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3,427,419

DISCONNECTING CONTACT ASSEMBLY FOR ELECTRICAL APPARATUS

Filed March 31, 1966

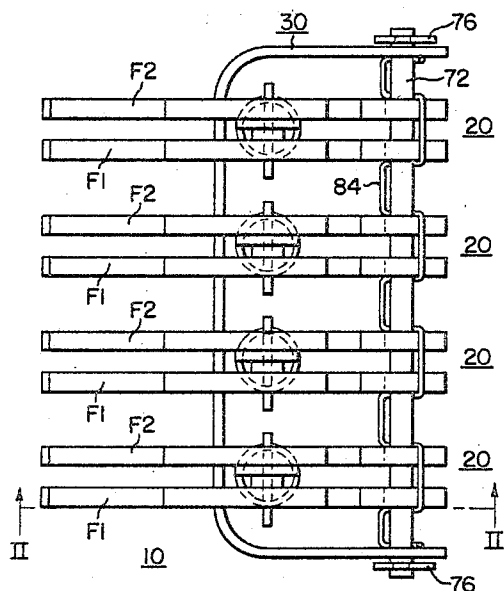


FIG. 1.

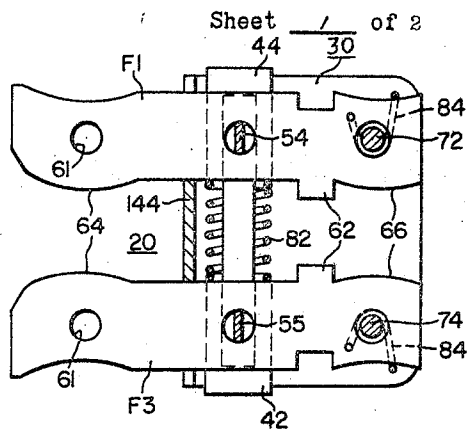


FIG. 2.

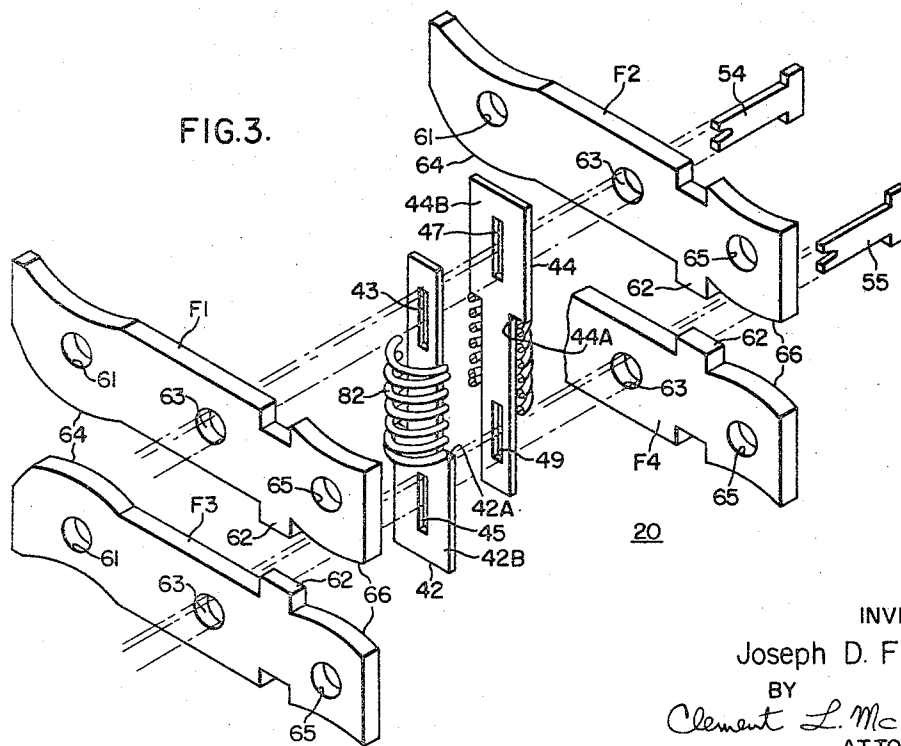


FIG. 3.

