wherein said key has a protuberance engaging one aperture surface of said first conductor to facilitate pivoting of said disconnect with respect to said first conductor.

12. A disconnect assembly as defined in claim 11 wherein said walls and said central member are integral parts of a one-piece frame.

References Cited by the Examiner

UNITED STATES PATENTS

1,992,036	2/35	Meier	200—166
2,303,425	12/42	Bickham	200—166
2,872,659	2/59	Wills	339—255

FOREIGN PATENTS

864,644 1/41 France.

KATHLEEN H. CLAFFY, *Primary Examiner*.

BERNARD A. GILHEANY, *Examiner*.