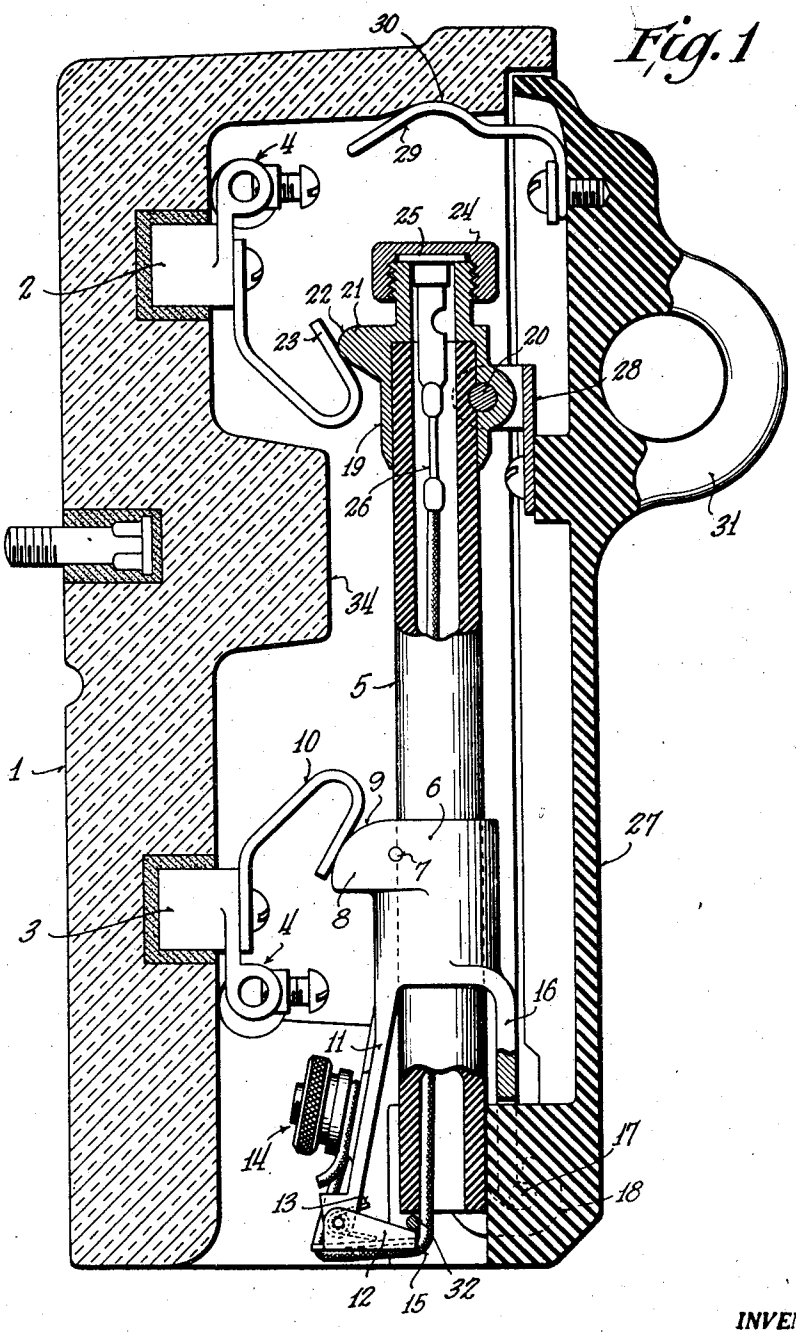
Oct. 8, 1946. A. G. STEINMAYER 2,409,077

