April 5, 1932. T. BIRKENMAIER 1,852,283

SWITCH

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Fig. 1.

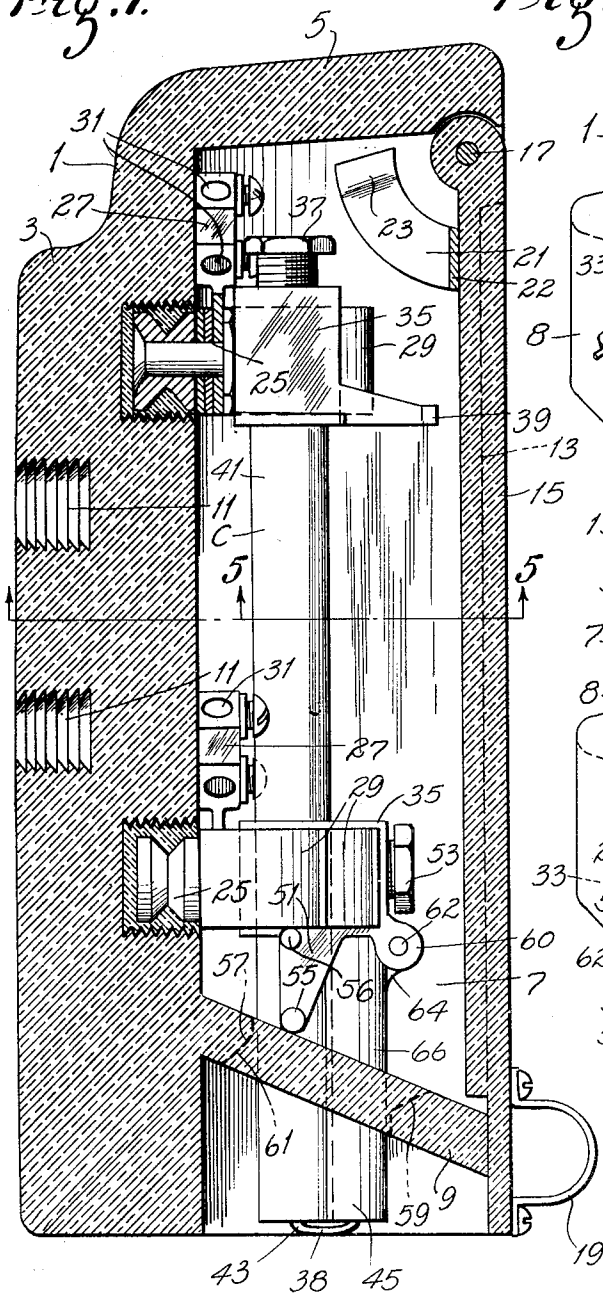
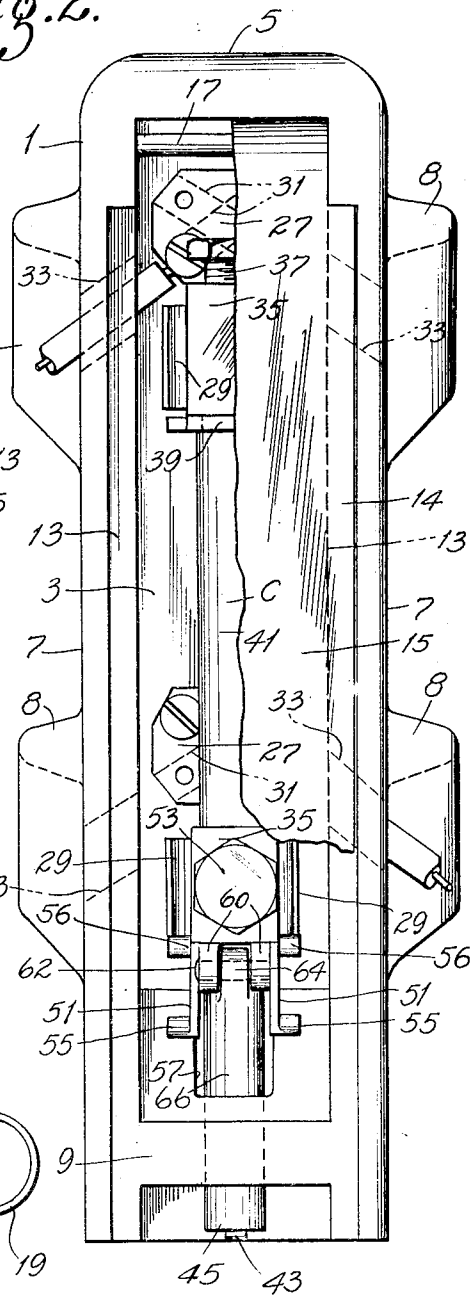



Fig. 2.

