April 5, 1949. W. O. SCHULTZ 2,466,486

FUSE CONSTRUCTION

Original Filed June 27, 1938 2 Sheets-Sheet 1

Fig. 1.

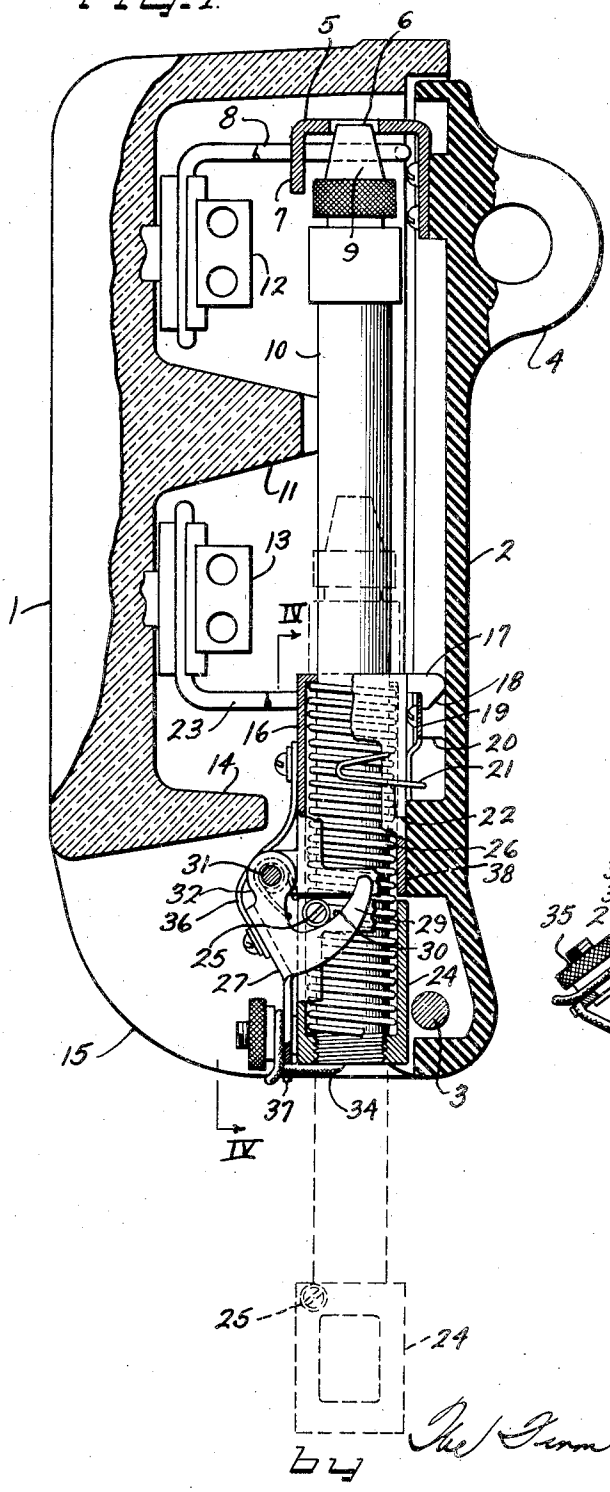
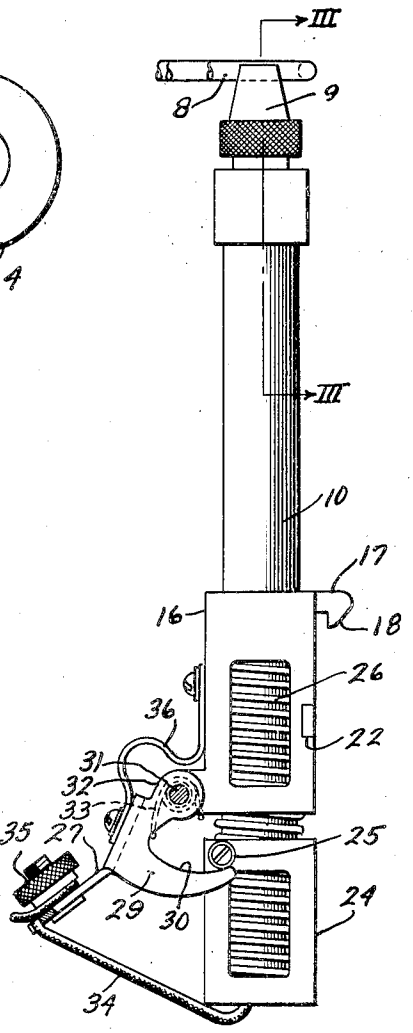