EXPULSION FUSE

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Fig. 1



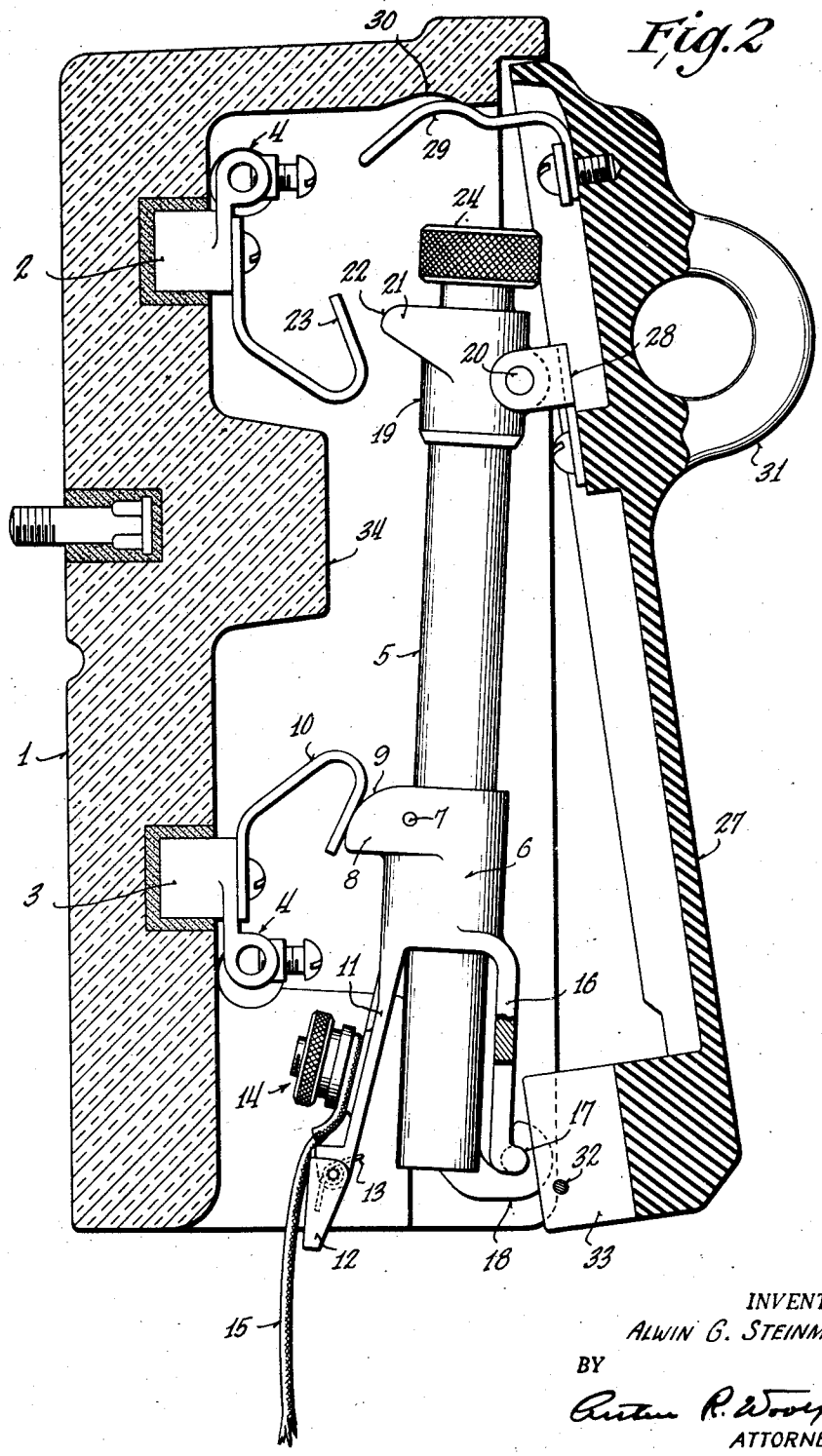
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Fig. 2



