Feb. 27, 1934. W. O. SCHULTZ 1,949,186

FUSE

Filed Jan. 9, 1933

Fig. 1

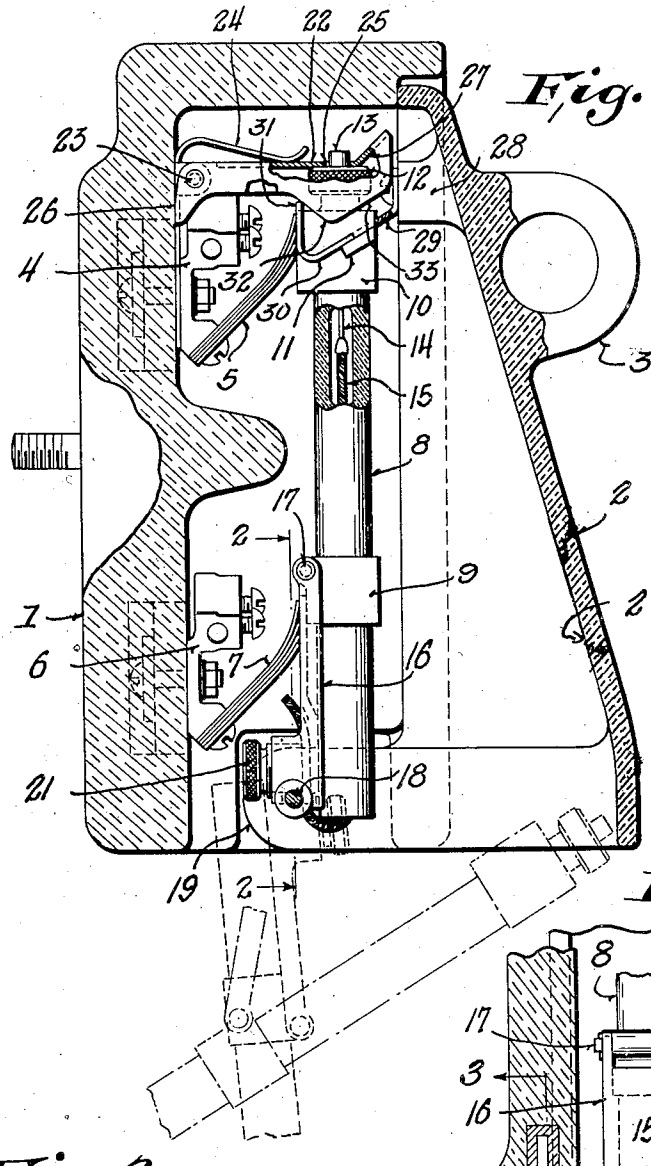


Fig. 2

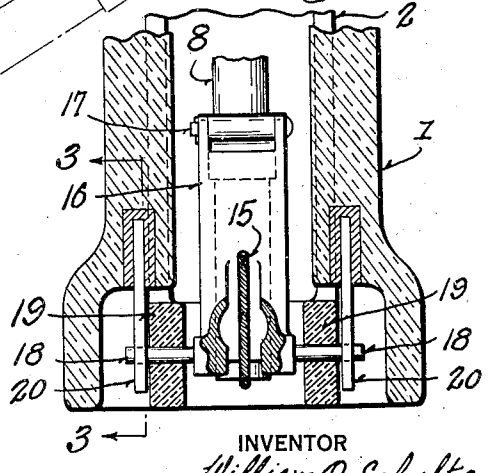
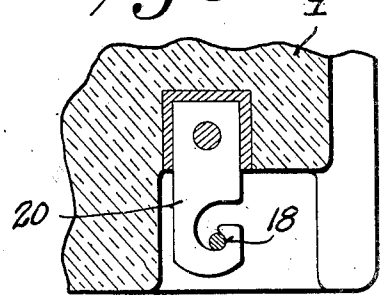


Fig. 3



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FUSE

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15 Claims. (Cl. 200—127)

This invention relates to fuses of the cutout type.

This invention has for its object the provision of a drop-out fuse structure which is enclosed or housed within a box of porcelain or other insulating material and wherein all live parts are enclosed against accidental contact, both in the closed and in the drop-out or open position.