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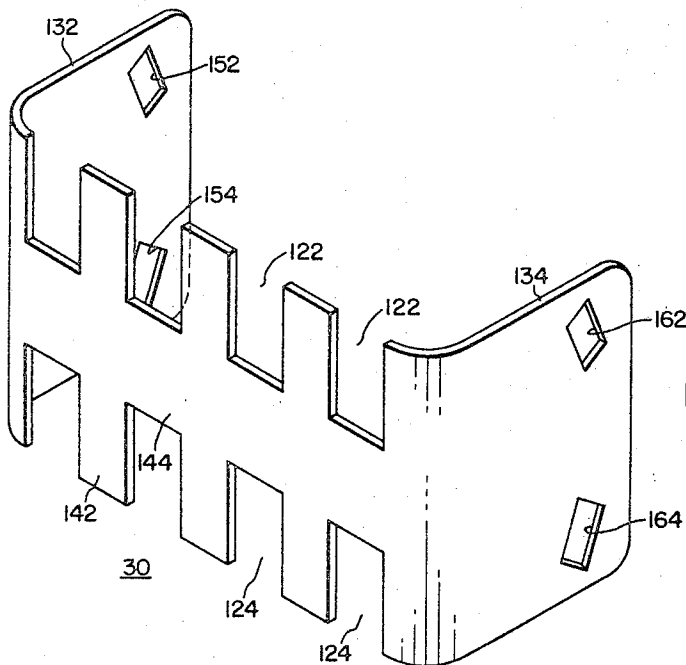
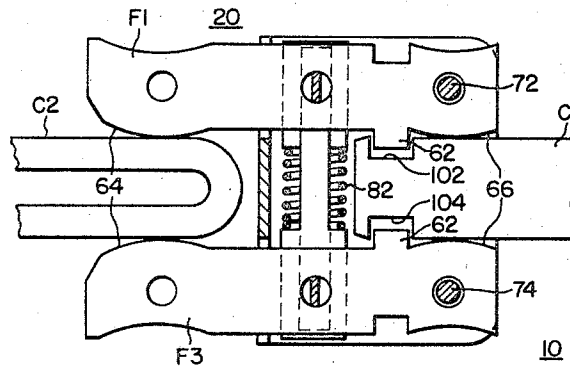
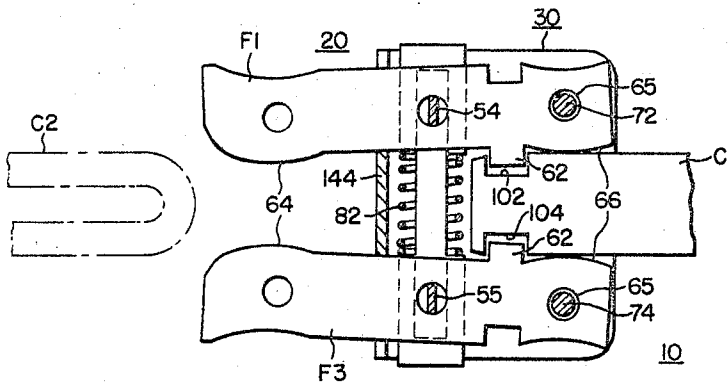
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DISCONNECTING CONTACT ASSEMBLY FOR ELECTRICAL APPARATUS

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10 Claims

Int. Cl. H01h 1/50, 3/00

ABSTRACT OF THE DISCLOSURE

This invention relates to electrical apparatus and more particularly to disconnecting contact assemblies for electrical apparatus, such as circuit breakers or switches. Each contact assembly comprises at least one pair of laterally spaced contact fingers disposed on each side of an associated conductor and resilient means disposed between opposite pairs of contact fingers for biasing the ends of the opposite pairs of contact fingers toward one another.

In certain types of electrical apparatus, such as switchgear of the metal enclosed type, circuit interrupters, such as circuit breakers or switches, are provided which are relatively movable into and out of an associated housing. In order to facilitate the electrical connection or disconnection of such a circuit interrupter with respect to the relatively stationary power conductors which are disposed inside the associated housing, circuit interrupters of the type described have been provided in the past with various types of primary disconnecting contacts. It has been found that known disconnecting contact structures, particularly those designed to carry relatively large magnitudes of current, such as 1000 amperes or more, have certain disadvantages with respect to either the relatively large overall size of the disconnecting contact structure required to carry a particular current rating or with respect to the undesirable mechanical stresses to which certain parts of known disconnecting contact structures are subjected in operation. It is therefore desirable to provide an improved disconnecting contact structure which is more compact in construction for a particular current rating than known structures of the same general type and which avoids certain undesirable mechanical stresses in certain parts of the overall structure.

It is an object of this invention to provide a new and improved disconnecting contact assembly for current carrying electrical apparatus.

Another object of the invention is to provide a more compact construction in a disconnecting contact assembly compared with known structures of the same general type.

A further object of the invention is to substantially reduce or eliminate certain undesirable mechanical stresses which result in certain parts of known structures of the same general type.

Other objects of the invention will, in part, be obvious and will, in part, appear hereinafter.

