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METHOD AND APPARATUS FOR BREAKING ELECTRICAL CIRCUITS UNDER HEAVY LOAD

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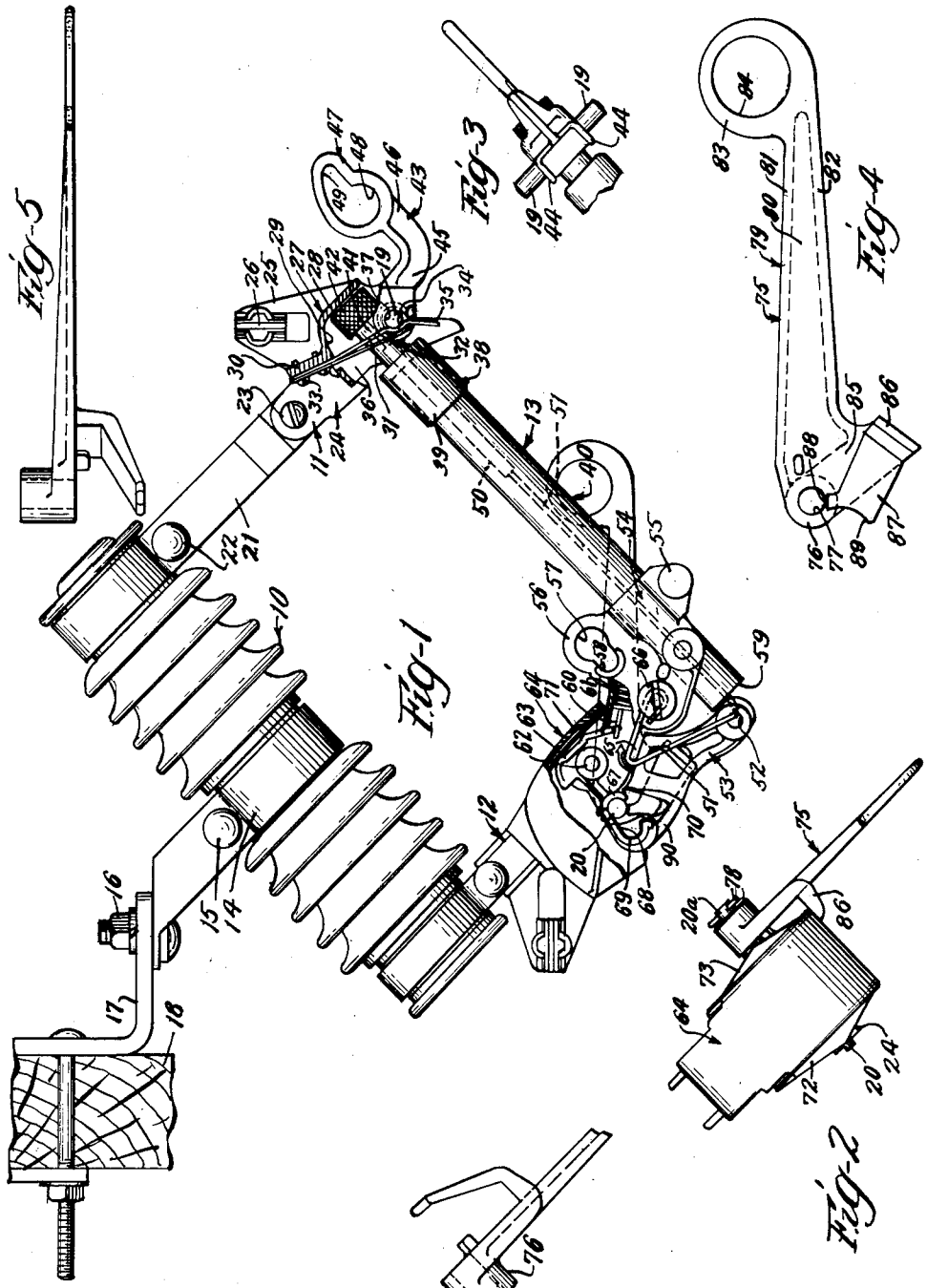


Fig-1

Fig-2

Fig-3

Fig-4

Fig-5

Fig-6

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METHOD AND APPARATUS FOR BREAKING ELECTRICAL CIRCUITS UNDER HEAVY LOAD

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18 Claims. (Cl. 200—114)

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The present invention relates to methods and apparatus for breaking electrical circuits under heavy load, and is particularly concerned with an improved method whereby service operators on high tension electric transmission lines may open a circuit in safety even though it is carrying a heavy current.

