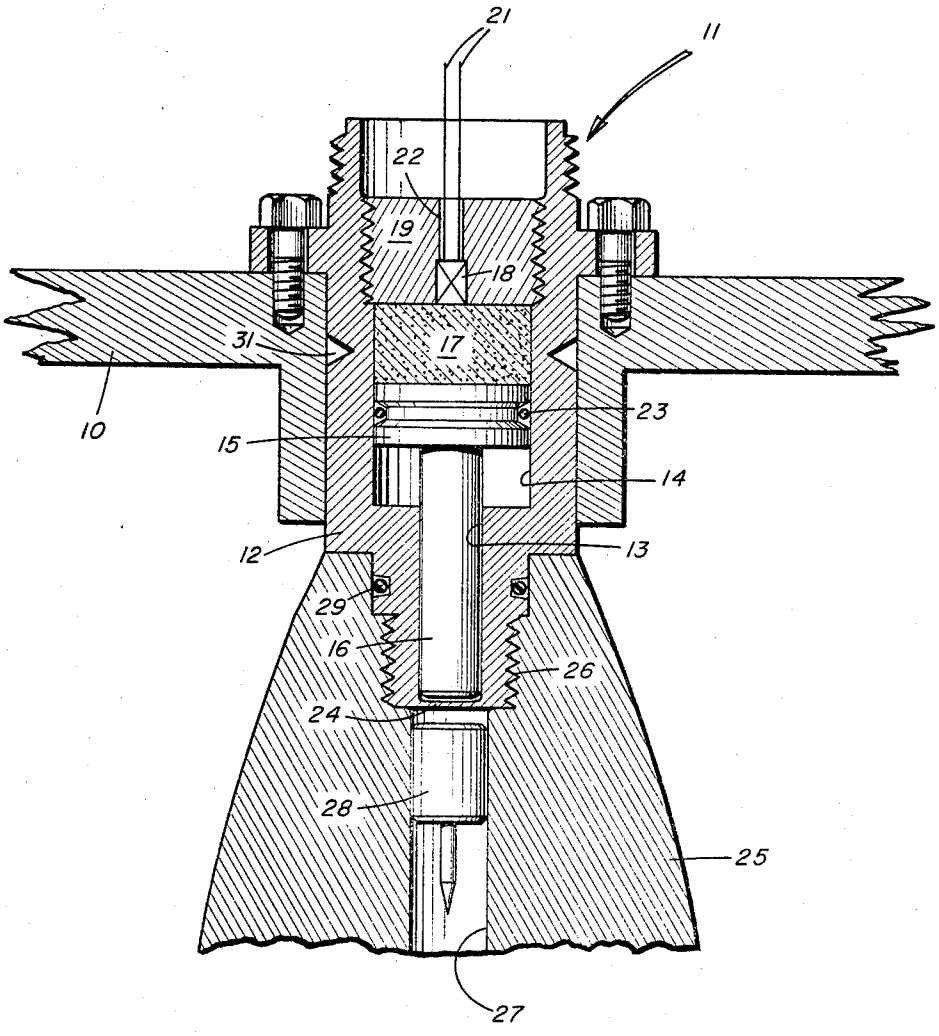
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EXPLOSIVE DRIVER AND RELEASE MECHANISM

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Oscar Ray Vass
Rolph Albert
INVENTORS.
BY
ATTORNEY.
Elvin McClelland
AGENT.

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EXPLOSIVE DRIVER AND RELEASE MECHANISM

Oscar R. Vass, Adelphi, and Rolph Albert, Silver Spring, Md., assignors to the United States of America as represented by the Secretary of the Navy

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The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

This invention relates generally to arming devices for depth bombs and more particularly to a novel explosive driver and release mechanism for both actuating a stab-initiated explosive delay train in an arming device and releasing the explosive component incorporating that arming device from a carrier body or support structure.

In certain minesweeping activities depth charge systems wherein a number of explosive depth bombs are releasably carried by a charge support assembly have been found useful. The present invention is designed for use with such a system to function first as an explosive-powered driver or actuating mechanism and second as an explosive release mechanism. The two functions are of single origin and occur in the aforementioned order but with an extremely small interval of time between the events. The mechanism embodies the features of an attachment device, a powerful and instantaneous actuator, and a releasing device in one compact unit having the advantages of simplicity, reliability and ready adaptability for a number of applications merely through variation of the configurations of its components. Using such a device permits the sequential separation from a carrier body of a number of explosive components after initiation of an explosive delay train contained within each. Moreover, by releasing the explosive components in sequence after initiating the delay elements, each unit is sufficiently remote from the carrier body at the time of detonation, thereby preventing any damage to the carrier body.

In accordance with the teachings of the present invention there is provided a body containing an electrically-initiated detonator, a main charge and a piston driven by the force of the explosion of the main charge. The moving piston is adapted then to strike a stabber pin to initiate an explosive delay element in the arming device, while the high pressure resulting from the explosive charge detonation, acting in conjunction with the impact force of the piston when it bottoms, causes structural failure of the containing body at a stress-notched point thereon to thereby detach the body from its support structure.

One of the objects of the present invention is to provide an actuating means for the arming device of a carrier-supported depth bomb which also releases the bomb from the carrier substantially at the same time the arming device is actuated.

Another object is to provide a mechanism for arming and simultaneously releasing an explosive weapon from a carrier body.

