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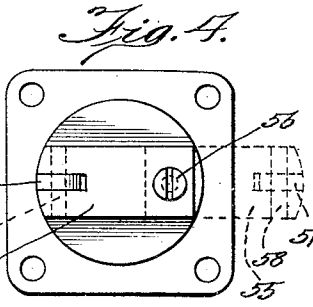
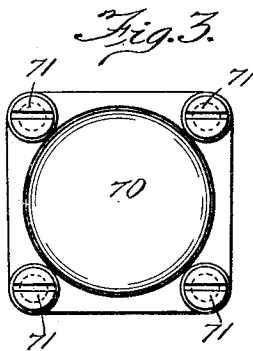
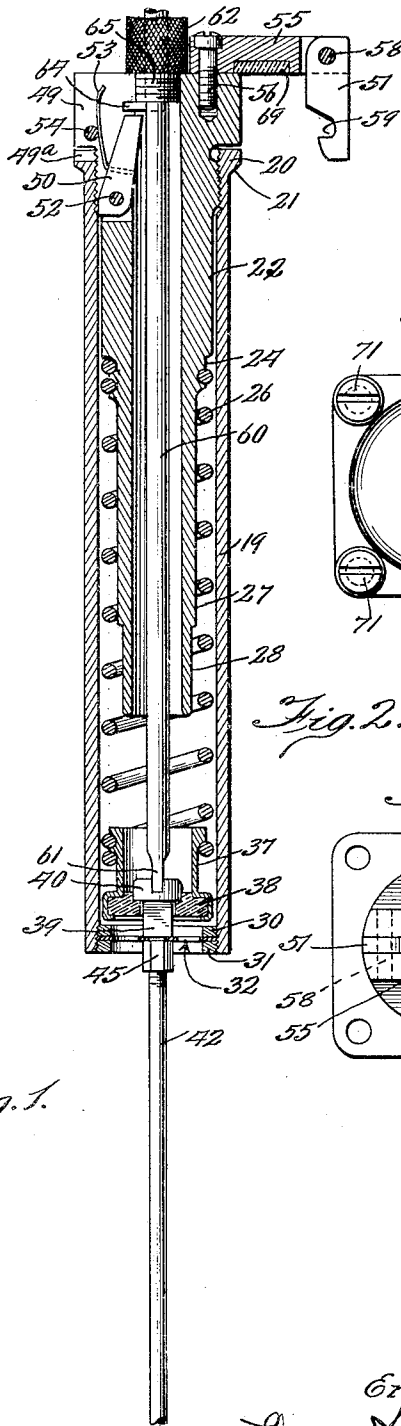
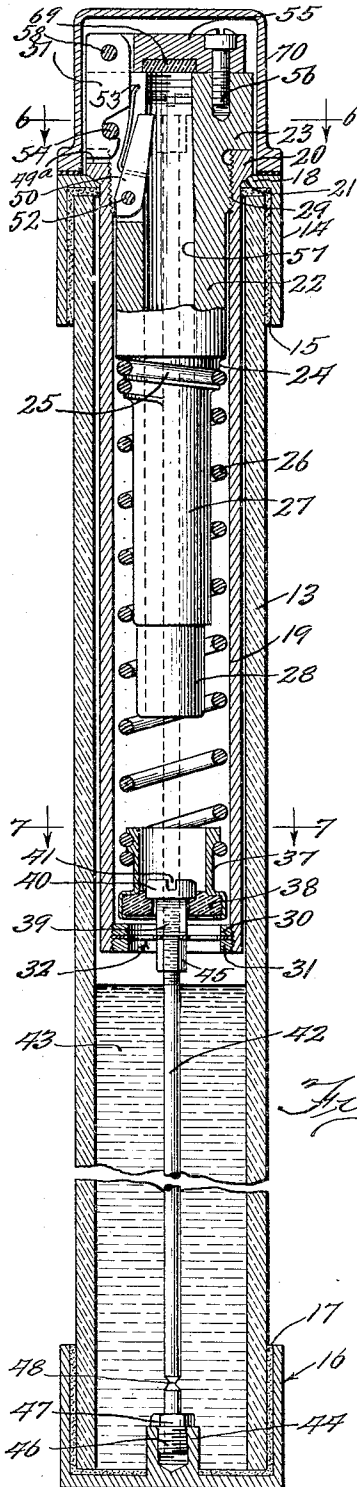
E. N. NORDHEM