Fig. 2.



Inventor
WILLIAM O. SCHULTZ

by The Firm of Charles F. Kelly Attys.

April 5, 1949. W. O. SCHULTZ 2,466,486

FUSE CONSTRUCTION

Original Filed June 27, 1938 2 Sheets-Sheet 2

Fig. 3.

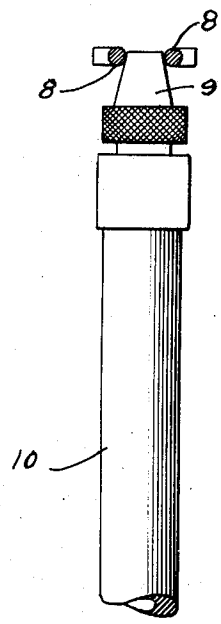
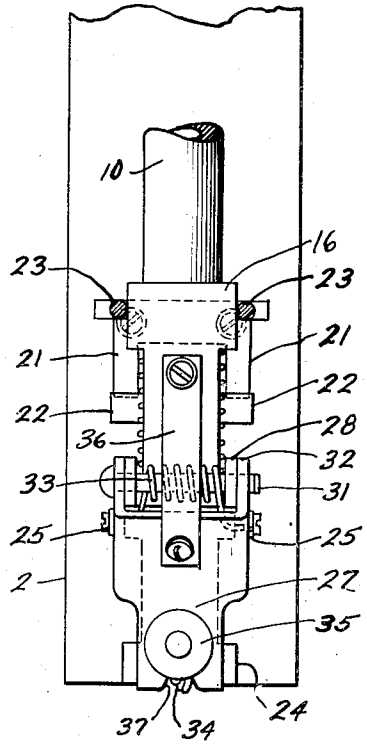


Fig. 4.



Inventor
WILLIAM O. SCHULTZ

by The Firm of Charles Hobbs Attys.

Patented Apr. 5, 1949

2,466,486

UNITED STATES PATENT OFFICE

2,466,486

FUSE CONSTRUCTION

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

Continuation of application Serial No. 215,977, June 27, 1938. This application October 1, 1945, Serial No. 619,572

4 Claims. (Cl. 200—114)

1

This invention relates to fuse constructions and is particularly directed to a drop-out type of fuse, and is a continuation of my application Serial Number 215,977, entitled "For Fuse constructions," filed June 27, 1938, which is a continuation in part of my application filed May 24, 1934, Serial Number 727,250 for "Fuse constructions." Application No. 215,977 has become abandoned; and application No. 727,250 has resulted in Patent No. 2,423,258, dated July 1, 1947.

Objects of this invention are to provide a novel form of fuse, such as the expulsion fuse type, in which the fuse tube operates first in the manner of an expulsion fuse, then moves downwardly and increases the gap in the circuit, and finally comes to rest projecting outwardly from the body portion so as to give a visual signal indicating that the fuse has blown.

In greater detail, objects of this invention are to provide a housed type of expulsion fuse in which the fuse tube is biased towards motion axially of the fuse tube and downwardly and outwardly from the housing and is normally restrained from such motion by the fuse link, the rupturing of the fuse link releasing the fuse tube and allowing such outwardly biased fuse tube to be projected downwardly and outwardly from the housing.

