

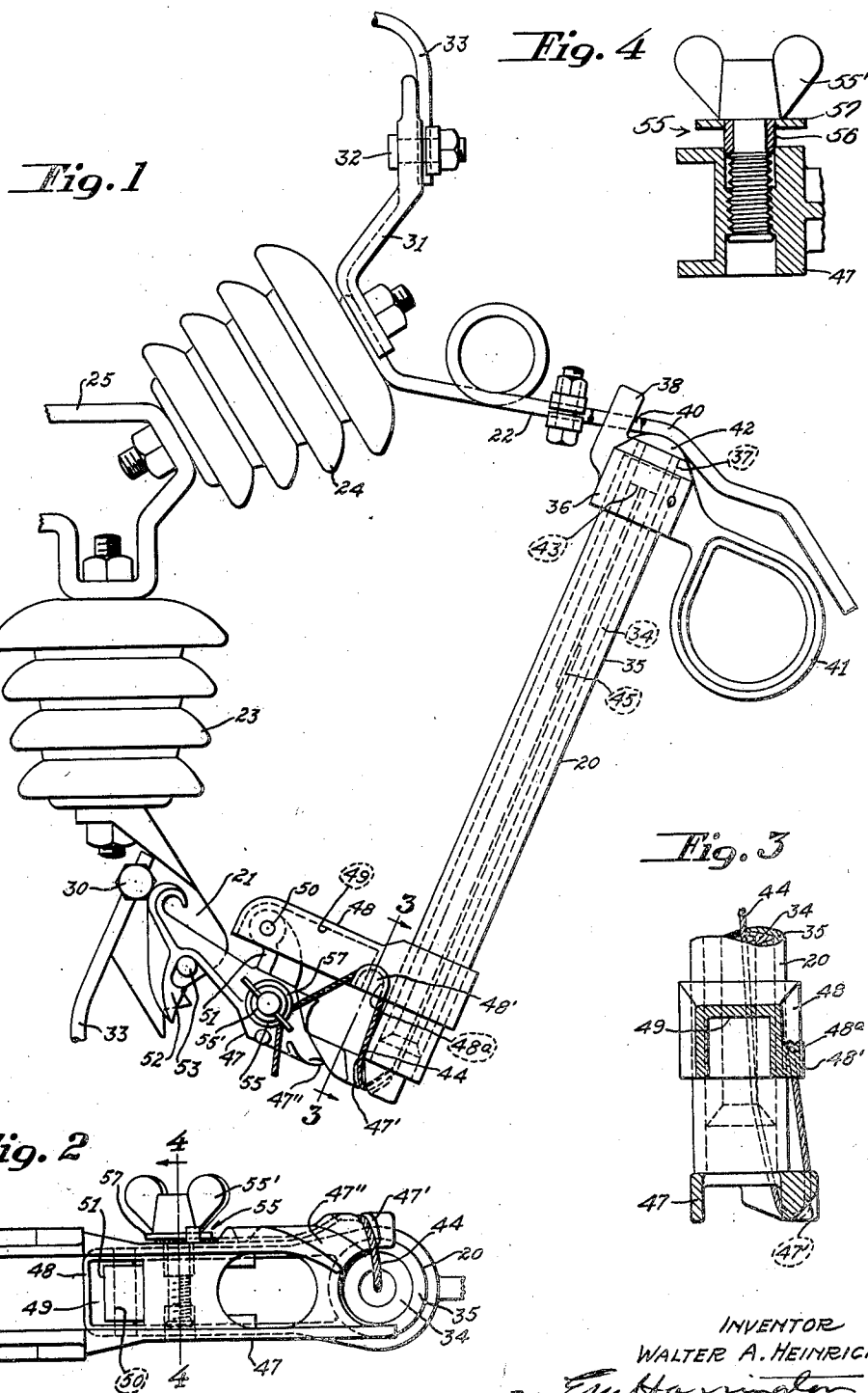
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W. A. HEINRICH

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FUSE SWITCH

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INVENTOR
WALTER A. HEINRICH
BY *Emm Harrington*
ATTORNEY

UNITED STATES PATENT OFFICE

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FUSE SWITCH

Walter A. Heinrich, St. Louis, Mo., assignor to
James E. Kearney Corporation, St. Louis, Mo.,
a corporation of Missouri

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This invention relates generally to electrical switches of the high tension, fused, disconnect type, and more specifically to the type of trip out electrical switch disclosed in an application for patent bearing Serial No. 691,280, filed September 28, 1933, in the names of Francis J. McCluskey and Charles Adin Fox, the predominant object of the invention being to provide a trip out electrical switch of the type mentioned with improved means for attaching the fuse link of the structure in its switch-closing position so that excessive strains are not applied to the fuse link when said fuse link is serving to retain the switch in its closed position.

