Nov. 7, 1939. W. O. SCHULTZ 2,178,650

FUSE CONSTRUCTION

Filed Oct. 8, 1936 2 Sheets-Sheet 1

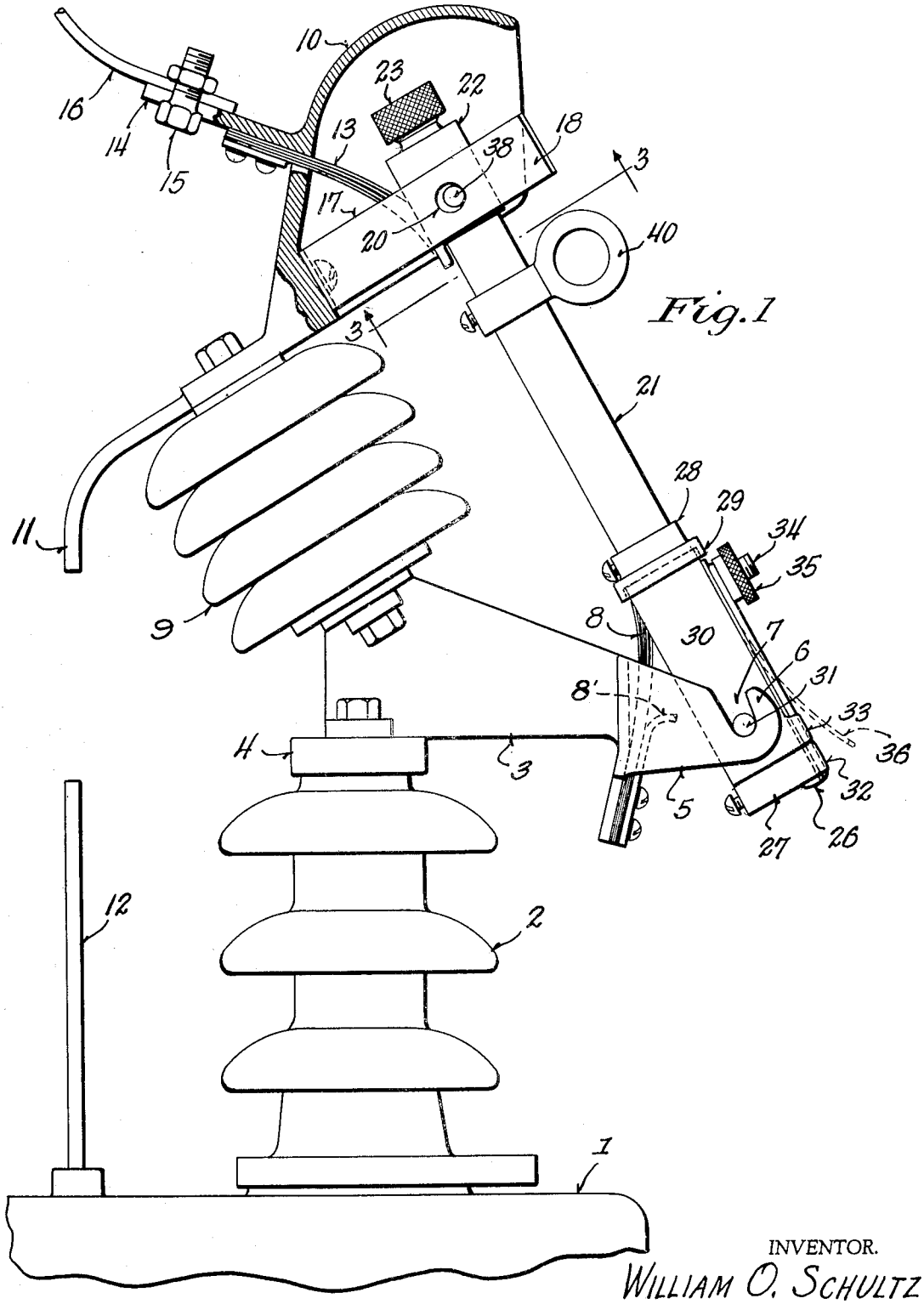


Fig. 1

INVENTOR.
WILLIAM O. SCHULTZ
BY
Arthur R. Woodford
ATTORNEY.