Further objects are to provide a construction in which the lower fastening means for the fuse link is so constructed that it tends to quickly withdraw whatever remains of the lower portion of the fuse link from the fuse tube, such action being also assisted by gas pressure generated within the fuse tube. When a relatively heavy overload occurs, the gas pressure is pronounced and tends to blow any remaining portion of the fuse link out of the fuse tube with considerable force but on light overloads a much lesser gas pressure is generated so that the fuse extracting means, which moves outwardly as the fuse tube moves downwardly, plays a much more important part under light overload conditions than under heavy overload conditions, but under both conditions has the important function of removing any remaining portion of the fuse link.

Further objects are to provide a construction in which means are provided for facilitating the downward motion of the fuse tube, in which latching means are provided for normally holding the fuse tube in elevated position, and in which the latching means is so constructed that the means urging the fuse tube downwardly also urges the latching means to releasing position and causes the latching means to execute releasing motion while the fuse tube moves through the initial portion of its downward motion, and in which additional means may be provided, if desired, for additionally urging the latching means towards releasing position when the fuse link is ruptured, either or both of said means providing for positively releasing the latching means when the fuse link is ruptured.

2

A further object is to provide a construction in which the upper stationary contacts yieldingly engage the upper contact of the fuse tube and maintain engagement with the upper contact of the fuse tube until the latching means has released the fuse tube for unhampered downward motion.

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

Figure 1 is a side elevation of the device, with parts in vertical section, such view showing in dotted lines the final position of the fuse tube after the fuse link has been ruptured.

Figure 2 is a view with parts removed showing the position of the fuse tube while the fuse link is being withdrawn and just before the latching means completely releases the fuse tube.

Figure 3 is a view of the upper end of the fuse tube when in the position shown in Figure 2, the upper contacts being sectioned on the line III—III of Figure 2.

Figure 4 is a fragmentary sectional view on the line IV—IV of Figure 1.

Referring to the drawings, particularly Figure 1, it will be seen that the fuse comprises a housing 1 which may be formed of any suitable insulating material, such as porcelain, to which a door 2 is hingedly joined adjacent its lower end in any suitable manner, as by means of the transverse pin 3. The door may be of a phenolic condensation product or other suitable insulating material. It is provided with an eye or handle 4 for facilitating the opening of the door. The door is provided with a rigid clip 5 adjacent its upper end which in turn is provided with an opening 6 therethrough. The clip 5 also has a downwardly extending tongue 7, which fits between the upper spring contact arms 8, such arms tending to move towards each other to grip the upper conical contact 9 of the nut of the fuse tube 10.

The housing 1 may be provided with a barrier 11 between the upper terminal member 12 and the lower terminal member 13 and is provided with a lower, inwardly extending portion 14 and with side flanges 15 below the portion 14 to accommodate motion of the latching and fuse extracting member, such member also constituting

a contact member for the end of the fuse link, as will hereinafter appear.

The fuse is provided with a lower contact member 16 which in reality is a sleeve of cup-like construction and is provided with a hook 17 having a beveled face 18. This hook normally hooks over a transverse strap 19 carried by bosses 20 former integrally with the door. The bosses 20 also carry a pair of V-shaped spring arms 21 which bear downwardly against lugs 22 formed integrally on the contact 16 and thus hold the hook 17 locked to the strap 19.

The lower terminal member is provided with a pair of spring arms 23 which grip the lower contact 16. The spring arms 23 and the spring arms 8 are preferably provided with outwardly turned ends in the usual manner to facilitate the closing and opening of the door with the consequent insertion or withdrawal of the upper and lower contacts of the fuse tube.

The lower end of the fuse tube rigidly carries a sleeve or member 24 which is equipped with rollers 25 on opposite sides thereof. The member 24 is in reality a cup-like member and the members 16 and 24 house the compression spring 26 which surrounds the fuse tube and urges the fuse tube downwardly, thus assisting the action of gravity when the fuse tube is released for downward motion. The door is partly cut away and together with the housing provides an opening for the downward projection of the fuse tube to the dotted line position shown in Figure 1.