Further objects of this invention are to provide an enclosed type of fuse in which the cover remains in place while the fuse drops out of position, thereby disconnecting the fuse assembly from the stationary contacts, and thus moves away from the live contacts when the fuse blows, the invention providing an expulsion type of fuse which is housed, but which nevertheless actually disconnects both ends of the fuse assembly from the live contacts.

In greater detail objects of this invention are to provide a housed type of drop-out fuse in which the fuse assembly and the cover to the housing are hinged adjacent the lower portion of the fuse structure, in which the blowing of the fuse automatically releases mechanism adjacent the lower portion of the fuse and allows such portion to first move outwardly towards the door and thereafter allows the entire body of the fuse to move downwardly, disconnecting the fuse assembly from the latch mechanism and allowing the fuse assembly to drop outwardly towards the door, thereby disconnecting the fuse assembly from the stationary contacts.

Further objects are to provide a construction of enclosed drop-out fuse in which the fuse and door may be removable as a single unit and may be replaced by merely hooking them into a lower hinge means, in which means are provided whereby the door, together with the fuse assembly may be open even though the fuse has not blown, in which the door, together with the fuse assembly, may be readily repositioned and thereafter rocked into closed position.

Both the opening and closing of the apparatus is freely accomplished by means of a door ring so that a lineman or attendant may operate the fuse with a fuse pole.

Further objects are to provide means which insures the complete blowing of the fuse before the contacts are opened so that there is no arcing at the contacts, the interruption of the circuit always occurring inside the fuse tube by the blowing and expulsion action thereof, thereby avoiding burning or pitting of the contacts or other destruction of the permanent portions of the fuse.

Further objects are to provide a fuse construction which operates on light overload conditions as well as on heavy overload conditions, the invention providing means whereby a roughly predetermined interval of time elapses before the actual permanent contacts are broken, thereby allowing time for the fuse to build up sufficient pressure in the tube to give the expulsion action necessary to extinguish the arc, and confining the actual rupturing of the circuit in the first instance to the interior of the tube, means being provided to insure contact between the contacts of the fuse and the terminal contacts or stationary contacts for a material portion of the swing of the fuse, thereby securing the interval of time required for the fuse to build up sufficient pressure in the tube to give the expulsion action necessary to extinguish the arc.

Further objects are to provide a housed type of drop-out fuse having the characteristics hereinabove enumerated, which nevertheless may be as readily and freely handled as the usual housed type fuses and which may be easily re-fused and which is of simple and reliable construction.

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

Figure 1 is a vertical sectional view through the device.

Figure 2 is a fragmentary sectional view on the line 2—2 of Figure 1.

Figure 3 is a fragmentary sectional view on the line 3—3 of Figure 2.

Referring to the drawing, it will be seen that a casing 1 has been provided which may be formed of porcelain and which pivotally carries a door 2 provided with a door ring 3. The door may be made of any suitable material, such as a phenol condensate, commonly known as "Bakelite".

The casing is provided with an upper terminal member 4 having brush contacts 5 and a lower terminal member 6 having brush contacts 7.

The fuse assembly comprises an expulsion fuse tube 8 which is provided with a lower contact 9 and an upper contact 10. The upper contact 10 is provided with outwardly projecting cam members 11 for a purpose hereinafter to appear. This upper contact is also provided with a cap or nut 12 which clamps the upper end of the fuse link in place against the upper contact in the usual manner. The upper cap 12 is provided with an upwardly projecting pin 13.

The fuse link comprises an upper reduced portion 14 from which extends a flexible leader 15, the leader passing downwardly and being

looped around the lower portion of the tube, as shown in Figure 1.

The lower contact 9 hingedly carries a lever 16 which in effect constitutes a contact lever. It is pivotally mounted upon the lower contact 9, as indicated at 17, and is pivotally mounted upon the transversely extending pivot pin or trunnion member 18. This pivot member or pin 18 also extends through the inwardly directed lips or ears 19 of the cover, as most clearly shown in Figure 2. The transverse pin is removably carried within hook-shaped hinge members 20, see Figure 3, which are carried by the casing 1 and, when the fuse is opened, are disconnected from any live part of the apparatus.