1,857,322

HIGH TENSION CUT-OUT AND THE LIKE

Filed May 27, 1929

2 Sheets-Sheet 1



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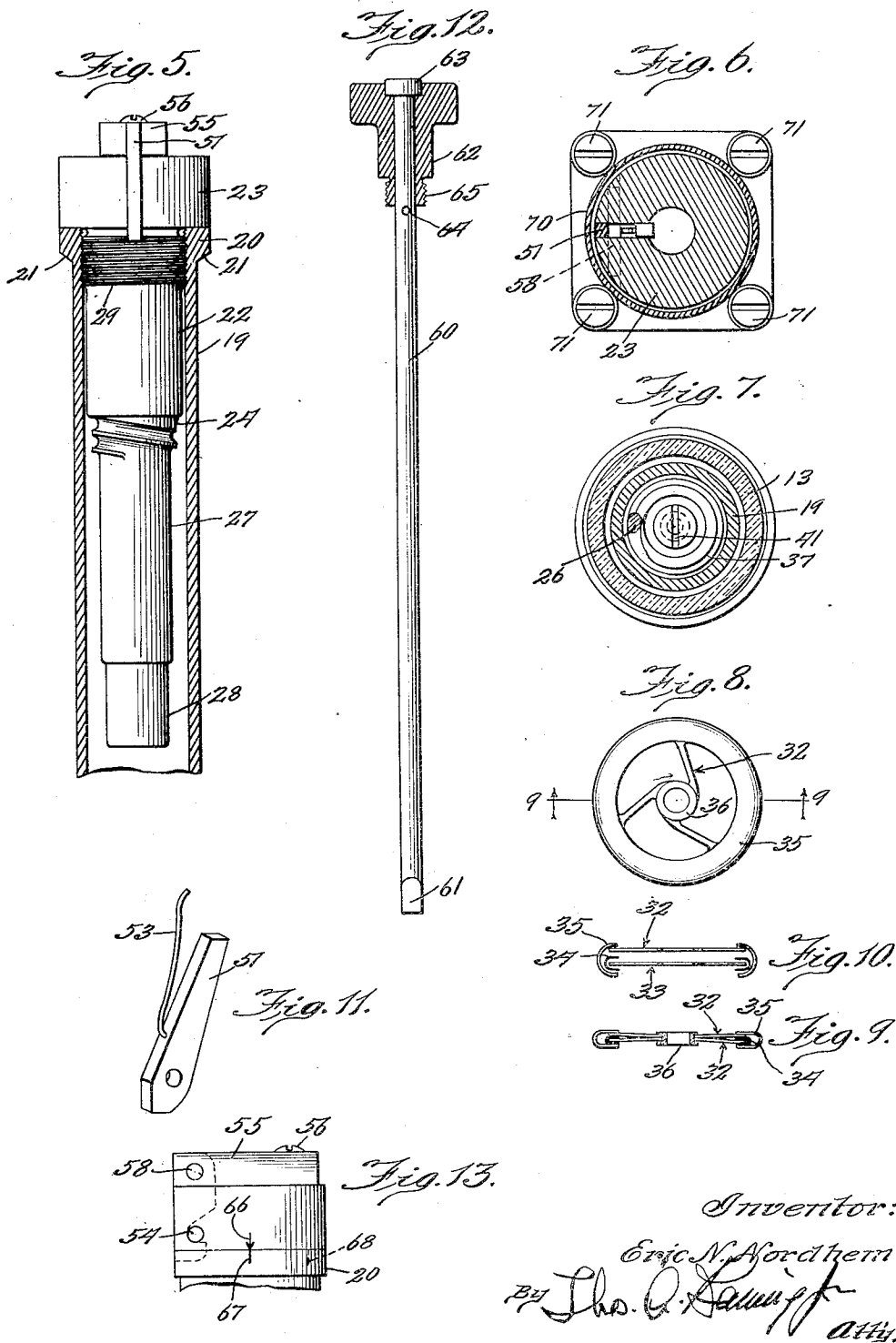
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HIGH TENSION CUT-OUT AND THE LIKE

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

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HIGH TENSION CUT-OUT AND THE LIKE

Application filed May 27, 1929. Serial No. 366,262.

This invention has to do with certain improvements in high tension cut-outs and the like. The invention relates particularly to improvements in high tension fuses; and more particularly the invention has to do with improvements in high tension fuses which are provided with a suitable quenching bath for quenching the arc to extinguish the same.

One of the objects of the invention is to provide a high tension cut-out of such a construction that the operation of finally opening the circuit will be performed by breaking a conducting element by subjecting the same to torque, such torque being released or made effective by the overload condition. In this connection it is more particularly the object to establish the opening of the circuit due to the exertion of such torque at a point within the body of the quenching liquid.

A still further object of the invention is to make provision for breaking or severing the conductor by the exertion of such torque, together with means for immediately thereafter longitudinally operating the disconnected parts of the conductor so as to move them a very substantial distance apart. In this way the twisting operation is immediately followed by a longitudinal separation of the sections which have been twisted apart so as to result in a final extinguishment of the current flow under the best possible conditions.

