

Dec. 6, 1938.

E. J. HANLEY

2,139,581

DELAY ELECTRIC BLASTING CAP

Filed Oct. 27, 1936

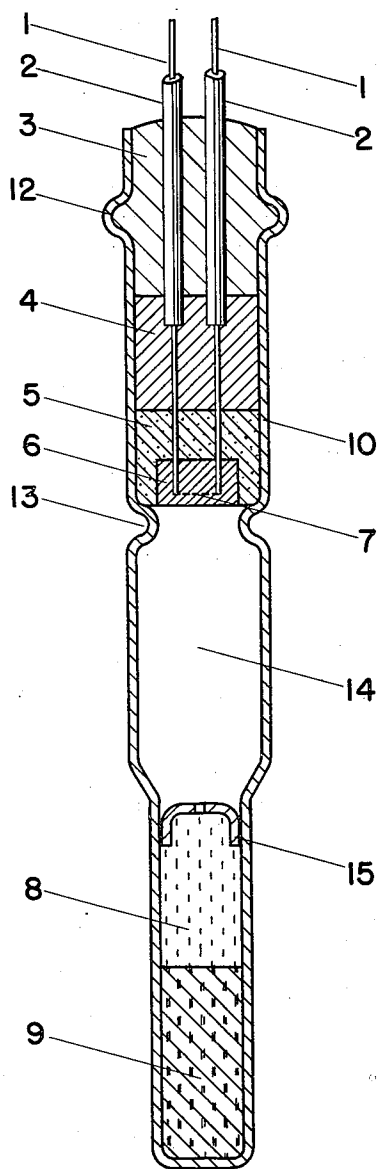


FIG. 1

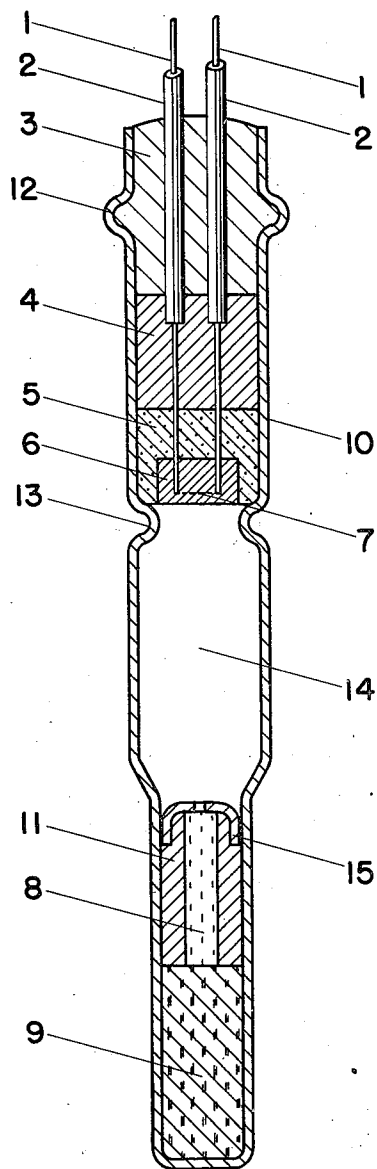


FIG. 2

INVENTOR

EDWARD J. HANLEY

BY

Bussell H. H. H. H. ATTORNEYS

UNITED STATES PATENT OFFICE

2,139,581

DELAY ELECTRIC BLASTING CAP

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

Application October 27, 1936, Serial No. 107,760

6 Claims. (Cl. 102—10)

This invention relates to an improvement in delay electric blasting caps, such as are used for detonating explosive charges successively by electric blasting caps ignited simultaneously.

Heretofore delay electric blasting caps having no vent for escape of gases from the burning fuse have been known. In such blasting caps the delay fuse composition is comprised of a mixture, e. g., barium peroxide and selenium, such that substantially no gas is evolved in its combustion or reaction, and consequently no gas, or substantially no gas is evolved on combustion of the delay fuse. Such a ventless delay electric blasting cap is shown in United States Letters Patent No. 1,999,820, to Henry E. Nash.

Such delay electric blasting caps as the above have suffered from the disadvantage of occasionally producing instantaneous firing. I have found that the reason for this occasional instantaneous firing of such delay blasting caps is a slightly loose fit of the lead delay fuse in the cap shell and the consequent escape of hot gases between top and bottom of the delay fuse, allowing the hot gases to reach the sensitive explosive charge in the base of the blasting cap, and detonate the same.

In commercial manufacture of blasting caps according to the invention described in United States Letters Patent No. 1,999,820, it has been found desirable to surround the bridgewire with a composition, applied as a paste and then dried, comprising a mixture, for example, of mercury fulminate or diazodinitrophenol with potassium chlorate, charcoal, and nitrostarch, which is heat sensitive to the small amount of heat developed by the fusion of the bridgewire, and which, on burning, develops a flash sufficient to ignite the adjacent composition of the delay fuse. The composition surrounding the bridgewire burns with the evolution of gas, but the amount of such composition present is so small, and the quantity of gas produced on burning so small, that no substantial gas pressure sufficient to burst the sealed cap is developed.

However, the quantity of hot gas developed by combustion of the flash charge surrounding the bridgewire is sufficient to force such hot gases into any crevice in the interior of the blasting cap, and such a crevice has heretofore comprised the space between the lead delay fuse and the copper cap shell. It will be appreciated that, in assembling blasting caps, strong pressure could not be used in forcing the lead delay fuse into a blasting cap already charged with a sensitive high explosive, such as fulminate of mercury or

diazodinitrophenol, because of the chance of causing explosions by the friction between the tightly fitting lead delay fuse and grains of sensitive explosive adhering to the interior walls of the copper cap shell.