For a fuller understanding of the nature and objects of the invention, reference should be had to the following detailed description taken in conjunction with the accompanying drawings, in which:

FIGURE 1 is a top plan view of a disconnecting contact assembly embodying the principal features of the invention;

FIG. 2 is a view, partly in side elevation and partly in section, of the disconnecting contact assembly shown in FIG. 1, taken along the line II-II in FIG. 1;

FIG. 3 is an exploded view in perspective of a portion of the structure shown in FIG. 1, with certain parts cut away;

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FIG. 4 is a view, partly in side elevation and partly in section, showing the disconnecting contact assembly of FIG. 1 assembled on an associated conducting member;

FIG. 5 is a view, partly in side elevation and partly in section, of the disconnecting contact assembly shown in FIG. 1 with the contact assembly mounted on an associated first conducting member and engaging a second conducting member; and

FIG. 6 is a perspective view illustrating the unitary frame of the disconnecting contact assembly shown in FIG. 1.

Referring now to the drawings and FIGS. 1 and 5 in particular, the disconnecting contact assembly 10 shown therein comprises, in general, a plurality of laterally spaced contact finger assemblies 20 which are assembled on an associated unitary frame member 30 and which are adapted to electrically connect or bridge a first conducting member, which is illustrated as a relatively movable contact C1, and a second conducting member, which is illustrated as a relatively stationary contact C2. As shown in FIG. 5, the stationary contact C2 is a generally rectangular conductor suitable for connecting to the bus bars or power conductors of an associated switchgear structure (not shown) with the end of the stationary conductor or contact C2 being generally curved or arcuate in configuration to facilitate the entrance of the end of the contact C2 which meets and engages the contact finger assemblies 20 of the contact assembly 10, as will be explained in greater detail hereinafter. The relatively movable contact C1, as illustrated, is also generally rectangular in configuration and is adapted to receive the disconnecting contact assembly 10 which is mounted or assembled on the end of the movable contact C1. It is to be noted that the contact C1 may form part of a circuit interrupter, such as a circuit breaker or switch, which is relatively movable into and out of an associated housing in a switchgear structure.

More specifically, each of the contact finger assemblies 20 comprises a first pair of elongated contact fingers F1 and F2 and a second pair of elongated contact fingers F3 and F4 which are disposed on opposite sides of the associated conducting member C1, as shown in FIGS. 3 and 5. Each of the contact fingers F1 through F4 includes a first contact surface 64 adjacent to one end of each contact finger, which is generally curved or arcuate in configuration to facilitate the entrance of the stationary contact C2 between the opposite contact fingers and to permit a limited degree of misalignment between the stationary contact C2 and the contact fingers of the disconnecting contact assembly 10. In addition, each of the contact fingers F1 through F4 includes a second contact surface 66 at the other end of each contact finger which is adapted to engage one of the opposite sides of the associated contact C1 and which is generally curved or arcuate in configuration to act as a pivot surface during certain relative movements of the contact fingers which are disposed on the opposite sides of the contact C1, as will be explained hereinafter.

In order to assist in maintaining the contact fingers F1 through F4 in assembled relation with the associated contact or conducting member C1 and to prevent longitudinal movement of the respective contact fingers with respect to the contact C1, each of the contact fingers F1 through F4 includes a projecting portion 62 which extends partially into one of the transversely extending recesses or slots 102 and 104 which are provided adjacent to the end of the contact C1 on which the disconnecting contact assembly 10 is mounted. It is to be noted that sufficient clearance is provided between the projecting portions 62 of the fingers F1 through F4 and the associated surfaces of the contact C1 which form the slots 102 and 104 to facilitate assembly of the disconnect-

ing contact assembly 10 on the contact C1 and to permit limited relative movement of the contact fingers F1 through F4 and the associated contact C1, as will be explained hereinafter.

In order to bias the contact surfaces 64 and 66 of the opposite pairs of contact fingers F1 and F2 and F3 and F4, respectively, toward one another to thereby insure the high contact pressure between the respective contact fingers and the associated conducting members C1 and C2 which is necessary for efficient current transfer between the conducting members C1 and C2, the biasing spring 82 is disposed between the opposite pairs of contact fingers F1 and F2 and F3 and F4, respectively, of each of the contact finger assemblies 20, as best shown in FIGS. 3 and 5. In order to limit the separation of the opposite pairs of contact fingers F1 and F2 and F3 and F4, respectively, of each contact finger assembly 20 and to provide a means through which the biasing forces of the spring 82 may be transmitted to the respective contact fingers, each contact finger assembly 20 includes a pair of retaining members or links 42 and 44 which extend between the pairs of contact fingers on the opposite sides of the contact or conducting member C1 and which are pivotally connected to the opposite pairs of contact fingers F1 and F2 and F3 and F4, respectively, adjacent to the opposite ends of the retaining members 42 and 44 by the upper and lower cross pins 54 and 55, respectively, as viewed in FIG. 3.