One of the objects of the invention is to provide a simple method for opening an electrical circuit carrying a relatively heavy current without drawing an arc in the open air and without endangering the operator in any way.

Another object of the invention is the provision of an improved method of breaking electrical circuits by means of mechanically rupturing the fusible element of a fuse link, while the fuse link is confined in a fuse tube control, so that the arc which results cannot go to ground or expand to other live parts. Heretofore, operators finding it necessary to open a circuit at a cut-out have simply pulled the cut-out open as a disconnect. This is quite hazardous because of the possibility that there may be heavy currents broken and a number of accidents have resulted from this practice.

The arc when drawn in the open air sometimes expands or is blown by air currents to grounded metal or into other circuits. Instead of breaking the circuit, this initiates a fault condition or a short circuit, endangering the linemen operating the cut-out.

I have discovered that by utilizing the structure of a fused drop-out cut-out and by providing means for mechanically rupturing the fusible element, such an apparatus can be used for breaking relatively heavy currents with comparative safety because the arc is confined to the tube of the fuse unit and is discharged from the bottom of the tube in the same manner as when the fusible element is melted by an excessive current load.

Another object of the invention is the provision of an improved apparatus for breaking heavy electrical currents, including a fused drop-out cut-out in which the operating element for mechanically rupturing the fusible element is trip-free, and by this I mean that as soon as this element has been actuated the operator may freeze the element in any position but the fuse tube will clear the circuit automatically.

Another object of the invention is the improvement of the structure of fused drop-out cut-out units so that they are particularly adapted to hold a fuse leader during rupturing operation, which involves pulling, and eliminating the possibility of

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the breaking of the fuse leader at the point of bend.

Another object of the invention is the provision of an improved apparatus for breaking circuits carrying heavy currents, including a fused drop-out cut-out in which the additional apparatus for breaking the circuit mechanically under heavy load has no effect on the normal operation of the cut-out.

Other objects and advantages will be apparent from the following description and the accompanying drawings, in which similar characters of reference indicate similar parts throughout the several views.

Referring to the drawings, of which there is a single sheet, accompanying the specification,

Fig. 1 is a side elevational view in partial section, showing the structure of a fused drop-out cut-out equipped with auxiliary apparatus embodying my invention;

Fig. 2 is a fragmentary top plan view of the lower contact fixture housing and load break lever;

Fig. 3 is a fragmentary plan view of the pry-out lever structure used at the top of the cut-out;

Fig. 4 is a side elevational view of the load break lever;

Fig. 5 is a top plan view of the load break lever;

Fig. 6 is an end elevational view of the load break lever.

Referring to Fig. 1, the present apparatus preferably includes one or more insulators 10 provided with laterally projecting contact arms 11 and 12 for supporting a fuse tube unit 13.

Various modes of supporting the fuse tube unit may be employed, and the present fused drop-out cut-out structure employed in this apparatus is substantially the same as that disclosed in the prior application of David C. Hubbard and William L. Hollander, Serial No. 13,704, filed March 8, 1948, Patent No. 2,581,954, granted January 8, 1952, on Fused Drop-Out Cut-Outs.

The insulator 10 is supported by means of a clamping metal band 14, which has a clamping bolt 15, and is mounted by means of another bolt 16 on an angle bracket 17, carried by a cross arm 18.

The insulator 10 is mounted at substantially 45 degrees so that the fuse tube unit is mounted in such a position that it may pivot by gravity on the upper trunnions 19 or on the lower trunnions 20.

The fuse tube unit is supported at its upper end by the contact arm 11, which includes a clamp-

ing metal band 21, clamped about a cylindrical part of the insulator 10 by bolt 22. At its right end the two ends of the band 21 are secured by means of a screw bolt 23 to a cast metal contact fixture 24.

This contact fixture 24 has an upper connector flange 25, provided with an aperture for passing a connector bolt 26, by means of which an electrical conductor may be connected to the upper contact fixture 24. The contact fixture 24 is formed with a hood 27, having an upper flat wall 28 and a rear wall 29.

