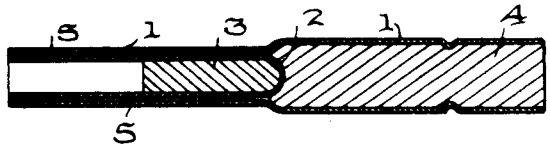
July 22, 1947. J. TAYLOR ET AL 2,424,374

EXPLOSIVE BOOSTER

Filed May 20, 1943

Fig. 1.



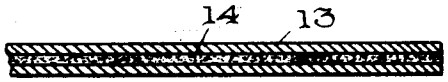
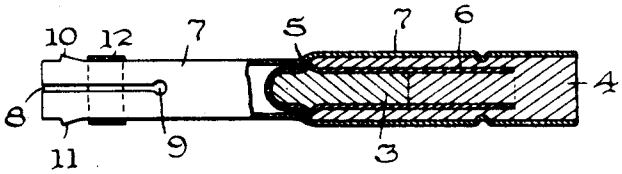


Fig. 2.

Fig. 3.



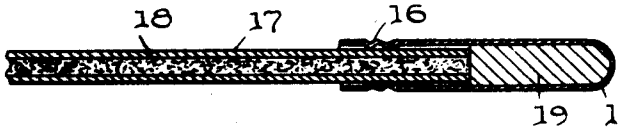


Fig. 4.

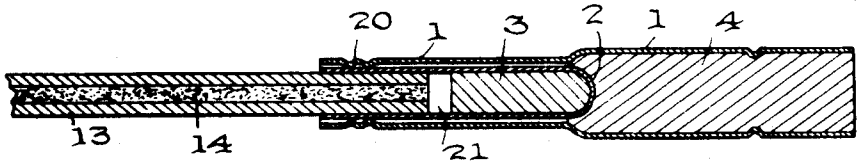


Fig. 5.

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EXPLOSIVE BOOSTER

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8 Claims. (Cl. 102—27)

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The present invention relates to improvements in the manufacture of intermediate explosive boosters and to the new or improved explosive boosters thereby obtained, and more particularly to intermediate explosive boosters in which an explosive charge is cast into a tubular container.

By an intermediate explosive booster we mean a booster that comprises a detonating explosive charge and is adapted to be assembled with a detonator or detonating fuze, optionally having a booster cap attached thereto, or to the like detonating components of the blasting assembly, for the purpose of transmitting an enhanced detonating impulse to an explosive charge in effective detonation contact with the booster explosive. Intermediate explosive boosters are useful in demolition and blasting operations, and in the assembly of mines or the like, for military or other purposes where it is required to bring about the detonation of an explosive charge from a distant point, especially when this explosive charge is insufficiently sensitive to be initiated with certainty by means of a detonator, detonating fuze or the like attached to it directly at the time the component parts of the blasting assembly are put together.

As the explosive for the intermediate booster there is frequently employed a pellet of compressed tetryl or compressed guncotton, but for convenience or cost in manufacture of the intermediate explosive booster it would often be desirable to employ a charge of an explosive adapted to solidify as it cools to ordinary temperature, cast in fluid condition at raised temperature into a container.

As such a charge there may be used, for instance, molten mixtures of trinitrotoluol and tetryl, or pentaerythritol-tetranitrate, or partially molten mixtures of trinitrotoluol with pentaerythritol tetranitrate or cyclo-trimethylene-trinitramine, and in the specification of the U. S. application of James Taylor numbered 424,947, a form of intermediate booster containing a cast explosive charge intended for assembly with a detonator is described. Cast explosive booster charges are, however, somewhat less sensitive to initiation than compressed tetryl or compressed guncotton charges, and while boosters containing cast explosive charges function satisfactorily when the detonator, detonating fuze or the like is brought into close juxtaposition with the cast booster charge, the cast booster charge may fail to detonate if in the assembly they are not brought close together.

In transport and storage it is most usual for

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the intermediate explosive booster to be attached in detonation contact with the explosive charge which it is required to detonate in the case of ammunition of certain kinds, but in the case of explosive charges for demolition and the like purposes it is frequently more convenient that the attachment of the intermediate explosive booster to the explosive that it is required to detonate should be deferred until a late stage, for instance until the operator is about to place the explosive into position. In any case, the attachment of the detonator or detonating fuze, whether or not provided with a booster cap, is delayed as long as possible, and for demolition purposes is therefore carried out at the locus where the blast is to take place during the laying of the shot.