The leader 15 of the fuse link is clamped to the lower portion of the lever 16 by means of the thumb screw or thumb nut 21, see Figure 1, and normally holds the lower end of the lever in contact with the lower end of the fuse tube 8. The upper end of the fuse tube is held by means of a latch 22 which is hingedly mounted upon the upper terminal member 4, as indicated at 23. It is urged downwardly by means of a spring 24. This latch member or lever 22 is provided with an aperture 25 within which the pin 13 is normally received. The lever is provided with a pair of feet 26, see Figure 1, which contact with the casing when the lever is in the position shown in Figure 1 and prevent downward motion of the lever beyond a predetermined point.

The lever is provided with an upwardly projecting cam surface or portion 27 which is adapted to be engaged by the pin 13 of the fuse assembly when the fuse is rocked into place, such lever being lifted by the pin and thereafter snapping down into locking position.

The cover is provided with an inwardly directed boss 28 which carries a forked bracket 29 provided with a pair of spaced arms having downwardly slanting portions 30 and upwardly directed portions 31. The downwardly slanting portions 30 normally rest upon the lugs or cam members 11 of the upper contact 10 of the fuse assembly.

The last described construction is for the purpose of permitting the opening of the door while the fuse link is still intact. When the door is pulled open by means of the door ring 3, the portions 30 of the springlike arms of the bracket 29 are raised as they travel over the cam members 11 and consequently engage the cam faces 32 formed on opposite sides of the lever 22 and raise the lever against the action of the spring 24, thereby releasing the pin 13 and allowing the fuse assembly to move outwardly with the door.

When the door is again closed, the upwardly projecting arms 31 engage the forward cam faces 33 formed on opposite sides of the lever 22 and also aid in raising the lever, allowing the door to snap shut.

In this connection it is to be noted that even if the fuse assembly is detached from the upper lever in the manner hereinafter to appear, that nevertheless the door is held in a closed position.

When the fuse blows, the lower portion of the link is expelled and the lever 16 is free to pivot at its lower end upon the pin 18 and at its upper end upon the pivot pin 17. This allows the lower end of the fuse assembly to rock outwardly and downwardly, thereby allowing the pin 13 to free itself from the upper latch. The fuse then drops downwardly and rocks outwardly to a certain extent until the upper end of the fuse contacts with the outwardly and downwardly slanting inner surface 2' of the door.

If the door is made with an outwardly slanting inner surface of sufficiently great angular inclination, the fuse will drop clear of the casing. It will assume successive positions with its upper end riding against the surface 2' of the door, the final position prior to leaving the door being shown in the upper dotted line position of Figure 1, and the ultimate position being shown in the downwardly directed dotted position in Figure 1.

On the other hand, it is to be noted that it is possible to form the door without bowing it outwardly to the extent shown in Figure 1 and nevertheless have the fuse drop clear of the contacts. Under these conditions, the lower end of the fuse rocks downwardly and outwardly and the upper end slides downwardly and outwardly against the inner surface 2' of the door but it need not necessarily leave the door. However, even under these conditions both the upper and the lower contacts carried by the fuse are separated a material distance from the stationary contacts, and it is, therefore, to be understood that this device may function in either of the two ways hereinabove described.

It is to be noted that the upper brush contact 5 bears outwardly against the upper contact 10, and that the lower brush contact 7 bears outwardly against the contact lever 16, thereby biasing the fuse assembly towards outward motion or releasing motion, the fuse assembly being, however, held against releasing motion by the fuse link and the lever 16.

It is obvious that both the door and the fuse assembly may be readily detached from the hinge 20 by unhooking the pin 18 therefrom. See for example Figure 3.

Also it is to be noted that the fuse is held securely by the door as it is pivoted upon the pin 18 carried by the door and also is locked by the coaction of the projecting lugs or cam members 11 with the spring arms 30, the latter as hereinbefore explained being carried by the upper portion of the door.

It is to be noted when the fuse blows and the fuse drops away from the stationary contacts, that the hinge is dead and consequently there is no live part projecting from the casing.

It is to be noted also that a certain delay of a small fraction of a second corresponding roughly to a few cycles of a 60-cycle current elapses before contact is broken between the contacts of the fuse and the stationary contacts of the casing. This enables the fuse to clear and rupture the circuit within the fuse tube itself prior to actual separation of the contacts. By this means arcing at the contacts with their consequent pitting and destruction is avoided.