The rear wall is joined to a supporting flange 30, which supports a pair of contact springs 31, and a pair of reinforcing springs 32, by means of a pair of screw bolts 33. The contact springs and reinforcing springs are arranged in two sets, each of which has the contact spring 31 above and the reinforcing spring 32 below, and these two sets are spaced from each other sufficiently to receive the fuse tube unit 13, which has a pair of laterally extending trunnions 19.

The contact springs are formed in each case with a partially cylindrical recess 34, in which the trunnions 19 rest, and they are formed also with the downwardly diverging end portions 35 for guiding the trunnions into this position.

The hood 27 has a pair of side walls 36, which are formed with downwardly open grooves 37, partially cylindrical in shape for engaging the upper side of the trunnions 19. Thus the trunnions 19 are rotatably mounted in the upper grooves 37 of the sides 29 of the hood 27, and held there by the contact springs 31 which engage the trunnions at the partially cylindrical formations 34.

The fuse tube unit may be pulled out of the upper contact fixture 24 by exerting a pull toward the right in Fig. 1, and the fuse tube unit may be forced into the position of Fig. 1 by merely pushing it in between the diverging ends of the springs 35 and the forward edge of the side wall 36 of hood 27.

The fuse tube unit is provided at its upper end with a contact fixture 38, having a tubular formation 39, for receiving the insulating fuse tube 40 which is secured therein by transverse pins. The fuse tube contact fixture 38 has an upper cylindrical tube 41 for passing the fuse tube leader, which is clamped in place by means of the screw cap 42.

The fuse tube fixture has its portion 41 provided with a laterally projecting pair of cylindrical trunnions 19, which are located on the forward side, that is, the right of the portion 41, so that the downward blast of the gases coming out of the fuse tube 40 tend to pivot the fuse tube unit 13 in a clockwise direction, which tends to keep the lower end in engagement with its contact arm 12.

The upper trunnions 19 are shown in Fig. 3, and they pivotally support a pry-out lever 43, which has a pair of spaced pivot flanges mounted on the trunnions 19. As the pry-out lever 43 is a casting, the trunnions 19 may be formed by a through pin which is driven through the apertures in the pivot flanges 44 and frictionally held in the body of the upper contact fixture 38.

The pry-out lever extends forwardly at 45 and upwardly at 46 and is provided with a ring or eye 47, which may have a large circular aperture 48 for passing the head of a disconnect tool and a narrower slot 49 for engaging the shank of a disconnect tool but resisting the passage of the head.

When the pry-out lever 43 is pushed upward it acts against the forward edge of the top 28 of hood 27, and as it moves counterclockwise it pries the trunnions 19 out of the upper contact fixture.

The fuse tube 40 contains a fusible element 50, having a leader at each end, the upper leader being clamped by screw clamp 42. The lower leader 51 extends downward out of the open end of the fuse tube through an eye 52 in the ejector lever 53.

At its lower end the fuse tube 40 supports a lower contact fixture 54, having a through bore for receiving the lower end of the fuse tube 40, which is securely clamped therein by means of a bolt 55.

Lower fixture 54 is also formed with a ring flange 56, having an enlarged circular hole 57 and a smaller slot 58. Lower fixture 54 is spaced from the lower end 59 of the fuse tube, which is open for the discharge of gases and from which the leader 51 emerges.

The lower fixture 54 may be constructed substantially as disclosed in said prior patent to Hubbard and Hollander, having a laterally projecting cylindrical housing 60, receiving a coil spring 61 which urges the throwout lever 53 in a clockwise direction.

The end of the housing 60 is split for receiving the pivot flange of the throwout lever 53, which is pivotally mounted on a rivet 62 and has a shock resisting shoe 63 engaging the under side of a hood 64 on the lower contact arm 12.

The shoe 63 resists the upward movement of the fuse tube unit 13 which is caused by the reaction of the tube as it expels gases from the open end 59. The laterally projecting housing 60 carries a flange 65 about which the leader 51 is bent, and the leader is carried over and wrapped about a screw bolt 66, which clamps the end of the leader with the throwout lever 53 pulled up into the position of Fig. 1.

