Oct. 18, 1949. S. I. LINDELL 2,484,839

FUSE MOUNTING

Filed April 22, 1946 2 Sheets-Sheet 1

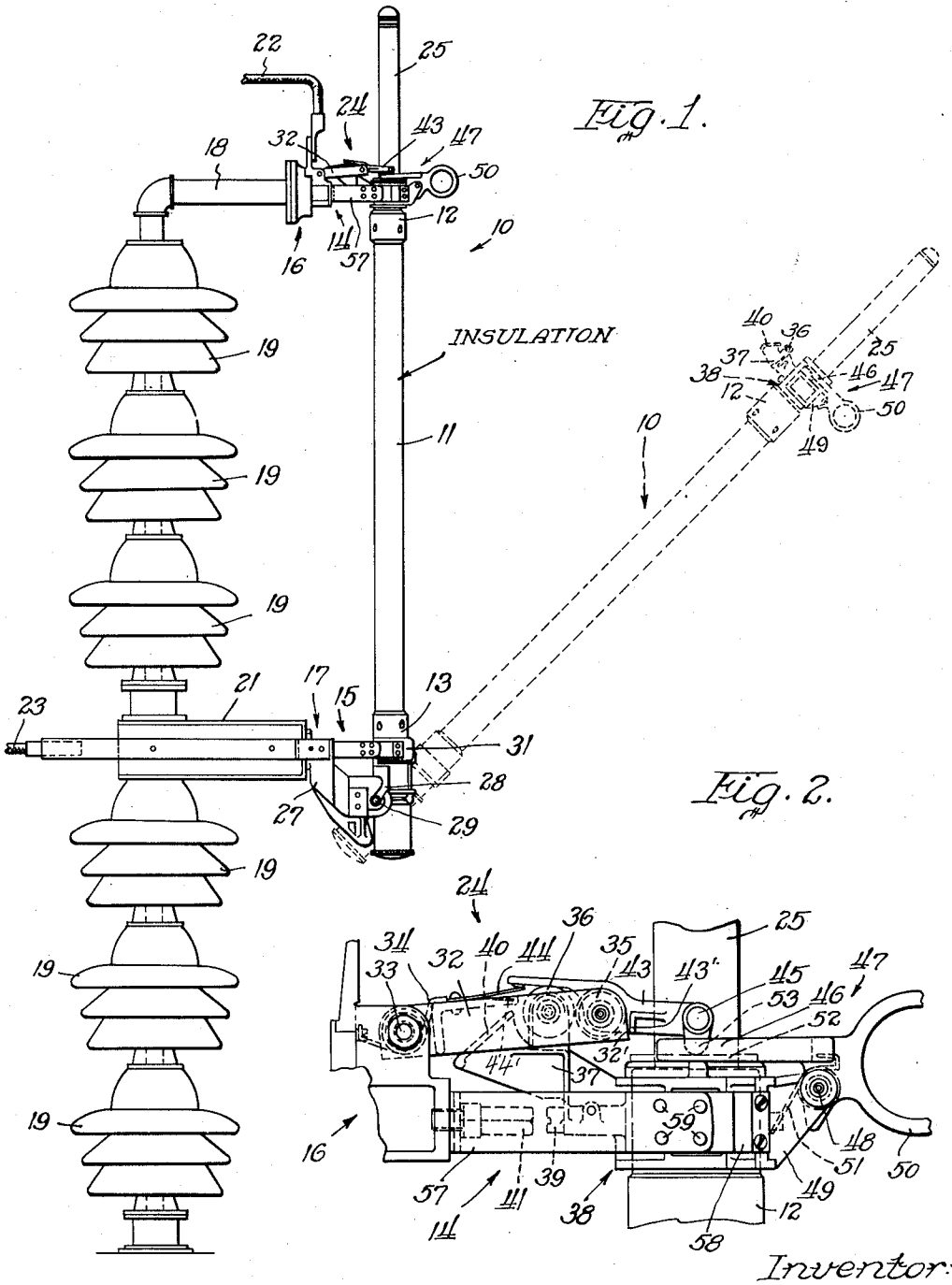


Fig. 1.

Fig. 2.

Inventor:
Sigurd I. Lindell
By Brown, Jackson, Boettcher & Dienner
Attys.