It will be seen that a very simple type of housed drop-out fuse has been provided by this invention in which the fuse drops out away from the stationary contacts without opening the cover. In other words, this invention secures the advantages of both the housed type of fuse and also of the drop-out type of fuse.

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. A housed type of drop-out fuse comprising a

casing having stationary contacts, a door for said casing, said door and casing providing a downwardly flaring opening in the lower portion of the structure, a fuse assembly having spaced contacts normally engaging said stationary contacts, mechanism releasably holding said fuse in position, and a fuse link forming a portion of said fuse assembly and normally holding said mechanism against releasing movement.

2. A housed type of drop-out fuse comprising a casing having stationary contacts, a door for said casing, said door and casing providing a downwardly flaring opening in the lower portion of the structure, a fuse assembly having spaced contacts normally engaging said stationary contacts, mechanism releasably holding said fuse in position, and a fuse link forming a portion of said fuse assembly and normally holding said mechanism against releasing movement, said fuse link directly engaging a portion of said mechanism.

3. A housed type of drop-out fuse comprising a casing having stationary contacts, a downwardly and outwardly flaring door for said casing, the lower portion of said door providing with said casing an enlarged opening, a fuse tube having spaced contacts normally engaging said stationary contacts, a fuse link electrically joining said spaced contacts, and mechanism for holding said fuse tube in position, said mechanism being movable to a releasing position whereby said spaced contacts of said fuse tube will fall away from said stationary contacts, said mechanism being held against releasing motion by said fuse link.

4. A housed type of drop-out fuse comprising a casing having stationary contacts, a downwardly and outwardly flaring door for said casing, the lower portion of said door providing with said casing an enlarged opening, a fuse tube having spaced contacts normally engaging said stationary contacts, a fuse link electrically joining said spaced contacts, and mechanism for holding said fuse tube in position, said mechanism being movable to a releasing position whereby said spaced contacts of said fuse tube will fall away from said stationary contacts, said mechanism being held against releasing motion by said fuse link, said door being pivoted to said casing adjacent the lower portion of said door.

5. A housed type of drop-out fuse comprising a casing having stationary contacts, a door for said casing, said door having a portion spaced outwardly from said casing, a fuse tube having spaced contacts normally engaging said stationary contacts and having a fuse link electrically joining said spaced contacts, and mechanism normally holding said fuse tube in position and movable to a releasing position, said fuse tube, when said mechanism moves to a releasing position, moving towards the said spaced portion of said door, said mechanism being normally restrained against motion by said fuse link.

6. A housed type of drop-out fuse comprising a casing having stationary contacts and having hinge means adjacent the lower portion of said casing and distinct and separate from said stationary contacts, a door for said casing supported from said hinge means, a fuse tube having spaced contacts normally engaging said stationary contacts, said fuse tube being supported from said hinge means and biased towards movement away from said stationary contacts to disconnecting position, and a fuse link carried by said fuse tube and electrically joining said spaced contacts, said fuse link normally holding said fuse tube in position and releasing said fuse tube when said link is ruptured, said door remaining in closed position when said fuse tube moves to disconnecting position.

7. A housed type of drop-out fuse comprising a casing having stationary contacts and having hinge means adjacent the lower portion of said casing and distinct and separate from said stationary contacts, a door for said casing supported from said hinge means, a fuse tube having spaced contacts normally engaging said stationary contacts, said fuse tube being supported from said hinge means and biased towards movement away from said stationary contacts to disconnecting position, and a fuse link carried by said fuse tube and electrically joining said spaced contacts, said fuse link normally holding said fuse tube in position and releasing said fuse tube when said link is ruptured, said door remaining in closed position when said fuse tube moves to disconnecting position, said hinge means being electrically disconnected from both stationary contacts after said fuse tube moves to disconnecting position.

