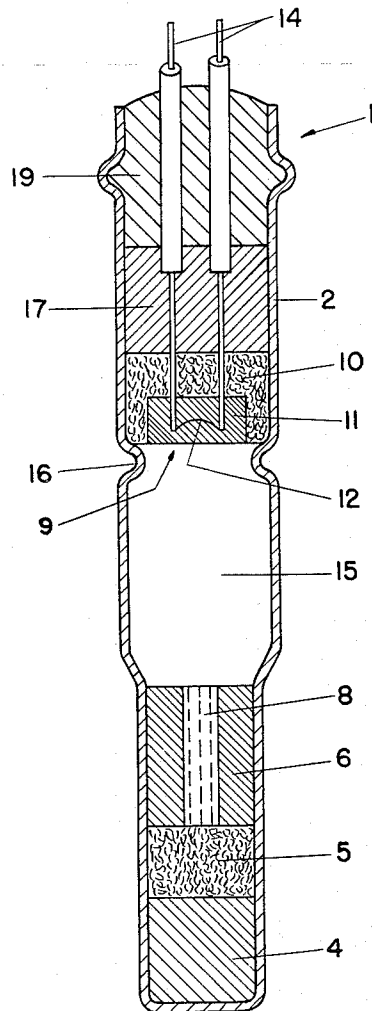


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E. J. HANLEY
PRIMING COMPOSITION
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EDWARD J. HANLEY
INVENTOR.

BY

Cleveland B. Hollander
ATTORNEY.

UNITED STATES PATENT OFFICE

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PRIMING COMPOSITION

Edward J. Hanley, Kingston, N. Y., assignor to
Hercules Powder Company, Wilmington, Del.,
a corporation of Delaware

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This invention relates to an improved explosive charge and more particularly to an improved priming charge for use in delay electric blasting caps.

Firing devices, for example, electric blasting caps or delay electric blasting caps may contain a single explosive charge of detonating materials such as diazodinitrophenol, mercury fulminate, or lead azide either alone or in admixture with an oxidizing salt such as potassium chlorate. Firing devices of this type may also contain an explosive charge comprising a base charge of secondary explosive such as, tetryl, T. N. T., pentaerythritoltetranitrate, nitrostarch or their equivalents with a priming charge superimposed thereon. The priming charge may be any of the detonating materials or admixture thereof with oxidizing salts described hereinbefore.

The explosive charges used in firing devices are ignited by, for example, a bridge wire assembly, a match head, a cavity type plug, or by a fuse in the case of delay action devices.

In manufacturing delay electric blasting caps of the type described in my U. S. Patent 2,139,581 or the U. S. Patent 1,999,820 to Nash, difficulties have been experienced in obtaining a priming charge which will be satisfactorily detonated by the fuse used. The explosive charge must be fired by the molten fuse powder due to the construction of the device. This type of ignition is rather difficult unless proper contact is made between the fuse and the explosive charge. When the fuse is pressed into place, there is a danger of desensitizing the explosive charge, as excessive pressure on priming explosives causes "dead-pressing" or desensitizing. An additional difficulty in manufacturing these delay devices is caused by dust from the explosive charge often adhering to the walls of the shell and causing shots during assembling operations. Further, from the explosive adhering to the shell walls, there is a danger that an instantaneous shot will be obtained when the device is used due to this dust flashing around the fuse element. Another disadvantage of the delay firing devices is their extremely long shell which makes them hard to handle in explosive operations.

It is the object of this invention to produce an improved electric firing device.

A further object of this invention is to produce an improved delay electric blasting cap.

A further object of this invention is to provide an improved explosive charge for firing devices.

A further object of this invention is to provide

an improved priming charge for delay electric blasting caps.

A further object of this invention is to provide an easily ignitable, non-dusty priming explosive.

A further object of this invention is to provide a priming explosive which is efficient in small quantities.

A still further object of this invention is to provide an explosive which when pressed into a container will not be desensitized, even by excessively high pressures.

Other objects will be apparent hereinafter.

These objects, in general, have been accomplished by using an admixture of lead azide and a comminuted flame producing compound as the priming charge for delay caps. An admixture of lead azide and comminuted black powder or smokeless powder has been found to produce a priming charge which is sensitive to ignition by the fuses used in delay electric blasting caps. These admixtures have also been found to be strong priming agents for secondary explosives and to be non-dusty when charged into a shell. Further, they cannot be dead-pressed.

Having now indicated in a general way the nature and scope of my invention, there follows a detailed description of preferred embodiments thereof with reference to the drawing in which the figure represents a delay electric blasting cap containing a priming charge in accordance with this invention.