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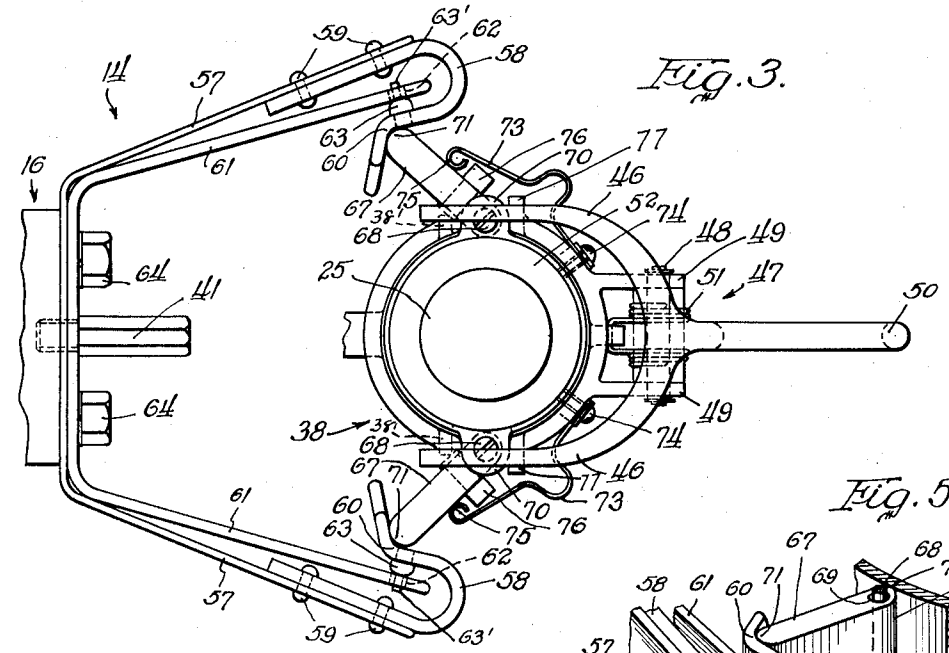


Fig. 3.

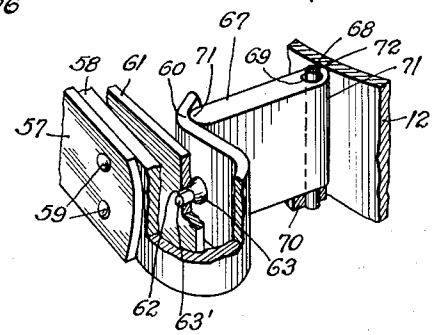


Fig. 5.

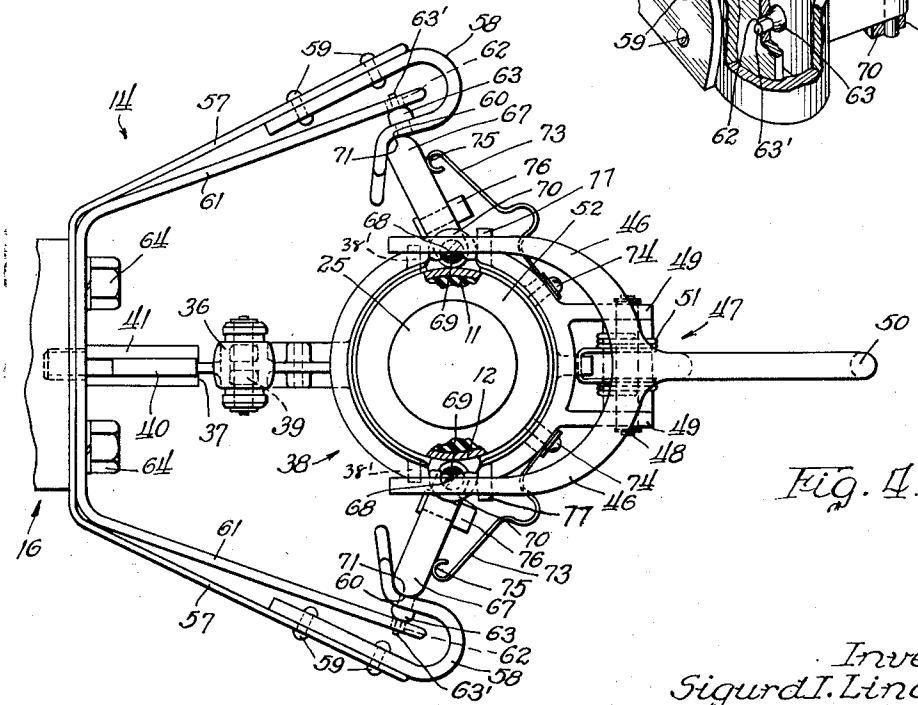


Fig. 4.

Inventor:
Sigurd I. Lindell.
By Brown, Jackson, Boettcher & Dienner
Attys.