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EXPULSION FUSE

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Fig. 3

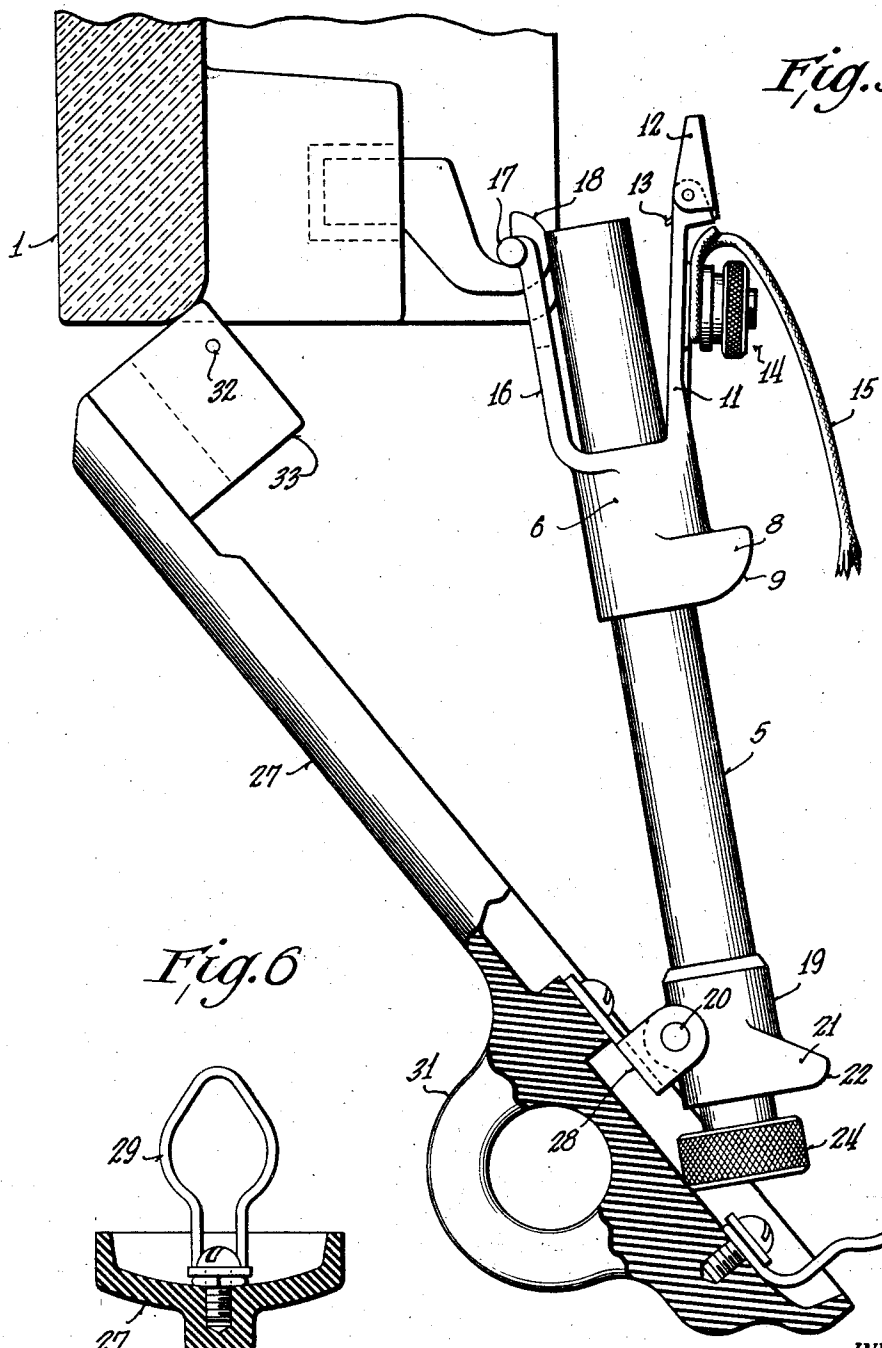


Fig. 6

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EXPULSION FUSE

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Fig. 4

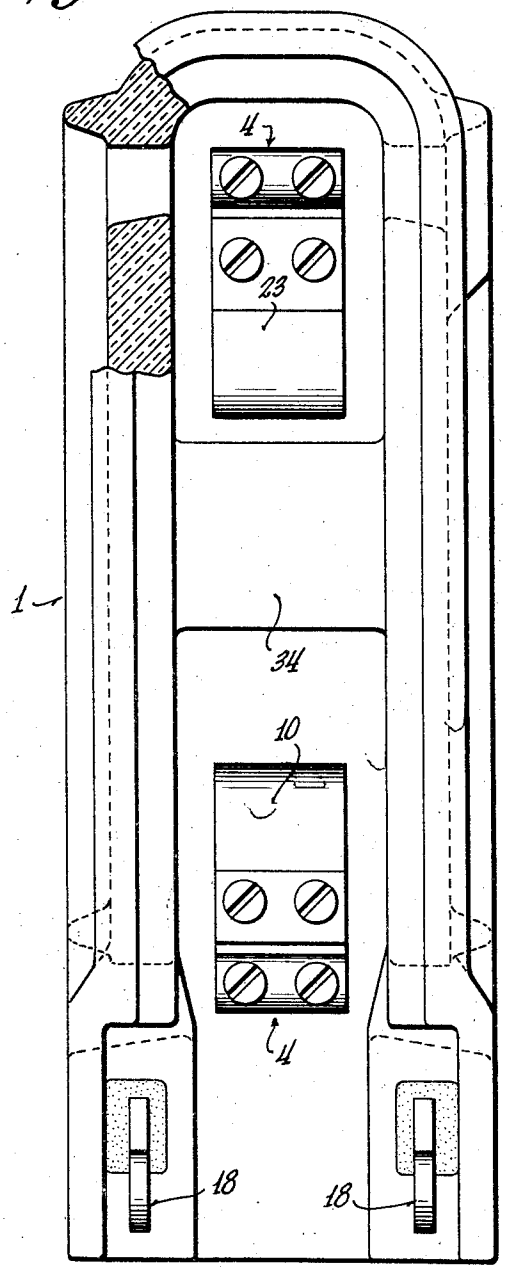
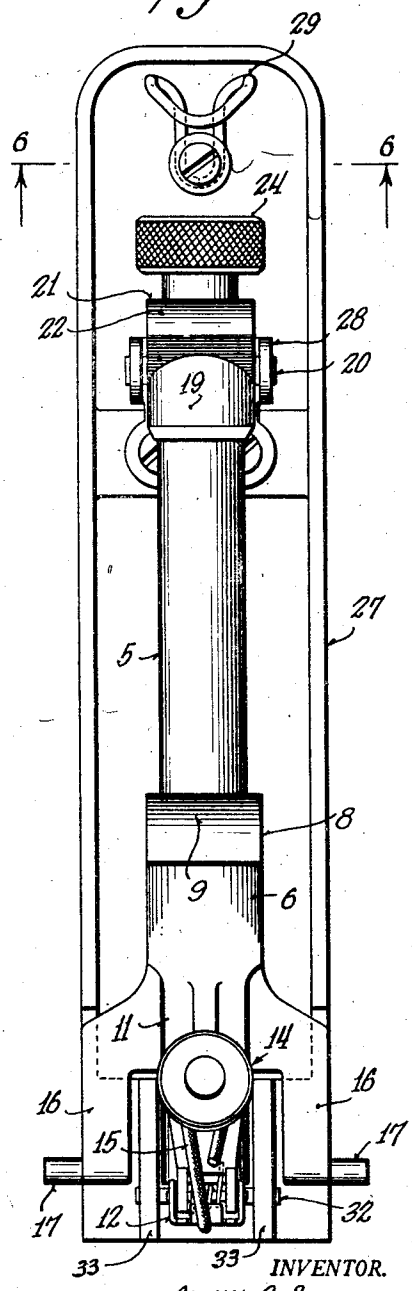


Fig. 5



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UNITED STATES PATENT OFFICE

2,409,077

EXPULSION FUSE

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Application June 4, 1943, Serial No. 489,599

10 Claims. (Cl. 200—114)

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This invention relates to expulsion fuses and is particularly directed to a housed type of expulsion fuse.