8. A housed type of drop-out fuse comprising a casing having stationary contacts and having hinge means adjacent the lower portion of said casing and distinct and separate from said stationary contacts, a door for said casing supported from said hinge means, a fuse tube having spaced contacts normally engaging said stationary contacts, said fuse tube being supported from said hinge means and biased towards movement away from said stationary contacts to disconnecting position, and a fuse link carried by said fuse tube and electrically joining said spaced contacts, said fuse link normally holding said fuse tube in position and releasing said fuse tube when said link is ruptured, said door remaining in closed position when said fuse tube moves to disconnecting position, said door having means for releasing said fuse tube when said door is pulled open, said door and fuse tube rocking outwardly about said hinge means.

9. A housed type of drop-out fuse comprising a casing having stationary contacts and having hinge means adjacent the lower portion of said casing and distinct and separate from said stationary contacts, a door for said casing supported from said hinge means, a fuse tube having spaced contacts normally engaging said stationary contacts, said fuse tube being supported from said hinge means and biased towards movement away from said stationary contacts to disconnecting position, and a fuse link carried by said fuse tube and electrically joining said spaced contacts, said fuse link normally holding said fuse tube in position and releasing said fuse tube when said link is ruptured, said door remaining in closed position when said fuse tube moves to disconnecting position, said hinge means being electrically disconnected from both stationary contacts after said fuse tube moves to disconnecting position, said door having means for releasing said fuse tube when said door is pulled open, said door and fuse tube rocking outwardly about said hinge means.

10. A housed type of drop-out fuse comprising a casing having stationary contacts, a door for said casing hinged adjacent the lower end of said door, a fuse tube having spaced contacts normally engaging said stationary contacts, a lever hinged to one of said spaced contacts at the upper end of the lever and hingedly support-

ed adjacent the lower end from said casing, latch mechanism adjacent the upper end of said fuse tube for holding said fuse tube, said lever being adapted to rock about its lower end to move said fuse tube downwardly away from said latch, said fuse tube subsequently rocking outwardly, and a fuse link normally holding said lever against motion with respect to said fuse tube, said door remaining closed when said fuse blows.

11. A housed type of drop-out fuse comprising a casing having stationary contacts, a door for said casing hinged adjacent the lower end of said door, a fuse tube having spaced contacts normally engaging said stationary contacts, a lever hinged to one of said spaced contacts at the upper end of the lever and hingedly supported adjacent the lower end from said casing, latch mechanism adjacent the upper end of said fuse tube for holding said fuse tube, said lever being adapted to rock about its lower end to move said fuse tube downwardly away from said latch, said fuse tube subsequently rocking outwardly, and a fuse link normally holding said lever against motion with respect to said fuse tube, said door remaining closed when said fuse blows, said door having means for releasing said latch when said door is pulled open, whereby said door may be pulled open and said fuse tube and door moved outwardy.

12. A housed type of drop-out fuse comprising a casing having contacts, a door for said casing hinged to said casing, a fuse tube having spaced contacts normally engaging the contacts carried by said casing, a lever hinged to one of said spaced contacts adjacent one end of the lever and hingedly supported adjacent the other end from said casing, latch mechanism for normally restraining said fuse tube against motion, said lever being adapted to rock about its last mentioned end to detach said latch, and a fuse link normally holding said lever against motion with respect to said fuse tube, said door remaining closed when said fuse blows.

13. In a device of the character described, including a housing having spaced terminals, an open bottom, and hinge supports adjacent the bottom; a drop-out fuse comprising a tube having spaced contacts engageable with said terminals, and a lever pivotally connected at one end with said tube and adapted to be supported at the other end by said hinge supports, whereby said fuse may be mounted in the housing for subsequent movement through said open bottom.

14. In a device of the character described including a housing having spaced terminals, an open bottom, and hinge supports adjacent the bottom; a drop-out fuse comprising a tube having spaced contacts engageable with said terminals, a lever pivotally connected at one end with said tube and adapted to be supported at the other end by said hinge supports, and a fuse link connecting said contacts and engaging said lever, whereby said fuse may be mounted in the housing for subsequent movement through said open bottom.

15. A housed type of drop-out fuse comprising a casing having an open bottom, contacts carried by said casing, a fuse tube having spaced contacts normally engaging the contacts carried by said casing, a lever hinged to said fuse tube and hingedly supported at a lower point from said casing, latch mechanism normally restraining said fuse tube against motion, said lever being adapted to rock about the hinge support from said casing, and a fuse link normally holding said lever against motion with respect to said fuse tube.

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