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UNITED STATES PATENT OFFICE

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FUSE MOUNTING

Sigurd I. Lindell, Chicago, Ill., assignor to S & C Electric Company, a corporation of Delaware

Application April 22, 1946, Serial No. 663,833

21 Claims. (Cl. 200—114)

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This invention relates, generally, to electric circuit interrupter mounting devices and it has particular relation to mounting devices for high voltage fuses in regard to detachably connecting the same into a circuit. It may be said also that it relates to fuse clips for detachably mounting high voltage fuses in an electric circuit and for providing the required electrical connection between a fuse tube terminal and its associated line terminal.

The present invention is particularly adapted for use with the fuse construction disclosed in the copending application of Sigurd I. Lindell and Charles H. Baker, Serial No. 663,832, filed April 22, 1946. Also, it is specifically designed for use with the drop out fuse construction disclosed in the copending application of Sigurd I. Lindell, Serial No. 663,834, filed April 22, 1946.

The fuse construction of Lindell and Baker is intended for use on electric power systems operating at 115 kv. and at a frequency of 60 cycles. The fuse tube in assembled condition for mounting on the line terminals and connection thereto has a weight of the order of 40 to 50 pounds. The fuse tube itself is over 4 feet long and has an external diameter of about 3 inches. The end terminals are constructed in corresponding proportions. As set forth in detail in the copending application of Lindell, provision is made for moving or dropping out the fuse tube to the open circuit position where an air gap is introduced in the circuit so that the fuse tube, after the fuse has blown, will not be required to withstand the system voltage. Since the fuse is designated for out-of-doors mounting, provision must be made for disengaging its terminals from the line terminals in a positive manner regardless of the presence of sleet, corrosion etc. Accordingly, it is required that particular attention be paid to the arrangement and construction of the fuse clips and the manner in which the same are engaged by the fuse tube terminals.

It is, therefore, an object of this invention to provide contact clips and a fuse tube terminal construction for operation therewith that will be simple and efficient in operation, which may be readily and economically manufactured and which will permit the fuse tube to be placed in service readily and which will facilitate moving and effect positive movement of the fuse tube to the drop out position when the fuse blows.

Another object is to introduce a readily disengageable rigid connector between each fuse tube terminal and its associated contact clip for

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providing direct electrical connection therebetween.

A further object is to provide a contact link having wiping contact engagement not only with the contact surface of the contact clip but also with the contact surface of the fuse tube terminal associated therewith on closing and relative rocking or rolling movement on disengagement without relative sliding.

Another object is to arrange the mechanical connection between the fuse tube terminal and the associated contact clip which provides the electrical connection therebetween so as to bias the fuse tube away from the closed position thereof.

A still further object is to employ contact links for interconnecting the fuse tube terminal and the associated contact clips and to arrange the same so that a rocking movement takes place between each end of each link and the contact surface engaged thereby.

A further object is to provide for guiding the contact links into the associated fuse clip when the fuse is moved toward the closed position and to limit the movement thereof relative to the associated fuse tube terminal before the contact engagement takes place.

Still another object of this invention is to avoid the use of flexible shunts for interconnecting the contact links with the associated fuse tube terminal.

Another object is to employ a toggle action to provide high pressure line contact engagement with the clip and associated fuse tube terminal with the major component of the force of the toggle acting at right angles to the direction of movement of the fuse tube to the open position whereby the holding force required to be exerted by the latch in holding the fuse tube in the closed position is reduced.

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

This invention is disclosed in the embodiment thereof shown in the accompanying drawings and it comprises the features of construction, combination of elements and arrangement of parts which will be exemplified in the construction hereinafter set forth and the scope of the application of which will be indicated in the appended claims.

For a more complete understanding of the nature and scope of this invention, reference can be had to the following detailed description, taken in connection with the accompanying drawings, in which;

Figure 1 is a view, in side elevation, of a drop out fuse tube mounted on an insulator stack and provided with the fuse mounting of the present invention;

Figure 2 is a view, in side elevation and at an enlarged scale, of the upper latch terminal construction shown in Figure 1;

Figure 3 is a top plan view of the upper contact clip and the upper fuse tube terminal as the fuse tube is moved toward the closed position;

Figure 4 is a view, similar to Figure 3, but showing the fuse tube in the closed and latched position, certain parts being broken away in order to more clearly illustrate the details of construction; and

Figure 5 is a fragmentary perspective view, at an enlarged scale, showing the manner in which a contact link is arranged to have direct contact engagement with the associated fuse tube terminal.

Referring now particularly to Figure 1 of the drawings, it will be observed that the reference character 10 designates, generally, a fuse construction such as disclosed in the copending application of Lindell and Baker referred to hereinbefore. The fuse construction 10 includes a tube 11 of suitable insulating material having terminals or ferrules 12 and 13 at its ends for contact engagement with fuse contact clips, shown generally at 14 and 15, respectively. The contact clips 14 and 15 are carried by contact clip supports or power line terminals which are shown generally at 16 and 17.