Referring now to the figure, there is shown a delay electric blasting cap 1 comprising a casing 2 having a base charge 4 comprising a secondary explosive charge positioned in the closed end of the casing 2. The secondary explosive charge 4 may be, for example, tetryl, T. N. T., pentaerythritoltetranitrate, nitrostarch, or the like. Superimposed on base charge 4 is a priming charge 5. The priming charge 5 is, in accordance with this invention, an admixture of lead azide and comminuted flame producing material such as black powder or smokeless powder. Contacting the priming charge 5 is a fuse element 6 containing a fuse powder train 8. The fuse powder 8 may comprise an admixture of barium peroxide and selenium or other similar mixtures such as is described in my U. S. Patent 2,139,581, and U. S. Patent 1,999,820 to Nash, or the well known black powder fuse used in vented type delays.

Spaced above the fuse element 6 is a firing assembly comprising a cavity plug 10 in which is positioned an ignition compound 11 capable

of igniting the fuse powder train 8. The ignition of compound 11 is accomplished by the bridge wire 12 connected across leg wires 14 which extend without the casing 1 to allow connection to an electric circuit. Between the firing assembly 9 and the fuse element 6 is an air space 15 provided to allow expansion of the gases formed when the ignition compound 11 is ignited.

The firing assembly 9 is maintained in place by a corrugation 16 and by a waterproofing compound 17 and a sealing compound 19. The waterproofing compound 17 is usually an asphalt material or its equivalent while the sealing compound 19 is usually sulfur or the like.

The above described delay is of the ventless type, but I have found that my admixture of lead azide and flame producing material may also be used to advantage in delays of the vented type. Thus, it is possible to use my explosive with a black powder fuse which, of course, requires a vented construction. The means of ignition of the fuse shown is by the cavity type plug, but other means of igniting the fuse such as by a match head or by a superimposed ignition compound are within the scope of my invention.

The priming mixture which I have found to be extremely desirable for use in the delay described above comprises an admixture of lead azide and a comminuted flame producing material. The lead azide which I have preferably used is free-flowing, fine grain material which will pass a 200 mesh sieve. The comminuted flame producing material preferably may be either black powder, for example, of the shot gun type, or smokeless powder of the pyro type which will pass a 200 mesh sieve. The admixture when used is free-flowing and is free of dust and is, therefore, very easy to charge into shells without having the admixture adhere to the sides of the shells.

In preparing admixtures, I have found that I may use lead azide within the range of about 60 to about 95% and flame producing material within the range of about 5 to about 40%. However, I prefer to use lead azide within the range of about 85 to about 90% and the flame producing material within the range of about 10 to about 15% as by maintaining this ratio, only about 0.05 to 0.06 gram of the material is required to detonate a base charge of tetryl in a .25 caliber delay cap. The use of ratios outside my preferable range increases the amount of material needed to insure complete detonation of the base charge.

In order to show the type charge which I have found to be advantageous for use in delay electric blasting caps, the following examples are given.

Example 1

A first delay electric blasting cap was charged with a base charge of 0.30 gm. of tetryl pressed under 3500 lbs. per sq. in. A priming charge of 0.06 gram of 85/15 lead azide/black powder was superimposed thereon and a fuse pressed into the shell into firm contact with the priming charge. The regular firing assembly, waterproofing and seal were then added to complete the device. The finished device functioned satisfactorily.

Example 2

A first delay electric blasting cap similar to Example 1 was prepared but 0.05 gram of 90/10 lead azide/black powder was used as the priming charge. The device functioned perfectly.

Example 3

A first delay electric blasting cap similar to Example 1 was prepared, but 0.06 gram of 85/15 lead azide/ground pyro smokeless powder was used as the priming charge. The device functioned satisfactorily.

Example 4

First delays were made in accordance to Examples 1, 2, and 3, but with pentaerythritoltetranitrate as the base charge. Each device functioned satisfactorily.

After charging of the shells of the above examples, there was no explosive adhering to the shell walls as the lead azide-black powder mixture does not produce dust. This is advantageous as it eliminates the danger of premature explosions during insertion of the fuses and also has been found to prevent flashing past the fuse which results in instantaneous shots.

In the above examples it was also found that due to the small weight of priming charge required, the shell length could be reduced about 1/2 of an inch. This is a definite advantage as delay electric caps known to the industry are exceptionally long and any reduction in the overall length is a sought after advance.

The priming mixture of this invention shows many advantages over those mixtures used heretofore. Thus, my admixture of lead azide and black powder allows shorter shells to be used; prevents instantaneous shots; is safer because there is no dust adhering to the shell after charging; is free-flowing and, therefore, easy to charge; is easily ignited by the delay fuses; is less liable to be detonated by accidental blows against the shell as the amount of sensitive priming explosive is very small, is cushioned by the admixed flame producing material and occupies a much smaller section in the shell than is the case in known delay caps; and is more economical than any of the known priming explosives and cannot be dead-pressed.