Still more particularly it is an object to accomplish the functions of twisting apart and longitudinal separation by the use of a single spring of sufficient strength. When the device is set and is in normal operation this spring is stretched out to create a tension which tends to separate the conductor, and the spring is also under a twist or torsion of amount sufficient to twist the conductor apart at the proper point. Such twist action is however normally resisted by means of a fuse conductor or a companion element of sufficient mechanical strength, the arrangement being such that when the fuse is blown by overload condition the mechanical element also burns off, thereby allowing the exertion of the full amount of torsion. It results in

breaking the conductor whereupon the tension results in separating the conductor sections from each other.

Another feature of the invention relates to the provision of means for very conveniently and readily reloading and resetting the device after a circuit opening operation so as to again place the same in service.

Another feature of the invention relates to the provision of a construction of very simple form, and one which can be readily manufactured at low cost.

Another feature of the invention relates to the provision of an arrangement such that when the circuit is opened, the movable conductor section will be drawn up through the bath of liquid with a minimum amount of disturbance thereto. This arrangement also results in a considerable reduction in the amount of resistance or friction which must be overcome, thereby insuring an extremely quick and unobstructed movement of parts. In connection with the foregoing it is an object of the invention to provide a construction in which the spring, the releasing or controlling fuse, and practically all of the moving parts, are located in the air space above the liquid.

Other objects and uses of the invention will appear from a detailed description of the same which consists in the features of construction and combinations of parts hereinafter described and claimed.

In the drawings:

Figure 1 shows a longitudinal section through a device embodying the features of the present invention, the same being set and the parts being in the normal operating condition, a portion of the structure being, broken away so as to shorten the figure;

Figure 2 shows a longitudinal section through the spring cartridge removed from the shell, the resetting tool being in place for the resetting of a new element;

Figure 3 shows a top view of the assembled device;

Figure 4 shows a view similar to that of Figure 3, with the exception that the cap has been removed;

Figure 5 shows a view similar to the upper

portion of Figure 2 being taken at right angles thereto;

Figure 6 shows a horizontal view of the transverse section on the line 6—6 of Figure 1, looking in the direction of the arrows;

Figure 7 shows a cross section on the line 7—7 of Fig. 1, looking in the direction of the arrows;

Figure 8 shows a plan view of the fuse element removed from the rest of the structure and on enlarged scale;

Figure 9 shows a cross section on the line 9—9 of Fig. 8 looking in the direction of the arrows;

Figure 10 shows a view similar to that of Figure 9, but prior to clamping the fuse sections together;

Figure 11 shows a perspective view of the catch pawl and spring removed from the rest of the structure;

Figure 12 shows a detail view of the resetting tool removed from the rest of the structure, the head thereof being shown in section; and

Figure 13 shows a fragmentary detail view of the companion head block with the key marks by means of which their relative positions are located.

In the construction shown in the figures I have provided an outer shell or chamber 13 of glass or other insulating material of considerable mechanical strength. A ferrule 14 is secured to the upper end thereof as by means of solder 15; and a cap 16 is secured to the lower end of said shell as by means of solder 17. The upper end 18 of the ferrule is preferably carried over a sufficient distance to overlie the end of the shell 13 as shown in Figure 1, thereby establishing an end seat or abutment.

A cartridge 19 of conducting material and less length than the shell 13 is set down into said shell when the device is charged and in operation. This cartridge 19 has its upper end 20 slightly enlarged to establish a downwardly tapering shoulder 21 as best shown in Figures 2 and 5, which shoulder rests against a similar tapered seat at the inner periphery of the flange 18. This arrangement establishes a considerable friction between these parts when the cartridge 19 is in place and the spring is under tension.

Within the upper end of the cartridge 19 there is located a head-block 22. The upper end thereof, 23, is of enlarged size so that it overlies the upper end portion 20 of the cartridge already referred to. This block 22 reaches down into the cartridge and at the position of a shoulder 24 is provided with two or three turns of spiral groove 25 to accommodate the upper end convolutions of the spring 26 within the cartridge 19. Below the shoulder 24 the size of the block 22 is reduced as shown at 27 so as to accommodate the spring which surrounds said reduced

portion. At its lower end the block 22 suffers a further reduction of size as shown at 28.

The upper portion of the block 22 is threaded into the upper end of the cartridge 19 as shown at 29. These threads work rather easily so that the block can be readily turned with respect to the cartridge.

There is a ring 30 threaded into the lower end of the cartridge 19; and a companion ring 31 may also be threaded into the lower end of the cartridge to clamp the peripheral portion of a fuse element against the ring 30. This fuse element is shown in detail in Figures 8, 9, and 10. It includes a peripheral portion which is clamped between the rings 30 and 31, together with a hub portion, said portions being joined together by a series of spokes which are preferably not exactly radial.