The terminals 16 and 17 are arranged to be mounted in insulated spaced relation. The amount of insulation will, of course, depend upon the voltage impressed therebetween. The line terminals 16 and 17 may be variously mounted. They may be mounted horizontally, or at an angle, or they may be mounted one above the other as shown in Figure 1.

In the particular construction shown in Figure 1 the power line terminal 16 is carried by a support pipe 18 that, in turn, is carried by a stack of insulators 19. Midway of the stack of insulators 19 there is provided a mounting bracket 21 for carrying the lower power line terminal 17. Conductors 22 and 23 may be connected, as illustrated, to the power line terminals 16 and 17 and serve to connect the fuse construction 10 into the circuit.

The fuse construction 10 is of the drop out type. The details of construction of the drop out mechanism are more fully set forth in the copending application of Lindell, above referred to. It is here pointed out that the upper fuse tube terminal 12 has associated therewith a latch mechanism, which is indicated, generally, at 24. This serves to hold the fuse construction 10 in the position shown in the drawing until the fuse blows. When the fuse blows, a latch tube 25 is moved upwardly to operate the latch mechanism 24 so as to permit the fuse construction 10 to automatically fall under the influence of gravity to the position shown by the broken lines in Figure 1 assisted by the forces exerted by the fuse contact clips 14 and 15 as will appear hereinafter.

The lower line terminal or contact clip support 17 has a hinge extension 27 which extends forwardly of the terminal 17 and is slotted, as indicated at 28, for receiving trunnions 29, only one of which is shown. The trunnions 29 are integrally formed with and constitute extensions of a trunnion and pivot contact assembly or cradle 31 which is secured to the lower fuse tube terminal 13 and serves to carry the fuse construction 10 and permit its being swung into the closed position shown in Figure 1 and also to swing to the drop out position, shown by the broken lines, when the fuse blows.

In Figure 2 of the drawings the latch construction 24 is illustrated in more detail. As there shown, the latch 24 includes a latch lever 32 which may be rockably mounted by a bolt 33 on the upper power line terminal 16. A coil spring 34 surrounding the bolt 33 serves to bias the latch lever 32 in a clockwise direction. At its forward end the latch lever 32 carries a hook roller 35 behind which a latch roller 36 is arranged to be positioned to hold the fuse construction 10 in the closed position. The latch roller 36 is carried by a nose portion 37 that is formed integrally with an upper fuse tube holder that is indicated, generally, at 38. The upper fuse tube holder 38 surrounds the upper end of the upper fuse tube terminal 12 and is held in place thereon by a retaining screw 39. The nose portion 37 has an inclined face 40 which, when the fuse construction 10 is moved toward the closed position, first engages the roller 35 and lifts the same together with the latch lever 32 sufficiently to permit the latch roller 36 to pass thereunder to the latched position shown in Figure 2. A stop pin 41, threaded into the upper line terminal 16 through the bottom of the contact clip 14, serves to limit the inward movement of the fuse construction 10, the head of the retaining screw 39 on engaging the outer end of the stop pin 41 preventing further inward movement of the fuse construction 10.

With a view to releasing the latch roller 36 from behind the hook roller 35, a pry out lever 43 is mounted for rocking movement about the axis of the roller 35 on the latch lever 32. Its movement relative thereto in a clockwise direction is limited by a web 43' extending therefrom and arranged to engage the forward end of the latch lever 32. The pry out lever 43 is biased for movement in a clockwise direction by a leaf spring 44 that extends from the upper surface of the latch lever 32 near its rear end and bears against the under side of the pry out lever 43, as illustrated. A reenforcing spring 44', which is relatively stiff as compared to the leaf spring 44, is arranged to cooperate with the adjacent end of the pry out lever 43 to aid in lifting the hook roller 35 above the latch roller 36.

In order to move the pry out lever 43 in a counterclockwise direction so as to raise the latch lever 32 and move the hook roller 35 out of engagement with the latch roller 36, the pry out lever 43 has bosses 45 extending oppositely therefrom on opposite sides of the latch tube 25, only one of the bosses 45 being shown in the drawing. Fingers 46, extending from a pull ring and trip member, indicated generally at 47, are arranged to engage the underside of the bosses 45 and to move the same upwardly. The member 47 is rockably mounted by a pin 48 which extends through ears 49 integrally formed with the upper fuse tube holder 38. The member 47 also includes an integrally formed ring 50 for receiving the hook of a switch stick to permit manual operation of the member 47 and tripping of the latch mechanism 24. A coil spring 51, surrounding the pin 48, serves to normally bias the member 47 for movement in a counter-clockwise direction.