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SWITCH

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Fig. 3.

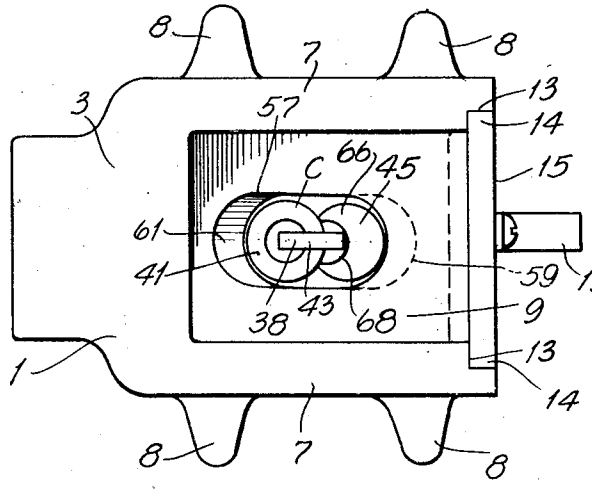



Fig. 6.

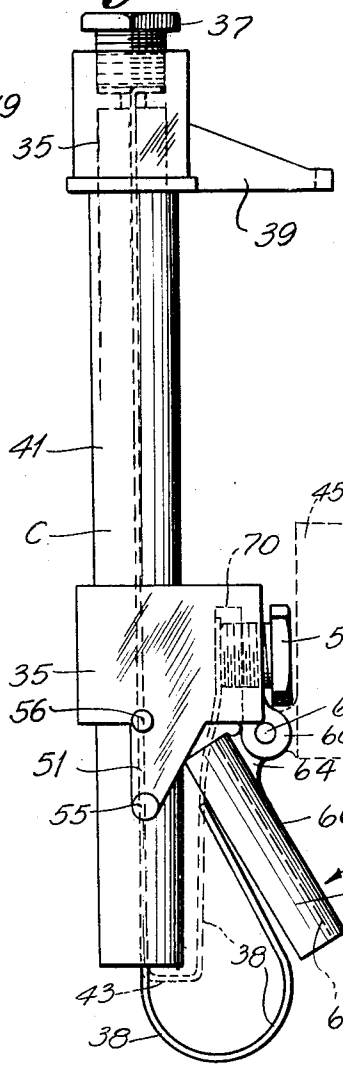
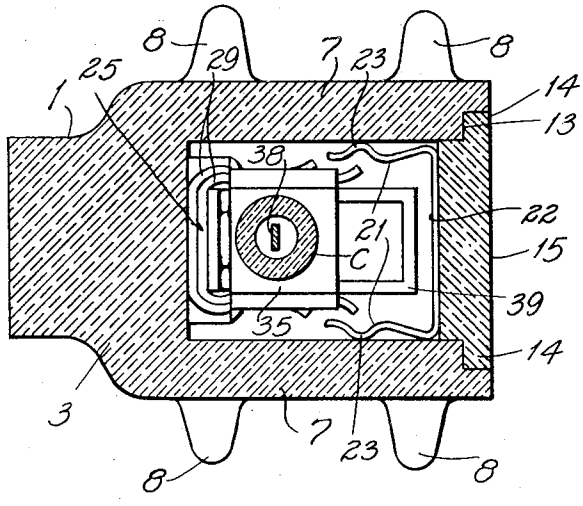



Fig. 5.