The tube is normally latched in its upper position by means of latching means 27, and this latching means is in the form of a lever and is pivotally mounted upon lugs or ears 28, see Figure 4, integral with the contact or sleeve 16. The latching means 27 has a pair of hook-like arms 29 on opposite sides thereof which have a cam like upper edge 30 engaging below and normally holding the rollers 25 and thus holding the tube in its elevated position. The curved upper surface 30 of the latching means is not concentric with the pivot pin 31 which passes through the ears 28 of the contact 16 and the ears 32 of the latching means 27. Instead, this curve or cam surface is so formed that as the latching means moves in a clockwise direction, as viewed in Figures 1 and 2, when rupture of the fuse link occurs, it allows the fuse tube to move downwardly a certain distance during the initial downward motion of the fuse tube.

It is thus clear that the force of the compression spring 26 rocks the latching means to releasing position, as shown in Figure 2, when the fuse link is ruptured. Additional means may be provided in the form of the spring 33 to urge the latching means towards releasing position.

The latching means is normally restrained by the fuse link 34, such fuse link being clamped below the thumb nut 35 carried by the lever or latching means 27. It is to be noted that a flexible leader 36 electrically joins the latching means 27 with the contact 16. The fuse link electrically connects the upper and lower contacts of the fuse tube in the usual manner and passes through the open lower end of the expulsion fuse tube, to the latching means 27, a notch 37 being preferably provided in the lower end of the lever or latching means 27.

It is to be noted from reference to Figures 2 and 3 that the upper contacts 8 grip the conical upper contact 9 of the fuse tube 10 until the latching means has released the fuse tube. Further, it sometimes happens that it is desirable to close the door and have the door remain closed, although the fuse tube has been removed. This is provided for as the downwardly extending finger 7 of the bracket 5 carried adjacent the upper end of the door fits between the converging spring contacts 8 and thus serves to releasably hold the upper end of the door closed even if the fuse tube is removed.

It is clear that the opening 6 in the bracket 5 cooperates with the upper contact 9 of the fuse tube so that when the door is pulled open, the upper contact 9 of the fuse tube is engaged by the wall of the opening 6 and thus the strain of pulling the fuse tube outwardly from the upper contact is not borne by the lower contact and its hook 17 but instead is borne directly by the bracket 5 secured to the upper end of the door.

Further it is to be noted that an abutment 38 is provided on the inner face of the door adjacent its lower portion which bears against the contact 16. However, this does not interfere with the free sliding motion of the fuse tube as the slidable portion of the fuse tube is not in engagement with this abutment.

The fuse tube may be removed from the door by unhooking the hook 17 from the strap 19. In repositioning the fuse tube, the beveled lower face 18 of the hook 17 rides over the strap 19, thus compressing the springs 21. When the hook has passed over the strap 19, it moves downwardly under the influence of the springs 21 and thus locks the fuse tube to the door.

When an overload occurs after the reactive forces have ceased due to the expulsion of gases, the spring 26 urges the fuse tube downwardly, the latching means 27 being released by the ruptured fuse link 34. The downward motion of the fuse tube through the initial portion of its stroke causes the latching means 27 to rock to releasing position.

As stated, if desired the spring 33 may also be provided to supplement the action of the spring 26 and to provide, if desired, means acting directly on the latching means urging it to releasing position. Obviously the spring 33 can be omitted if desired as the spring 26 will, as stated, cause the latching means to move to its releasing position upon downward motion of the fuse tube through the initial portion of its stroke when released upon rupture of the fuse link. The latching means also acts as a fuse link retracting means and withdraws any remaining unburned portion of the fuse link upon rupture of the fuse link, in addition to the action of the expulsive gases generated during rupture of the fuse link. It serves to quickly withdraw the fuse link and thus quickly stretch out and extinguish the arc within the fuse tube. This action will take place under heavy overloads and under light overloads. However, under light overloads it may happen that the expulsive action of the gases is not very great and much less than under heavy overloads. Consequently, there is less tendency for any remaining unburned portion of the fuse link to be expelled by the expulsive gases and the fuse link extracting and latching means, therefore, plays a very important function under these conditions of light overload, for when the fuse link is ruptured, the latching means not only releases the fuse tube but also quickly withdraws any remaining unburned portion of the fuse link.