Nov. 7, 1939. W. O. SCHULTZ 2,178,650

FUSE CONSTRUCTION

Filed Oct. 8, 1936 2 Sheets-Sheet 2

Fig. 2

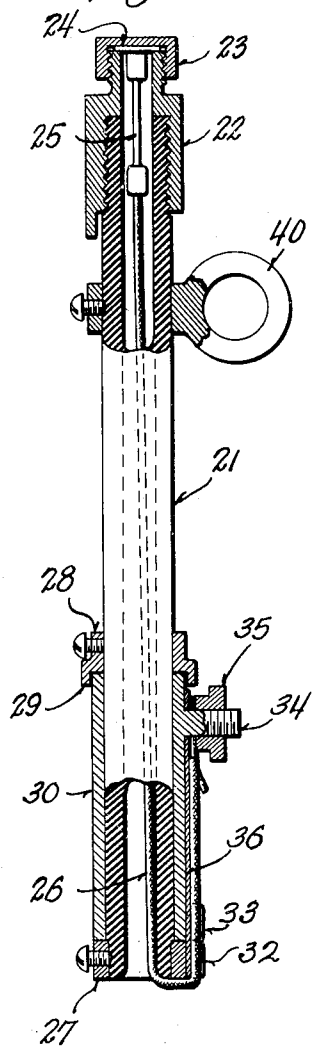
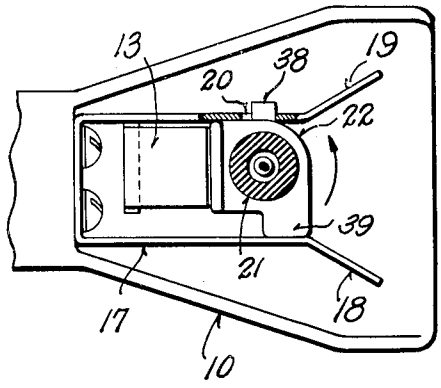


Fig. 3



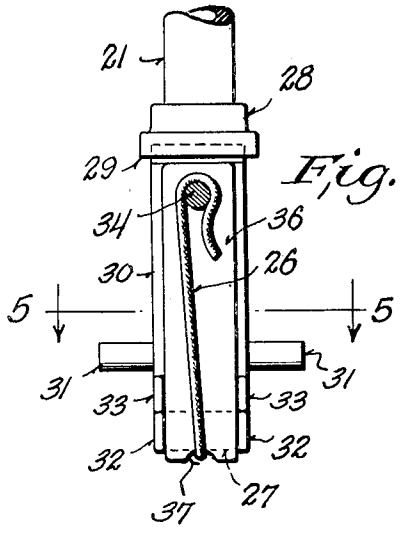
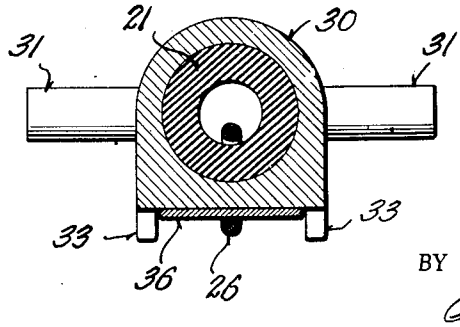


Fig. 4

Fig. 5



INVENTOR.
WILLIAM O. SCHULTZ
BY
Arthur R. Davis
ATTORNEY.

Patented Nov. 7, 1939 2,178,650

UNITED STATES PATENT OFFICE

2,178,650

FUSE CONSTRUCTION

William O. Schultz, South Milwaukee, Wis., assignor to Line Material Company, South Milwaukee, Wis., a corporation of Delaware

Application October 8, 1936, Serial No. 104,644

20 Claims. (Cl. 200—116)

This invention relates to a fuse construction and is particularly directed to a fuse construction associated with a transformer or other electrical device.

This invention is intended to provide a fuse construction which is particularly useful on a single bushing transformer which is now quite common for rural service. These transformers are made up with only one primary bushing, the other side of the primary winding being solidly grounded to the transformer case.