The laterally projecting housing 60 also supports a pair of partial bearings 67, one being located and projecting laterally from each side for engagement with the trunnions 20, which are carried by the hood 64 and spaced from each other in an axial direction sufficiently to receive and pass the throwout lever.

The throwout lever has an elongated slot 68, with a projecting border wall 69 that engages the trunnions 20, and the throwout lever has an open side at 70 in the wall 69, so that the trunnions may be passed into the slot 68 when the fused cut-out unit 40 is hanging downward, all as described in said prior patent.

The lower contact fixture 64 on contact arm 12 comprises a cast metal hood 64, which has an upper wall 71 and a pair of side walls 72, 73. It is open at its bottom and the front or right side in Fig. 1.

The trunnions 20 comprise relatively short cylindrical members, the threaded ends of which are secured in the side walls 72, 73 by means of nuts 74. One of the trunnions 20*a* has a cylindrical extension serving as an exterior trunnion for supporting the load break lever 75.

Load break lever 75 comprises an elongated lever formed with a hub 76, having a bearing bore 77 to be received on the trunnion 20*a* and secured by means of a washer and cotter pin 78. Thus the load break lever is pivotally mounted on an extension of one of the lower trunnions.

The load break lever has an elongated tapered arm 79 formed of a web 80, and upper and lower

reinforcing flanges 81, 82. At its end the arm 79 has a ring formation 83 with a round aperture 84, large enough to pass the head of the tool on a disconnect stick.

The load break lever 75 has a relatively wide body 85 below the hub 76, this body having a radial width sufficient to bring the lateral extension 86 of the body out beyond the side wall 73 of hood 64.

Lateral extension 86 extends laterally from the load break lever 75 far enough so that an actuating arm 87 carried by extension 86 may extend backwardly toward the hub 76, but may be located inside the hood 64.

At its end the rearward extension 87 has an upwardly extending lug 88, Fig. 4, which is adapted to bear on the lower side of the trunnion 20*a*, inside the hood 64, to prevent the sidewise tilting of the lever when force is exerted on the eye 84.

The actuating arm 87 is formed with an engaging corner 89 on its lower left side, in Fig. 4, which is adapted to engage the ejector arm lip 90 to pivot the ejector arm 53 about its pivot 62, when the parts are in the position of Fig. 1.

The operation of the foregoing apparatus is as follows:

The fuse tube having been provided with a new fuse and leader 50, 51 and the leader having been passed through the eye 52, about the flange 65 and secured by the bolt 66, the fuse tube unit has now been re-fused.

The fuse tube unit is then lifted by means of a disconnect stick passing through the eye 57 and the fuse tube unit 13 hangs downward in an inverted position compared to Fig. 1. The ejector lever 53 is then uppermost, and the open side 70 of the wall 69 is presented between the trunnions 20 and the fuse tube unit is hooked on the trunnions 20 by means of the slot 68 and wall 69.

The fuse tube unit then hangs downward from the trunnions 20, and the disconnect stick is taken out of the ring 57 and placed in the ring 43 of the pry-out lever. Using the disconnect stick, the fuse tube unit is then pivoted from its inverted hanging position on the trunnions 20 in a counterclockwise direction until its trunnions 19 are engaged in the grooves 37 and 34 of the top contact fixture 27.

The fuse tube unit is now mounted for operation in its normal manner and upon passage of an excessive current the fuse 50 will be melted, permitting the spring 61 to move the throwout lever 53 clockwise on its pivot 62. This rotates the partial bearing 67 above the trunnions 20, which are carried by hood 64 until the partial bearing 67 rotates to the forward or right side of trunnions 20.

Further rotation of the ejector lever 53 in a clockwise direction causes the partial bearing 67 to kick backward against the trunnions 20, urging the fuse tube unit out of the hood 64 to break the circuit mechanically at the contact fixtures 64 and 54 after the fuse has melted and after the arc has been extinguished by the gases and parts of the fuse passing out the lower end 59 of fuse tube 49. Such is the normal operation of the fused drop-out cut-out.

The fused drop-out cut-out may also be used as a disconnect at its upper end when it is known that there is no current on the line by merely prying the fuse tube unit out of its upper contacts 37, 34, by means of the prying lever 43 and then permitting it to pivot downward on the lower trunnions 20.