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SWITCH

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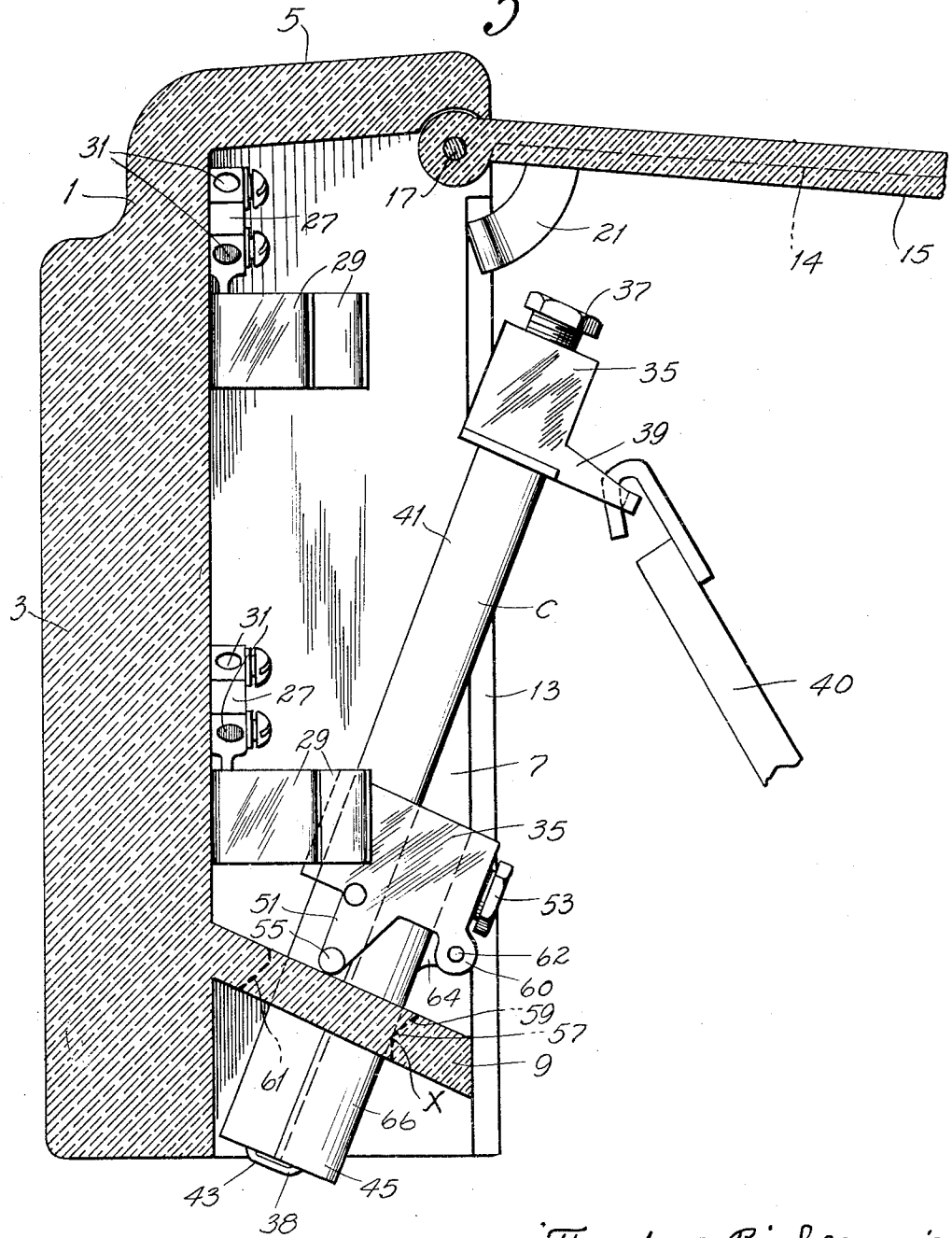
Fig. 4.

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Patented Apr. 5, 1932 1,852,283

# UNITED STATES PATENT OFFICE

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## SWITCH

Application filed April 19, 1929. Serial No. 356,359.

This invention relates to switches and with regard to certain more specific features, to fuse switches of the tubular type.

Among the several objects of the invention may be noted the provision of an improved type of a fuse switch wherein a tubular expulsion chamber is arranged for ready opening so that a fuse or switch link or the like may be readily applied thereto; the provision of a device of the class described which is adapted to operate advantageously with an improved form of housing; and the provision of a device of the class described which is economical and rugged in construction and simple in operation. Other objects will be in part obvious and in part pointed out hereinafter.