Objects of this invention are to provide a fuse construction in which the fuse structure is carried by or supported from the transformer bushing, in which the fuse is so mounted that the expelled gases and metallic vapors are directed away from the casing, in which an expulsion type of dropout fuse is provided, in which the fuse executes automatic motions when the fuse link is ruptured and thus releases itself, and in which the fuse may be manually released without placing undue stresses upon the bushing and without breaking the fuse link.

Further objects are to provide a construction in which brush contacts are employed and in which these brush contacts assist the fuse or bias the fuse for motion towards inoperative position when released by the fuse link, and in which the motion towards inoperative position is completed under the action of gravity.

Further objects are to provide a fuse construction which may be operated to either open or close the fuse by means of a switch stick and which is so made that the switch stick may be manipulated to easily reach either the releasing portion of the structure or may engage a portion of the fuse unit and may be operated to thrust or push the fuse unit back into circuit after it has been refused.

Further objects are to provide a simple construction which may be cheaply manufactured, which is easy to install and easy to operate.

An embodiment of the invention is shown in the accompanying drawings, in which:

Figure 1 is a fragmentary elevation, partly in section, showing the fuse in operative position.

Figure 2 is a view of the fuse tube removed from the remaining structure, with parts in section.

Figure 3 is a sectional view on the line 3—3 of Figure 1.

Figure 4 is a fragmentary view of the lower portion of the fuse, with parts broken away.

Figure 5 is an enlarged sectional view on the line 5—5 of Figure 4.

Referring to the drawings, it will be seen that a transformer casing has been indicated by the reference character 1 and the bushing by the reference character 2.

A hinge member 3 is bolted or otherwise removably attached to the upper terminal 4 carried by the bushing 2. This hinge member is provided with a bifurcated or forked end 5 between the arms of which the fuse unit is positioned in a manner hereinafter described. This hinge member is provided with hookline portions 6 having upwardly opening slots 7. It is also provided with a springlike brush contact 8. A stop 8' may be provided to limit the rocking motion of the fuse tube and prevent its striking the casing when it drops outwardly.

The hinge member 3 also supports a spacing insulator 9 which in turn supports the upper contact structure and sleet hood 10, the sleet hood and upper contact structure having a downwardly projecting arcing tip 11 opposed to the usual arcing tip 12, which latter extends upwardly from the casing 1 of the transformer to provide for surge protection.

The sleet hood may be formed of a plurality of members or may be formed of one integral structure, for example the integral structure as shown in Figure 1. It carries a springlike upper brush contact 13 which, similarly to the lower contact 8, tends to bear or press outwardly. It is also provided with a contact ear or portion 14 which, by means of the connector 15, is joined to the line wire or live wire 16.

The upper structure or sleet hood 10 is provided with an internally located U-shaped member or contact member 17 which may be provided with divergent ears or terminal portions 18 and 19, see Figure 3, which constitute arcing horns. One of the arms, for instance that carrying the ear 19, is apertured, as indicated at 20

The fuse unit may comprise an expulsion fuse tube 21 which has an upper contact 22 provided with a closure cap 23 by means of which the button head 24 of the fuse link is clamped to the upper contact. The fuse link may comprise a fusible reduced section 25 and a flexible leader 26 extending therefrom and projecting outwardly through the open lower end of the fuse tube.

The lower portion of the fuse tube carries a bottom collar 27 and an upwardly spaced collar 28. It is preferable to provide the upper collar with an overhanging shouldered portion 29 to act as a rain or snow shedding portion for the upper end of the metal sleeve 30. The metal

sleeve 30, see Figures 1 and 2, is loosely mounted on the fuse tube 21 while the collars 27 and 28 are rigid with the fuse tube, thus, it will be seen, providing a structure in which the fuse tube is rotatably carried within the metal sleeve 30

The metal sleeve 30 may also be considered the trunnion member as it carries a pair of trunnions 31 which project outwardly from opposite sides and which are received within the slots 7 of the hinge member 6. The lower collar 27, rigid with the fuse tube, and the sleeve 30 are respectively provided with outwardly projecting pairs of ears 32 and 33, see particularly Figures 1, 4 and 5. The sleeve 30 is also provided with an outwardly projecting screw or stud 34 which receives the clamping nut or thumb nut 35.