I will now describe the operation of this apparatus as a load break switch.

To break the load under heavy electric currents the operator places the tool end of his disconnect stick in the eye 84 of the load break lever 75. A downward pull on this load break lever causes the corner 89 on the load break lever extension 87 to engage the lip 90 on the ejector lever 53.

This exerts a counterclockwise torque on the ejector lever 53 by means of the load break lever 75, and the length of the load break lever 75 is sufficient so that it may cause the ejector lever 53 to place such a tension on the leader 51 that the fusible element 50 is ruptured and pulled apart mechanically.

This causes a break of the circuit at the broken fusible element 50 and as the fusible element 50 is elongated it narrows down in cross section so that it then tends to melt because its cross section is reduced in proportion to the amount of current it is carrying.

Thus the stretching of the fusible element causes it to fuse because its decreased cross section causes it to be melted by the current it carries, and at the same time the fusible element 50 is physically stretched apart making a mechanical break in the circuit which thereafter causes an arc that blows the lower end and particles of the fuse and its leader out of the tube 49 at 59, and permits the ejector lever 53 to operate to eject the lower contact fixture 54 from the hood 64.

It should be noted that the load break lever cannot interfere with the operation of the ejector arm 53 upon the fusing of the fusible element 50, and after the operator has given the load break lever 75 a forcible pull the device acts automatically and it is trip-free thereafter from the load break lever.

If the operator should freeze the load break lever which is carried by the trunnions on the hood 64, this will not interfere with the operation of the fused drop-out cut-out. The load break lever 75 is held in the position of Fig. 1 by being raised to that position when the fuse tube assembly is fused.

My method of breaking electrical circuits carrying heavy current is substantially as follows:

A fusible element is interposed in the circuit and secured at its upper and lower ends to contact fixtures. The lower contact fixture includes a fuse throwout lever and a multiplying load break lever which engages the fuse throwout lever and places sufficient torque upon it to pull the fusible element apart.

The method includes the narrowing or thinning of the fusible element by means of the tension placed upon it until it fuses and/or breaks in two, thereby causing an arc which is confined by the fuse tube, and expelled and extinguished by the walls of the tube as the gases are discharged downwardly out of the end of the tube.

The method includes the pulling out of the fusible element and leader after it is broken by means of the ejector arm, and the physical breaking of the current again after the arc is extinguished between a contact fixture carried by the fuse unit and a contact arm carried by the insulator.

It will thus be observed that I have invented an improved method of breaking circuits carrying heavy currents by providing a frangible element which may also be the fusible element, and

this frangible element is mechanically broken by placing a strain upon it sufficient to break it.

This strain is preferably a tensile strain which narrows the fusible or frangible element downward in cross section and causes it to fuse and break in two to break the circuit physically inside a fuse tube.

By means of my load break arrangements very heavy electrical currents may be broken with comparative safety, and with the only cost involved being the cost of a new fusible element provided with leaders. Standard fuses may be employed in my apparatus and the apparatus may be used over and over again wthout damage to any of its parts except the fuse.

While I have illustrated a preferred embodiment of my invention, many modifications may be made without departing from the spirit of the invention, and I do not wish to be limited to the precise details of construction set forth, but desire to avail myself of all changes within the scope of the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States, is:

1. In a load-break switch, the combination of an insulating support with a pair of contact arms carried by said support, a fuse tube unit hingedly mounted on one of said contact arms and provided with a fuse controlling the release of said unit from the other contact arm, and a force-multiplying lever movably mounted directly upon said support and located to place a tension on said fuse to break it physically within the tube, the said fuse tube unit being adapted to operate independently of said force-multiplying lever when the fuse melts responsive to an overload.

2. In a load-break switch, the combination of an insulating support with a pair of contact arms carried by said support, a fuse tube unit hingedly mounted on one of said contact arms and provided with a fuse controlling the release of said unit from the other contact arm, and a force-multiplying lever movably mounted directly upon said support and located to place a tension on said fuse to break it physically within the tube, the said fuse tube unit being adapted to operate independently of said force-multiplying lever when the fuse melts responsive to an overload, said force-multiplying lever being provided with an enlarged ring at its free end and being pivotally mounted on said support.