In order to retain the contact fingers, the retaining members 42 and 44 and the spring 82 in loosely assembled relationship, each contact finger assembly 20 includes an upper cross pin 54 which is generally rectangular in cross-section and which extends through the aligned openings 63 in the contact fingers F1 and F2, respectively, and also through the longitudinally extending slots 43 and 47 in the links 42 and 44, respectively, which are also generally rectangular in configuration. Similarly, the lower cross pin 55 extends through the aligned openings 63 in the contact fingers F3 and F4 and also through the longitudinally extending slots 45 and 49 of the links 42 and 44 respectively, which are also generally in rectangular configuration, similarly to the cross-section of the cross pin 55. It is to be noted that one end of each of the cross pins 54 and 55 is bifurcated with the bifurcated ends of the cross pins 54 and 55 being spread after said cross pins are assembled with the associated contact fingers and links to thereby maintain the associated contact fingers, links and the spring 82 in assembled relationship. It is also to be noted that each of the contact fingers F1 through F4 may include an opening adjacent to one end near the contact surface 64, as indicated at 61, which may be employed to receive a fixture or jig to facilitate the assembly of the contact finger assembly 20 during the manufacture thereof. The link 42 includes a shoulder portion 42A which serves as a spring seat for one end of the biasing spring 82, while the link 44 similarly includes a shoulder portion 44A which is spaced away from the corresponding shoulder portion 42A of the link 42 and which serves as a spring seat for the other end of the biasing spring 82. Although the widths of the slots provided at the opposite ends of each of the links 42 and 44 may be substantially the same in a particular application, it is to be understood that the widths of the slots 45 and 47 in the wider portions of the links 42 and 44 as indicated at 42B and 44B, respectively, may be wider or greater than the widths of the associated slots 43 and 49 in the respective links to facilitate the assembly of the contact finger assembly 20, as shown in FIG. 3. It is to be noted that the links 42 and 44 may be formed from a suitable material, such as soft steel, having sufficient mechanical strength to withstand the tension stresses which result when the links 42 and 44 are transmitting the biasing forces from the spring 82 to the associated contact fingers F1 through F4 of each contact finger assembly 20 and which is relatively immune to the stress

corrosion or cracking which sometimes occurs in certain types of copper alloys.

Referring now to FIG. 6, there is illustrated the unitary frame or cage member 30 on which the contact finger assemblies 20 shown in FIG. 1 are assembled or supported prior to the assembly of the disconnecting contact assembly 10 on the associated conducting member or contact C1. The frame or cage member 30 is generally U-shaped in configuration and includes a pair of spaced side walls 132 and 134 and a central traverse or bight portion, as indicated at 142, which extends between and connects the associated side walls 132 and 134. In order to maintain the contact finger assemblies 20 in laterally spaced relationship across the width of the central portion 142 of the frame 30, the central portion 142 includes a plurality of upper and lower, spaced recesses or slots 122 and 124, respectively, which are adapted to receive corresponding adjacent ends of the opposite pairs of contact fingers which make up the respective contact finger assemblies 20 on opposite sides of a transversely extending wall portion, as indicated at 144 in FIG. 6.

In order to retain the contact finger assembly 20 in assembled relationship with the frame 30, the side walls 132 and 134 of the frame 30 include the upper and lower spaced openings 152 and 154 and 162 and 164, respectively, which are adapted to receive the upper and lower cross pins 72 and 74, respectively, shown in FIGS. 1 and 2. The order to permit limited movement of the cross pins 72 and 74 with respect to the side walls 132 and 134 of the frame 30, which is necessary during the assembly of the disconnecting contact 10 on the associated conducting member C1 or during the entrance of the stationary contact C2 into the contact fingers which make up the respective contact finger assemblies 20, the openings 152, 154, 162 and 164 are generally rectangular in configuration and adapted to loosely receive the ends of the upper and lower cross pins 72 and 74, respectively. It is to be noted that the upper cross pin 72 passes through the aligned openings 65 in the upper pair of contact fingers F1 and F2 adjacent to the contact surfaces 66, while the lower cross pin 74 passes through similar aligned openings 65 provided in the lower pair of contact fingers F3 and F4 in the respective contact finger assemblies 20. Suitable means, such as the locking members or retainers 76, may be provided at the opposite ends of each of the cross pins 72 and 74 to retain the cross pins 72 and 74 in assembled relationship with the associated frame 30 and the associated contact finger assemblies 20.