It will be understood that the details and examples hereinbefore set forth are illustrative only, and that the invention as broadly described and claimed is in no way limited thereby.

What I claim and desire to protect by Letters Patent is:

1. An initiating explosive for priming secondary explosives used as base charges for firing devices comprising an admixture of lead azide within the range of about 60% to about 95% and a comminuted flame producing material within the range of about 5% to about 40%, said comminuted flame producing material selected from the group which consists of black powder and smokeless powder.

2. An initiating explosive for priming secondary explosives used as base charges for delay electric firing devices comprising an admixture of lead azide within the range of about 60% to about 95% and a comminuted flame producing material within the range of about 5% to about 40%, said comminuted flame producing material selected from the group which consists of black powder and smokeless powder.

3. An initiating explosive for priming secondary firing devices comprising an admixture of lead azide within the range of about 60% to about 95%, said lead azide characterized by a particle size which will pass a 200-mesh sieve and a comminuted black powder within the range of about 5% to about 40%.

4. An initiating explosive for priming secondary explosives used as base charges for delay electric firing devices comprising an admixture of lead azide within the range of about 60% to about 95%, said lead azide characterized by a particle size which will pass a 200-mesh sieve and a comminuted smokeless powder within the range of about 5% to about 40%.

5. An initiating explosive for priming secondary explosives used as base charges for delay electric firing devices comprising an admixture of lead azide within the range of about 60% to about 95%, said lead azide characterized by a particle size which will pass a 200-mesh sieve and a comminuted pyro smokeless powder within the range of about 5% to about 40%.

6. A firing device including a secondary explosive base charge and a superimposed priming charge therefor comprising an initiating explosive comprising lead azide within the range of about 60% to about 95%, said lead azide characterized by a particle size which will pass a 200-mesh sieve and a comminuted flame producing material within the range of about 5% to about 40%, said comminuted flame producing material selected from the group which consists of black powder and smokeless powder.

7. A delay electric blasting cap including an initiating explosive comprising lead azide within the range of about 60% to about 95%, said lead azide characterized by a particle size which will pass a 200-mesh sieve and a comminuted black powder within the range of about 5% to about 40%.

8. A delay electric blasting cap including an initiating explosive comprising lead azide within the range of about 60% to about 95%, said lead azide characterized by a particle size which will pass a 200-mesh sieve and a comminuted smokeless powder within the range of about 5% to about 40%.

9. A delay electric blasting cap including an initiating explosive comprising lead azide within the range of about 60% to about 95%, said lead azide characterized by a particle size which will pass a 200-mesh sieve and a comminuted pyro smokeless powder within the range of about 5% to about 40%.

10. A delay electric blasting cap including an initiating explosive comprising lead azide within the range of about 60% to about 95% and a comminuted flame producing material within the range of about 5% to about 40%, said comminuted flame producing material selected from the group which consists of black powder and smokeless powder.

11. A delay electric blasting cap including an initiating explosive comprising lead azide within

the range of about 60% to about 95% and a comminuted black powder within the range of about 5% to about 40%.

12. A delay electric blasting cap including an initiating explosive comprising lead azide within the range of about 60% to about 95% and a comminuted pyro smokeless powder within the range of about 5% to about 40%.

13. A delay electric blasting cap including an initiating explosive comprising lead azide within the range of about 60% to about 95% and a comminuted smokeless powder within the range of about 5% to about 40%.

14. A delay electric blasting cap including an initiating explosive comprising lead azide within the range of about 85% to about 90% and a comminuted flame producing material within the range of about 10% to about 15%, said comminuted flame producing material selected from the group which consists of black powder and smokeless powder.

15. A delay electric blasting cap including an initiating explosive comprising lead azide within the range of about 85% to about 90% and a comminuted black powder within the range of about 10% to about 15%.

16. A delay electric blasting cap including an initiating explosive comprising lead azide within the range of about 85% to about 90% and a comminuted pyro smokeless powder within the range of about 10% to about 15%.

17. A delay electric blasting cap including an initiating explosive comprising lead azide within the range of about 85% to about 90% and a comminuted smokeless powder within the range of about 10% to about 15%.

18. A firing device including an initiating explosive comprising lead azide within the range of about 60% to about 95%, said lead azide characterized by a particle size which will pass a 200-mesh sieve and a comminuted flame producing material within the range of about 5% to about 40% superimposed upon a base charge comprising a secondary explosive, said comminuted flame producing material selected from the group which consists of black powder and smokeless powder.

19. A delay electric blasting cap including an initiating explosive comprising lead azide within the range of about 60% to about 95%, said lead azide characterized by a particle size which will pass a 200-mesh sieve and a comminuted flame producing material within the range of about 5% to about 40% superimposed upon a base charge comprising a secondary explosive, said comminuted flame producing material selected from the group which consists of black powder and smokeless powder.

EDWARD J. HANLEY.