3. In a load-break switch, the combination of an insulating support with a pair of contact arms carried by said support, a fuse tube unit hingedly mounted on one of said contact arms and provided with a fuse controlling the release of said unit from the other contact arm, and a force-multiplying lever movably mounted directly upon said support and located to place a tension on said fuse to break it physically within the tube, the said fuse tube unit being adapted to operate independently of said force-multiplying lever when the fuse melts responsive to an overload, said force-multiplying lever being provided with an enlarged ring at its free end and being pivotally mounted on said support, said fuse tube unit including a spring pressed fuse ejector lever acting on the fuse and the force-multiplying lever acting on the fuse ejector lever.

4. In a load-break switch, the combination of a hooded contact fixture provided with a pair of parallel walls, each wall supporting a contact trunnion, the trunnions extending into said hood and being spaced from each other, one of said trunnions being extended outwardly, and a force-multiplying lever rotatably mounted upon said outer extension, the said lever being provided with a laterally and an inwardly projecting arm extending into said hood for engagement with the fuse ejector lever of a fuse tube unit and for placing a breaking tension on a fuse on the fuse tube unit.

5. In a load-break switch, the combination of a hooded contact fixture provided with a pair of parallel walls, each wall supporting a contact trunnion, the trunnions extending into said hood and being spaced from each other, one of said trunnions being extended outwardly, and a force-multiplying lever rotatably mounted upon said outer extension, the said lever being provided with a laterally and an inwardly projecting arm extending into said hood for engagement with the fuse ejector lever of a fuse tube unit and for placing a breaking tension on a fuse on the fuse tube unit, a fuse tube unit having means for engaging said trunnions mounted upon a fuse ejector lever, and the fuse ejector lever having a shoulder engaged below said inwardly extending arm of the force-multiplying lever.

6. In a load-break switch, the combination of a hooded contact fixture provided with a pair of parallel walls, each wall supporting a contact trunnion, the trunnions extending into said hood and being spaced from each other, one of said trunnions being extended outwardly, and a force-multiplying lever rotatably mounted upon said outer extension, the said lever being provided with a laterally and an inwardly projecting arm extending into said hood for engagement with the fuse ejector lever of a fuse tube unit and for placing a breaking tension on a fuse on the fuse tube unit, a fuse tube unit having means for engaging said trunnions mounted upon a fuse ejector lever, and the fuse ejector lever having a shoulder engaged below said inwardly extending arm of the force-multiplying lever, said fuse ejector lever being provided with spring means for withdrawing a fuse from the fuse tube unit, the spring means acting independently of said force-multiplying lever to permit the fuse tube unit to operate on overload independently of the operation as a load-break switch.

7. The improvement in fused drop-out cutouts comprising a fuse tube unit pivotally mounted at one end and movably mounted at its other end, for release by the melting of a fuse, which comprises a force-multiplying lever mounted directly upon a separate support for said fuse tube unit to react against said support and to act on the lower end of the fusible element to exert a tensile force on the fusible element and to rupture the fusible element physically inside the fuse tube unit.

8. The improvement in fused drop-out cutouts comprising a fuse tube unit pivotally mounted at one end and movably mounted at its other end, for release by the melting of a fuse, which comprises a force-multiplying lever mounted directly upon a separate support for said fuse tube unit to react against said support and to act on the lower end of the fusible element to exert a tensile force on the fusible element and to rupture the fusible element physically inside the fuse tube unit, the said force-multiplying lever being mounted independently of the fuse tube unit so that the fuse tube unit is trip-free in so far as the force-multiplying lever is concerned.

9. In an apparatus for breaking heavy load circuits, the combination of an insulator with a pair of contact arms supported thereby, each

of said contact arms carrying a contact fixture, a fuse tube unit pivotally mounted on the uppermost of said contact arms for pivotal movement thereon into engagement or out of engagement with the lower contact arm, fusible means located in the fuse tube unit and projecting from the lower end thereof for controlling the engagement of the lower end of the fuse tube unit with the lowermost of said contact arms, and force-multiplying means mounted directly upon the lowermost of said contact arms to exert a tensile force on a fusible element in said fuse tube unit so that the fusible element may be ruptured physically to produce a break in the circuit and an arc in the fuse tube which is extinguished before the fuse tube unit pivots outward on the upper contact arm to make a physical break with the lower contact arm.