In accordance with this invention, the delay fuse composition, without a metallic sheath, may be pressed directly, or enclosed in a non-metallic, compressible sheath, into the blasting cap, expanded firmly, rigidly and tightly against the inner cap wall and prevent all voids through which hot gases might by-pass to the detonating explosive, and I thus prevent any possibility of an instantaneous shot by the use of my improved delay electric blasting caps.

To illustrate the blasting cap in accordance with this invention, reference is made to the accompanying drawing, in which Figure 1 represents a cross section of one form of my invention, and Figure 2 another form, both of which accomplish the same improvement.

Referring now particularly to Figure 1 of the accompanying drawing, 1, 1 represents conducting wires for connection to a source of electricity, 2, 2 insulation of said wires, 3 a plug of insulating material adapted to retain the wires in position and seal the blasting cap, said plug 3 being itself retained in the cap by means of crimp 12, 4 represents a plug of water-proofing composition, 5 a plug of sulfur or the like, into which the conducting wires are cast, retained in position by indentation 13, 7 represents a high-resistance, small diameter bridgewire, 6 a flash composition surrounding the bridgewire, 14 an air space below the flash composition, 8 a slow-burning fuse composition burning without the evolution of any substantial quantity of gas, e. g., a mixture of barium peroxide and selenium, or of red lead and sulfur, 15 a perforated capsule over the fuse 8, 9 the detonating charge of the cap, for example of a fulminate-chlorate mixture, or a diazodinitrophenol-chlorate mixture, and 10 the copper or brass cap shell.

In the preparation of delay blasting caps in accordance with this invention, detonating charge 9 will first be loaded into cap shell 10 in a loose state, then compressed by pins entering the shell until the detonating charge has reached a suitable density. Then fuse composition 8 and perforated capsule 15 will be placed in the cap shell, in a loose state, on top of detonating charge 9, and compressed by pins entering the cap shell until it has reached a suitable density, and has expanded tightly against the inner cap wall, and become rigidly and firmly compressed. Crimps

13 and 12 are made in shell 10 during the drawing down of said shell. Then the bridgewire and conducting wire assembly, including wires 1, 1, bridgewire 7, flash composition 6, and sulfur plug 5 will be inserted into the cap and rest lightly against indentation 13. Then a fused waterproofing composition 4 will be poured in, allowed to harden, then sealing composition 3 run in in a fused state, and allowed to harden.

10 When it is desired to insulate cap walls 10 against the heat of the burning fuse 8, as may be necessary for use with blasting explosives very sensitive to heat, and at the same time to economize in the quantity of expensive fuse composition, I may construct my delay blasting cap 15 in accordance with the design shown in Figure 2 of the accompanying drawing, which includes all of the features of that of Figure 1, except the use of a delay fuse 8 of reduced diameter and a sheath of fibrous, compressible, non-metallic material 11, for example of asbestos.

In the preparation of delay blasting caps in accordance with the form of my invention shown in Figure 2, detonating charge 9 will first be loaded in cap shell 10 in a loose state, then compressed by pins entering the shell until the detonating charge has reached a suitable density. Then sheath 11 will be inserted into the shell and placed on top of detonating charge 9. Then fuse compositions 3 will be loaded in a loose state into the central cavity of sheath 11 until said cavity is filled, covered by perforated capsule 15, and both sheath 11 and loose fuse composition 3 are compressed by pins entering the cap shell until the desired density of fuse composition 3 is attained and sheath 11 has expanded tightly, rigidly and firmly against the interior of cap wall 10. Thereafter the assembly of the delay blasting cap is continued as described in connection with Figure 1.

40 I do not limit myself to any particular shape or form of delay blasting cap, nor to any particular compositions of detonating charge or fuse charge, and it will be obvious that many alterations therein may be made without departing from the point of my invention; for example, I may, or may not, employ perforated capsule 15.

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

50 1. A delay blasting cap including a ventless casing, an igniter charge, a detonating charge,

and a fuse comprising a non-metallic, compressible sheath containing a composition which will burn without development of any substantial amount of gas, said fuse composition and sheath being expanded against the side walls of said casing by pressure from above, thereby being retained in position within said casing and against said detonating charge.

2. A delay blasting cap including a ventless casing, an igniter charge including diazodinitrophenol and potassium chlorate, a detonating charge including diazodinitrophenol, and a fuse comprising barium peroxide and selenium, said fuse being expanded against the side walls of said casing by pressure from above, thereby being retained in position within said casing and against the detonating charge.

3. A delay blasting cap including a ventless casing, an igniter charge, a detonating charge, a perforated capsule, and a fuse comprising a composition which will burn without development of any substantial amount of gas, said fuse being tightly, rigidly and firmly compressed beneath said perforated capsule within the casing and against the detonating charge.

4. A delay blasting cap including a ventless casing, an igniter charge, a detonating charge, a perforated capsule, and a fuse comprising barium peroxide and selenium, said fuse being tightly, rigidly and firmly compressed beneath said perforated capsule within the casing and against the detonating charge.

5. A delay blasting cap including a ventless casing, an igniter charge including a diazodinitrophenol and potassium chlorate, a detonating charge, a perforated capsule, and a fuse comprising barium peroxide and selenium, said fuse being tightly, rigidly and firmly compressed beneath said perforated capsule within the casing and against the detonating charge.

6. A delay blasting cap including a one-piece, metallic, ventless casing, an igniter charge, a detonating charge and an unwrapped slow-burning composition comprising a composition which will burn without development of any substantial amount of gas, said slow-burning composition being expanded against the side walls of said casing by pressure from above, thereby being retained in position within said casing and against said detonating charge.

EDWARD J. HANLEY.