The details of this fuse element are readily understood from Figures 8, 9, and 10. The fuse element comprises the upper and lower companion sections 32 and 33 each of which has a peripheral portion together with a hub portion together with the companion spokes. Element 32 is the fuse element and normally conducts the current, whereas, the element 33 is a mechanically stronger element whose function is to normally resist the twisting force or torque of the spring. Such resistance of torque will also be performed to some extent by the element 32 but ordinarily the main reliance for such strength will be placed on the element 33. The element 33 may be made of relatively strong noncorrosive material such as bronze, brass, nickel alloy, steel, etc.

A band or fibre or other nonconducting material 34 is placed around the edge of the element 33, and the edge portions of both of the elements 32 and 33 are then clamped together by an encircling clip 35. Preferably a stud or eyelet 36 is extended through the hubs of the two elements 32 and 33 so as to clamp them firmly together.

Examination of Figure 8 will show that the spokes which join together the hub and peripheral portions enter the hub portion more or less tangentially and at such a direction that a force tending to twist the hub in the clockwise direction when viewed as in Figure 8 will be resisted almost entirely by a tension in the spokes so that little if any shearing force will be created in said spokes.

The lower end of the spring 26 carries a sleeve 37 to which the spring is connected by causing two or three turns of the spring to embrace the same. This sleeve 37 has its lower end clipped around a block 38 of insulating material such as fibre or bakelite so as to hold the same in a firm manner.

The insulating block 38 is provided with a central noncircular perforation such as a square hole through which extends the square shank 39 of a stud. The upper end 40 of said

stud rests against the top face of the block 38, and said upper face is preferably cross-cut to establish a tool notch 41 (see Fig. 1).

There is a rod 42 of conducting material 5 which reaches down from the stud block 39 and through the bath of liquid 43 into a boss 44 which extends up from the center of the cap 16. This rod 42 has its upper end threaded so that it can be set freely up through the 10 eyelet or hub 36 and then threaded into the stud block 39. Thereupon a lock nut 45 on the rod 42 may be tightened up so as to firmly clamp the hub of the fuse element against the stud block 39. As a result thereof the 15 torsion communicated from the sleeve 37 into the stud block 39 may be transmitted to the central or hub portion of the fuse element and thus effectively taken care of.

The lower end of the rod 42 is enlarged at 20 46 where it enters the boss 44, into which it is easily threaded, and if desired, a nut 47 may be provided on the rod 42 immediately above this enlargement. The rod 42 is also provided with a notch 48 near its lower end 25 which notch serves to materially reduce the mechanical strength of the rod so that it may be easily twisted off at that point. Nevertheless, the tensile strength of the rod is sufficient to resist the up pull of the spring 26.

The head block 23 already referred to is provided with a radial slot 49 which reaches down low enough to accommodate a pawl 50 and a latch 51. The pawl 50 has its lower end pivoted on a pin 52 which extends across the notch 49. The upper end of said pawl 35 is normally projected inwardly towards the axis of the device by a leaf spring 53 which bears against another cross pin 54 reaching across the slot 49.

There is a head block 55 located above the head 23 said head block 55 being held at one side by a screw 56 which, however, is loose enough so that the head block 55 can be turned over to one side as shown in Figure 2 and as shown by the dotted lines in Figure 4. When the head block 55 is turned back into its normal position as shown in Figure 1, it overlies the upper end of the bore 57 which reaches up through the length of the 50 block 22 to its upper end. When said head block 55 has been turned into said position the latch 51 which is pivoted to the head block by a cross pin 58 will be dropped down into the slot 49 and the notch 59 of said latch will 55 then engage with the cross pin 54 reaching across said slot. In this manner the head block 55 will be retained at one side by the screw 56 and at the other side by the latch 51.

When the assembled cartridge together 60 with a rod 42 has been removed from the shell 13, the latch 51 may be swung away from the slot 49 and then the head block 55 can be turned around to the position of Figure 2. This will expose the upper end of the 65 through-hole 57.

There is a resetting tool shown in detail in Figure 12. The same includes a shank 60, the lower end 61 of which is flattened into the form of a screwdriver to engage the slot 41 of the stud head 40. The upper end of the 70 resetting tool 60 carries a head block 62 which is swivelled thereon, said head block being held in place by an enlargement 63 on the upper end of the shank 60. A pin 64 on the shank 60 serves to prevent the block 62 from 75 falling down along the shank. Also said pin will engage the slot 49 to prevent the shank from rotating when the tool is set down into the passage 57. The lower end of the head block 62 is threaded as shown at 65, and the 80 upper end of the passage 57 is correspondingly threaded. The head block 23 is provided with a key mark 66 and the head block or enlargement 20 is provided with two key marks 67 and 68 which are located on its face by or separated from each other an angular separation equal to the amount of twist which it is desired to establish in the spring.

Preferably, the block 55 is provided on its under face with a fibre insert 69 which overlies the upper end of the passage 57 and will receive the impact from the rod 42 and head 40 when the fuse operates.