The invention accordingly comprises the elements and combinations of elements, features of construction, and arrangements of parts which will be exemplified in the structure herinafter described, and the scope of the application of which will be indicated in the following claims.

In the acompanying drawings, in which is illustrated one of various possible embodiments of the invention,

Fig. 1 is a vertical section taken through a closed switch box and fuse cartridge comprising the invention;

Fig. 2 is a front elevation of Fig. 1, certain portions being broken away;

Fig. 3 is a bottom plan view of Fig. 1;

Fig. 4 is a view similar to Fig. 1, showing the door open and a fuse cartridge in partially removed position;

Fig. 5 is a cross section taken on line 5—5 of Fig. 1; and,

Fig. 6 is a side elevation of a fuse cartridge per se, showing the same in open position and a fuse link partially applied, and also showing an alternate position.

Similar reference characters indicate corresponding parts throughout the several views of the drawings.

Referring now more particularly to Fig. 1, there is illustrated at numeral 1 a box, composed of non-conducting material, preferably of porcelain. The box in its finished commercial form is preferably of a unitary construction, the various members thereof being baked together and comprising a back 3, a backwardly sloping top 5, side walls 7 and a septum 9. Recesses 11 are provided in the rear for cementing on suitable supporting means. The outer surfaces of the side walls 7 are provided with elevations 8 for increasing the leakage path. The forward opening in the box has edges in which are formed longitudinal depressions or recesses 13 for receiving the extending edges 14 of a door 15, the door being so formed as to come flush with the front of said box 1. By this means a tortuous crack, rather than a straight one is effected between the door and box, by means of which a better enclosing effect is had. The door 15 is hinged at the top of the box by means of a pin 17. At its lower end it is provided with an external finger piece 19 for opening and closing purposes.

Detents 21 are fastened to the upper end of said door 15. The detents are preferably formed with a cross strip 22 for fastening purposes. Each detent is preferably of curved form and is positioned nearly flush with the inner faces of the side walls 7 of the box, except that it has a bent portion 23, the effect of which portion 23 is to press against the said inner faces so as to spring the detents 21 slightly inward and thereby frictionally hold the door shut.

Also, when the door is drawn open, as illustrated in Fig. 4, then the bent or curved portions 23 of the detents spring outwardly and drop into their respective longitudinal door recesses 13. The door is thus held in open position. The economy of this construction is apparent, because it may be seen that the same recesses 13 that serve as a door stop and to more completely close the box against weather, also serve as recesses for the action of the detents 21.

Cemented into the inside of the back 3 of the box 1 are suitable line terminals 25, comprising wire sockets 27 and spring clips 29. The sockets 27 are arranged with cross passages 31, each of which is laterally tapped for set screws for wire holding purposes. The pair of set screws provided for each socket 27 may be used with either passage 31, where-

by wires may be brought in from either side of the switch through either combination of openings 33, or from one side only.

The spring clips 29 are of the type adapted to receive therebetween in electrical contact the flat sided terminal engaging elements 35 of the fuse cartridge C. The cartridge includes the upper element 35 having screw means 37 thereon for holding a fuse wire 38 in electrical contact. This upper element is also formed with a bridge portion 39 for hooking on an insulated tool 40 for removing and applying the cartridge. A long gas-expulsive insulating tube 41 is fastened to the upper engaging element 35 and surrounds said fuse link 38 down to a hair pin turn 43 on the latter.

The insulating tube 41 passes with a snug fit through the lower terminal engaging element 35. It is not held to the same with any device such as a set screw, because these have been found to damage the tube and promote leakage, so that an arc (such as is formed upon blowing) connects the terminals 35 over the shortest possible distance, namely through the portion of the tube 41 between said terminals.

The terminal engaging element 35 carries downwardly extending lugs 60 cooperating hingedly by means of a pin 62 with a lug 64, the latter lug 64 being formed with what will be designated as a short, open-sided, insulating member or cover 45. It is preferable that the member 45 be composed of fibre or the like and the lug 64 be formed integrally therewith, also of fibre. The cross sectional shape of the tube 45 is shown as a crescent in Fig. 3 and comprises a solid portion 66 having a longitudinal open slot or opening 68 which is open when the tube 45 is hinged open as illustrated in Fig. 6. When the tube 45 is hinged shut, as illustrated in Figs. 1 and 4, then the open side of the slot 68 is closed by the contiguous tube 41 against which the member 45 rests at that time.

