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EXPLOSIVE PRIMER

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Fig. 1

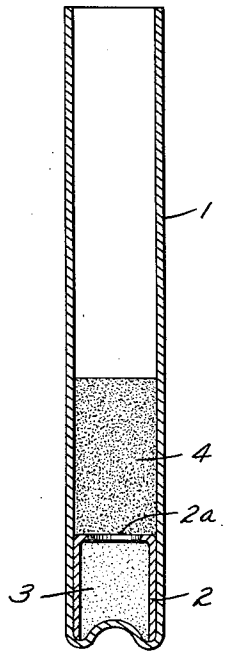
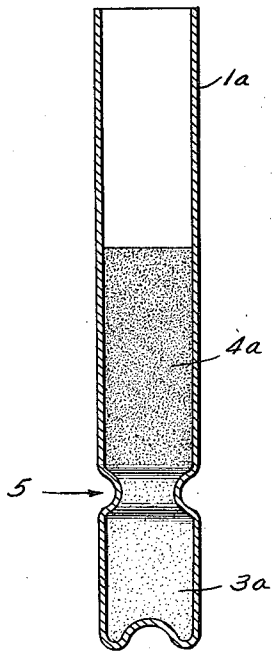


Fig. 2



Inventor
GEORGE MORRIS

BY Roy F. Steward
Attorney

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EXPLOSIVE PRIMER

George Morris, Ardrossan, Scotland, assignor to Imperial Chemical Industries Limited, a corporation of Great Britain

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5 Claims. (Cl. 86—1)

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The present invention relates to explosive primers of the kind comprising a tube closed at one end only and containing within the closed end a charge of compressed crystalline explosive powder sensitive to a detonating impulse, but relatively insensitive to flame or mechanical shock, the said primer being adapted to receive into the open end of the tube a detonable explosive element, for instance the end of a detonating fuse, and also adapted, when initiated from the closed end of the tube by a detonating impulse, to transmit an enhanced detonating impulse to the said detonable explosive element.

Explosive primers of the kind described are frequently employed for military or other purposes and are sometimes permanently attached to the detonator explosive element that is introduced into the open end of the tube and to which it is required to transmit the enhanced detonating impulse. Such an assembly is within the scope of the invention. Any assembly that includes a detonator or the like outside the tube and in detonation contact with the compressed crystalline explosive of the aforesaid characteristics situated within the tube at its closed end is also within the scope of the invention, although for reasons of safety in handling, such assembly will not usually be effected until, for instance, it is required to arm a projectile or a demolition assembly embodying the detonator or the like, together with the primer and the detonating explosive element to which the primer is required to transmit the enhanced detonating impulse.

In primers of the kind described, the compressed crystalline powder of the aforesaid explosive characteristics employed may be for instance tetryl, pentaerythritol tetranitrate or cyclotrimethylene-trinitramine.

Hitherto in the production of such primers the crystalline explosive powder has been introduced into an empty tube closed at its lower end, and compressed under a high pressure sufficient to ensure that the filling is well consolidated at the exposed end so that it will not crumble away as a result of handling or transport. Frequently, however, primers thus produced are less sensitive to initiation by a detonating impulse than is desirable, with the result that occasional failures are encountered in practice.

We have found that one cause of insufficient sensitiveness is that when sufficient pressure is applied to consolidate the crystalline explosive powder together satisfactorily at the open end of the tube, the particles at the closed end of the tube, although not so highly compacted as those

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at the open end, may be too highly compressed to respond to the detonating impulse.

According to the present invention, the foregoing difficulty is overcome by including in the novel explosive primer construction provision which, in effect, reduces the cross-section of the tube interior at a location relatively near the closed end, instead of having the tube interior uniform in diameter and unobstructed throughout its length, as heretofore. To this end, the tube of the new primer is interiorly divided by transversely extending means into charge zones relatively adjacent the closed and open ends, respectively; said means being of such character and so disposed that, while said zones are in communication with each other through a constricted passageway or channel which permits powdered explosive to pass, in the loading operation, from the open-end zone into the closed-end zone, transmission longitudinally into the closed-end zone of the heavy loading pressure applied at the open end of the tube is nevertheless substantially impeded. Consequently, that portion of the crystalline explosive powder charge occupying the closed-end zone is compressed or compacted to a degree considerably less than is normal for the given loading pressure under the operating conditions customary in prior practice, which prior practice included no provision for thus reducing transmission of the loading pressure to the body of powder adjacent the base or closed end of the tube.