The thumb nut 35 is employed to clamp or lock the outer end or free end of the leader 26 of the fuse link. It also clamps a flat or leaf spring 36 in place, the leaf spring in its unstressed position occupying the dotted line position shown in Figure 1. However, under normal conditions the leaf spring is held in contact with the sleeve 30 and collar 27 and is positioned between the pairs of ears 32 and 33, thus locking the fuse tube 21 against rotation. If desired, the lower end of the leaf spring or locking spring 36 may be notched, as indicated at 37 see Figure 4, to guide the leader 26 of the fuse link. The leaf spring 36 also acts to withdraw any unburned portion of the fuse link when the fuse link is severed.

The upper contact 22 is provided with a laterally projecting pin 38 which projects radially from one side thereof, as most clearly seen in Figures 1 and 3, and is also provided with an offset lug 39 whose flat face bears against one of the arms of the U-shaped member 17. This lug, however, is offset, that is to say, off center with respect to the center line of the fuse tube.

The arms of the U-shaped member 17 are sprung apart in the position shown in Figure 3 and thus tend to rotate the fuse tube by the pressure exerted against the offset lug 39 of the upper contact 22, the rotation tending to take place in the direction indicated by the arrow in Figure 3.

The operation of the apparatus is as follows:

When overload occurs and ruptures the fuse link, the spring 36 is released and thus no longer forms the interlock between the sleeve 30 and the collar 27. This, therefore, frees the tube for rotary motion. The tube is forced to rotate by the pressure of the spring arms of the U-shaped member 17, see Figure 3, and by the outward pressure of the brush contacts, particularly the upper brush contact 13. Either or both of these effects may be relied upon, but in the preferred construction, the arms 17 do not necessarily exert pressure on the parts, and the outward pressure of the brush contact 13 as well as that added by the brush contact 8 may be the sole means for biasing the tube towards both rotary and outward motion.

The offset lug 39, see Figure 3, tends to rotate the fuse tube in the direction of the arrow in Figure 3 if the arms 17 are employed to exert pressure due to their being sprung apart when the fuse is in operative position. However, the outward pressure of the brush contact 13 tends to rotate the fuse tube as the outward motion of the end of the fuse tube is resisted by the pin 38 of the upper contact 22 which is spaced outwardly from the axis of the fuse tube, and this alone may be relied upon to bias the tube towards rotary motion while it also serves as means to bias the tube towards outward motion. The part 39 may then serve only to secure proper spacing of the arms of the member 17 and to prevent wedging of the contact 22 between the arms of the member 17.

Thus, when the fuse tube is no longer locked against rotary motion, it releases itself from the upper contact member or U-member 17 and also from the brush contact 13 as the fuse tube now rotates and rocks outwardly, said rocking motion being about the axis of the trunnions 31, see Figure 1. The lower brush contact 8 also assists in the outward rocking motion of the fuse tube and the fuse tube is rocked clear over and rocks downwardly under the action of gravity, thus widely separating the upper contact of the fuse tube from the upper stationary contact formed jointly by the upper brush contact 13 and the U-member 17.

Also it will be seen that the gases and metallic vapors are discharged outwardly from the casing of the transformer and do not impinge against the main supporting insulator and consequently do not tend to form a conducting path over such insulator. The surge protection, however, remains intact and if a surge occurs, a flashover takes place between the members 11 and 12, see Figure 1.

The sleet hood protects the upper portion of the apparatus and prevents the upper contact from being locked in place by the accumulation of sleet.

If it is desired to manually trip the fuse while the link is intact, it is merely necessary for the operator to strike the ear 19, see Figure 3, with the end of the switch stick and this will release the pin 38, allowing the fuse tube to rock outwardly into inoperative position or open circuit position.

After the fuse has blown, it may be removed from the lower hinge support and may be re-fused, thus locking the fuse against rotation due to the action of the interlocking spring 36 which locks the sleeve 30 to the collar 27 as the spring 36 is now held in place by the leader 26 of the new fuse link. Thereafter the fuse may be repositioned in the lower hinge member and may be rocked into place by means of the fuse stick, any suitable manipulating eyelet, such as indicated at 40 in Figure 1, being secured to the insulating tube 21 of the fuse.