When it is desired to manually trip the latch mechanism 24, the hook of a switch stick is inserted in the ring 50 and member 47 is rocked

in a clockwise direction against the force of the spring 61 to lift the fingers 46 and thereby lift the bosses 45 extending from the pry out lever 43. As previously described, this rocks the pry out lever 43 until the leaf spring 44 engages the reenforcing spring 44' whereupon the latch lever 32 is lifted and the hook roller 35 is moved out of engagement with the latch roller 36. The fuse construction 10 is then free to fall to the position shown by the broken lines in Figure 1.

The latch mechanism 24 may be tripped, also, when the fuse construction 10 blows. As set forth in more detail in the copending application of Lindell, above referred to, when the fuse construction 10 blows, the latch tube 25 moves upwardly through a slight distance. Advantage is taken of this movement to trip the latch mechanism 24. For this purpose the latch tube 25 carries a flange 52 which, when moved upwardly, engages downwardly extending nose portions 53, only one of which is illustrated, from the pry out lever 43. Thus, the pry out lever 43 is operated by movement of the latch tube 25 upwardly in the same manner that it is operated by rocking of the member 47 manually by a switch stick.

The contact clips 14 and 15, which serve to connect the fuse tube terminals 12 and 13 to the power line terminals 16 and 17, are of duplicate construction. The manner in which each of the terminals 12 and 13 is connected to its contact clip is also essentially the same for each. Accordingly, only a description of the contact clip 14 will be set forth herein.

As shown in Figures 3 and 4 of the drawings, the contact clip 14 is of generally U-shape construction and it includes a generally U-shaped copper contact connector 57 which carries copper alloy contact shoes 58 near its outer ends. They are secured in place by rivets 59. The contact shoes 58 provide opposed contact surfaces 60 which are biased toward each other by a generally U-shaped contact spring 61, preferably formed of stainless steel. Near its outer ends the arms of the contact spring 61 are provided with apertures 62 for receiving projections 63' of guide pins 63 which extend from the contact shoes 58, as illustrated. The combination of the copper contact connector 57 and the contact spring 61 provides for good electrical conductivity for the clip 14 and at the same time the required degree of resiliency to urge the contact surfaces 60 of the contact shoes 58 toward each other with the required pressure, sufficient not only to assure the necessary contact pressure but also, as will hereinafter appear, to bias the fuse construction 10 outwardly away from the closed position thereof. The contact clip 14 may be held in place on the power line terminal 16 by suitable cap bolts 64 which extend through the base portion of each of the spring contacts 57 and the contact spring 61.

It is desired that a direct electrical connection be provided between the contact shoes 58 and the outer surface of the fuse tube terminal 12. One reason for this is to avoid the necessity of using a flexible shunt to complete the connection. For this purpose, as illustrated in Figures 3 and 4 of the drawings, pivot contacts or contact links 67 of suitable conducting material, such as brass, are pivoted on pins 68 which extend through clearance holes 69, Figure 5, in the links 67 and support them between ears 70 integrally formed with and extending radially outwardly from the upper fuse tube holder 38. The ends of the links 67 are rounded as indicated at 71 so as to provide

for wiping contact engagement with the contact surfaces 60 of the contact shoes 58 as the fuse construction 10 is moved toward the closed position from that shown in Figure 3 to that shown in Figure 4 and to provide for rolling or rocking movement in the reverse direction to overcome any tendency to stick in the presence of corrosion, sleet, etc. and to facilitate breaking loose therefrom. The rounded inner ends 71 of the links 67 also have a similar contact engagement with the adjacent surface 72, Figure 5, of the terminal 12. This is permitted because the links 67 are relatively loosely carried by the pins 68 as provided by the clearance holes 69.

It will now be obvious that, when the fuse construction 10 is in the closed position, as illustrated in Figure 4 of the drawings, the jaws of the contact clip 14 will be spread apart and the contact spring 61 will exert a relatively great pressure through the guide pins 63 and contact surfaces 60 of the contact shoes 58 onto the links 67 and they in turn will transmit this pressure directly against the surface 72 of the terminal 12. Since the links 67 pivot slightly about the pins 68 when the fuse construction is moved to the closed position, the rounded ends 71 thereof are moved with a wiping action into the final contact engaging position. This insures that good contact engagement is provided therebetween. In addition it facilitates movement of the fuse construction 10 out of the closed position since the links 67 perform no locking function and roll or rock without sliding to the contact disengaging position.