10. In an apparatus for breaking heavy load circuits, the combination of an insulator with a pair of contact arms supported thereby, each of said contact arms carrying a contact fixture, a fuse tube unit pivotally mounted on the uppermost of said contact arms for pivotal movement thereon into engagement or out of engagement with the lower contact arm, fusible means located in the fuse tube unit and projecting from the lower end thereof for controlling the engagement of the lower end of the fuse tube unit with the lowermost of said contact arms, and force-multiplying means mounted directly upon the lowermost of said contact arms to exert a tensile force on a fusible element in said fuse tube unit so that the fusible element may be ruptured physically to produce a break in the circuit and an arc in the fuse tube which is extinguished before the fuse tube unit pivots outward on the upper contact arm to make a physical break with the lower contact arm, the said force-multiplying means comprising an elongated lever pivotally mounted on the lower contact arm and having a part for exerting a downward tension on the fusible element.

11. In a lower contact assembly for a load break apparatus for electrical currents, the combination of a lower contact fixture provided with a pair of side walls, each side wall carrying an inwardly projecting trunnion for mounting the lower end of a fuse tube unit, one of said trunnions having an outward extension to serve as a trunnion for a load break lever, a load break lever having a hub mounted on said extension, and having an elongated arm provided with an actuating end portion, said load break lever having a lateral and backward extension for engaging an ejector lever on a fuse tube unit, whereby an ejecting force is impressed upon the ejector lever sufficient to rupture the fusible element in a fuse tube unit physically.

12. In a lower contact assembly for a load break apparatus for electrical currents, the combination of a lower contact fixture provided with a pair of side walls, each side wall carrying an inwardly projecting trunnion for mounting the lower end of a fuse tube unit, one of said trunnions having an outward extension to serve as a trunnion for a load break lever, a load break lever having a hub mounted on said extension, and having an elongated arm provided with an actuating end portion, said load break lever having a lateral and backward extension for engaging an ejector lever on a fuse tube unit, whereby an ejecting force is impressed upon the ejector lever sufficient to rupture the fusible element in a fuse tube unit physically, said load break lever being located and oriented to exert its force on the fusible element by a downward pull.

13. In a lower contact assembly for a load break apparatus for electrical currents, the combination of a lower contact fixture provided with a pair of side walls, each side wall carrying an inwardly projecting trunnion for mounting the lower end of a fuse tube unit, one of said trunnions having an outward extension to serve as a trunnion for a load break lever, a load break lever having a hub mounted on said extension, and having an elongated arm provided with an actuating end portion, said load break lever having a lateral and backward extension for engaging an ejector lever on a fuse tube unit, whereby an ejecting force is impressed upon the ejector lever sufficient to rupture the fusible element in a fuse tube unit physically, said load break lever being located and oriented to exert its force on the fusible element by a downward pull, said actuating end including a ring for engagement with the tool end of a disconnect stick.

14. In a load break apparatus, the combination of an insulating support with a pair of contact arms carried by said support in spaced relation to each other, a fuse tube unit comprising an insulating tube having a contact fixture adjacent each of its ends carried by said contact arms in a tilted position, trunnion and bearing connections between the contact fixture on each end of said fuse tube unit and each contact arm, whereby the fuse tube unit may pivot on trunnions at either end to open the circuit at the other end, one of said contact fixtures being provided with a spring pressed fuse ejector lever, a fuse in said fuse tube and secured at one end to the tube and at the other end to said fuse ejector lever, and means movably mounted upon one of said contact arms and reacting against said contact arm for engaging said fuse ejector lever to exert a physical force on said fuse to pull the fuse apart and break the circuit inside said tube.