It will be seen that a simple and relatively inexpensive type of fuse construction has been provided, which is carried by the bushing of a single bushing transformer, which may be manually operated, but which is automatic in its action upon the occurrence of overload, and which may be easily re-fused and put back into service.

Although this invention has been described in considerable detail, it is to be understood that such description is intended as illustrative rather than limiting, as the invention may be variously embodied and is to be interpreted as claimed.

I claim:

1. In a fuse construction, an electrical device having an insulating bushing provided with a terminal, a fuse construction for protecting said electrical device comprising a conducting base portion secured to said terminal and supported from said bushing, an insulator carried by said base portion, an upper contact carried by said insulator, a fuse unit pivotally supported from said base portion and electrically joining said base portion and said upper contact, said upper contact urging said fuse tube outwardly past dead

center, said fuse tube being actuated by gravity after passing dead center, a fuse link within said fuse tube, and means normally restrained by said fuse link for preventing outward motion of said fuse tube from said upper contact.

2. In an apparatus of the class described, an electrical device having a metal casing, a bushing carried by said casing, a drop-out fuse structure supported from said bushing and including a fuse tube movable from operative to inoperative position, means urging said fuse tube towards inoperative position and biasing said fuse tube towards rotation about its axis, mechanism normally holding said fuse tube in operative position and releasing said fuse tube when said mechanism operates, and a fuse link restraining said mechanism from releasing operation.

3. A fuse construction comprising spaced contacts, a fuse unit normally electrically connecting said contacts and including a fuse tube, means movably supporting said fuse tube for motion from operative to inoperative position away from one of said contacts, means also supporting said fuse tube for rotary motion about the longitudinal axis of said fuse tube, restraining means for holding said fuse tube in operative position, said restraining means releasing said fuse tube when said fuse tube rotates about its axis, said fuse tube being biased towards inoperative position, and a fuse link controlling said restraining means.

4. A fuse construction comprising a pair of spaced contacts, a fuse unit normally electrically connecting said contacts and including a fuse tube, means movably supporting said fuse tube for motion from operative position to inoperative position away from one of said contacts, said means supporting said fuse tube for rotary motion about the axis of said fuse tube, said fuse tube being biased towards rotary motion and towards inoperative position, latch means normally restraining said fuse tube against motion from operative to inoperative position and released upon rotation of said fuse tube about the axis of said fuse tube, means normally restraining said fuse tube against rotation about the axis of said fuse tube, and a fuse link controlling said last mentioned means.

5. A fuse construction comprising spaced contacts, a fuse unit normally electrically joining said spaced contacts and including a fuse tube, a sleeve pivotally mounted adjacent one of said contacts and revolubly carrying said fuse tube, said fuse tube being biased towards rocking motion from operative to inoperative position and being biased towards rotary motion about the longitudinal axis of said fuse tube, latching means for restraining said fuse tube against pivotal motion from operative to inoperative position, said latching means being released upon rotary motion of said fuse tube about the longitudinal axis of said fuse tube, and a fuse link normally restraining said fuse tube against rotary motion.

6. A fuse construction comprising spaced contacts, a fuse unit normally electrically joining said spaced contacts and including a fuse tube, a sleeve pivotally mounted adjacent one of said contacts and revolubly carrying said fuse tube, said fuse tube being biased towards rocking motion from operative to inoperative position and being biased towards rotary motion about the longitudinal axis of said fuse tube, latching means for restraining said fuse tube against pivotal motion from operative to inoperative position, said latching means being released upon rotary motion of said fuse tube about the longitudinal axis of said fuse tube, rotation-preventing means normally locking said fuse tube to said sleeve, and a fuse link controlling said rotation-preventing means.

7. A fuse construction comprising spaced contacts, a fuse unit normally electrically joining said spaced contacts and including a fuse tube, a sleeve pivotally mounted adjacent one of said contacts and revolubly carrying said fuse tube, said fuse tube being biased towards rocking motion from operative to inoperative position and being biased towards rotary motion about the longitudinal axis of said fuse tube, latching means for restraining said fuse tube against pivotal motion from operative to inoperative position, said latching means being released upon rotary motion of said fuse tube about the longitudinal axis of said fuse tube, a locking tongue for locking said fuse tube and said sleeve together, said locking tongue being biased towards releasing position, and a fuse link controlling said locking tongue.