In further explanation of the wiping action between the surfaces 71 of the links 67 and the cooperating contact surfaces 60 of the contact shoes 58 as the fuse construction 10 is moved to the closed position and the rolling action between these surfaces when the fuse construction 10 is moved away from the closed position, it is pointed out that these two different and desirable actions are the result of different interactions between the movement of the contact shoes 58 and the fuse construction 10 during the closing and opening movements of the latter. Considering first the closing movement, after the surface 71 engages the surface 60, the vertical axis of the surface 71, which is a cylindrical surface, cannot move further inwardly because of the inner ends of the contact shoes 58 which extend toward each other and act as stop means but rather this vertical axis shifts sideways to spread the contact shoes 58 apart as the fuse construction 10 is moved to the latched position, the stress being transmitted through the links 67 in compression. In so doing there is a wiping or sliding action between the surfaces 71 and 60. Now, when the fuse construction 10 is unlatched, it moves outwardly and bodily carries with it the links 67. At the same time the contact shoes 58 move inwardly but, because the links 67 are being moved bodily away from the closed position at the same time and the vertical axis of the cylindrical surface 71 is moved outwardly, the surfaces 71 and 60 roll or rock with respect to each other rather than have a relative wiping or sliding action as is the case during the closing operation of the fuse construction 10. A similar action takes place between the cylindrical inner ends 71 of the links 67 and the cylindrical contact surface 72 of the terminal 12. That is, the inner end surface 71 wipes into engagement with the contact surface 72 since it is restrained from acting otherwise by the pin 68 which acts as a stop means. However, because of the clearance

provided by the hole 69, through which the pin 68 extends, when the fuse construction 10 is swung out of its closed position, the surface 71 rocks over the surface 72.

It will be observed that the links 67 when pivotally mounted, as described, on the upper fuse tube holder 38 cooperate therewith in the manner of a toggle. The resilient force of the contact spring 61 is exerted through the links 67. However, the construction is such that the fuse in the closed position does not move the links 67 past the center position of the toggle; rather they are always maintained on the release side of this position. Consequently, the contact spring 61 always functions to urge the fuse construction 10 away from the closed position. It is held in this position only by the latch mechanism 24, previously described.

With a view to guiding the links 67 into operative position between the contact shoes 58 pivot contact springs 73 are secured, as by screws 74, to the upper fuse tube holder 38. The outer curved ends 75 of the springs 73 bear against the links 67 and normally urge them toward the positions thereof shown in Figure 3 of the drawings against webs 38' integrally formed with the upper fuse tube holder 38. Stop pins 76 are located in the links 67 to cooperate with webs 77, which also are integrally formed with the upper fuse tube holder 38, for limiting the movement of the links 67 away from the fuse tube 10 when they are out of engagement with the contact shoes 58 and a force should be applied to the links 67 sufficient to overcome the springs 73.

It has been indicated hereinbefore that the fuse construction 10 disclosed herein is particularly designed for operation in a power circuit which is energized at 115 kv. It will be understood that this voltage rating is set forth herein merely for illustrative purposes and that the principles of construction disclosed herein can be used for fuses that are adapted to function in a system operating at other voltages. By way of further illustration it is pointed out that the contact connector 57 and the contact spring 61 have a width of about 1¾" and that the outer span thereof between the outer ends of the contact connector 57 is about 9¼". The contact spring 61 urges the contact shoes 58 toward each other with a force of the order of about 150 pounds. However, because of the arrangement of the links 67, only a small component of this force is applied to the latch 24. The links 67 are preferably silver plated and they may have a width of 1⅜" and a length of 2¼". They may be ½" thick. It is repeated that these data are set forth merely to provide an indication of the relative sizes of the parts involved and are not to be considered as limiting the scope of the invention.

Since the contact shoes 58 are carried at the outer ends of the arms of the U-shaped contact connector 57, they have a relatively great freedom of movement and thus are essentially self aligning with respect to the links 67. Substantially line contact therewith is provided. This is highly desirable because the normal current carrying capacity of the fuse may be of the order of 200 to 300 amperes. This self aligning feature is promoted by the connection of the contact spring 61 thereto through the round headed guide pins 63, substantially point contact engagement therebetween being had.

Since certain further changes can be made in the foregoing construction and different embodiments of the invention can be made without departing from the spirit and scope thereof, it is intended that all matter shown in the accompanying drawings and described hereinbefore shall be interpreted as illustrative and not in a limiting sense.

What is claimed as new is:

1. Separable contact means for interconnecting a fuse tube terminal and a power line terminal comprising, in combination, means providing a pair of opposed contact surfaces, support means carried by said fuse tube terminal on opposite sides thereof, and a pair of contact links carried by said support means for engaging said contact surfaces and said opposite sides of said fuse tube terminal to provide direct electrical connection therebetween.