The operation of the device will be readily understood and is substantially as follows: 95 The current normally flows through the ferrule 14 and the cap 16, flowing through the metallic cartridge 19, through the arms of the fuse member 32, and through the rod 42. The spring 26 is at such time under tension and also under torsion. The tension of the 100 spring is resisted by the rod 42. The torsion of the spring is resisted by the arms of the fuse since said torque is established between the block 22 on the upper end and the cartridge 19 and the lower end of the spring. In 105 this connection it will be noted that the slot 49 of the head block 23 is carried down as a slight continuation 49^a into the head portion 20 of the cartridge 19, and when the latch 51 110 is turned down into the locking position of Figure 1 it enters this portion 49^a of the slot so as to prevent the parts 20 and 23 from turning with respect to each other.

As soon as the fuse member 32 blows as a 115 result of overload the arc will flash on to the member 33 and burn it off also. This will result in immediate destruction of the tension and torsion resistances. The torsion will then cause the insulating block 38 to twist 120 and thereby twist the rod 42 which will immediately be twisted off at the position of the notch 48. Immediately the tensional resistance of the rod will be destroyed, and the spring 26 will suddenly jerk the sleeve 37 125 upwards until the spring is closed. The inertia of the rod 42 will carry it on up through the passage 57 so that its head 40 will run over the top end of the pawl 50 and be hooked thereon as shown by the dotted lines in Fig- 130

ure 1. The impact of the rod will be absorbed by the fibre insert in the block 55.

After the device has operated, it is reset in the following manner:

5 Upon removing the cap 70 from the ferrule 14, said cap being normally held in place by a series of screws 71, the cartridge 19 can be withdrawn from the shell 13 in as much as the rod 42 has been severed and the spring
10 has been fully retracted. Thereupon the latch 51 can be turned up to disengage from the slot 49 and then the head block 55 can be turned around into the position of Figure 2. The pawl 50 can then be disengaged from the
15 head 40 so as to allow the rod to drop down and seat the square shank 39 in the hole of the insulating block 38 while the cartridge is thus withdrawn the broken off end 46 of the torsion rod may be removed from the boss 44
20 by means of a suitable tool.

The ring 31 may be unthreaded so as to release the peripheral portion of the fuse element.

25 The resetting tool may be pushed down through the passage 57 with its lower flattened end 61 inserted into the notch 41 of the shank head 40, and by forcing the resetting tool down the spring 26 will be stretched out to its full length so that the head 65 of the
30 resetting tool can be threaded into the upper end of the passage 57 temporarily. During this operation the pin 64 of the resetting tool is engaged with the slot 49 so that the rod 60 is held against rotation.

35 The above operation will stretch out the spring 26 to its full amount so as to bring the block 38 down close to the position of the fuse member. The old rod section 42 may then be unscrewed from the shank 39
40 and at the same time the central portion of the fuse element will be released. Then a new fuse element may be set into place and its periphery may be clamped by resetting the ring 31. A new rod 42 is then prepared
45 by running the lock-nut 45 down along the threads of said rod as far as possible. Thereupon, said rod may be set up through the hub of the fuse member and threaded into the shank block 39 as far as necessary.
50 Thereupon the lock-nut 45 may be threaded up to clamp the hub portion of the fuse member solidly to the rod 42.

55 During the above operations the head block 55 has been turned over to the side as shown in Figure 2. Also, prior to tightening up the nut 45, the block 23 was turned around to bring the index mark 66 into registry with the mark 68 on the back side of the head 20
60 of the cartridge 19. Under these conditions the spring is relieved of any torsion although under tension. Thereupon, when the nut 45 is tightened up, the position of the head 23 with respect to the head portion 20
65 is such that the newly inserted rod 42 oc-

cupies its working position with the spring relieved of torsion.

70 Thereafter, the cartridge with the resetting tool still in place and with the rod 42 secured in place may be set down into the shell 13 so as to bring the lower enlarged end 46 of the rod into threading engagement with the boss 44. The cartridge may then be rotated so as to rotate the rod 42 and thereby thread the engaging end 46 into the
75 boss until the nut portion 47 comes against the top end of the boss. This threading operation can be easily performed due to the fact that the threads are cut so as to run easily.

80 The threads 46 are cut in such direction that when the fuse lets go so as to release the torsion of the spring, the rotation of the rod 42 will tighten up the threads 46 thereby insuring a firm retention against backward
85 rotation or disconnection.

After the rod has been threaded into the boss 44, the resetting tool may be removed by first unscrewing its head block 62 from the
90 upper end of the passage 57. Thereafter the head 23 may be turned with respect to the head portion 20 of the cartridge 19 in such direction as to place the spring under torsion and bring the slots 49 and 49^a into registry. Thereupon the block 55 may also be swung
95 around to the proper position so that the latch 51 can be dropped down into the slots 49 and 49^a, thereby locking the head portions 23 and 20 together. At the same time the index mark 66 will have been restored to
100 registry with the mark 67 and the spring will have been placed under the desired torsion corresponding to this restoration of registry.