In military operations it frequently happens that the time available for manipulation at the locus where the detonation is desired to take place is very limited, and such manipulation may require to be carried out in a position exposing the operator to unusual danger from the enemy, and in such circumstances it may be inevitable that the materials required to complete the blasting assembly will be roughly and hastily handled, so that failure of the shot due to insufficiently close juxtaposition of the components is not unlikely. The erroneous employment of detonators or booster caps of a diameter slightly greater than the proper diameter but capable of partial insertion into the primer may result in failure due to the same cause. It is an object of the invention to provide an intermediate booster containing a cast explosive charge of greater certainty in action in such circumstances.

According to the present invention there is permanently positioned in the intermediate explosive booster in effective detonation contact with the cast explosive charge between the latter and the detonator, detonating fuze, or like component of the blasting assembly to be inserted into the booster, a smaller charge of compressed explosive that is substantially more sensitive to initiation by the impulse of a detonation than the cast booster explosive but is insensitive to initiation by flame. The smaller charge of the more sensitive explosive may consist of compressed pentaerythritol tetranitrate, compressed cyclo-trimethylene-trinitramine, or other compressed explosive of similar sensitiveness to initiation by a detonating impulse.

In putting the invention into effect, the portion of the tubular booster casing intended to receive the detonator, detonating fuze, or the like is of smaller internal diameter than the remainder,

and the compressed explosive charge is contained in a tube of which either the open end or the closed base protrudes into this portion, and is attached, if desired with the assistance of a cement close up to the cast primer explosive poured into the larger portion of the booster tube. The attachment of the detonator, detonating fuze or the like within the portion of the booster adapted to receive it may be provided by means of a crimped joint or by spring pressure, for instance, by the provision of longitudinal slots and protuberances in the narrow part of the booster casing, over which a movable collar is adapted to ride on to the protuberances to exert a gripping pressure. The tubular booster casing is preferably open at both ends, and may be made of any convenient material. If desired the portion of larger diameter may be provided with an internal or external cannelure or the like to assist in the retention of the solidified cast charge in it or to assist its own retention in the explosive charge of which it is intended to bring about the detonation. The tube containing the compressed explosive charge may, if desired, be wholly closed at one end, or may be provided with a pin hole at its closed end. This tube may also be made of any convenient material, and if both tubes are made of metal, the materials are preferably the same or such that one of them does not appreciably increase the tendency to corrosion of the other in the presence of moisture. The tube containing the compressed explosive charge may be provided with a circumferential ridge, enlargement or the like to assist its retention at the internal shoulder between the broad and narrow portions of the booster tube, which is desirably assisted by the employment of a cement.

The invention is further illustrated in the accompanying drawings, of which Fig. 1 represents one form of booster made in accordance with the invention specially adapted for assembly with detonating fuze. Fig. 3 represents another form of booster made in accordance with the invention adapted for assembly with a detonating fuze, or with a detonator. Fig. 2 represents a piece of detonating fuze without a booster cap and Fig. 4 represents a capped fuze either of which can be used with the booster shown in Fig. 3. Fig. 5 represents the booster shown in Fig. 1 crimped over the detonating fuze shown in Fig. 3, in imperfect juxtaposition.

In Fig. 1, 1 is the casing of the booster open at both ends, 2 is a tube closed at one end, namely, the right hand and as shewn in the figure, 3 is the charge of the more sensitive explosive. In this form of booster the charge 4 may be cast around a mandrel first inserted in place of the tube 2, which is withdrawn when the charge 4 has solidified. The tube 2 containing the charge 3 pressed into it is then cemented into position by means of a polyvinyl acetate cement 5. Alternatively the charge 4 may be cast into the casing 1 after the tube 2 loaded with the charge 3 has been cemented into its position in the tube 1.

