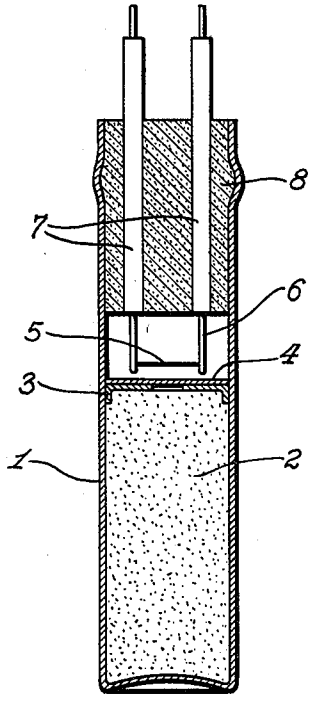
March 5, 1929. A. G. SCHURICHT ET AL 1,704,222

ELECTRICALLY IGNITED DETONATING OR BLASTING CAP

Filed Aug. 30, 1924



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Patented Mar. 5, 1929. 1,704,222

UNITED STATES PATENT OFFICE.

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ELECTRICALLY-IGNITED DETONATING OR BLASTING CAP.

Application filed August 30, 1924. Serial No. 735,203.

This invention relates to detonating or blasting caps and more particularly to that type adapted for electric ignition.

A detonating or blasting cap usually consists of a shell containing a main or explosive charge and a primary charge; these charges are usually capped by a perforated ferrule and on top of this ferrule is a priming or igniting charge. In an electrically ignited detonator, a plug carrying the igniter terminals is placed in the open end of the shell with the filament connecting the terminals over the priming charge. Where a fuse is used to ignite the primer, this fuse is inserted in the open end of the shell.

The function of the priming charge in an electric detonator loaded with a composition explosive charge is to detonate the primary charge which in turn detonates the main or explosive charge. Where the primary charge consists of straight mercuric fulminate, the priming charge itself need not consist of a high explosive as only a flash is required to detonate the fulminate priming charge. The principal reason for using mercuric fulminate as a priming charge is simply to obtain the necessary sensitiveness as the fulminate is extremely sensitive to heat, detonating at 160° C.

It was found that if mercuric fulminate is used as a priming charge without the admixture of other substances, it is somewhat too brisant to obtain the full detonating power of the remainder of the explosive charge. This was clearly shown in comparative lead plate tests of electric detonators before and after assembling with the firing device. The charged and pressed caps, but without a priming charge, when exploded by means of a fuse, gave uniformly good lead plate tests, whereas caps assembled with the firing device and exploded by means of an electric current gave very much inferior tests, a large number producing only partial penetration of the lead plate. Our explanation for this is that the explosion of the fulminate in the priming charge is so rapid and violent that it disrupts the wall of the cap before the explosive wave has had time to propagate itself through the main explosive charge of the detonator and that a part of its force, being no longer confined by the walls of the cap, is wasted instead of being directed downwardly into the main charge. In further substantiation of this theory, it was observed that if additional support is given to the wall of the cap the lead plate test shows decidedly improved results. It is, however, impracticable to a strengthen the cap shell itself.

One of the objects of this invention, therefore, is to provide a detonating or blasting cap with a priming or igniting charge in which the brisance thereof is reduced.

In accordance with this invention, a detonating or blasting cap containing an explosive charge of any suitable composition has a priming charge which itself contains a deterrent. While, as previously mentioned, the principal requirement of the priming charge is a hot flame, the substances which can actually be employed are limited on account of the necessity of their having a very low ignition point. Mercuric fulminate having a low ignition point (160° C.) is ideal as far as this is concerned, but as mentioned above, it is objectionable due to its being somewhat too brisant. It was found that the violence of the explosion could be tuned down without materially affecting the sensitiveness to heat by mixing with it certain other substances. Antimony sulphide has certain advantages, such as ease of mixing and free charging and as it also has a specific gravity very close to that of the fulminate, the danger of segregation is also avoided. On the other hand, it does not cut down the brisance sufficiently to entirely eliminate caps giving a poor lead plate test. It is also objectionable when considered from a safety viewpoint. Antimony sulphide, due to its crystalline structure, is a highly frictional material, it being used for this purpose in small arms, caps or primers. This necessarily increases the risk involved in mixing and charging and for that reason it was thought desirable to find some other material.