When the cap 70 is again set into place, the latch 51 will be covered over and held in such
105 position.

While I have herein shown and described only a single embodiment of the features of my present invention, still I do not limit myself thereto except as I may do so in the
110 claims.

I claim:

1. A cut-out device comprising in combination a tubular shell having a cap closing its lower end, a ferrule mounted on its upper
115 end, a cartridge adapted for insertion into the upper portion of said shell, said cartridge including a tubular casing of conducting material, a head member rotatably mounted on the upper end thereof, means for at times
120 locking the head member and the shell of the cartridge together against rotation, suitable markings on the head member and on the upper end of the shell of the cartridge for indicating the relative angular positions of
125 said parts with respect to each other, a spiral spring within said cartridge having a normal length less than the length of the cartridge, a connection between the upper end of said spring and the head member afore-
130

said, an insulating block connected to the lower end of the spring, there being a central perforation in said insulating block, a shank block having an enlarged head and a downwardly depending shank adapted to extend through the opening aforesaid, a rod of conducting material having its upper end connected to the shank block and its lower end connected to the cap at the lower end of the shell, said rod being provided with a section of reduced torsional strength adjacent to its lower end, and a fusible retaining member extending between the shank block and the lower portion of the cartridge shell, and including an inner hub portion non-rotatably connected to the shank block and an outer peripheral portion non-rotatably connected to the lower portion of the cartridge shell, together with a series of spokes extending between the peripheral portion aforesaid and the hub portion and engaging the hub portion in substantially tangential manner, whereby said spoke portions serve to restrain the hub and peripheral portions against relative rotation due to torsional tendency of the spring, substantially as described.

2. A cut-out device comprising in combination a tubular shell having a cap closing its lower end and a ferrule mounted on its upper end, a cartridge adapted for insertion into the upper portion of said shell, said cartridge including a tubular casing of conducting material, a head member mounted on the upper end thereof, a spiral spring within said cartridge having a normal length less than the length of the cartridge, a connection between the upper end of said spring and the head member aforesaid, an insulating block connected to the lower end of the spring, there being a central perforation in said insulating block, a shank having an enlarged head and a downwardly depending shank adapted to extend through the opening aforesaid, a rod of conducting material having its upper end connected to the shank block and its lower end connected to the cap at the lower end of the shell, said rod being provided with a section of reduced torsional strength adjacent to its lower end, and a fusible retaining member extending between the shank block and the lower portion of the cartridge shell, and including an inner hub portion non-rotatably connected to the shank block and an outer peripheral portion non-rotatably connected to the lower portion of the cartridge shell, together with a series of spokes extending between the peripheral portion aforesaid and the hub portion and engaging the hub portion in substantially tangential manner, whereby said spoke portions serve to restrain the hub and peripheral portions against relative rotation due to torsional tendency of the spring, substantially as described.

3. A cut-out device comprising in combi-

nation a tubular shell having a cap closing its lower end and a ferrule mounted on its upper end, a cartridge adapted for insertion into the upper portion of said shell, said cartridge including a tubular casing of conducting material, a head member mounted on the upper end thereof, a spiral spring within said cartridge having a normal length less than the length of the cartridge, a connection between the upper end of said spring and the head member aforesaid, an insulating block connected to the lower end of the spring, there being a central perforation in said insulating block, a shank block having an enlarged head and a downwardly depending shank adapted to extend through the opening aforesaid, a rod of conducting material having its upper end connected to the shank block and its lower end connected to the cap at the lower end of the shell, said rod being provided with a section of reduced torsional strength and a fusible retaining member extending between the shank block and the lower portion of the cartridge shell, and including an inner hub portion non-rotatably connected to the shank block and an outer peripheral portion non-rotatably connected to the lower portion of the cartridge shell, together with a series of spokes extending between the peripheral portion aforesaid and the hub portion and engaging the hub portion in substantially tangential manner, whereby said spoke portions serve to restrain the hub and peripheral portions against relative rotation due to torsional tendency of the spring, substantially as described.

4. A cut-out device comprising in combination a shell having its lower end closed, a cartridge adapted for insertion into the upper portion of said shell, said cartridge including a tubular casing of conducting material, a head member mounted on the upper end thereof, said head member being rotatable with respect to the casing of the cartridge, means for locking the head member in a given angular position on the cartridge, a spiral spring within the cartridge having a normal length less than the length of the cartridge, a connection between the upper end of said spring and the head member aforesaid, a rod of conducting material having its lower end connected to the closed lower end of the first mentioned shell, a connection between the upper end of said rod and the lower end of the spring, the rod being provided with a section of reduced torsional strength adjacent to its lower end, the rod normally resisting the torsional force of the spring, the spring normally being under torsion, and means constituting an electrical connection between the lower end of the cartridge shell and the upper end of the rod, said means including physical means for resisting the exertion of torque between the spring and the rod, substantially as described.

