Oct. 4, 1966 T. C. CERWONKA 3,276,372

BOOSTER DEVICE

Filed April 28, 1965

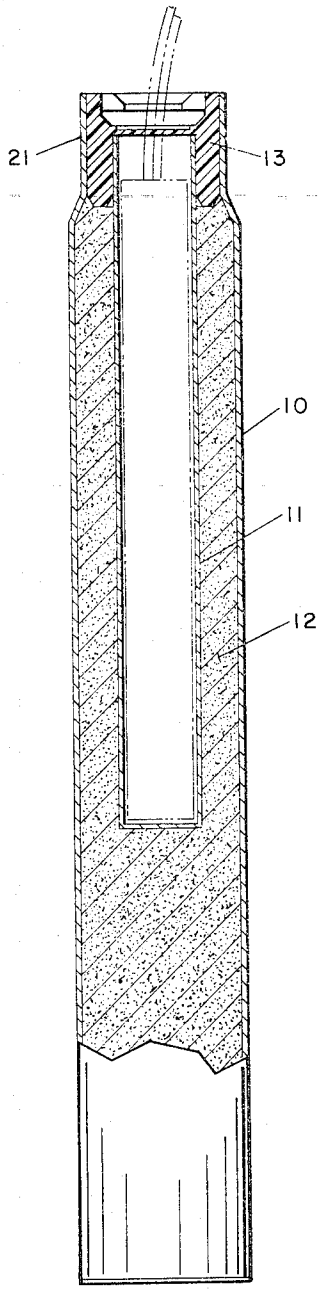


FIG. 1

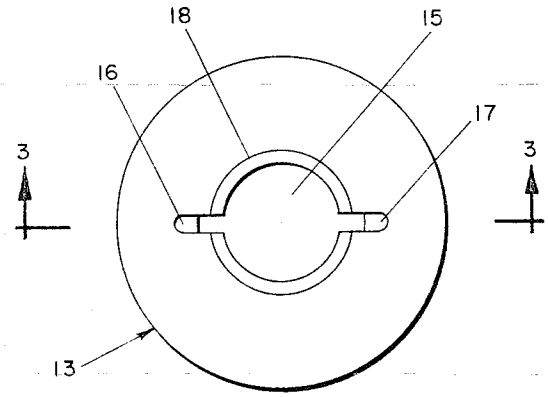


FIG. 2

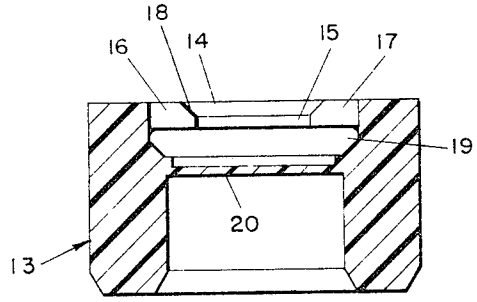


FIG. 3

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This invention relates to detonator boosters and more particularly to an improved booster device designed to be initiated by blasting caps.

The art in respect to the use of relatively insensitive blasting agents which require a booster charge to obtain proper detonation is well established. Frequently, it is most desirable to employ commercial electric blasting caps as the source of initiation for the booster charge. For so doing, a cap well is generally provided within the booster for insertion of the blasting cap therein. It is conventional practice to dimple or stake the cap well so that when the cap is inserted therein, the dimple or stake serves as a restraining means to retain the cap within its well. It has been found, however, that such restraining means are not entirely satisfactory. This has been due to an extent to the inability to hold close tolerances during dimpling or staking and to a further extent to the dimple or stake losing its resiliency when rigid material such as the pressed booster charge itself or a sealing compound such as molten sulfur or the like is placed behind the dimple or stake. Accordingly, on one hand, the blasting cap is difficult to insert into the cap well, and on the other, after the cap is forced into the well, a certain amount of deformation has occurred to the dimple or stake which makes this type restraining means unreliable. Moreover, under conventional practice, the cap well is not covered, and occasionally, foreign substances such as dirt, sand or rock enter the well and block the subsequent insertion of a blasting cap.