In the use of electrical switches of the type referred to, it has been found in the case of smaller fuse links of one to twenty-five ampere sizes, for instance, that tensional strains to which the fuse links are subjected in retaining the switches in the switch closed positions result at times in breaking of these smaller fuse links. The purpose of this invention therefore is to provide improved means for attaching the fuse link to parts of the switch structure so that the tensional strains set up in the fuse link as the result of the fuse link serving to retain the switch in the closed position are very materially reduced, thus eliminating breakage of the fuse links because of excessive tensional strains imparted thereto.

Fig. 1 is a side elevation of a trip out switch embodying the features of the present invention.

Fig. 2 is an inverted plan view of the structure illustrated in Fig. 1.

Fig. 3 is a section on line 3-3 of Fig. 1.

Fig. 4 is a fragmentary, sectional view taken on line 4-4 of Fig. 2 through the cartridge hinge member, and illustrating a preferred construction of the fuse link binding post.

In order that the present invention may be clearly understood, the construction of the switch with which it is associated will be described in more or less detail. This switch includes a tubular fuse housing, or fuse cartridge 20, which is removably and pivotally associated with the lower of a pair of relatively vertically spaced terminal members 21 and 22, the upper terminal member 22 being adapted to engage the free end of the fuse cartridge when the latter is disposed in the switch closed position as appears in Fig. 1. The terminal members, by preference, are mounted on individual insulators 23 and 24, carried by a suitable supporting strap 25, said strap being adapted for attachment to a cross arm or

other support (not shown). Line connection with the lower terminal is effected by means of a connector 30, and with the upper terminal 22 by means of a vertically extended arm 31 and connector 32. The connectors 30 and 32 may be of the split-bolt type and are shown as engaging line sections designated 33.

The fuse cartridge 20 is of the so-called expulsion type, and comprises an open-end tube of insulating material, this tube preferably being of composite construction embodying an inner, tubular portion 34 of horn fiber and an outer, tubular jacketing portion 35 of Bakelite or other insulating material having equivalent weather-resisting properties. It has been found advantageous to employ horn fiber in the construction of the cartridge because of the fact that such material has a beneficial de-ionizing effect on the arc which occurs when a fuse link ruptures, aiding materially in causing the arc to become quickly extinguished. At the upper end of the cartridge the inner tube 34 projects beyond the outer tube 35, thereby forming a step or shoulder by which a terminal member or cap 36 is positioned on the cartridge. The member 36 is secured to the cartridge by suitable means, such as rivets or pins, and is provided with a bore 37 which snugly receives that portion of the inner tube which projects beyond the outer tube. It will appear that this construction precludes any possibility of the cap 36 being blown off of the cartridge by the fuse gases, and further such gases are prevented from escaping from between the junction of the cap member and the tube. Projecting longitudinally beyond the end wall of the cap 36 is a guide finger 38 which is adapted to be engaged between laterally spaced, resilient arm portions 40 of the upper terminal member 22, during switch-closing movement of the cartridge. The puller ring 41 projected laterally at one side of the cap 36 serves as a manipulating member for the cartridge.

As shown in Fig. 1, the upper end of the cartridge is adapted to be closed or capped solely by means of a head element carried by and forming a part of the fuse link. Such head element comprises an externally convex disk 42 having an axially projecting plug 43 which provides a closure for the upper end of the cartridge. The head element 42 when properly seated provides a contact surface for direct engagement by the resilient arm portions 40 of the upper terminal 22. Due to its convexity, the head element will center itself relative to the resilient contact arms 40, and the spring pressure will be distributed

equally on opposite sides of the fuse head. The spring contact arms bear upon the fuse head, to effect high pressure, low resistance contact with that element, and produce a substantially gas-tight closure for the cartridge tube. The pressure on the end of the tube tends to move the cartridge axially downwardly, which results in tensioning of the fuse link and also operates to produce high pressure, low resistance contact between the lower switch terminal member 21 and its companion cartridge terminal member.

The fuse link, designated generally 44, is provided with a fusible section 45 of reduced current carrying capacity, and extends from the plug portion 43 of the contact head through the cartridge tube and out of the mouth at the lower end thereof for connection with a cartridge terminal member. The improved manner of connecting the lower end of the fuse link to the cartridge terminal member constitutes the basis of the present invention and the construction and arrangement of the parts which provide for the accomplishment of such improved manner of connecting the lower end of the fuse link to the cartridge terminal member will be presently described herein.