5. A cut-out device comprising in combination a shell having its lower end closed, a cartridge adapted for insertion into the upper portion of said shell, said cartridge including a tubular casing of conducting material, a head member mounted on the upper end thereof, said head member being rotatable with respect to the casing of the cartridge, means for locking the head member in a given angular position on the cartridge, a spiral spring within the cartridge having a normal length less than the length of the cartridge, a connection between the upper end of said spring and the head member aforesaid, a rod of conducting material having its lower end connected to the closed lower end of the first mentioned shell, a connection between the upper end of said rod and the lower end of the spring, the rod normally resisting the tensional force of the spring, the spring normally being under torsion, and means constituting an electrical connection between the lower end of the cartridge shell and the upper end of the rod, said means including physical means for resisting the exertion of torque between the spring and the rod, substantially as described.

6. A cut-out device comprising in combination a tubular shell having its lower end closed, a cartridge adapted for insertion into the upper portion of said shell, a spiral spring within said cartridge, a connection between the upper end of said spring and the upper portion of the cartridge, said spring being normally under tension and torsion, a conducting rod having its lower end connected to the lower closed end of the first mentioned shell, insulating means for connecting the upper end of said rod to the lower end of the spring to cause the rod to receive and resist the tension of the spring, a fuse element extending between the lower end of the cartridge and the upper end of the rod for carrying the current between these parts, and a mechanical torsion resisting element extending between the lower end of the cartridge shell and the lower end of the spring and the upper end of the rod serving to resist the torsional force of the spring, and being in proximity to the fuse element and subject to destruction when the fuse element is destroyed to thereby permit communication of torque from the lower end of the spring to the upper end of the rod, substantially as described.

7. A cut-out device comprising in combination a tubular shell having its lower end closed, a cartridge adapted for insertion into the upper portion of said shell, a spiral spring within said cartridge, a connection between the upper end of said spring and the upper portion of the cartridge, said spring being normally under tension and torsion, a conducting rod having its lower end connected to the lower closed end of the

first mentioned shell, insulating tension resisting means connecting the upper end of said rod to the lower end of the spring, and a torsion resisting element extending between the lower end of the cartridge shell and the lower end of the spring and the upper end of the rod and including means normally transmitting torsion force from the lower end of the spring into the lower end of the cartridge shell, and also including current conducting means extending between the lower end of the cartridge shell and the upper end of the rod said torsion transmitting means and said current conducting means being subject to destruction with overload of current and the torsion of the spring being sufficient to twist the conducting rod from the lower closed end of the shell substantially as described.

8. A cut-out device comprising in combination a tubular shell having its lower end closed, a cartridge adapted for insertion into the upper portion of said shell, a spring within said cartridge, a connection between the upper end of said spring and the upper portion of the cartridge, said spring being normally under tension and torsion, a conducting rod having its lower end connected to the lower closed end of the first mentioned shell, insulating torsion resisting means connecting the upper end of said rod to the lower end of the spring, and a torsion resisting element extending between the lower end of the cartridge shell and the lower end of the spring and including means normally transmitting torsion force from the lower end of the spring into the lower end of the cartridge shell and also including current conducting means for conducting current between the lower end of the cartridge shell and the upper end of the rod said torsion transmitting means and said current conducting means being subject to destruction with over load of current and the torsion of the spring being sufficient to twist the conducting rod from the lower closed end of the shell, substantially as described.

9. A cut-out device comprising in combination a cartridge, a spring within said cartridge, a connection between the upper end of said spring and the upper portion of the cartridge, said spring being normally under tension and torsion, a conducting rod having one end adjacent to the lower end of the cartridge, means for retaining the other end of the rod against tension and torsion, an insulating tension and torsion transmitting connection between the upper end of the rod and the lower end of the spring serving to so subject the rod to tension and torsion of the spring when said end of the spring is released, and a torsion resisting current conducting element extending between the lower end of the cartridge shell and the lower end of the spring and the upper end of the rod

normally transmitting torsion force from the lower end of the spring into the lower end of the cartridge shell and including current conducting means extending between the lower end of the cartridge shell and the upper end of the rod, said torsion resisting current conducting element being subject to destruction with overload of current and the torsion of the spring being sufficient to twist the rod in two to thereby sever the rod by torsion of the spring, substantially as described.