Accordingly, it is a principal object of the present invention to provide an improved booster device wherein a blasting cap can be inserted into the cap well of the booster in a facile manner and wherein the device is waterproof and wherein the cap well is shielded from foreign substances prior to use.

A further object of the invention is to provide sealing means for the booster comprising a resilient member for reliably holding an inserted blasting cap in place.

Other objects of the invention will appear hereinafter, the novel features and combinations being set forth in the appended claims.

Generally described, the present invention comprises a booster device which is designed to receive a blasting cap and to hold said cap securely therein, said device having in combination: an outer metal shell having a closed bottom and an open top; an inner metal shell of sufficient length and diameter to accommodate a blasting cap and of less length than the outer shell having a closed bottom and an open top and being coaxially disposed within said outer shell with the open top thereof positioned slightly below the top of the outer shell; a charge of cap-sensitive explosive disposed within the annular and bottom space between the outer shell and the inner shell to adjacent the top thereof; a resilient sealing member disposed over the charge and between the inner shell and the outer shell to the top thereof, said resilient sealing member having an overhanging lip in the top thereof with a central opening of less diameter than the inner shell and having a rupturable membrane beneath the overhanging lip, said membrane extending over the top of the inner shell; and a crimp formed adjacent the top of the outer shell to compress the sealing member.

A preferred embodiment of the invention has been chosen for purposes of illustration and description and

is shown in the accompanying drawings forming a part of the specification wherein reference symbols refer to like parts wherever they occur and wherein:

FIGURE 1 is a part elevational and part sectional view of a booster device in accordance with the invention;

FIGURE 2 is a top plan view of the resilient sealing means for the booster depicted in FIGURE 1; and

FIGURE 3 is an enlarged sectional view of the resilient sealing means for the booster taken along line 3—3 of FIGURE 2.

In FIGURE 1, an outer metal shell **10** has an inner metal shell **11** coaxially disposed therein. The inner shell **11** is of less length than the outer shell **10** and is of sufficient length and diameter to fully accommodate a conventional blasting cap which in respect to the device depicted is suitable for accommodating a No. 6 E.B. cap. The open top of the inner shell **11** is positioned slightly below the top of the outer shell **10**. A charge **12** of crystalline high explosive such as pentaerythritol tetranitrate (PETN) is disposed within the bottom and the annular space between the outer shell **10** and the inner shell **11** to adjacent the top thereof. A resilient sealing member **13** is disposed over the charge **12** and between the inner shell **11** and the outer shell **10** to fit approximately flush with the top of the outer shell.

Referring now additionally to FIGURES 2 and 3, the resilient sealing member **13** has a slotted overhanging lip **14** in the top thereof with a central opening **15**. The central opening **15** is of less diameter than the inner shell **11**, and slots **16** and **17** together with a tapered edge **18** and relief groove **19** at the top and immediately below the resilient lip **14**, respectively, permit easy initial insertion of a blasting cap into the upper portion of the sealing member **13**. A rupturable membrane **20** is positioned slightly below the relief groove **19** and extends over the top of the inner shell **11**. This entire assembly comprising the resilient sealing member **13** is then compressed adjacent the top of the outer shell **10** to compress the member therewithin and a permanent crimp **21** is thereby formed about the member.

The metallic shells for the device heretofore described were commercial bronze with the outer shell being 4½" L x ⅝" D crimped down to 9/16" D and the inner shell 2⅝" L x 5/16" D. The sealing member was neoprene having a durometer hardness of 75 and extended into the outer shell ⅜". The sealing member was molded as an integral piece with the rupturable membrane having a thickness of 0.004". The explosive was PETN pressed to a density of about 1.45 g./cc. with a charge weight of 20 g. It will be understood that these dimensions and amounts are approximate and that other materials may be used such as copper and aluminum for the shells, other cap-sensitive explosive such as cyclonite and tetryl, and other polymerization products of chlorophrene, Buna-S, reclaimed rubber and the like. It has been found, however, with the elastomers that the durometer hardness should be between about 70 and 80 to give optimum results for insertion of the cap into the booster well and its retention after insertion.