8. A fuse construction comprising a pair of spaced contacts, a fuse unit normally electrically joining said contacts and movable away from one of said contacts, said fuse unit including a fuse tube, a sleeve movably supporting said fuse tube, said sleeve also revolubly supporting said fuse tube for rotation about the longitudinal axis of said fuse tube, said fuse tube being biased towards inoperative position and towards rotation about the axis of said fuse tube, latching means for restraining said fuse tube against motion towards inoperative position, said latching means being released upon rotation of said fuse tube about the longitudinal axis of said fuse tube, and a fuse link controlling the rotation of said fuse tube.

9. A fuse construction comprising a pair of spaced contacts, a fuse unit normally electrically joining said contacts and movable away from one of said contacts, said fuse unit including a fuse tube, a sleeve movably supporting said fuse tube, said sleeve also revolubly supporting said fuse tube for rotation about the longitudinal axis of said fuse tube, said fuse tube being biased towards inoperative position and towards rotation about the axis of said fuse tube, latching means for restraining said fuse tube against motion towards inoperative position, said latching means being released upon rotation of said fuse tube about the longitudinal axis of said fuse tube, means normally locking said sleeve and said fuse tube together, and a fuse link controlling said last mentioned means.

10. A fuse construction comprising a pair of spaced contacts, a fuse unit normally electrically joining said contacts and movable away from one of said contacts, said fuse unit including a fuse tube, a sleeve movably supporting said fuse tube, said sleeve also revolubly supporting said fuse tube for rotation about the longitudinal axis of said fuse tube, said fuse tube being biased towards inoperative position and towards rotation about the axis of said fuse tube, latching means for restraining said fuse tube against motion towards inoperative position, said latching means being released upon rotation of said fuse tube about the longitudinal axis of said fuse tube, a collar rigid with said fuse tube and having a shouldered portion thereon, a leaf spring carried by said sleeve and normally engaging said shouldered portion to restrain said fuse tube against rotation, and a fuse link normally holding said leaf spring in engagement with said shouldered portion, said leaf spring being biased

towards motion away from said shouldered portion.

11. A fuse construction comprising a pair of spaced contacts, a fuse unit normally electrically joining said contacts and movable away from one of said contacts, said fuse unit including a fuse tube, a sleeve movably supporting said fuse tube, said sleeve also revolubly supporting said fuse tube for rotation about the longitudinal axis of said fuse tube, said fuse tube being biased towards inoperative position and towards rotation about the axis of said fuse tube, latching means for restraining said fuse tube against motion towards inoperative position, said latching means being released upon rotation of said fuse tube about the longitudinal axis of said fuse tube, a collar rigid with said fuse tube, said collar and said sleeve having shouldered portions, a locking member normally engaging said shouldered portions and locking said fuse tube against rotation with respect to said sleeve, and a fuse link controlling said locking member.

12. A drop-out fuse construction comprising a pair of spaced contacts, one of said contacts including a U-shaped member having arms, one of said arms having an aperture therein, a fuse unit normally electrically joining said contacts and including a fuse tube, a pivotally mounted sleeve movably supporting said fuse tube for rocking motion from operative to inoperative position, said fuse tube being revoluble within said sleeve about the axis of said fuse tube, said fuse tube having a projecting member normally located within said aperture and restraining said fuse tube against motion towards inoperative position, said fuse tube being biased towards inoperative position and towards rotary motion and releasing said projecting member upon rotary motion of said fuse tube about the longitudinal axis of said fuse tube, and a fuse link restraining said fuse tube against rotary motion.

13. A drop-out fuse construction comprising a pair of spaced contacts, one of said contacts including a U-shaped member having arms, one of said arms having an aperture therein, a fuse unit normally electrically joining said contacts and including a fuse tube, a pivotally mounted sleeve movably supporting said fuse tube for rocking motion from operative to inoperative position, said fuse tube being revoluble within said sleeve about the axis of said fuse tube, said fuse tube having a projecting member normally located within said aperture and restraining said fuse tube against motion towards inoperative position, said fuse tube being biased towards inoperative position and towards rotary motion and releasing said projecting member upon rotary motion of said fuse tube about the longitudinal axis of said fuse tube, means normally locking said fuse tube against rotation with respect to said sleeve, and a fuse link controlling said last mentioned means.

