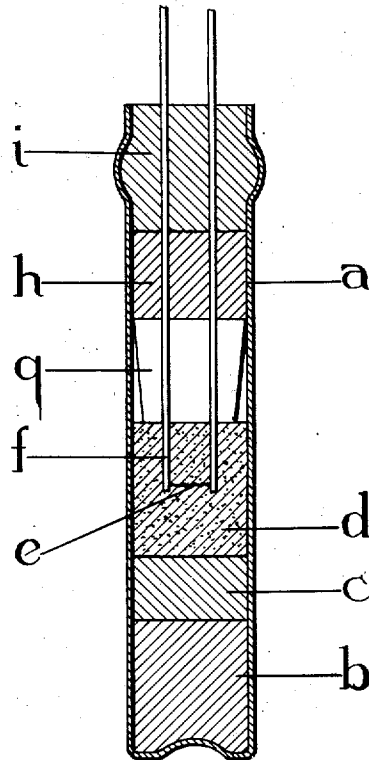


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G. A. NODDIN
ELECTRIC BLASTING CAP
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UNITED STATES PATENT OFFICE

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ELECTRIC BLASTING CAP

Application filed August 13, 1930. Serial No. 474,980.

This invention relates to electric blasting caps, and more particularly to an improved lead azide primed electric blasting cap, and comprises essentially the manufacture of such a cap without the use of a pressed binding and ignition charge for lead azide heretofore required.

It has long been recognized that lead azide possesses certain advantages over mercury fulminate as a primer in composition blasting caps; firstly, it is fundamentally cheaper to produce than mercury fulminate; secondly, less of it is required to detonate a given secondary detonating compound; thirdly, it is certain in action even without an inner capsule, whereas fulminate in reasonable amounts is certain only with a capsule; fourthly, it cannot be dead pressed within the ranges of pressure ordinarily considered for blasting caps; fifthly, it is less affected by moisture. However, it has been recognized as well that lead azide possesses at least two inherent disadvantages; the outstanding disadvantages are, one, that it is less easily ignited than mercury fulminate; and, two, that it does not bind as satisfactorily in cap shells. Because of these disadvantages all lead azide primed blasting caps which have been successfully manufactured and marketed have contained, either mixed with the lead azide or superimposed upon it, a material which, when pressed into the cap shell, has possessed satisfactory ignition and binding qualities. Numerous compounds and mixtures have been used for this purpose, as for example the normal or basic salts of styphnic and picric acids, particularly, and in some cases mixtures of mercury fulminate with oxidizing compounds and the like and mixtures of sulphocyanate and oxidizing compounds, either with or without an added low flash point fuel.

Electric blasting caps containing lead azide as a priming charge have likewise been provided with one of these igniting and binding agents. These electric detonators have usually been ignited by either of two general methods; one, a so called match head in which a wire is surrounded by a mass or bulk of ignitable material, and two, a bridge wire

embedded in a loose charge of ignitable material. In both cases the ignition is effected by heat generated in the bridge wire by passage of electric current from an outside source through leading wires attached to said bridge. For a loose charge, to which this invention relates, there has been used for the most part mercury fulminate, either alone or with potassium chlorate, gun cotton, and mixtures of fulminate, antimony sulfide, and potassium chlorate. A mixture comprising 80 parts of mercury fulminate and 20 parts of potassium chlorate has been in more common use. In addition there has recently been proposed (in the copending application of H. A. Lewis, Serial #347,915, filed March 18, 1928) a mixture of a sulphocyanate, an oxidizing agent and a low flash point fuel, this latter composition having the advantages of those previously used, of low cost, satisfactory compatibility with all materials commonly used for blasting cap shells, and high resistance to moisture.

One of the objects of my invention is to simplify the manufacture of electric blasting caps. Another object of my invention is to improve generally upon the manufacture of blasting caps. A further object of my invention is to provide an electric blasting cap which may be manufactured at lower cost than those heretofore produced.

By using in a lead azide primed electric blasting cap, a loose charge containing a sulphocyanate, an oxidizing agent, and a low flash point fuel for igniting the same I have discovered that a satisfactory electric blasting cap can be produced without the use of an igniting and binding agent with the lead azide priming charge. I have found that the heat supplied by the above preferred loose ignition charge is wholly adequate to ignite pressed lead azide without failure. Furthermore, I have found that no binding agent is necessary with the lead azide charge provided the electric detonator contains above the lead azide charge a loose charge of ignition material which is held in place by the usual means of holding the bridge wire, as for example, by a sulphur plug.

By this means the ignition compound or-

dinarily mixed with or superimposed upon the lead azide is eliminated and the material cost of such ignition material saved. In addition the operations which have heretofore been necessary, such as the mixing of the ignition mixture with the lead azide, or the charging of the mixture on to the lead azide, are entirely eliminated.