15. In a load break apparatus, the combination of an insulating support with a pair of contact arms carried by said support in spaced relation to each other, a fuse tube unit comprising an insulating tube having a contact fixture adjacent each of its ends carried by said contact arms in a tilted position, trunnion and bearing connections between the contact fixture on each end of said fuse tube unit and each contact arm, whereby the fuse tube unit may pivot on trunnions at either end to open the circuit at the other end, one of said contact fixtures being provided with a spring pressed fuse ejector lever, a fuse in said fuse tube and secured at one end to the tube and at the other end to said fuse ejector lever, and means for engaging said fuse ejector lever to exert a physical force on said fuse to pull the fuse apart and break the circuit inside said tube, said means comprising an elongated lever pivotally mounted upon the contact arm adjacent said fuse ejector lever and adapted to engage said fuse ejector lever to exert a downward pull on the fuse ejector lever.

16. In a load break apparatus, the combination of an insulating support with a pair of contact arms carried by said support in spaced relation to each other, a fuse tube unit comprising an insulating tube having a contact fixture adjacent each of its ends carried by said contact arms in a tilted position, trunnion and bearing connections between the contact fixture on each end of said fuse tube unit and each contact arm, whereby the fuse tube unit may pivot on trunnions at either

end to open the circuit at the other end, one of said contact fixtures being provided with a spring pressed fuse ejector lever, a fuse in said fuse tube and secured at one end to the tube and at the other end to said fuse ejector lever, and means for engaging said fuse ejector lever to exert a physical force on said fuse to pull the fuse apart and break the circuit inside said tube, said means comprising an elongated lever pivotally mounted upon the contact arm adjacent said fuse ejector lever and adapted to engage said fuse ejector lever to exert a downward pull on the fuse ejector lever, said latter contact arm being provided with a hood having a pair of inwardly projecting trunnions to be engaged by the adjacent contact fixture on said fuse tube unit and said hood having one of its trunnions projecting outwardly to provide support for said lever.

17. In a load break apparatus, the combination of an insulating support with a pair of contact arms carried by said support in spaced relation to each other, a fuse tube unit comprising an insulating tube having a contact fixture adjacent each of its ends carried by said contact arms in a tilted position, trunnion and bearing connections between the contact fixture on each end of said fuse tube unit and each contact arm, whereby the fuse tube unit may pivot on trunnions at either end to open the circuit at the other end, one of said contact fixtures being provided with a spring pressed fuse ejector lever, a fuse in said fuse tube and secured at one end to the tube and at the other end to said fuse ejector lever, and means for engaging said fuse ejector lever to exert a physical force on said fuse to pull the fuse apart and break the circuit inside said tube, said means comprising an elongated lever pivotally mounted upon the contact arm adjacent said fuse ejector lever and adapted to engage said fuse ejector lever to exert a downward pull on the fuse ejector lever, said latter contact arm being provided with a hood having a pair of inwardly projecting trunnions to be engaged by the adjacent contact fixture on said fuse tube unit and said hood having one of its trunnions projecting outwardly to provide support for said lever, said elongated lever having a lateral extension and a backwardly extending extension provided with a lug for engaging under the trunnion in said hood and having a shoulder for directly engaging the fuse ejector lever.

18. In a load break switch attachment for fused drop-out cut-outs, the combination of an insulating support with a pair of contact arms extending in the same direction from said support for supporting a fuse tube unit, the uppermost of said contact arms being provided with a pair of downwardly open grooves for receiving trunnions, and with spring means for pressing trunnions into said grooves to provide a releasable bearing for supporting the upper end of the fuse tube unit, a fuse tube unit comprising a tube and contact fixtures at each of its ends, the upper contact fixture having trunnions receivable in the grooves of the upper arm and removable by a pull exerted with a disconnect stick, said trunnions rotatably mounting the fuse tube unit at its upper end, a hood carried by the lower contact arm and provided with inwardly extending trunnions for supporting the lower fuse tube unit fixture, partial bearing means for rotatably supporting the fuse tube unit on said lower trunnions, and a spring pressed ejector arm pivotally mounted on said lower contact fixture and exerting a pull on a fuse and its leader extending from said fuse tube unit, the ejector lever being arranged to lift the partial bearing means from the lower trunnions upon blowing of the fuse, and a force-multiplying ejector lever pivotally mounted on said lower hood and having a laterally and inwardly extending arm engaging said ejector lever when the fuse tube unit is installed, said arm permitting the ejector lever to operate independently to expel the fuse tube unit from the lower hood upon the fusing of the fuse, even though the force-multiplying lever is held in downward position.

RALPH J. BASKERVILLE.

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