In order to maintain the ends of the contact fingers F1 through F4 which make up the respective contact finger assemblies 20 in laterally spaced relationship adjacent to the contact surfaces 66 of the respective contact fingers, suitable means, such as the spacer springs 84 may be disposed on each of the cross pins 72 and 74 to extend transversely between the side walls 132 and 134 of the frame 30 with portions of each of the spacer springs 84 being alternately captured or disposed on the associated cross pins 72 and 74 and to pass over the outer surfaces of the opposite pairs of contact fingers which make up each of the contact finger assemblies 20, as best shown in FIGS. 1 and 2.

Considering the overall operation of the disconnecting contact assembly 10, it is to be noted that prior to the assembly of the disconnecting contact assembly 10 on the associated conducting member or contact C1, as best shown in FIG. 3, the cross pin 54 is actuated by the force of the coil spring 82 which is transmitted through the generally T-shaped link 44 to the outer or upper end of the slot 43 in the generally T-shaped link 42 and that the cross pin 55 is actuated in the opposite direction by the force of the coil spring 82 which is transmitted through the associated link 42 to the outer or lower end of the slot 49 in the link 44. It is also to be noted that the corresponding position of the cross pin 54 with respect to the slot 47 in the link 44 is at the inner or

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lower end of the slot 47, while the corresponding position of the cross pin 55 in the lower slot 45 of the link 42 is at the inner or upper end of the slot 45 with sufficient clearance or lost motion being provided in the slots 45 and 47 between the cross pins 55 and 54, respectively, and the other ends of the slots 45 and 47, respectively, to permit the required relative movements of the opposite pairs of contact fingers which make up each of the contact finger assemblies 20 either during the assembly of the disconnecting contact assembly 10 on the associated conducting member or contact C1 or during the entrance of the conducting member C2 into the opposite pairs of contact fingers which make up the disconnecting contact assembly 10. It is to be noted that the lengths of the slots 43 and 45 of the link 42 and the slots 47 and 49 of the link 44 along with the size of the coil spring 82 may be selected so that the spring 82 is slightly compressed between the shoulder portions 42A and 44A on the associated pair of links 42 and 44, respectively, which are included in each of the contact finger assemblies 20 prior to the assembly of the disconnecting contact assembly 10 on the associated conducting member or movable contact C1. It is to be noted that the parts which make up each of the contact finger assemblies 20 may be conveniently preassembled with the cross pins 54 and 55 retaining the contact finger assemblies 20 in assembled relationship prior to the assembly of the contact finger assemblies 20 on the associated frame 30 by means of the cross pins 72 and 74, as previously explained.

During the assembly of the disconnecting contact assembly 10 on the associated conducting member or contact C1, the corresponding ends of the contact fingers which project outside of the frame 30 and on which the contact surfaces 64 are provided may be manually actuated or pushed toward one another against the forces exerted on the opposite pairs of contact fingers by the compression spring 82 to thereby pivot or rotate the opposite pairs of contact fingers about the opposite edges of the central wall portion 144 of the frame 30, as best shown in FIG. 4. As shown in FIG. 4, the contact surfaces 64 on the opposite pairs of contact fingers must be actuated toward one another sufficiently to pivot the opposite pairs of contact fingers about the edges of the wall portion 144 of the frame 30 to rotate or separate the opposite ends of the opposite pairs of contact fingers which include the contact surfaces 66 sufficiently to permit the projecting portions 62 on the opposite pairs of contact fingers to enter the associated slots or recesses 102 and 104 in the associated conducting member or contact C1.

It is to be noted that during the assembly of the disconnecting contact assembly 10 on the conducting member C1, that the corresponding portions of the opposite pairs of contact fingers to which the links 42 and 44 are pivotally connected are also rotated about the opposite edges of the wall portion 144 of the frame 30 and separated by a distance which is greater than the distance between the corresponding portions of the contact fingers prior to the assembly of the disconnecting contact assembly 10 on the conducting member C1. More specifically, as best shown in FIG. 3, each link 42 will move upwardly with the upper pair of contact fingers F1 and F2 and each link 44 will move in a downward direction with the associated lower pair of contact fingers F3 and F4 during the assembly of the disconnecting contact assembly 10 on the conducting member C1. The upper cross pin 54 of each contact finger assembly 20 will therefore be positioned at the outer or upper end of the slot 43 of the link 42 and at a position which is intermediate the ends of the slot 47 in the link 44 while the lower cross pin 55 will be positioned at the outer or lower end of the slot 49 in the link 42 and at a position which is intermediate the ends of the slot 45 and the link 42. The distance or spacing between the shoulder portions 42A and 44A on each associated pair of links 42 and 44 respectively will, therefore, be reduced or decreased during the assembly of