In Fig. 3, 7 is the casing of the booster open at both ends, 6 is the body of a tube closed at one end, namely, the left hand end as shewn in the figure, and 5 is a layer of polyvinyl acetate cement by which the closed end of the tube 6 is attached to the body of the booster 7. 8 is one of two slots with enlarged terminal portions 9 in the body of the tube 7, and 10 and 11 are protuberances pressed into the body of the tube 7. 12 is a movable collar adapted to ride up on to the protuberances 10 and 11. The numbers 3 and 4 have the same significance as in Fig. 1. In this form of booster the tube 6 containing the compressed charge 3 compressed into it is first cemented into the tube 7, and the charge 4 is then cast around the tube 6 and into its open end.

The fuze illustrated in Fig. 2 may consist of cordeau detonant or the like, or textile detonating fuze. In the former case the envelope 13 is of a metallic nature, and the core 14 consists of trinitrotoluol; in the latter case the envelope 13 consists of textile coverings and the core 14 may consist, for instance, of pentaerythritol-tetranitrate.

The capped fuze illustrated in Fig. 4 may either be a detonating fuze capped with a booster cap or a safety fuze capped with a detonator. In the former case the envelope 17 and the core 18 may be as described in Fig. 2 and the charge 19 within the tube 15 may consist of compressed pentaerythritol tetranitrate or tetryl. In the latter case the envelope 17 comprises textile coverings and the core 18 is of ordinary fuze powder and the filling 19 of the tube 15 comprises a charge of a composition sensitive to detonation when ignited by the flame from the fuze powder. The charged tube or detonator tube is crimped to the fuze at 16.

In Fig. 5 the parts 1, 2, 3, 4, 13 and 14 have the same significance as in Figs. 1 and 2, the assembly being made by crimping the booster over the detonating fuze as shown at 20; an air space due to imperfect juxtaposition is shown at 21. In spite of this air space, the booster functions satisfactorily.

If in the assembly of the detonating fuze illustrated in Fig. 2 or the capped fuze illustrated in Fig. 4 with the booster illustrated in Fig. 3 the juxtaposition of the components is imperfect, so that a space is left between the end of the detonating fuze or the end of the tube 15 and the closed end of the tube 6, the booster will nevertheless detonate satisfactorily.

We claim:

1. An explosive booster comprising a tubular casing open at both ends of narrower diameter at one end than at the other, said narrower end being adapted to receive a detonating component, a tube of smaller diameter than said casing closed at one end, located within the casing, sealing off the narrower portion of the casing from the wider portion, a flame-insensitive detonating explosive charge compressed within said tube into contact with the closed end thereof, and a second flame-insensitive detonating explosive charge, larger in quantity than said compressed charge, cast within the wider portion of said casing in direct contact with said tube and said compressed charge, said compressed charge being substantially more sensitive to initiation than said cast charge.

2. An explosive booster comprising a tubular casing open at both ends of narrower diameter at one end than at the other, said narrower end being adapted to receive a detonating component and to retain said component after insertion by deformation of the casing about said component, a tube of smaller diameter than said casing closed at one end located within the casing with the open end of the tube protruding into the wider portion of the casing, the closed end of the tube sealing off the narrower portion of the casing from the wider portion, a flame-insensitive detonating explosive charge compressed within said tube into contact with the closed end thereof, and a second flame-insensitive detonating explosive charge, larger in quantity than said compressed charge, cast within the wider portion of

said casing in direct contact with said tube and the free surface of the compressed charge, said compressed charge being substantially more sensitive to initiation than said cast charge.

3. An explosive booster as claimed in claim 2 wherein the portion of the casing adapted to receive the component of the blasting assembly is slotted and protuberanced and provided with a movable external collar capable of contracting said portion for the purpose of exerting gripping pressure on said component.

4. An explosive booster as claimed in claim 1 wherein the cast explosive charge comprises a solidified molten mixture of trinitrotoluol and tetryl.

5. An explosive booster as claimed in claim 1 wherein the cast explosive charge consists of a solidified at least partially molten mixture of trinitrotoluol and pentaerythritol-tetranitrate.

6. An explosive booster as claimed in claim 1 wherein the cast explosive charge consists of a solidified partially molten mixture of trinitrotoluol and cyclotrimethylene-trinitramine.

7. An explosive booster as claimed in claim 1 wherein the compressed explosive is compressed pentaerythritol-tetranitrate.

8. An explosive booster as claimed in claim 1 wherein the compressed explosive is compressed cyclotrimethylene-trinitramine.

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