Dec. 15, 1931. J. SCHURMANN 1,836,291

ELECTRIC BLASTING FUSE

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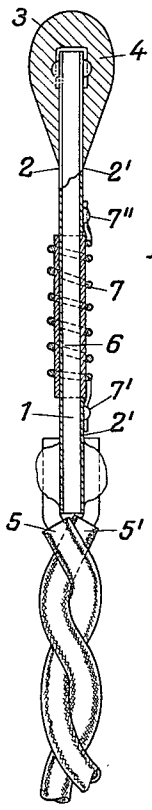


Fig. 1.

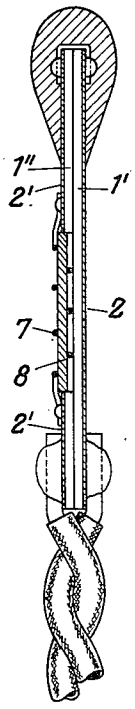


Fig. 2.

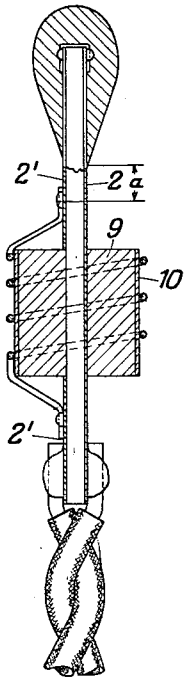


Fig. 3

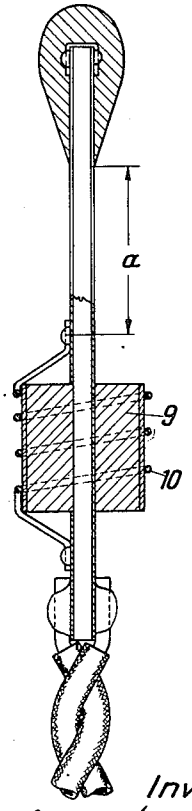


Fig. 4.

Inventor:
Julius Schürmann
By Henry Orth Jr.
Atty.

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Fig. 5.

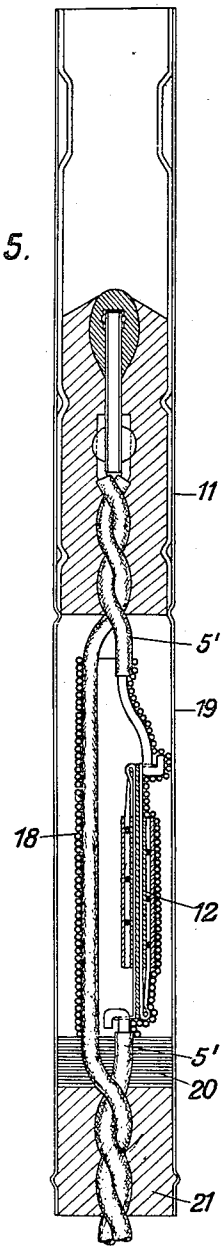


Fig. 7.

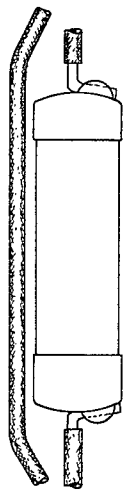
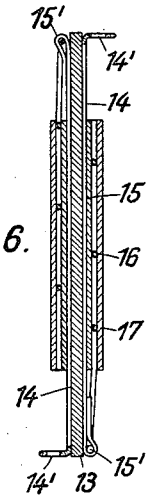


Fig. 6.



Inventor:
Julius Schürmann
By Harvey Ortlip Jr
Atty

Patented Dec. 15, 1931 1,836,291

UNITED STATES PATENT OFFICE

JULIUS SCHÜRMANN, OF BERLIN-ZEHLENDORF, GERMANY, ASSIGNOR TO THE FIRM FABRIK ELEKTRISCHER ZUNDER G. M. B. H., OF COLOGNE-NIEHL, GERMANY

ELECTRIC BLASTING FUSE

Application filed November 19, 1928, Serial No. 320,448, and in Germany July 13, 1928.

Electric blasting fuses have recently been required to have a blasting voltage in excess of a prescribed minimum value in order to ensure sufficient security against stray currents and possible other undesired electrical currents, that is to say that the fuse shall only ignite, if the difference of potential at the fuse wires exceeds 10 or 20 volts or other prescribed voltage and at the same time require a current of 100, 150, 200 and more milli-amperes. To attain this end it has been proposed to increase the resistance of the ignition wire embedded in the priming charge (which may be either a match-head or a loose mass), for example, by making the ignition wire exceptionally long, and in this manner the difference of potential at the ends of the ignition wires required for blasting has been raised to a certain degree.

When such fuses are subjected to a lower voltage than the blasting voltage, of course, a smaller current than the blasting current is obtained, but as the heat generated by this current accumulates in the priming charge, the ignition temperature is finally obtained even with the smaller currents and the fuse is ignited if the small current is maintained long enough. As a stray current, contrary to the blasting current, may act for an unlimited period, such fuses are therefore only pseudo-proof against stray currents.

According to the present invention, security against constant stray currents is attained with an ignition wire which may be of normal resistance, for example, of normal length and diameter, by interposing a resistance outside the priming charge and between the current leads and the ignition wire so that the heat of the current generated in this interposed resistance cannot reach the priming charge. The interposed resistance is preferably disposed as near to the ignition wire as compatible with these conditions, for example, it is arranged in the fuse cartridge itself or in an outer case or wound upon the cartridge or outer case or upon both. This is done to shorten as much as possible that part of the current lead through which any stray current might enter the ignition wire without passing through the interposed resistance.