Objects of this invention are to provide a housed type of fuse construction in which a fuse tube and door assembly are provided, in which the door is movably supported with reference to the fuse tube and is released upon blowing of the fuse link so that the door may execute motion with reference to the fuse tube and unlatch the fuse tube and door assembly from the stationary portion of the apparatus, the fuse tube and door assembly thereafter rocking outwardly to open position and thereby completely removing the fuse tube from the circuit and also giving a visual indication that the fuse has blown.

Further objects are to provide a construction in which good positive contact is provided between the contacts of the fuse tube and door assembly and the stationary contacts, in which this secure and positive contact does not impede opening motion of the fuse tube and door assembly as there is no gripping of the contacts of the fuse tube and door assembly by the stationary contacts, but in which the stationary contacts urge the fuse tube and door assembly towards inoperative position.

Further objects are to provide a fuse construction of the drop-out type in which the circuit is cleared within the fuse tube prior to motion of the contacts of the fuse tube away from the stationary contacts, to thereby avoid burning of the stationary contacts, in which relatively heavy contact pressure is secured between the contacts of the fuse tube and the stationary contacts without in any way impeding the drop-out action of the fuse tube and door assembly.

In greater detail further objects are to provide a very simple type of housed drop-out fuse device in which a simple form of spring latch is employed for normally latching the fuse tube and door assembly in place, in which this spring latch is released from its latching engagement with the housing by relative motion between the door and fuse tube, and in which after release of the latch the fuse tube and door assembly rock downwardly to their lowermost position.

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

Figure 1 is a sectional view through the device showing the parts in the position they occupy when the fuse link is intact.

Figure 2 is a view corresponding to Figure 1 showing the position of the parts as they start

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to move outwardly after rupture of the fuse link.

Figure 3 is a fragmentary view, partly in section and partly broken away, showing the final position of the parts following rupture of the fuse link.

Figure 4 is a front view, partly broken away, looking into the housing with the door and fuse tube assembly removed.

Figure 5 is a rear view of the door and fuse tube assembly removed from the housing.

Figure 6 is a sectional view on the line 6—6 of Figure 5.

Referring to the drawings, it will be seen that the device comprises a fuse housing 1 of porcelain which has upper and lower stationary terminals 2 and 3 each of which is provided with means indicated generally at 4 for receiving and clamping the incoming and outgoing conductors.

A fuse tube 5 of insulating material is normally mounted within the housing. It carries a lower metal sleeve 6 which constitutes the lower terminal of the fuse tube and which is rigidly attached to the fuse tube in any suitable manner, as by means of the pin 7 for instance. This sleeve is provided with a rearwardly projecting enlargement 8 which has a rounded cam face 9 which bears against the U-shaped lower stationary spring contact member 10. The lower contact or sleeve 6 is provided with an integral, rearwardly positioned arm 11 which projects downwardly at a slanting angle to the fuse tube and to whose lower end a fuse link extractor 12 is pivotally mounted. The fuse link extractor is urged towards fuse link extracting motion by means of the spring 13. The arm 11 also carries the clamping means such as the stud and clamping nut indicated generally at 14 for clamping the lower end of the flexible leader 15 of the fuse link in place after the fuse link has been passed beneath the flip-out or fuse link extracting member 12.

The lower contact or sleeve 6 is also provided with an integral, forwardly located arm 16 which extends downwardly and which is bifurcated at its lower end and provided with outwardly projecting trunnions 17 which are removably positioned within the hook like members or bearing portions 18. The hook like bearing portions 18 are rigidly carried by the housing, as shown in Figure 4, and provided with overhanging upper portions so as to overhang the trunnions 17 when the fuse tube is in the position shown in Figure 1. The tube carries an upper

contact or sleeve like member 19 at its upper end which is rigidly secured thereto as by means of the pin 20, such pin also serving as a pivot pin in a manner hereinafter to appear.

The upper contact or sleeve 19 is provided with an outwardly projecting contact portion 21 which has a rounded rear cam face 22 normally bearing against the U-shaped upper spring contact member 23, such upper contact member 23 being carried by the upper terminal 2. The upper terminal 19 of the fuse tube is threaded at its upper end and receives the clamping cap 24 which clamps the head 25 of the fuse link in place against the upper terminal. The fuse link may be of any suitable type and may have a fusible section indicated at 26.