Another object of this invention, therefore, is to provide a blasting cap in which the primer not only has a deterrent component to cut down the brisance, but in which the deterrent is a lubricant as distinguished from a frictional material.

Further objects will appear from the detailed description taken in connection with the accompanying drawing, in which the figure is a longitudinal section of an electrically ignited detonating or blasting cap.

Referring to the accompanying drawing,

1 designates a shell of drawn metal, and, of course, of comparatively light material. This shell contains an explosive charge 2, which may consist of primary and secondary charges, as usual. The explosive charge is covered by a perforated ferrule 3 and capped by a primary or igniting charge 4 embodying this invention. Arranged over the primary or igniting charge is a filament 5 attached to the terminals 6 of lead wires 7, which are arranged in a plug 8. The detonating or blasting cap is and may be of any suitable and usual construction well known to those skilled in the art.

We have discovered that a highly suitable substance for admixture with a brisant substance, such as mercuric fulminate, is litharge or the yellow mon-oxide of lead. Litharge is obtained in the form of a very fine powder and it has lubricating properties. While its specific gravity is considerably greater than that of mercuric fulminate, its property of clinging to and coating the crystals of fulminate effectually prevents segregation. Antimony sulphide, being crystalline and having approximately the same size as the fulminate crystals, does not cling to or coat the fulminate crystals. Litharge, on the other hand coats or covers the fulminate crystals and it is this coating of the crystals which apparently slows down the speed of the explosion. The sensitiveness of the fulminate to heat is not materially affected by mixing with litharge.

In our experimental work, we found that mixtures containing from forty (40) to fifty (50) per cent litharge and sixty (60) to fifty (50) per cent mercuric fulminate gave best results, although these percentages may be somewhat exceeded. It was also found that these two substances mixed readily and that the resulting mixture charged freely. That the two substances mixed are not subject to segregation was demonstrated by shaking some of the caps loaded with this material in an automatic shaker for ten hours and firing in an upright as well as inverted position. Of a large number of caps tested in this manner all functioned properly. No difficulty of any kind was encountered in either the mixing or charging operations. The improvement found in the lead plate test was remarkable and a decided improvement was also obtained in the trauzl block expansion. The sensitiveness of the caps to heat was not materially affected.

It will, therefore, be seen that the invention accomplishes its objects. A detonating or blasting cap is provided in which ignition, even electrically, is insured. A priming charge consisting of from forty to fifty per cent litharge and fifty to sixty per cent mercuric fulminate is superior to the regular priming charge consisting of antimony sulphide and mercuric fulminate. It is safer to handle in both the mixing and charging operation due to its physical properties. It is inert having no effect either on the metal of the cap or on the composition itself. It is almost as sensitive as a straight fulminate priming charge. In addition to these advantages, the low cost of the litharge lowers the material cost of the cap and as no additional labor or operations are involved, the final cost of the finished product is somewhat lower than that of the regular antimony priming charge.

While we have described one embodiment of our invention, it will be understood that the invention is susceptible of various embodiments and to other priming charges than those containing mercuric fulminate. It is further to be understood that while litharge is the most suitable deterrent so far found, other deterrents having the general characteristics of litharge may be used. Furthermore, while we have found certain proportions of the priming charge and the deterrent preferable, these proportions may be varied within limits. It is further obvious that various changes may be made in details without departing from the spirit of this invention; it is, therefore, to be understood that this invention is not to be limited to the details described.

Having thus described the invention, what is claimed is:

1. An electrically ignited blasting cap containing an explosive charge and a priming or igiiiting charge thereover consisting of a granular brisant substance whose grains are coated witb a deterrent.

2. A detonating or blasting cap containing an explosive charge and a priming charge consisting of a brisant substance and litharge.

3. A detonating or blasting cap containing an explosive charge and a priming charge consisting of a brisant substance coated with litharge.

4. A detonating or blasting cap containing an explosive charge and a priming charge consisting of mercuric fulminate and litharge.

5. A detonating or blasting cap containing an explosive charge and a priming charge consisting of from fifty to sixty per cent of mercuric fulminate and fifty to forty per cent of litharge.

6. An electrically ignited blasting cap containing an explosive charge, a priming or igniting charge thereover, and containing a deterrent and a filament arranged over the priming or igniting charge.

In testimony whereof we affix our signatures this 8th day of July, 1924.

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