In utilizing the device, the bottom of a blasting cap is easily inserted into the upper portion of the resilient sealing member due to the combination of the tapered edge at the central opening, the slots and the relief groove as hereinbefore described. As the cap is further inserted, the bottom thereof contacts the rupturable membrane and is easily forced therethrough, and the cap is further advanced until it is fully seated within the inner shell. In this position, as shown with the cap and leg wires out of function in FIGURE 1, the overhanging lip in the top of the sealing member overhangs the top of the blasting cap with the leg wires thereof extending up through the central opening. If any accidental pull is imparted to the leg

wires tending to dislodge the cap from the inner shell, the overhanging lip restrains the pullout movement of the cap and thereby keeps it reliably within the booster. The booster devices were field tested by shooting large containers filled with blasting composition insensitive to conventional blasting caps. The large containers had a booster well therein to accommodate the booster device entirely. Moreover, the booster devices were provided with adhesively affixed plastic pull-out tabs. It is sometimes desired, at the end of a day's work, for example, to remove the device from its well after complete insertion. This is difficult to accomplish in the absence of pull-out tabs since the device is entirely encased in its well. It was found that the objects of the invention were attained and that the shots were saisfactory in all respects.

Since further modification within the scope of the invention will be apparent to those in the art, it is intended that the invention be limited only by the appended claims.

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

1. A booster device which is designed to receive a blasting cap and to hold said cap securely therein, said device having in combination:

(a) an outer metal shell having a closed bottom and an open top;

(b) an inner metal shell of sufficient length and diameter to accommodate a blasting cap and of less length than the outer shell having a closed bottom and an open top and being coaxially disposed within said outer shell wtih the open top thereof positioned slightly below the top of the outer shell;

(c) a charge of cap-sensitive explosive disposed within the annular and bottom space between the outer shell and the inner shell to adjacent the top thereof;

(d) a resilient sealing member disposed over the charge and between the inner shell and the outer shell to the top thereof, said resilient sealing member having an overhanging lip in the top thereof with a central opening of less diameter than the inner shell and having a rupturable membrane beneath the overhanging lip, said membrane extending over the top of the inner shell; and

(e) a crimp formed adjacent the top of the outer shell to compress the sealing member.

2. A booster device which is designed to receive a blasting cap and to hold said cap securely therein, said device having in combination:

(a) an outer metal shell having a closed bottom and an open top;

(b) an inner metal shell of sufficient length and diameter to accommodate a blasting cap and of less length than the outer shell having a closed bottom and an open top and being coaxially disposed within said outer shell with the open top thereof positioned slightly below the top of the outer shell;

(c) a charge of cap-sensitive explosive disposed within the annular and bottom space between the outer shell and the inner shell to adjacent the top thereof;

(d) a resilient sealing member disposed over the charge and between the inner shell and the outer shell to the top thereof, said resilient sealing member having a slotted overhanging lip in the top thereof with a tapered central opening of less diameter than the inner shell and having a relief groove and a rupturable membrane beneath the overhanging lip, said membrane extending over the top of the inner shell; and

(e) a crimp formed adjacent the top of the outer shell to compress the sealing member.

3. The booster device of claim 2 wherein the resilient sealing member is an elastomer having a durometer hardness of not more than 80.

4. The booster device of claim 2 wherein the resilient sealing member is a polymerization product of chlorophrene having a durometer hardness of about 75.

5. The booster device of claim 2 wherein the charge of cap-sensitive explosive is pentaerythritol tetranitrate.

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