An insulating door 27 is provided with a clip 28 spaced downwardly from its upper end which clip is provided with a pair of ears pivoted on the pivot pin 20 so that the door is adapted to rock about the pin 20 to a limited extent with reference to the fuse tube 5. The door is provided with a spring latch 29 having an upwardly bowed portion which normally fits within the upwardly recessed portion 30 of the housing and which is released therefrom as will hereinafter appear. The door is also provided with an integral manipulating eyelet or handle 31 so that the fuse tube and door assembly may be manually rocked to open and closed position by means of a switch stick and may also be lifted from and repositioned on the hook like supports 18.

From the description thus far given it is apparent that the outward urging action of the spring contacts 10 and 23 tends to rock the fuse tube about the trunnions 17 and consequently tends to move the pivot pin 20 outwardly and thus also tends to rock the door about the point or portion at which the spring catch 29 seats within the recess 30 of the housing. This action is restrained, however, until the fuse link is ruptured as the door is provided with a transversely extending pin 32 adjacent its lower portion which pin extends between two spaced, rearwardly projecting ears or webs 33 formed integrally with the door 27. This pin is engaged by the fuse link as the leader 15 of the fuse link is positioned in front of the pin 32 as shown in Figure 1.

The operation of the apparatus is as follows: When an overload occurs, the fuse link is ruptured and the fuse link extractor 12 quickly withdraws all or the major part of any remaining portion of the fuse link, the action of the fuse link extractor producing an initial, almost vertical, downward motion of the remaining portion of the fuse link and being assisted by the expulsive action of the gases generated as a result of the rupture of the fuse link. This quickly clears the circuit within the tube and in addition frees the pin 32 of the door 27 and allows the door to pivot about the pivot pin 20, the spring contacts 10 and 23 urging the fuse tube towards rocking motion about the trunnions 17. The lower spring contact 10 continues to urge the fuse tube towards rocking motion even after the upper stationary spring contact 23 no longer contacts with the projecting portion 21 of the upper contact of the fuse tube. The parts pass through the position shown in Figure 2 and it will be seen that as the door rocks about the pivot pin 20 and as the pivot pin moves outwardly to the right as viewed in Figure 2, the spring latch 29 disengages itself from the recess 30 of the housing and thus the door is unlatched from the housing. The door and fuse tube then rock as a unit to their final position shown in Figure 3. It is to be noted that in the initial rocking motion of the door, such rocking motion is also assisted by the action of the spring latch 29 as the spring latch biases the door towards rocking motion about the pin 20.

It is obvious that in refusing, the lineman can remove the door and fuse tube assembly from the hooks 18 by inserting a switch stick in the eyelet or handle portion 31 and lifting the fuse tube and door assembly from the housing. After refusing the fuse tube and door assembly is repositioned and is rocked to closed position, the spring catch 29 yielding slightly and sliding into interlocking engagement with the recessed portion 30 of the housing.

It will be seen that the fuse link is tensioned not only by the flip-out device 12, but also by the pin 32 carried by the door as the door is urged towards counter-clockwise rocking motion. The pin 32 is a round pin and serves as a guide over which the leader of the fuse link will freely slide during expulsion and extraction of the fuse link.

It is apparent that on heavy overloads the expulsive action will be great. On very light overloads the flip-out device or fuse link extractor will play the major part in extracting the fuse link but under all conditions of overload it is apparent that the circuit will be cleared with certainty within the fuse tube prior to the motion of the contacts of the fuse link away from the stationary contacts and consequently there can be no burning of either the stationary contacts or the contacts of the fuse tube. In addition to this it is to be noted that the flip-out device or fuse link extractor has very little inertia and assists materially, particularly on small overloads, in a quick clearing of the circuit within the fuse tube. It is also to be noted that there is very little chance of internal flash-over within the housing as the upper and lower stationary contacts and upper and lower contacts of the fuse tube are spaced apart a considerable distance. It is also preferable to provide a barrier 34 integral with the housing 1.