At its lower end the cartridge tube is provided with means for effecting its pivotal and detachable connection with the lower switch terminal 21. Such means includes a hinge member or lever 47 which is pivotally connected to the outer end of a bracket member 48, the latter member being rigidly secured to and projecting at a right angle from the cartridge tube. The bracket 48, which is preferably spaced a short distance from the lower end of the tube, is provided with a recess or pocket 49, open at the bottom of bracket member 48, which forms a housing for a pivot pin 50. The hinge member 47 is formed intermediate of its ends, with a laterally projecting arm portion 51 which extends into the recess or pocket 49 and pivotally engages the pin 50. Thus the bearing portions of members 47 and 48 are protected from ice and snow which otherwise would tend to hamper operation of the switch.

As is shown in Fig. 1, one end of the member 47 is adapted to abut the lower end face of the cartridge tube, and at the opposite, bifurcated end of said member 47 downwardly extended, hook-like portions 52 are provided which engage trunnions 53 formed on the lower terminal member 21. Under normal operating conditions, opening and closing of the switch is effected by swinging the cartridge about the axis of the trunnions 53, there being no movement of the hinge member 47 relative to the cartridge tube. The latter movement under normal conditions of operation is prevented by the fuse link.

In accordance with the improved arrangement disclosed herein the fuse link extends out of the mouth of the cartridge tube and passes downwardly about an end portion of the hinge member 47, wherein a more or less U-shaped groove 47' is formed which provides a seat for the portion of the fuse link which embraces said end portion of said hinge member. The end portion of the hinge member 47' is provided also with a groove 47'' which serves as a seat for the fuse link when the snubbing block is not employed. After embracing the end portion of the hinge member 47 the fuse link passes upwardly, where it is extended about a snubbing block 48' formed on the bracket element 48, said snubbing block being extended outwardly from said

bracket element as shown to the best advantage in Fig. 3, and being provided with a semi-circular groove 48'' which provides a seat for the fuse link. From the snubbing block 48' the fuse link passes to a binding post 55 which projects from the side of the hinge member 47, said binding post comprising a wing screw 55' having associated means which prevent the wing screw from acting in the manner of a capstan or winch to produce undue tension in the fuse link, or possibly rupturing said fuse link as that element is being secured to the hinge member 47 through the instrumentality of the binding post. Thus, as appears in Fig. 4, the wing screw 55', which is pinned to the screw shank, is provided with a sleeve 56 terminating adjacent to the screw head in an annular flange or washer 57. That portion of the screw shank upon which the sleeve 56 is disposed is preferably devoid of screw-threads and is reduced in diameter to substantially the root diameter of the screw-threads. Hence any substantial longitudinal displacement of the sleeve is prevented and the flange or washer portion 57 is always maintained adjacent to the screw head, which expedient facilitates the operation of securing a fuse link to the hinge member 47.

When the cartridge is disposed in switch closed position, the fuse link is held under constant tension by reason of the tendency of the hinge member 47 to turn about the pivot pin 50 resulting from forces set up by the upper resilient terminal. A distinct advantage is obtained by arranging the hinge member 47 so that its fuse-engaging end is movable in an arc substantially tangential to the axis of the fuse link, such arrangement, when the link becomes ruptured, enabling the fuse section attached to the hinge member to be pulled from the cartridge with a minimum of interference therefrom. It is extremely important to note that the provision of the snubbing block 48' on the bracket element 48 and the snubbing of the fuse link about said snubbing block very substantially reduce the tensional strain to which the fuse link is subjected when said fuse link is maintaining the switch in the switch closed position. As a matter of fact, actual tests have shown that the tensional strain set up in a fuse link secured in accordance with the snubbing principle is approximately fifty percent less than when the fuse link was secured in other ways. It is obvious, therefore, that the employment of the snubbing principle in securing the fuse link to the hinge member 47 entirely eliminates the tendency heretofore present for fuse links to be broken by excessive mechanical strains applied thereto when said fuse links were serving to maintain the switches in switch closed positions.

The operation of the switch, upon occurrence of an overload or short circuit, is believed to be obvious from the foregoing, but for purposes of completeness may be described as follows: When the fuse link becomes ruptured as by reason of abnormal current passing therethrough, the hinge member 47, freed at its outer or fuse link engaging end and acting under the forces imparted thereto, turns rapidly about the two axes defined by the trunnions 53 and the pivot pin 50. Movement of the hinge member about the trunnions is accompanied by an endwise lowering of the cartridge tube, which, when clear of the upper terminal member, swings under gravity action to full open position. It is ob-

vious that the hinge member considered as a lever has a high velocity ratio and that its outer or link-engaging end moves very rapidly. Accordingly the ruptured ends of the fuse link become quickly separated, resulting in practically instantaneous extinguishment of the arc created therebetween.