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the disconnecting contact assembly 10 on the conducting member C1 to further compress the spring 82 which will thereby increase the forces exerted on the contact fingers of each contact finger assembly 20 by the spring 82 to increase the contact pressure between the contact surfaces 66 of the opposite pairs of contact fingers and the associated conducting member C1. It is to be noted that after the disconnecting contact assembly 10 has been assembled on the associated conducting member or movable contact C1 as shown in FIG. 4, the contact surfaces 66 on the opposite pairs of contact fingers which make up the contact finger assemblies 20 and which engage the opposite sides of the conducting member C1 are disposed at the right ends of the respective contact fingers, as viewed in FIG. 4, to function as pivot surfaces during the entrance of the stationary contact C2 which is indicated in phantom in FIG. 4. It is also to be noted that after the disconnecting contact assembly 10 is assembled on the associated conducting member C1 that the distance or spacing between the contact surfaces 64 on the opposite pairs of contact fingers which make up the respective contact finger assemblies 20, is arranged to be less than the thickness of the generally rectangular conducting member C2 prior to the entrance of the stationary contact or conducting member C2 into the disconnecting contact assembly 10.

As just mentioned, the coil spring 82 included in each of the contact finger assemblies 20 is compressed during the assembly of the disconnecting contact assembly 10 on the associated conducting member C1 with the coil spring 82 exerting forces on the associated contact fingers which make up each of the contact finger assemblies 20 to bias the contact surfaces 66 of the opposite pairs of contact fingers toward one another to insure high contact pressure between the contact fingers and the conducting member C1. The compression of the coil spring 82 also causes the coil spring 82 to exert forces on the associated contact fingers which make up each of the contact finger assemblies 20 which bias the opposite ends of the opposite pairs of contact fingers which include the contact surfaces 64 toward one another with the contact surfaces 64 of the opposite pairs of contact fingers being then separated by the distance which is less than the thickness of the generally rectangular conductor C2, as shown in FIG. 4. When the conducting member or stationary contact C2 is actuated toward the right, as viewed in FIG. 4, to the final engaged position shown in FIG. 5, the corresponding ends of the opposite pairs of contact fingers which make up each of the contact finger assemblies 20 are forced apart to a distance or spacing which is greater than that shown in FIG. 4 by the thickness of the generally rectangular conducting member or stationary contact C2, as shown in FIG. 5. During the entrance of the conducting member C2 into the disconnecting contact assembly 10, the opposite pairs of contact fingers which make up each of the contact finger assemblies 20 are rotated or pivoted in opposite directions about the contact surfaces 66 at the opposite ends of the contact fingers which bear against the conducting member C1 to permit the entrance of the conducting member C2 against the forces exerted on the contact fingers which make up each of the contact finger assemblies 20 by the compression spring 82 which has already been compressed during the assembly of the disconnecting contact assembly 10 on the associated conducting member C1 prior to the entrance of the conducting member C2. It is to be noted that, as the opposite pairs of contact fingers pivot about the contact surfaces 66 during the entrance or engagement of the conducting member C2 with the disconnecting contact assembly 10, the corresponding portions of the opposite pairs of contact fingers which make up each of the contact finger assemblies 20 and which are pivotally connected to the associated pair of links 42 and 44 are rotated or separated to a greater distance or spacing during the entrance of a conducting member C2 into the dis-