14. A drop-out fuse construction comprosing a pair of spaced contacts, one of said contacts including a U-shaped member having arms, one of said arms having an aperture therein, a fuse unit normally electrically joining said contacts and including a fuse tube, a pivotally mounted sleeve movably supporting said fuse tube for rocking motion from operative to inoperative position, said fuse tube being revoluble within said sleeve about the axis of said fuse tube, said fuse tube having a projecting member normally located within said aperture and restraining said fuse tube against motion towards inoperative position, said fuse tube being biased towards inoperative position and towards rotary motion and releasing said projecting member upon rotary motion of said fuse tube about the longitudinal axis of said fuse tube, means normally locking said fuse tube against rotation with respect to said sleeve, a fuse link controlling said last mentioned means, and a sleet hood covering the upper portion of said fuse tube and said U-shaped member.

15. A fuse construction comprising spaced contacts, a fuse unit normally electrically connecting said contacts and including a fuse tube, means movably suporting said fuse tube for motion from operative to inoperative position away from one of said contacts, means also supporting said fuse tube for rotary motion about the longitudinal axis of said fuse tube, a yieldingly urged restraining means for locking said fuse tube against rotary motion, restraining means for holding said fuse tube in operative position, said last mentioned restraining means releasing said fuse tube when said fuse tube rotates about its axis, and a fuse link holding said first mentioned restraining means in locking position, said first mentioned restraining means serving to withdraw said fuse link when said fuse link is ruptured.

16. A fuse construction comprising spaced contacts, a fuse unit normally electrically connecting said contacts and including a fuse tube, means movably supporting said tube for motion from operative to inoperative position away from one of said contacts, means also supporting said fuse tube for rotary motion about the longitudinal axis of said fuse tube, restraining means for holding said fuse tube in operative position, said restraining means releasing said fuse tube when said fuse tube rotates about its axis, locking means for locking said fuse tube against rotary motion, said locking means being yieldingly urged outwardly towards releasing position, and a fuse link extending over said locking means and normally restraining said locking means against releasing motion, said locking means acting as a fuse link withdrawing means upon rupture of said fuse link.

17. A fuse construction comprising spaced contacts, a fuse unit normally electrically connecting said contacts and including a fuse tube, means supporting said fuse tube for lateral motion and for rotary motion about the axis of said fuse tube, said fuse tube being movable laterally into operative position and movable into inoperative position by a combined rotary and lateral motion, and a fuse link, normally restraining said fuse tube against motion to inoperative position.

18. A fuse construction comprising a pair of spaced contacts, a fuse unit normally electrically conecting said contacts and including a fuse tube, means movably supporting said fuse tube for motion from operative to inoperative position away from one of said contacts, means also supporting said fuse tube for rotary motion about the longitudinal axis of said fuse tube, restraining means for holding said fuse tube in operative position, said restraining means releasing said fuse tube when said fuse tube rotates about its axis, and a fuse link normally restraining said fuse tube against rotary motion, said fuse tube being movable into operative position by a lateral motion and moving into inoperative position by a combined rotary motion about its longitudinal axis and a lateral motion.

19. A fuse construction comprising a pair of spaced contacts, a fuse unit normally electrically connecting said contacts and including a fuse

tube, said fuse tube being movably supported for motion from operative position to inoperative position away from one of said contacts, rotary latch means normally holding said fuse tube against motion from operative to inoperative position, said latch means being rotatable about the axis of said fuse tube, and a fuse link restraining said latch means against rotation.

20. A fuse construction comprising a pair of spaced contacts, a fuse unit normally electrically connecting said contacts and including a fuse tube, said fuse tube being movably supported for motion from operative to inoperative position away from one of said contacts, latch means carried by said fuse tube and normally restraining said fuse tube against motion, said latch means being rotatable about the axis of said fuse tube, and a fuse link normally restraining said latch means against rotary motion.

WILLIAM O. SCHULTZ.