The lower terminal engaging element 35 is provided with a recess 70 into which the longitudinal opening 68 leads when the member 45 is closed. The recess is intersected by a set screw 53 threaded thereinto, the said screw serving as a fastening for the fuse link when it is in connected position.

A further improvement of the lower terminal 35, taken in connection with the septum 9, consists in said lower and rearward extension 51, which in effect comprises two follower lugs 55, one on each side of the tube 41. These lugs engage the upper forwardly sloping surface of the septum 9. This upper surface, composed of porcelain, similar to the remainder of the box, is preferably glazed and is therefore smooth. It is to be understood that the septum may be constructed of other material such as fiber, bakelite or the like.

The septum 9 is provided with an opening 57 having an upper beveled portion 59 forwardly and a lower beveled portion 61 rearwardly, said opening being adapted to receive the lower ends of the tubes 41, 45 snugly but not tightly. The fit between the lower end of the cartridge and said opening 57, when the latter is canted forwardly (Fig. 4), is rather loose, while when the cartridge is in vertical or terminal engaging position, the fit is snug enough to substantially separate the interior and exterior of the box (see Fig. 1).

The result of this is also to positively and automatically hold the member 45 shut against the tube 41, whereby, in effect said member 45 comprises part of a tube, one wall of which is a portion of the wall of the tube 41 (see Fig. 1). It is also to be noted that as the lower terminal is engaged, the cartridge tends to rotate therein, thereon effecting a reaction at point X (Fig. 4) so as to positively close the member 45 and form a complete tubular portion about the fuse link therein.

It will be seen that the septum is not at the lowermost region of the box 1 but is raised somewhat, so that when the cartridge is in terminal engaging position then the lower end of the cartridge, for purposes of protection, is within the confines of the back 3, side walls 7 and door 15.

The switch may be supplied with a fuse cartridge by opening the door to the Fig. 4 position and inserting the lower end of the cartridge through the opening in the septum. The member 45 is at this time manually held against the tube 41. The lugs 55 limit the degree of insertion. This is an easy operation because the fit is loose.

When the lugs strike the septum, the operator pushes the cartridge back into the Fig. 1 position with the terminal engaging elements 35 within the confines of the terminals 29. At this time the lugs 55 ride up on the sloping septum with the cartridge pivoting at point X (Fig. 4) so that there is always attained a proper and accurate engagement. No high degree of skill nor care needs be exercised in pushing home the cartridge. Lugs 56 above the lugs 55 engage beneath the lower set of spring clips 29 so as to prevent upward disconnecting movement of the cartridge when the reaction due to a blowing fuse is effected.

Removal is effected by applying the tool hook at bridge 39 and drawing down the cartridge. It pivots on the lugs 55 until contact is broken and then falls forward to a position slightly beyond the Fig. 4 position. After this the cartridge may be pulled out of the septum opening 57 by hand or with the tool.

The advantage of this construction is that it greatly simplifies the manufacture. Also, the cartridge is positively placed in a position where the lower open ends of the tubes are

outside of the box, so that when the cartridge blows gases are not engendered within the box.

The advantage of the cartridge per se is when it is withdrawn from the box, the open-sided cover member 45 may be hinged open and the set screw 53 withdrawn, whereupon the portion of the fuse in the recess 70 may be readily removed. The other portion in the tube 41 may be removed from the upper end thereof by removing the cap screw 37.

Furthermore, when it is desired to re-insert a new fuse link, this may readily be done by feeding it through the tube 41 and fastening it at the upper terminal engaging element 35 by means of the screw 37. It may then be readily bent around and fed into the recess 70 of the lower terminal engaging element without the necessity for feeding it through a second tube, such as would be required if the member 45 were a stationary tube annexed to the tube 41. After the fuse link is fastened in position as indicated by dotted lines in Fig. 6, the cover member 45 may be brought into its closed position over its respective length of fuse such as shown in Fig. 1 or 4 and thereafter the fuse cartridge is ready to be applied to the septum 9 as above described. It will be seen that the member 45 rests against the tube 41 and forms a second tube which is openable along its length and removable after having been opened. In view of the above, it will be seen that the several objects of the invention are achieved and other advantageous results attained.