The accompanying illustrations show examples of the construction of fuses according to the invention to an enlarged scale.

Fig. 1 shows a match-head fuse, partly in section, with a resistance wound upon the pole strip.

Fig. 2 shows a match-head fuse in section with an interposed resistance inserted in the pole strip.

Figs. 3 and 4 show match-head fuses in section with resistance fitted upon the pole strip.

Fig. 5 is a section through a blasting cartridge with an interposed resistance inserted in one of the current leads.

Fig. 6 is a detail sectional view and Fig. 7 a side view of parts shown in Fig. 5.

In the example shown in Fig. 1, the numeral 1 designates the usual pole strip, i. e. a strip of insulating material covered on both sides with the usual conducting foils 2 and 2′. The numeral 3 designates the ignition wire, 4 the priming charge and 5 and 5′ the usual current leads soldered to the strips 2 and 2′. The strip 2 connects the lead 5 to the ignition wire 3 in the usual manner, but the connection between the lead 5′ and the ignition wire 3 is interrupted.

Below the composition 4, insulation 6 is placed around the covered strip 1 and a resistance wire 7 is wound upon the insulation 6. One end of the wire 7 is attached at 7′ to the lower part of the covering strip 2′ and connected through it to the lead 5′ whilst the other end of the wire 7 is attached at 7″ to the upper part of the covering strip 2′ and through it with the ignition wire 3, so that the wire 7 is interposed between the lead 5′ and the ignition wire 3.

In the example shown in Fig. 2, the connection made between the ignition wire and one of the leads through the strip 2′ is not only broken to a certain extent, but the insulating strip 1 is also provided at the point of interruption with a recess. If the strip 1 is composed in approved manner of two strips 1′ and 1″ each coated on the outside with a conducting covering, the recess may be formed e. g. by slotting the strip 1″. An insulating strip 8 is inserted in the slot and the resistance wire 7 is wound on the strip

8 and connects the lead 5′ to the ignition wire 3.

In the example shown in Fig. 3, the resistance wire is carried by a bobbin 9 of insulating material fitted upon the strip 1. The bobbin 9 may also be covered with an additional insulating coating 10 e. g. of high insulating or heat resisting properties.

The example shown in Fig. 4 is similar in construction to that shown in Fig. 3 but the covered strip 1 is longer by the distance *a* between the upper end of the resistance wire 7 and the underside of the composition 4 in order to retard the transmission of heat from the resistance wire 7 to the composition 4.

In the construction according to Fig. 5, the fuse head is constructed in the usual manner and fixed in the blasting cartridge 11. Outside the cartridge 11 the current lead 5′ is broken and a resistance 12 is inserted in the break. This resistance consists of an insulating support 13, made for example as shown in Fig. 6 from a cardboard strip on both sides of which is laid a brass strip 14. Around the strip 13 and outside the brass strips 14 is laid an insulating covering 15 upon which a resistance wire 16 is wound and the whole is enclosed in insulating material 17. The brass strips 14 are doubled over at opposite ends to grip the ends 15′ of the resistance wire, which for greater security are also soldered to the strips 14. The free ends 14′ of the brass strips are bent out and preferably drilled to receive the broken ends of the lead 5′ and also to enable them to be more surely soldered thereto. The resistance 12 and the lead 5 are strengthened and more perfectly insulated by enclosing them in insulating and refractory material, e. g. by winding asbestos strip or cord 18 around them jointly or by enclosing them in an insulating sleeve of asbestos or other insulating material.

In the form shown in Fig. 5 the blasting fuse 11 is inserted in an outer case 19 which is so long that it extends beyond the resistance 12 to such a distance that the current leads 5 and 5′ twisted together below the resistance 12 can be sealed in the outer case 19 by means of a plug 20 and sealing compound 21.

It will be apparent that the fuse is mechanically protected at its most delicate portion, i. e. between the match-head and the resistance, against any touch with other current wires, and any stray current entering into the lead 5 or 5′ at any other point—perhaps by fault of insulation—cannot reach the ignition wire without passing through the interposed resistance.

The insulating material and as far as possible all the sealing compounds employed in the fuse are preferably of non-inflammable material so that the fuse is not only proof against low voltages and low amperes but is also proof against fire-damp.

Instead of the resistance shown in Fig. 6, a small resistance rod of carbon, silit or similar artificial resistance material may be employed, the invention not being restricted to any particular construction of interposed resistance nor to blasting fuses only of the match-head type, since the invention is applicable to electric blasting fuses of any construction or arrangement of priming charge.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed I declare that what I claim is:—

1. An electrically ignited blasting fuse comprising a fuse casing containing a priming charge, an electrical ignition member in the charge and conducting elements to said member; in combination with a tube tightly surrounding the casing, current leads thereon, and a resistance element in said tube included between one of said leads and the conducting elements.

2. An electrically ignited blasting fuse, comprising a fuse casing, a priming charge and its support, an electric ignition member in the charge and current leads to said member all cemented in said casing; in combination with a tube contacting with said casing and a resistance element in said tube and in one of said leads, and means for sealing said leads in said tube to inclose the resistance element between the casing and sealing means.

3. An electrically ignited blasting fuse comprising a support, electrically conducting leads on opposite sides of said support, a priming charge connecting said leads, an igniting element in the charge bridging the leads, an insulating support close to said charge and a resistance winding on the support and included in one of the leads, all closely arranged and forming a unit for insertion in a blasting charge.

In testimony whereof I affix my signature.

JULIUS SCHÜRMANN.