2. Separable contact means for interconnecting a fuse tube terminal and a power line terminal comprising, in combination, means providing a pair of opposed contact surfaces, support means carried by said fuse tube terminal on opposite sides thereof, and a pair of contact links carried by said support means for engaging said contact surfaces and said opposite sides of said fuse tube terminal to provide direct electrical connection therebetween, the contact making ends of said links being rounded to provide relative rocking movement between them and the associated contact surfaces of said means and said fuse tube terminal when the fuse tube is moved to the open position.

3. Separable contact means for interconnecting a fuse tube terminal and a power line terminal comprising, in combination, means providing a pair of opposed contact surfaces, support means carried by said fuse tube terminal on opposite sides thereof, and a pair of contact links loosely pivoted on said support means to engage intimately the adjacent portions of the surface of said fuse tube terminal when the fuse tube is moved to the closed position and said links engage said contact surfaces of said contact clip.

4. Separable contact means for interconnecting a fuse tube terminal and a power line terminal comprising, in combination, means providing a pair of outwardly flared resiliently mounted contact surfaces, a pair of contact links for engaging said contact surfaces and spreading the same apart when the fuse tube is moved to the closed position, and means for mounting said contact links on opposite sides of said fuse tube terminal so as to engage the surface thereof with a pressure determined by the force exerted by said resiliently mounted contact surfaces when the fuse tube is in the closed position.

5. Separable contact means for interconnecting a fuse tube terminal and a power line terminal comprising, in combination, means providing a pair of outwardly flared resiliently mounted contact surfaces, a pair of contact links for engaging said contact surfaces and spreading the same apart when the fuse tube is moved to the closed position, means for mounting said contact links on opposite sides of said fuse tube terminal so as to engage the surface thereof with a pressure determined by the force exerted by said resiliently mounted contact surfaces when the fuse tube is in the closed position, and spring means for guiding said contact links into engagement with said contact surfaces and for limiting the movement thereof relative to said mounting means when they are out of engagement therewith.

6. Separable contact means for interconnect-

ing a fuse tube terminal and a power line terminal comprising, in combination, means providing a pair of outwardly flared resiliently mounted contact surfaces, a pair of contact links for engaging said contact surfaces and spreading the same apart when the fuse tube is moved to the closed position, and means for mounting said contact links on opposite sides of said fuse tube terminal so as to engage the surface thereof with a pressure determined by the force exerted by said resiliently mounted contact surfaces when the fuse tube is in the closed position, the relationship between said outwardly flared contact means and said contact links when the fuse tube occupies the closed position being such that the fuse tube is biased to the open position.

7. Separable contact means for interconnecting the terminals of a fuse tube and the corresponding power line terminals comprising, in combination, a pair of generally U-shaped contact clips each having a pair of outwardly flared resiliently mounted contact surfaces, and a pair of contact links mounted pivotally on opposite sides of each fuse tube terminal and to engage the contact surfaces of the corresponding contact clip.

8. Separable contact means for interconnecting the terminals of a fuse tube and the corresponding power line terminals comprising, in combination, a pair of generally U-shaped contact clips each having a pair of outwardly flared resiliently mounted contact surfaces, support means carried by each fuse tube terminal on opposite sides thereof, and a pair of contact links carried by each support means for engaging the contact surfaces of the corresponding contact clip and said opposite sides of the fuse tube terminal associated therewith to provide direct electrical connection therebetween.

9. Separable contact means for interconnecting the terminals of a fuse tube and the corresponding power line terminals comprising, in combination, a pair of generally U-shaped contact clips each having a pair of outwardly flared resiliently mounted contact surfaces, support means carried by each fuse tube terminal on opposite sides thereof, and a pair of contact links loosely pivoted on each support means to engage intimately the adjacent portions of the surface of the fuse tube terminal thereat, the contact making ends of said links being rounded to provide relative wiping movement between them and their associated contact surfaces when the fuse tube is moved to the closed position.

10. Separable contact means for interconnecting the terminals of a fuse tube and the corresponding power line terminals comprising, in combination, a pair of generally U-shaped contact clips each having a pair of outwardly flared resiliently mounted contact surfaces, a pair of contact links for engaging the contact surfaces of each contact clip and spreading the same apart when the fuse tube is moved to the closed position, and means for mounting each pair of contact links on opposite sides of each fuse tube terminal so as to engage the surface thereof with a pressure determined by the force exerted by the associated resiliently mounted contact surfaces when the fuse tube is in the closed position.