As many changes could be made in carrying out the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

I claim:

1. A cartridge comprising terminal engaging elements spaced by means of a tube, a fuse link joining said terminal engaging elements one portion thereof passing through said tube and another lying outside of the same and a hinged member on one of the engaging elements adapted to swing against said tube and cover said outside part of the fuse link.

2. A cartridge comprising terminal engaging elements spaced by means of a tube, a fuse link joining said terminal engaging elements one portion thereof passing through said tube and another lying outside of the same and a hinged member on one of the engaging elements adapted to swing against said tube and cover said outside part of the fuse link to form a tube therearound.

3. A cartridge comprising terminal engaging elements spaced by means of a tube, a fuse link joining said terminal engaging elements one portion thereof passing through said tube and another lying outside of the same where the tube extends beyond one of the engaging elements and means hinged to said last-named engaging element for covering and uncovering said external portion of the link.

4. In a fuse switch a cartridge comprising terminal engaging elements spaced by means of a tube, a fuse link joining said terminal engaging elements one portion thereof passing through said tube and another lying outside of the same, a hinged member on one of the engaging elements adapted to swing against said tube and cover said outside part of the fuse link, supporting means for the cartridge comprising means having an opening therein, line terminals, the periphery of said opening holding the hinged member to the tube when the line terminals are engaged by the terminal engaging elements.

5. A cartridge comprising terminal engaging elements spaced by means of a tube, a fuse link joining said terminal engaging elements one portion thereof passing through said tube and another lying outside of the same, a hinged member on one of the engaging elements adapted to swing against said tube and cover said outside part of the fuse link and means for holding said hinged member to the tube.

6. A cartridge comprising terminal engaging elements spaced by means of a tube, a fuse link joining said terminal engaging elements one portion thereof passing through said tube and another lying outside of the same, a hinged member on one of the engaging elements adapted to swing against said tube and cover said outside part of the fuse link and means for holding said hinged member to the tube operable automatically when the cartridge is placed to make electrical contact.

7. A cartridge comprising terminal engaging elements, a fuse link joining said engaging elements and passing through a tube therebetween, a portion of said link lying externally of said tube and a movable portion on one of the engaging elements adapted to cover and uncover the external portion of the link.

8. A cartridge comprising terminal engaging elements, a fuse link joining said engaging elements and passing through a tube therebetween, a portion of said link lying externally of said tube and a movable portion fastened to the cartridge adapted to cover and uncover the external portion of the link.

9. A cartridge comprising terminal engaging elements, a fuse link joining said engaging elements and passing through a tube therebetween, a portion of said link lying externally of said tube, a movable portion fastened to the cartridge adapted to cover and uncover the external portion of the link and

form a tube around said external portion of the link.

10. In a fuse cartridge an upper terminal engaging element, a lower terminal engaging element, a tube extending from the upper element through the lower element, a recess in said lower element, a swingable portion on the lower element having an open portion accommodating a length of fuse link, said open portion leading to and communicating with said recess, a fuse link fastened to the upper element and passing through the tube, a portion of said link lying outside of the tube and comprising the length within the swingable portion.

11. In a fuse switch, line terminals, a cartridge comprising terminal engaging elements spaced by means of a tube, a fuse link joining said terminal engaging elements one portion thereof passing through said tube and another lying outside of the same, a hinged member on one of the engaging elements adapted to swing against said tube and cover said outside part of the fuse link, supporting means for the cartridge comprising means having an opening therein, the periphery of said opening holding the hinged member to the tube.

12. In a fuse cartridge a tube, a juxtaposed cover, a fuse having a leg in the tube and a leg under said cover, said juxtaposed cover being movable to uncover the fuse leg thereunder and hingeable on the cartridge to permit ready placement of said fuse.

In testimony whereof I have signed my name to this specification this 17th day of April, 1929.

THEODORE BIRKENMAIER.