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INSULATED SAFETY ELECTRIC BLASTING CAP

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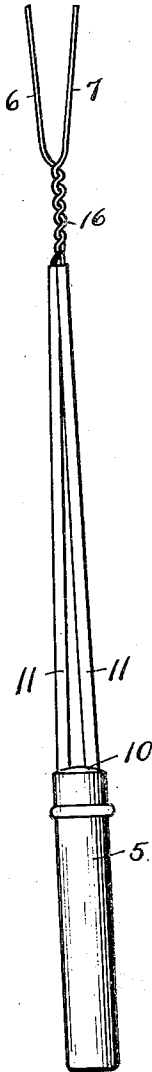


Fig. 1.

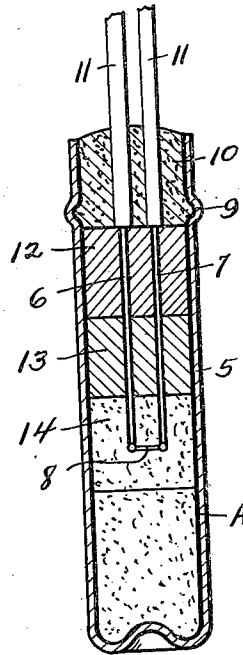


Fig. 2.

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INSULATED SAFETY ELECTRIC BLASTING CAP.

Application filed July 22, 1925. Serial No. 45,327.

This invention has for its object to provide an electric blasting cap which cannot be prematurely exploded by accidentally, or otherwise, coming in contact with stray electric currents, of any nature, either while being transported or actually used on the job.

Many cases have been recorded where loss of life and destruction of property have been caused by premature explosions of dynamite or other commercial explosives. There was a cause for each of these accidents. Cases are on record where a shot has been prepared for firing and which has prematurely exploded, apparently without cause. It is thus seen that the cause for premature explosions is not always visible to an observer. With the ever increasing use of electrical power and electric labor saving appliances in and about coal mines and quarries and construction projects, there is always the possibility of encountering stray electric currents. These currents may be found flowing through moist earth, between the source of supply and bad joints or bonds of trolley rails or on water or steam pipes. The average electric blasting cap of present American manufacture can be fired by impressing across the ends of its lead wires an E. M. F. of from one to two volts. Potentials of this order cannot be detected without the aid of electrical measuring instruments. Many tests have been made wherein considerably higher potentials have been recorded and yet could not be detected by moist hands of an observer. Not all of the premature explosions have been due to electric blasting caps being exploded by stray currents or accidental contact of same with conductors carrying the electric current, but a number of accidents have thus been caused.

Among the objects of my invention is to provide an electrically insulated structure of such nature as to make it impossible to complete a circuit through the metal shell and either of the lead wires to which the fuse head is attached.

A further object is to provide a fuse head for an electric blasting cap, insulated from the charge in the base of the shell and side wall of the metal shell and which can be used in connection with a safety shunt or some form of short circuiting the exposed ends of the lead wires. When this has been done the electric blasting cap cannot be exploded by the electric current so long as the safety shunt is in place. My new electric blasting cap differs in this respect from other types of electric blasting caps, except the match head type, and differs from the former match head type in that the efficiency of the insulation is not dependent upon special forms of assembly in the manufacture of the caps.

Further objects and advantages of the invention will be set forth in the detailed description which now follows:

In the accompanying drawings:

Fig. 1 is a side view of an assembled electric blasting cap;

Fig. 2 is a sectional view upon an enlarged scale of the cap itself.

Like characters of reference designate corresponding parts throughout the several figures of the drawing.

The assembly shown in the drawing is that of the ordinary type of electric blasting cap, wherein 5 designates a shell of any suitable material. The material commonly employed is copper or gilding metal but I wish it to be understood that the invention is not limited to use in connection with any particular kind of metal. The usual lead wires 6 and 7 have their inner ends bridged or connected by a filament or bridge wire 8. The shell 5 is preferably provided with an annular channel 9 for the reception of a body of dielectric material 10, which surrounds the insulated portions 11 of the lead wires and holds the lead wires in such centered relation with respect to shell 5 as to prevent contact of said wires with the side of the metal shell. Lateral movement of the bare portions of the lead wires, from the lower surface of the dielectric material 9, downwardly or inwardly, is prevented by properly locating or centering the wires in a body of dielectric sealing material 12 and in a sulphur insulator 13. The usual American practice is to employ shells having an inside diameter approximating one fourth of an inch. Now in order to provide space for the bridge wire or filament—8—it is necessary to space the two lead wires approximately one eighth of an inch from inside to inside. This makes the distance between opposite sides greater than one eighth inch and reduces the clearance between the poles or wire ends to less than one sixteenth inch. On production work it is necessary