connecting contact assembly 10. It is to be noted in FIG. 5 that the portions of the opposite pairs of contact fingers which previously engage the opposite edges of the wall portion 144 of the frame 30 as shown in FIG. 4 are actuated during the entrance of the conducting member C2 into the disconnecting contact assembly 10 to a position which is displaced or spaced from the adjacent edges of the wall portion 144 of the frame 30, as best shown in FIG. 5. More specifically, as shown in FIG. 3, during the entrance of the conducting member C2 into the disconnecting contact assembly 10, the link 42 of each pair of associated links 42 and 44 is actuated in an upward direction with the associated upper pair of contacts F1 and F2 of each contact finger assembly 20 and the link 44 is actuated in the downward direction, as viewed in FIG. 3, with the associated lower pair of contact fingers F3 and F4. The upper cross pin 54 shown in FIG. 3 is, therefore, positioned at the outer or upper end of the slot 43 of the link 42 and in a position which is intermediate the ends of the slot 47 of the link 44 and farther away from the lower end of the slot 47 than the position of the cross pin 54 in the slot 47 prior to the insertion of the conducting member C2 into the disconnecting contact assembly 10. Similarly, the lower cross pin 55, as shown in FIG. 3 is, therefore, positioned at the outer or lower end of the slot 49 of the link 44 and in a position which is intermediate the ends of the slot 45 in the link 42 farther away from the inner or upper end of the slot 45 than the position in which the cross pin 55 was disposed prior to the entrance of the conducting member C2 into the disconnecting contact assembly 10. The spacing or distance between the shoulder portions 42A and 44A of each associated pair of links 42 and 44, respectively, is therefore further reduced or decreased to thereby further compress the coil spring 82 during the entrance of the conducting member C2 into the disconnecting contact assembly 10. The further compression of the coil spring 82 during the entrance of the conducting member or stationary contact C2 into the disconnecting contact assembly 10 increases the biasing forces which are exerted by the coil spring 82 on the contact fingers at the opposite ends thereof which are transmitted through the associated pair of links 42 and the cross pins 54 and 55 to thereby insure high contact pressure between the opposite ends of each of the associated contact fingers and the associated conducting members C1 and C2, respectively.

It is important to note that in the final engaged position of the stationary contact C2 with the disconnecting contact assembly 10, the forces exerted on the contact fingers which make up each of the contact finger assemblies 20 of the disconnecting contact assembly 10 are transmitted substantially entirely through the associated pair of retaining members or links 42 and 44 which are stressed in tension by the compression of the associated coil spring 82 and through the cross pins 54 and 55 and that substantially none of the forces exerted by the coil spring 82 on the associated contact fingers to insure high contact pressure with the associated conducting members is transmitted through the frame 30 which may be formed from a suitable material having a relatively lower mechanical strength, such as aluminum. In the normal operating condition of the disconnecting contact assembly 10, therefore, the frame 30 is subjected to substantially no mechanical stresses to thereby substantially eliminate the possibility of any mechanical fatigue or failure in the frame 30. As previously mentioned, the resilient manner in which the contact finger assemblies 20 are assembled on the associated frame 30 and the curved surfaces of the contact surfaces 64 at the entrance to the contact finger assemblies 20 permits a limited degree of misalignment between the relatively stationary contact C2 and the disconnecting contact assembly 10 during the engagement of the disconnecting contact assembly 10 by the stationary contact C2. It is also to be noted that the force of each coil spring 82 included in each of the contact finger as-

semblies 20 is resiliently or flexibly divided between eight contact points in each contact finger assembly 20 with one fourth of the spring force acting on each of the eight contact points.

It is to be understood that one or more contact finger assemblies 20 may be provided in a particular disconnecting contact assembly, as disclosed, as may be required in a particular application for a particular current rating. In addition, it is to be understood that the disconnecting contact assembly 10 may be disposed on a relatively stationary associated contact or conducting member with the conducting member which enters the disconnecting contact assembly being relatively movable in a particular application but the disclosed construction in which the disconnecting contact assembly is disposed on the movable conductor is preferred to permit replacement or maintenance of the assembly on a drawout circuit breaker or interrupter while the bus bars in the associated housing remain energized. It is also to be understood that, in a particular application, the associated pair of links 42 and 44 may be disposed outside the associated opposite pairs of contact fingers with the associated coil spring being modified to extend outside the associated links in such a modified arrangement. This arrangement would be less desirable since the spacing between the contact fingers at each end of the links would be substantially eliminated to thereby decrease the cooling effect of the spacing which is introduced by the presence of the links 42 and 44 in the contact finger assemblies 20 as disclosed.

The apparatus embodying the teachings of this invention has several advantages. For example, the disconnecting contact assembly structure as disclosed is relatively compact compared to known structures of the same general type since the biasing spring is disposed intermediate the associated pairs of contact fingers to thereby decrease the overall size of the disconnecting contact assembly. In addition, the biasing means or spring 82 is maintained in compression rather than tension during the operation of the disconnecting contact assembly 10 to thereby extend the life of the spring 82 compared with that which would normally result if the spring were stressed in tension. A further advantage of the disconnecting contact assembly 10 as disclosed is that the frame or cage 30 which forms part of the assembly is substantially relieved of any mechanical stresses during the normal operation of the disconnecting contact assembly 10 with the mechanical stresses being carried by a pair of links in each contact finger assembly which may be formed from a material having a suitable mechanical strength. An additional advantage is that the contact finger assemblies each forms a convenient subassembly which also lends itself to rapid and economical assembly into an overall disconnecting contact assembly. Finally, the links included in each contact finger assembly of the disconnecting contact assembly 10 function as spacer members as well as force transmitting and retaining members in the disclosed disconnecting contact assembly construction to thereby improve the heat dissipation in the assembly by increasing the cooling surfaces on the contact fingers.