It will be seen that a very simple type of housed expulsion fuse has been provided by this invention which is rugged in its construction, which has relatively easily produced and assembled parts and which is reliable in operation.

It is also to be noted that neither the door nor any auxiliary member slides during the operation of the apparatus on overload. All of the motions causing release are pivotal motions, the door pivoting with reference to the fuse tube and the fuse tube pivoting with reference to the housing and the door and fuse tube assembly both pivoting as they rock outwardly with reference to the housing. There is thus very little chance of the sticking of any of the parts as might occur had sliding motion been relied upon instead of free pivotal action in all stages of the unlatching and outward swinging of the parts.

It is to be noted that either the contacts carried by the fuse tube or the stationary contacts can be made yielding, the stationary contacts having been shown as yielding contacts. It is also obvious that at least one of the contacts must be yielding or resilient so as to bias the door towards rocking motion with reference to the fuse tube and to bias both the fuse tube and the door towards rocking motion with reference to the housing.

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 construction comprising a housing, a fuse tube pivotally supported from the housing and normally positioned within the housing, pivot means fixedly carried by said fuse tube, a door pivoted on said pivot means, said fuse tube having spaced contacts, stationary contacts carried by said housing and normally engaging the contacts of said fuse tube, a fuse link within said fuse tube normally electrically connecting the contacts of said fuse tube and coacting with said door to normally prevent said door from pivoting with reference to said fuse tube, said door being biased towards rocking motion with reference to said fuse tube and said fuse tube being biased towards rocking motion with reference to said housing, said door normally interlocking with said housing and releasing itself from said housing when said door rocks with reference to said fuse tube.

2. A housed type of drop-out fuse construction comprising a housing, a fuse tube pivotally supported from the housing and normally positioned within the housing, pivot means fixedly carried by said fuse tube, a door pivoted on said pivot means, said fuse tube having spaced contacts, stationary contacts carried by said housing and normally engaging the contacts of said fuse tube, a fuse link within said fuse tube normally electrically connecting the contacts of said fuse tube and coacting with said door to normally prevent said door from pivoting with reference to said fuse tube, at least one of said contacts being resilient and biasing the door towards rocking motion with reference to said fuse tube and biasing said fuse tube towards rocking motion with reference to said housing, said door normally interlocking with said housing and releasing itself from said housing when said door rocks with reference to said fuse tube.

3. A housed type of drop-out fuse construction comprising a housing, a fuse tube pivotally supported from the housing and normally positioned within the housing, pivot means fixedly carried by said fuse tube, a door pivoted on said pivot means, said fuse tube having spaced contacts, stationary contacts carried by said housing and normally engaging the contacts of said fuse tube, a fuse link within said fuse tube normally electrically connecting the contacts of said fuse tube and coacting with said door to normally prevent said door from pivoting with reference to said fuse tube, said stationary contacts being resilient and biasing the door towards rocking motion with reference to said fuse tube and biasing said fuse tube towards rocking motion with reference to said housing, said door normally interlocking with said housing and releasing itself from said housing when said door rocks with reference to said fuse tube.

4. A housed type of drop-out fuse construction comprising a housing, a fuse tube normally positioned within said housing and pivoted on said housing and having only rocking motion with reference to said housing and biased for rocking motion, a door pivoted on said fuse tube and having only rocking motion with reference to said fuse tube and biased for such rocking motion, interengaging pairs of spaced contacts carried by said housing and fuse tube, a fuse link within said fuse tube normally electrically connecting the contacts of said fuse tube and normally coacting with said door to prevent rocking motion of said door with reference to said fuse tube, and latching means for normally latching said door to said housing and releasing said door from said housing when said door rocks with reference to said fuse tube.