As certain changes may be made in the device herein illustrated and described without departing from the spirit and full intended scope of the invention, it is to be understood that the present description shall be construed in an exemplary and not in a limiting sense, except as the invention is defined by the appended claims.

I claim:

1. A fuse switch comprising spaced terminal members, a hollow fuse holder having a fuse link disposed therein, said fuse holder being mounted for swinging movement to open and close a circuit between the terminal members, a hinge member pivotally engaging one of said terminal members and adapted to engage the lower end of the fuse holder so as to support said fuse holder in the switch closed position and being adapted for pivotal movement relative to said fuse holder from the switch closed position, said hinge member being normally held against pivotal movement relative to said fuse holder by said fuse link, means for securing said fuse link to said hinge member, and a snubbing element about which is passed a portion of the section of the fuse link extended between the lower end of the fuse holder and said securing means, said snubbing element being supported by said fuse holder at a point above the lower end of the fuse holder.

2. A fuse switch comprising spaced terminal members, a hollow fuse holder having a fuse link disposed therein, said fuse holder being mounted for swinging movement to open and close a circuit between the terminal members, a hinge member pivotally engaging one of said terminal members and adapted to support said fuse holder in the switch closed position and being adapted for pivotal movement relative to said fuse holder to release the fuse holder from the switch closed position, said hinge member being normally held against pivotal movement relative to said fuse holder by said fuse link, a bracket member attached to said fuse holder, means for securing said fuse link to said hinge member, and a snubbing element on said bracket member about which is passed a portion of the section of the fuse link extended between the fuse holder and said securing means.

3. A fuse switch comprising spaced terminal members, a hollow fuse holder having a fuse link disposed therein, said fuse holder being mounted for swinging movement to open and close a circuit between the terminal members, a hinge member pivotally engaging one of said terminal members and adapted to support said fuse holder in the switch closed position and being adapted for pivotal movement relative to said fuse holder to release the fuse holder from the switch closed position, said hinge member being normally held against pivotal movement relative to said fuse holder by said fuse link, a bracket member attached to said fuse holder to which said hinge member is pivotally attached, means for securing said fuse link to said hinge member, and a snubbing element on said bracket member about which is passed a portion of the

section of the fuse link extended between the fuse holder and said securing means.

4. A fuse switch comprising spaced terminal members, a hollow fuse holder having a fuse link disposed therein, said fuse holder being mounted for swinging movement to open and close a circuit between the terminal members, a hinge member pivotally engaging one of said terminal members and adapted to support said fuse holder in the switch closed position and being adapted for pivotal movement relative to said fuse holder to release the fuse holder from the switch closed position, said hinge member being normally held against pivotal movement relative to said fuse holder by said fuse link, a bracket member attached to said fuse holder to which said hinge member is pivotally attached, means for securing said fuse link to said hinge member, and a snubbing element on said bracket member about which is passed a portion of the section of the fuse link extended between the fuse holder and said securing means, said snubbing element being provided with a groove providing a seat for the fuse link.

5. A fuse switch comprising spaced terminal members, a hollow fuse holder having a fuse link disposed therein, said fuse holder being mounted for swinging movement to open and close a circuit between the terminal members, a hinge member pivotally engaging one of said terminal members and adapted to support said fuse holder in the switch closed position and being adapted for pivotal movement relative to said fuse holder to release the fuse holder from the switch closed position, said hinge member being normally held against pivotal movement relative to said fuse holder by said fuse link, a bracket member attached to said fuse holder to which said hinge member is pivotally attached, means for securing said fuse link to said hinge member, and a snubbing element on said bracket member about which is passed a portion of the section of the fuse link extended between the fuse holder and said securing means, said hinge member and said snubbing element being provided with grooves providing seats for portions of the fuse link.

6. A fuse switch comprising spaced terminal members, a hollow fuse holder having a fuse link disposed therein, said fuse holder being mounted for swinging movement to open and close a circuit between the terminal members, a hinge member pivotally engaging one of said terminal members and adapted to support said fuse holder in the switch closed position and being adapted for pivotal movement relative to said fuse holder to release the fuse holder from the switch closed position, said hinge member being normally held against pivotal movement relative to said fuse holder by said fuse link by having an end portion thereof embraced by said fuse link, a bracket member attached to said fuse holder to which said hinge member is pivotally attached, means for securing said fuse link to said hinge member, and a snubbing element on said bracket member about which is passed a portion of the section of the fuse link extended between the fuse holder and said securing means, said hinge member and said snubbing element being provided with grooves providing seats for portions of the fuse link.

WALTER A. HEINRICH.