11. Separable contact means for interconnecting the terminals of a fuse tube and the corresponding power line terminals comprising, in combination, a pair of generally U-shaped contact clips each having a pair of outwardly flared

resiliently mounted contact surfaces, a pair of contact links for engaging the contact surfaces of each contact clip and spreading the same apart when the fuse tube is moved to the closed position, and means for mounting each pair of contact links on opposite sides of each fuse tube terminal so as to engage the surface thereof with a pressure determined by the force exerted by the associated resiliently mounted contact surfaces when the fuse tube is in the closed position, the relationship between the outwardly flared contact surface portions of each contact clip and the associated pair of contact links when the fuse tube occupies the closed position being such that the fuse tube is biased to the open position.

12. Separable contact means for interconnecting a fuse tube terminal and a power line terminal comprising, in combination, means on said power line terminal providing a pair of outwardly flared resiliently mounted contact surfaces, and a pair of toggle links carried by said fuse tube terminal on opposite sides thereof for engaging said contact surfaces with a toggle action.

13. The invention, as set forth in claim 12, wherein the toggle links in the closed position are on the release side of the toggle.

14. The invention, as set forth in claim 12, wherein the ends of the links engaging the contact surfaces are rounded whereby they engage the same with a wiping action and disengage with a rolling or rocking action.

15. The invention, as set forth in claim 12, wherein the contact surfaces are on contact shoes carried at the ends of a U-shaped flexible contact connector whereby self-aligning substantially line contact engagement is had with the toggle links, and a generally U-shaped contact spring is nested with said contact connector and the ends thereof urge said contact shoes into engagement with said links, there being relatively small area contact engagement between said contact shoes and said ends of said contact spring.

16. A separable contact construction comprising, in combination, a contact member having a convex contact surface, a contact arm biased toward said contact surface, said contact member and said arm being movable relative to each other, contact means for interconnecting said arm and said contact member, said contact means having a convex contact surface for engaging said convex contact surface of said contact member, and stop means on said contact member cooperating with said contact means whereby said contact surfaces engage with a wiping action and disengage with a rolling or rocking action on relative movement of said contact member and arm toward and away from each other.

17. A separable contact construction comprising, in combination, a contact member having oppositely facing convex contact surfaces, a pair of arms on opposite sides of and biased toward said contact surfaces, said contact member and said arms being movable relative to each other, contact means for interconnecting said arms and said contact member, said contact means having convex contact surfaces for engaging said convex contact surfaces of said contact member, and stop means on said contact member cooperating with said contact means whereby the mutually engaging contact surfaces engage with a wiping action and disengage with a rolling or rocking action on relative movement of said contact

member and arms toward and away from each other.

18. A separable contact construction for interconnecting a line terminal and a movable terminal at one end of an elonagte member that is pivoted at the other end comprising, in combination, a contact member carried by said movable terminal having oppositely facing convex contact surfaces extending parallel to the longitudinal axis of said elongate member, a pair of arms carried by said line terminal on opposite sides of and biased toward said contact surfaces, contact means for interconnecting said arms and said contact member, said contact means having convex contact surfaces parallel to said longitudinal axis when said elongate member is in the circuit closed position for engaging said convex contact surfaces of said contact member, and stop means carried by said movable terminal and cooperating with said contact means whereby the mutually engaging contact surfaces engage with a wiping action and disengage with a rolling or rocking action on movement of said elongate member into and out of the circuit closed position.

19. In a dropout fuse construction, in combination, a pair of stationary line terminals in insulated spaced relation, contact means on each line terminal providing a pair of opposed contact surfaces, a fuse tube, terminals at the ends of said fuse tube, support means carried by each fuse tube terminal on opposite sides thereof, a pair of contact links carried by each of said support means for engaging the corresponding pair

of opposed contact surfaces and the opposite sides of the associated fuse tube terminal to provide direct electrical connection therebetween, means pivotally mounting said fuse tube near one end whereby the same can be moved to the closed position and can fall under the influence of gravity to the open position, and releasable latch means mounted near the other end of said fuse tube for holding the same in the closed position with said contact links in engagement with said contact surfaces and the opposite sides of the associated fuse tube terminal.

20. The invention, as set forth in claim 19, wherein the contact means comprises a generally U-shaped contact clip and the contact surfaces are provided by outwardly flared resiliently mounted contact engaging portions thereon.

21. The invention, as set forth in claim 19, wherein the contact means comprises a generally U-shaped contact clip having resilient arms biased toward each other for engagement by the contact links indivdual thereto and acting to urge the fuse tube away from its closed position through said contact links.

SIGURD I. LINDELL.

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