10. A cut-out device comprising in combination a cartridge, a spring within said cartridge, a connection between the upper end of said spring and the upper portion of the cartridge, said spring being normally under strain and torsion, a conducting rod having one end adjacent to the lower end of the cartridge, means for retaining the other end of the rod against strain and torsion, an insulating connection between the upper end of the rod and the lower end of the spring serving to subject the rod to strain and torsion of the spring when said end of the spring is released, means intermediate between the lower end of the spring and the lower end of the cartridge for normally resisting the torsion of the spring, and means for destroying said resistance with over load of current flow between the cartridge and the rod, substantially as described.

11. A cut-out device comprising in combination a spring normally under strain and torsion, a conducting rod having one end adjacent to a movable end of the spring, an insulating connection between the said ends of the spring and rod, means for retaining the other end of the rod against movement, a torsion resisting and conducting element extending between the spring end of the rod and a stationary part for transmitting current between these parts, said element including a fusible portion for destruction by over load current, whereby over load current serves to destroy said part and release the torsion of the spring for operation on the rod, substantially as described.

12. A cut-out device comprising in combination a spring normally under strain and torsion, means for anchoring one end of said spring stationary, a conducting rod having one end adjacent to the other movable end of the spring, means for anchoring the other end of said rod, an insulating connection between the movable end of the spring and the adjacent end of the rod for transmitting strain and torsion between these parts, and a device between the movable end of the spring and the adjacent end of the rod and the stationary part for normally anchoring these parts against rotation, said device including a fusible conducting element, said device being subject to destruction by over load of current to thereby release the torsion of the

spring for operation on the rod, substantially as described.

13. A cut-out device comprising in combination a spring normally under strain and torsion, a conducting rod of sufficient strength to normally resist the strain of the spring but of insufficient strength to normally resist the torsion of the spring, whereby when the torsion of the spring is communicated to said rod, the rod is severed by torsion, and a device extending between the movable end of the spring and the adjacent end of the rod and a stationary part for conducting current between the movable end of the rod and the stationary part, said device also having sufficient torsional strength to normally resist the torsion of the spring and being subject to destruction by over load of current to thereby release the torsional force of the spring into the rod to sever the rod, substantially as described.

14. A cut-out device including in combination a rod which may be severed by torsion, means for anchoring one end of said rod against movement, spring means normally under torsion, an insulating connection between said spring means and the free end of the rod, and means connecting the free ends of the spring and rod with a stationary part and including a current conducting torsion resisting means between the stationary part and the rod, said current conducting torsion resisting means being subject to destruction by over load of current, and the torsion of the spring being sufficient to sever the rod, substantially as described.

15. As a new article of manufacture, a fusible device comprising in combination a pair of companion elements each including a hub portion, a circumferential portion, and a series of spoke portions extending between said parts, one of said companion elements being a fusible current conductor and the other being a mechanically stronger element, means for joining together the hub portions of the elements mechanically and electrically, and means for insulating the peripheral portions of the elements from each other and for joining them together mechanically, substantially as described.

16. As a new article of manufacture, a fusible torque resisting device comprising in combination a pair of companion elements each including a hub portion and a peripheral portion and a series of spokes joining said portions together, said spokes entering the hub portions in a direction substantially tangential thereto to thereby most effectively resist torsional forces, means for mechanically and electrically joining together the hub portions, and means for insulating the peripheral portions from each other and for joining them together mechanically, substantially as described.

17. As a new article of manufacture a tor-

sion resisting fusible device comprising a hub member and a separate peripheral member together with a series of spoke portions extending between the hub and peripheral members and entering the hub member in a substantially tangential direction to thereby effectively resist torsional forces, said spoke portions being fusible under over load of current to permit relative rotation between the hub and peripheral members, substantially as described.

18. As a new article of manufacture a torsion resisting fusible device comprising a fusible element having a hub portion and a peripheral portion together with a series of spoke portions extending between said parts and formed of fusible conducting material subject to fusion by over load of current to thereby release the hub portion from the peripheral portion, substantially as described.

19. A cartridge for use in connection with a cut-out device, said cartridge including a tubular shell of conducting material, a rotatable head mounted upon the upper end thereof, means for locking said head and shell in a given angular position in respect to each other, a spiral spring within the shell having its upper end connected to said head, and a fusible element connecting the lower end of the shell with the lower end of the spring and insulated from the spring, said fusible element including a hub portion subject to torsion of the spring and a peripheral portion connected to the shell and a series of spoke portions connecting said hub and peripheral portions together and constituting a portion of the electric circuit, substantially as described.

20. A cartridge for a cut-out device, said cartridge including a tubular shield of conducting material, a spiral spring within said shield, a mechanical connection between the upper end of said spring and the upper portion of the shield, an insulating block mechanically connected to the lower portion of the spring, and a fusible element extending between the lower portion of the shell and the insulating block aforesaid and including a hub portion and a peripheral portion together with a series of spoke portions connecting said parts together, substantially as described.

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