It will be seen that this invention provides a novel form of housed type expulsion fuse in which not only the expulsion action is obtained but also in which the fuse tube moves vertically

downwardly from the housing and thus increases the gap in the electric circuit.

It will be seen further that the projecting fuse tube when the fuse link has ruptured gives a visual indication of the condition of the apparatus and indicates that refusing is needed.

It will be seen further that the operation of the expulsion fuse will be extremely rapid as it has not only the expulsive action heretofore utilized in expulsion fuses, but also because whatever remains of the lower end of the fuse link after the blowing of the fuse tube is substantially instantly snapped out of the tube by means of the spring urged lower contact and latching member.

It is to be noted also that the latching means has an elongated sector-shaped portion that holds the upper contact of the fuse tube in engagement with the upper stationary contact of the housing while the arc is being extinguished within the fuse tube and the link is being withdrawn from the fuse tube. This insures the retention of the upper contact of the fuse tube in engagement with the upper stationary contact during this interval.

It will be seen further that the construction is simple, is easy to handle, and that the fuses are easy to replace and that the device is eminently practical.

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 as my invention:

1. In a drop-out fuse device, in combination, a sleeve, means for rotatably mounting said sleeve, a fuse tube slidably mounted in said sleeve, a spring biasing said fuse tube for movement relative to said sleeve, a fuse link in said fuse tube tensioned by said spring and restraining said fuse tube from movement in said sleeve, and cooperating contacts adjacent one end of said fuse tube and including resilient means for exerting a force laterally of said fuse tube.

2. In a drop-out fuse device, in combination, a sleeve, means for rotatably mounting said sleeve, a fuse tube slidably mounted at one end in said sleeve, a spring biasing said tube for movement relative to said sleeve, a fuse link in said tube tensioned by said spring and restraining said tube from movement in said sleeve, a terminal carried by the other end of said tube, a stationary terminal

adjacent said other end of said tube, and resilient contact means electrically interconnecting said terminals, the stress aplied to said fuse link by said spring being independent of and unaffected by the resilient force applied to said contact means.

3. In a drop-out fuse device, in combination, a sleeve, means for rotatably mounting said sleeve, a fuse tube slidably mounted at one end in said sleeve, a spring biasing said fuse tube for movement relative to said sleeve, a fuse link in said fuse tube tensioned by said spring and restraining said fuse tube from movement in said sleeve, a terminal carried by the other end of said fuse tube, and a stationary terminal adjacent the other end of said fuse tube normally electrically connected to the terminal of said fuse tube, said terminals being arranged and adapted to maintain contact by lateral pressure while said fuse tube moves through said sleeve a predetermined distance after said fuse link blows.

4. In a drop-out fuse device, in combination, a sleeve, means for rotatably mounting said sleeve, a fuse tube slidably mounted at one end in said sleeve, a spring biasing said fuse tube for movement relative to said sleeve, a fuse link in said fuse tube tensioned by said spring and restraining said fuse tube from movement in said sleeve, contact means carried by the other end of said tube, a stationary contact means adjacent the other end of said tube, the stationary contact means and the contact means carried by said fuse tube being normally inter-connected and one of said contact means being resilient and engaging the other contact means in a plane substantially at right angles to the axis of said fuse tube.

WILLIAM O. SCHULTZ.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
Re. 21,563	Schultz	Sept. 10, 1940
Re. 21,780	Schultz et al.	Apr. 22, 1941
2,063,466	Schultz et al.	Dec. 8, 1936
2,098,433	Schultz	Nov. 9, 1937
2,204,320	Schultz	June 11, 1940
2,291,646	Ramsey	Aug. 4, 1942
2,423,258	Schultz	July 1, 1947