As a preferred example of the electric detonator covered by my invention I have given diagrammatically in the single figure of the drawing an illustration of such a cap. In the drawing *a* represents a metallic shell. This may be of gilding metal, brass, copper, nickel, aluminum, steel or any other of the other metals ordinarily considered satisfactory for blasting cap shells. Letter *b* refers to a charge of a secondary detonating compound which, for example, may comprise tetranitromethylaniline (tetryl) pentaerythrite tetranitrate, erythrite tetranitrate, trinitrotoluene, picric acid or mixtures of these materials. The letter *c* designates a pressed charge of lead azide. The letter *d* represents a loose charge of ignition material preferably a composition comprising a sulphocyanate an oxidizing agent, and a low flash point fuel. In this composition I prefer to use that disclosed in the copending applications of H. A. Lewis, one of which has resulted in U. S. Patent 1,797,509, and the other of which is Serial No. 474,016, filed August 8, 1930, in which lead sulphocyanate, potassium chlorate, and ground Pyro powder have been shown to be satisfactory as a sulphocyanate, an oxidizing agent, and a low flash point fuel respectively. In the drawing the letter *e* refers to a bridge wire, *f* to leading wires attached to said bridge, *g* a sulphur plug through which the leading wires pass, *h* a charge of waterproofing material, and *i* a charge of sulphur as sealing agent.

It will be understood of course that my invention is applicable not only to the above preferred embodiment, but may also be used in the several types of lead azide primed electric blasting caps, and that I do not intend to be limited in my invention except as indicated in the following patent claims.

I claim:

1. A lead azide primed electric blasting cap having a loose ignition composition above the lead azide charge free of a pressed ignition charge.

2. A lead azide primed electric blasting cap having above the lead azide charge a loose charge of a composition comprising a sulphocyanate, an oxidizing agent, and a low flash point fuel, and free of a pressed ignition composition either mixed with or superimposed upon said lead azide.

3. A lead azide primed electric blasting cap having above the lead azide charge a loose charge of a composition comprising lead sul-

phocyanate, potassium chlorate and ground pyro powder, and free of a pressed ignition composition either mixed with or superimposed upon the said lead azide.

4. A lead azide primed electric blasting cap having above the lead azide charge a loose charge of a composition comprising 30-50% lead sulphocyanate, 10-30% potassium chlorate and 30-50% ground pyro powder and free of a pressed ignition composition either mixed with or superimposed upon the said lead azide.

5. An electric blasting cap comprising a metal shell, a charge of a secondary detonating compound, a pressed charge of lead azide, a loose charge of an ignition composition consisting of a sulphocyanate, an oxidizing agent and a low flash point fuel, said blasting cap being free of a pressed ignition charge and having a bridge wire attached to current leading wires embedded in said loose charge.

6. An electric blasting cap comprising a metal shell, a charge of a secondary detonating compound, a pressed charge of lead azide, a loose charge of an ignition composition consisting of lead sulphocyanate, potassium chlorate, and ground pyro powder, said blasting cap being free of a pressed ignition charge and having a bridge wire attached to current leading wires embedded in said loose charge.

7. An electric blasting cap comprising a metal shell, a charge of a secondary detonating compound, a pressed charge of lead azide, a loose charge of an ignition composition consisting of 30-50% lead sulphocyanate, 10-30% potassium chlorate, and 30-50% ground pyro powder, said blasting cap being free of a pressed ignition charge and having a bridge wire attached to current leading wires embedded in said loose charge.

8. An electric blasting cap comprising a metal shell, a pressed charge of tetryl, a pressed charge of lead azide, and a loose charge of an ignition composition consisting of a sulphocyanate, an oxidizing agent and, a low flash point fuel, said blasting cap being free of a pressed ignition charge and having a bridge wire attached to current leading wires embedded in said loose charge.

9. An electric blasting cap comprising a metal shell, a pressed charge of tetryl, a pressed charge of lead azide, and a loose charge of an ignition composition consisting of lead sulphocyanate, potassium chlorate, and ground pyro powder, said blasting cap being free of a pressed ignition charge and having a bridge wire attached to current leading wires embedded in said loose charge.

10. An electric blasting cap comprising a metal shell, a pressed charge of tetryl, a pressed charge of lead azide, and a loose charge of an ignition composition consisting of 30-50% lead sulphocyanate, 10-30% potas-

sium chlorate, and 30-50% ground pyro powder, said blasting cap being free of a pressed ignition charge and having a bridge wire attached to current leading wires embedded in said loose charge.

In testimony whereof I affix my signature.

GEORGE A. NODDIN.

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