5. A housed type of drop-out fuse construction comprising a housing, a fuse tube normally positioned within said housing and pivoted on said housing and having only rocking motion with reference to said housing and biased for rocking motion, a door pivoted on said fuse tube and having only rocking motion with reference to said fuse tube and biased for such rocking motion, interengaging pairs of spaced contacts carried by said housing and fuse tube, a fuse link within said fuse tube normally electrically connecting the contacts of said fuse tube and normally coacting with said door to prevent rocking motion of said door with reference to said fuse tube, quick acting fuse link extracting means, and latching means for normally latching said door to said housing and releasing said door from said housing when said door rocks with reference to said fuse tube.

6. A housed type of drop-out fuse construction comprising a housing, a fuse tube normally positioned within said housing and pivoted on said housing and having only rocking motion with reference to said housing and biased for rocking motion, a door pivoted on said fuse tube and having only rocking motion with reference to said fuse tube and biased for such rocking motion, interengaging pairs of spaced contacts carried by said housing and fuse tube, a fuse link within said fuse tube normally electrically connecting the contacts of said fuse tube and normally coacting with said door to prevent rocking motion of said door with reference to said fuse tube, quick acting fuse link extracting means acting independently of any motion of either said door or fuse tube for extracting any remaining portion of the fuse link upon rupture of the fuse link, and latching means for normally latching said door to said housing and releasing said door from said housing when said door rocks with reference to said fuse tube.

7. A housed type of drop-out fuse construction comprising a housing having upper and lower stationary contacts, a fuse tube normally positioned within said housing and pivoted adjacent its lower end to said housing and biased for outward rocking motion with reference to said housing and having upper and lower contacts normally engaging said stationary contacts, a door pivoted intermediate its ends to said fuse tube and biased for rocking motion with reference to said fuse tube, said housing and said door having interlocking portions releasable upon rocking motion of said door independently of any downward motion of said door, a fuse link within said fuse tube normally electrically connecting the contacts of said fuse tube, fastening means carried by the lower contact of said fuse tube for securing the lower end of said fuse link, and means carried by said door adjacent its lower end over which said fuse link is looped.

8. A housed type of drop-out fuse construction comprising a housing having upper and lower stationary contacts, a fuse tube normally positioned within said housing and pivoted adjacent its lower end to said housing and biased for outward rocking motion with reference to said hous-

ing and having upper and lower contacts normally engaging said stationary contacts, a door pivoted intermediate its ends to said fuse tube and biased for rocking motion with reference to said fuse tube, said housing and said door having interlocking portions releasable upon rocking motion of said door, a fuse link within said fuse tube normally electrically connecting the contacts of said fuse tube, fastening means carried by the lower contact of said fuse tube for securing the lower end of said fuse link, said door having a pair of spaced ears located on opposite sides of said fuse tube, and a pin extending between said ears over which said fuse link is looped.

9. A housed type of drop-out fuse construction comprising a housing having upper and lower stationary contacts, a fuse tube normally positioned within said housing and pivoted adjacent its lower end to said housing and biased for outward rocking motion and having upper and lower contacts normally engaging said upper and lower stationary contacts, a door pivoted intermediate its ends to said fuse tube, a spring latch carried by the upper portion of said door and normally interlocking with said housing and biasing said door towards rocking motion in a direction to release said door, a fuse link within said fuse tube

normally electrically connecting the contacts of said fuse tube, and means carried by the lower portion of said door and engaging said fuse link and normally restraining said door against rocking motion.

10. A housed type of drop-out fuse construction comprising a housing, a fuse tube pivotally supported from said housing and normally positioned within said housing and having upper and lower contacts, a fuse link within said fuse tube normally electrically connecting the contacts of said fuse tube, resilient stationary contacts carried by said housing and normally engaging the upper and lower contacts of said fuse tube, a door pivoted to the upper contact of said fuse tube, said resilient stationary contacts biasing said fuse tube for rocking motion with reference to said housing and biasing said door toward rocking motion with reference to said fuse tube, latch means carried adjacent the upper portion of said door normally latching said door to said housing and releasable upon rocking motion of said door independently of any downward motion of said door, and means carried by said door and engaging said fuse link and normally restraining said door against rocking motion.

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