The invention also includes a method for the production of an explosive primer of the kind described which includes the steps of loading the crystalline explosive powder into the tube, the said powder being allowed to pass freely through an aperture in a transverse member capable of resisting longitudinal pressure and to fill the space between the said transverse member and the closed end of the tube and also to fill a portion of the tube above the transverse member, to form a continuous charge occupying the two charge zones and the connecting passageway, and consisting throughout of the same crystalline explosive powder; and applying a loading pressure sufficient to compact the powder above the transverse member. The term "above" as used herein denotes that zone of the tube leading from the transverse member in the direction of the open end of the tube. Expressed in general terms, therefore, the novel method involves interposing, at a location intermediate the ends of the continuous body or column of charge material, more particularly at a location relatively near the

closed end of the primer tube, a resistance to transmission of the loading pressure through said body which is effective to reduce the compacting action thereof upon that portion of the charge adjacent the closed end of the tube to substantially below what it would otherwise be.

In a primer according to the invention, therefore, the portion of the charge at the closed end is less highly compacted together than the remainder of the charge, and this reduction is not merely that comparatively minor reduction which normally results from the heretofore customary employment of an unobstructed primer tube. On the contrary, the reduction in compacting effect accomplished in the new primer is so substantially greater in degree than the aforesaid normal, and said portion of the charge is thereby rendered so much more receptive to a detonating impulse from the exterior, that the failures encountered in prior practice can now be virtually eliminated. The more tightly compacted portion of the charge on the near side of the pressure supporting wall nevertheless is detonated satisfactorily, since it is in close physical contact with the less tightly compacted explosive through the blank or open portion of the transverse pressure resisting member.

According to one form of the invention, the tube into which the crystalline explosive powder is compressed contains at its base a rigid immobile inverted cup having a terminal perforation. Such a primer tube may be made by forcibly pressing an inverted perforated cup into the bottom of a closed end tube in which it forms a force fit.

According to another form of the invention the pressure resisting transverse but incomplete wall adjacent the base of the primer tube may be formed by a cannelure in the wall of the tube.

By way of an example, the charge of the powdered explosive to be used is run into a tube provided with the pressure resisting transverse but incomplete wall at its base, the tube if desired is shaken or tapped subsequent to the introduction of the powder, and a loading pressure of for instance 5 to 15 tons per square inch is applied by a plunger on the overlying powder against the near side of said wall so as to give it the desired compactness at the open end of the tube.

The invention is further illustrated in the drawings, Figs. 1 and 2, which depict in vertical axial section specifically different primer structures embodying the invention.

In the primer illustrated in Fig. 1, element 1 is an aluminium tube, 2 is an inverted aluminium cup forming a force fit in the tube 1 and having its transverse base or end wall perforated or otherwise apertured as indicated at 2*a*. At 3 is the less densely and at 4 is the more tightly compacted charge, which consists of pentaerythritol tetranitrate crystals.

Fig. 2 illustrates another form which the novel primer may take, wherein cannelure 5 in the wall of the tube 1*a*, located intermediate the ends of the complete compressed charge, provides transverse inwardly extending means capable of resisting and reducing the compacting effect upon portion 3*a* of said charge by application of consolidating pressure to the charge at its face remote from the closed end of the tube. Thereby portion 3*a* of the charge is less densely compacted than portion 4*a*, and is also less densely compacted than the corresponding portion in a primer not having the constriction formed by the cannelure.

I claim:

1. The method of producing an explosive primer which comprises placing in a primer tube closed at only one end a charge in the form of a continuous body consisting of a crystalline explosive powder sensitive to a detonating impulse but relatively insensitive to flame or mechanical shock, and applying loading pressure to that end of said charge adjacent the open end of the tube, while interposing, at a location intermediate the ends of said charge, a resistance to transmission of the loading pressure which is effective to reduce the compacting action thereof upon that portion of the charge adjacent the closed end of the tube to substantially below what it would be in the absence of such interposed resistance.

2. The method of producing an explosive primer as claimed in claim 1, in which said resistance is interposed at a location relatively near the closed end of the tube.

3. The method of producing an explosive primer as claimed in claim 1, in which the loading pressure is on the order of 5 to 15 tons per square inch.

4. The method of producing an explosive primer as claimed in claim 2, in which said crystalline explosive powder is selected from the group consisting of tetryl, pentaerythritol tetranitrate, and cyclotrimethylene-trinitramine.

5. The method of producing an explosive primer as claimed in claim 3, in which the loading pressure is on the order of 5 to 15 tons per square inch.

GEORGE MORRIS.

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