to provide a slight clearance between the fuse head and shell in order to facilitate the assembly. Further the insulators cannot be made to exact dimensions and due to these facts the fuse head will drift to one side or the other of the shell. This still further reduces the distance between the pole or end of the lead wire and the side wall of the metal shell. It will be noted that the priming charge —14— is composed of loose powder. The explosives most generally used consist of mercury fulminate or a mixture of potassium chlorate and some inorganic nitrate. Carbon and sulphur may also be added to this latter class of initial explosives. In this form of construction it is essential that the filament or bridge wire be in contact with the explosive; which is also in contact with the metal shell. Now the explosives used for this purpose, except the carbon, are when pure, very poor conductors of the electric current, but in ordinary commercial use these compounds are not chemically pure. Commercial mercury fulminate usually contains a small amount of free mercury and moisture and there is usually a small amount of moisture present in the chlorates or nitrates used. The bridge wire generally used consists of platinum, or a platinum iridium alloy. Base metal wire is seldom if ever used for this purpose. In joining the platinum filaments or bridge wires to the poles or lead wire ends it is necessary to employ some form of flux which must come in contact with the lead wire end and bridge wire. Traces of the flux are usually present on the finished assembly. The combination of this flux, free mercury, moisture and other impurities has a tendency to reduce the electrical resistance of the explosive material in which the bridge is embedded and which is always in contact with the match and shell, unless special means is provided to prevent intimate contact between the explosive and the above named surfaces. Small projections of solder also reduce the clearances between the shell and poles or exposed lead wire ends. If special means is not provided an electrical circuit can be made between the outside of the metal shell and either of the exposed ends of the lead wires. External insulation of the metal shell cannot be relied upon to prevent such a circuit being formed. It is pointed out that the part of the circuit between the side wall of the shell and pole is comparatively a poor conductor of the electric current, but on the other hand it is a property of poor conductors or resistors, to heat, when carrying an electric current. If contact is made between the upper lead wire ends and metal shell this section of the circuit will heat sufficiently to explode the charge, under comparatively low E. M. F. values. It is the purpose of this part of my invention to

provide a suitable form of insulator within the ordinary type of electric blasting cap to prevent the possibility of forming a complete circuit of this kind. This is done by applying a coating of a dielectric material —A— to the inner wall of the shell and upon the bridge wire and pole pieces or lead wire ends, sometimes referred to as the terminals. In practice I employ a material to cover the bridge wire which is inflammable but which has a high dielectric value. I may use any suitable material in this relation but mention nitro-cellulose lacquer, as a material that will serve the purpose.

By referring to Fig. 1, it will be seen that the insulation 11 terminates short of the outer ends of the lead wires and that the outer ends of said lead wires are left bare. I preferably short circuit the lead wires at a point close to the terminal end of the insulation, so that if the outer or bared ends of the wires should come into contact with stray electric currents, prior to the time of use of the detonator, no flow of current across the bridge wire 8 can take place. In the present instance, I have shown this object as being accomplished by twisting the bared portions of the lead wires into engagement with each other, as indicated at 16. However, this construction is not claimed in the present application but is being made the subject matter of a separate application.

Having described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. An electric blasting cap of the ordinary type, having its shell coated on the inside with a highly dielectric material, an explosive charge in the lower portion of the shell, a body of dielectric and water-proof sealing material within the shell, above said charge, a pair of lead wires passing entirely through said sealing material, an igniting element connecting the lower ends of the lead wires and lying wholly below the sealing material, and directly in the explosive charge and a coating of inflammable dielectric material directly upon said igniting element and lower ends of the lead wires.

2. An electric blasting cap of the ordinary type, containing an explosive charge in its lower portion, a body of dielectric and water-proof sealing material within the shell, above said charge, a pair of lead wires which pass entirely through said sealing material and project therebelow, a bridge wire connecting the lower ends of said lead wires and lying wholly below the sealing material, and a coating of inflammable dielectric material directly upon said bridge wire and the lower ends of the lead wires.

In testimony whereof he affixes his signature.

HARRY L. GRANT.