Since numerous changes may be made in the above-described apparatus and different embodiments of the invention may be made without departing from the spirit and scope thereof, it is intended that all the matter contained in the foregoing description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

I claim as my invention:

1. A disconnecting contact assembly comprising a conductor, at least two corresponding pairs of elongated, laterally spaced contact fingers having adjacent ends disposed on opposite sides of the conductor, separate means disposed generally transversely to the contact fingers and extending between corresponding pairs of contact fingers intermediate the ends of the contact fingers for retaining the contact fingers in assembled relationship and for per-

mitting limited relative movement of the opposite corresponding pairs of contact fingers, and resilient means in compression disposed on the retaining means between corresponding opposite pairs of contact fingers and biasing the ends of the opposite pairs of contact fingers toward one another through said retaining means.

2. The combination as claimed in claim 1 wherein the conductor includes a recess and each of the contact fingers includes a projecting portion which extends into the recess to assist in maintaining the contact fingers in assembled relation with the conductor.

3. A disconnecting contact assembly comprising a conductor, at least two corresponding pairs of elongated, laterally spaced contact fingers having adjacent ends disposed on opposite sides of the conductor, separate means disposed generally transversely to the contact fingers and extending between corresponding pairs of contact fingers intermediate the ends of the contact fingers for retaining the contact fingers in assembled relationship and for permitting limited relative movement of the opposite corresponding pairs of contact fingers, and resilient means disposed on the retaining means between corresponding opposite pairs of contact fingers for biasing the ends of the opposite pairs of contact fingers toward one another, each retaining means comprising a pair of links pivotally connected to corresponding pairs of contact fingers on opposite sides of the conductor, each link of each pair of links having a shoulder portion spaced away from the shoulder portion on the associated link, and the resilient means comprising a spring disposed on each pair of links between the shoulder portions of the links and maintained in compression as assembled to apply biasing forces to the associated contact fingers.

4. A disconnecting contact assembly comprising a conductor, at least one pair of elongated, laterally spaced contact fingers disposed on each of the opposite sides of the conductor with each contact finger engaging the conductor adjacent to one end, a pair of retaining members extending generally transversely between corresponding pairs of contact fingers on opposite sides of the conductor and being operatively connected to both of the associated pairs of contact fingers to permit relative movement of the retaining members and the contact fingers, each retaining member having a shoulder portion disposed away from one of the associated pairs of contact fingers and away from the shoulder portion of the other retaining member, and resilient means disposed between corresponding pairs of contact fingers and between the shoulder portions of each pair of retaining members to bias corresponding portions of the associated pairs of contact fingers toward one another.

5. The combination as claimed in claim 4 wherein the resilient means comprises a spring disposed on the pair of retaining members between the shoulder portions on the retaining members, said spring being compressed when assembled to apply biasing forces to the associated contact fingers through the retaining members.

6. The combination as in claim 4 wherein the conductor includes a recess and each of the contact fingers includes a projecting portion which extends into the recess of the conductor to assist in maintaining the contact fingers in assembled relation with the conductor.

7. A disconnecting contact assembly comprising a unitary frame having a pair of spaced side walls and a transversely extending central wall portion connecting the side walls, a conductor projecting between the side walls, at least one pair of elongated contact fingers disposed between the side walls of the frame on each of the opposite sides of the central wall portion and the conductor to engage the conductor at adjacent ends of the contact fingers, a pair of links extending between and being pivotally connected to corresponding pairs of contact fingers on opposite sides of the conductor to permit limited relative movement of the associated pairs of contact fingers, each of the links having a shoulder portion disposed adjacent to one of the associated pairs of contact fingers and spaced away from the shoulder portion of the other link, and resilient means disposed between the shoulder portions of the pair of links and between the associated pairs of contact fingers to bias the ends of the opposite pairs of the contact fingers away from the conductor toward one another.

8. The combination as claimed in claim 7 wherein the resilient means comprises a spring which is maintained in compression when assembled with the associated links and contact fingers to apply biasing forces to the contact fingers through the links.

9. The combination as claimed in claim 7 wherein an additional means extending between the side walls of the frame is provided to retain corresponding ends of the contact fingers in assembled relation with the frame and to maintain the corresponding ends of the contact fingers in laterally spaced relation.

10. The combination as claimed in claim 7 wherein the conductor includes a recess and each of the contact fingers includes a projecting portion which extends into the recess of the conductor to assist in maintaining the contact fingers in assembled relation with the conductor.

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U.S. Cl. X.R.

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