Still another object is the provision of an explosive driver and release mechanism for actuating a stab-initiated explosive delay train in the arming device of a weapon and for releasing the weapon from a carrier body substantially at the same time the delay train is actuated.

Still other objects, advantages and improvements will be apparent from the following description taken in connection with the accompanying drawing illustrating a fragmentary longitudinal sectional view of one adaptation of the device constructed in accordance with the present invention.

Referring now to the single figure of the drawing, for a more complete understanding of the invention, the numeral **10** indicates a support structure on the carrier body to which is affixed the explosive driver and release mechanism constructed in accordance with the present invention and generally designated by the reference **11**. The explosive driver and release mechanism **11** comprises a body **12** having a bore **13** and a counterbore **14** therein, a piston **15** slideably disposed in counterbore **14** and having a rod portion **16** extending into bore **13** in sliding relationship therewith, an explosive charge **17** in the counterbore adjacent piston **15**, an electrically-initiated detonator **18** abutting charge **17**, and an end closure block **19** fully positioned within counterbore **14** and effectively forming a closed well or cavity within body **12** for housing the components of the explosive driver.

Cylindrical block **19** is provided with an axial bore therethrough and a counterbore at one end thereof for receiving, respectively, a set for conductors **21** and the detonator **18**, and is externally threaded for engaging a threaded portion of counterbore **14** in body **12** near the open end thereof. A seal is formed about the detonator leads **21** by a plug **22** of suitable insulating material potted into the bore of end closure block **19**. Leads **21** are connected to the detonator **18** and to a power source, not shown, positioned outside of body **12** on the carrier body **10**, whereby the mechanism may be actuated by applying an electric current through the conductors or leads **21** to the detonator.

When closure block **19** is tightly threaded into the counterbore **14** of body **12**, the detonator **18** abuts the explosive charge **17** and the charge is forced against the face of piston **15**. Piston **15** is provided with an annular groove wherein there is supported a sealing means, such as O-ring **23**. The piston rod **16**, at this time, extends substantially to the end of bore **13** which so nearly passes through the entire length of body **12** that the remaining piece **24** of body **12** in the axial path of the bore is so thin that it constitutes but a protective membrane or rupture disc. Alternatively, the bore might pass entirely through the body **12** and be closed by an actual disc member secured to the end of the body by any suitable means.

An arming device body **25** is threadably secured to the body **12** as at **26** and is provided with a through passage **27** to an explosive delay element, not shown, contained within the arming device. Secured within passage **27** and positioned adjacent the rupture disc **24** of body **12** is a stabber pin **28** for initiating the explosive delay element when hit thereagainst.

An annular groove is shown near the end part of body **12** which threadably engages the arming device body **25** and is provided therein for the purpose of supporting an O-ring seal **29**. It is possible, however, for the O-ring **29** used to seal between the after end of the arming device and the body of the explosive driver and release mechanism to be mounted on either the arming device or the mechanism body, and for it to be discarded completely if internal contamination of the arming device is not a problem.

The releasing mechanism of the present invention is composed of the aforedescribed explosive driver mechanism in combination with a stress notch **31** provided in the outer peripheral wall of the body **12** and longitudinally positioned thereon opposite the explosive charge **17** therewithin.

Operatively, the arming device body **25** is attached to the explosive driver and release mechanism **11** prior to actuation, the body **12** of the mechanism **11** being solidly affixed to some type of support structure **10** on the carrier body as by screws as shown in the drawing, or the

body **12** may be designed with external screw threads for allowing it to be screwed directly into the support structure. The mechanism is actuated by applying an electric current to the detonator leads **21**, thus initiating the detonator **18** and the main explosive charge **17**. The force of the explosion of explosive charge **17** follows the path of least resistance and drives the piston **15**, moving rod **16** through the protective rupture disc **24**. The moving piston rod **16** first strikes the stabber pin **28**, initiating the explosive delay element in arming device **25**, and then the piston head **15** bottoms in the body **12** on the shoulder formed at the juncture of bore **13** and counterbore **14**. The high pressure resulting from the explosive charge detonation and contained within body **12** then acts in conjunction with the impact force of the piston **15** to cause structural failure of body **12** at its weakest point, the stress notch **31**. Thus the arming and releasing functions of the mechanism are completed and an initial velocity is imparted to the released body **25**.

In another contemplated embodiment, the stabber of the arming device, with which the mechanism is to be used, would be provided with a pressure-tight seal, such as an O-ring, and a shoulder would be provided within the arming device body against which the stabber would solidly bottom after penetrating the initiator of the delay element. In this manner, the aforedescribed explosive driver and release mechanism might be modified by eliminating the piston and piston rod. The high pressure gases resulting from the explosive charge **17** would first burst through the protective rupture disc **24**, bottoming the stabber and initiating the explosive delay train, and then the high pressure gas confined above the bottomed stabber would cause failure of the body **12** at the stress notch **31** as described earlier, completing the release function.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. For example, the use of the explosive driver and release mechanism is not limited to the actuation of devices containing a stab-initiated explosive delay train, but could be adapted to mechanically actuate many other devices which require a release from a carrier body immediately after actuation. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. An explosive driver and release mechanism for actuating a stab-initiated explosive delay train in the arming device of a depth bomb or the like and for releasing the bomb from a carrier body substantially at the same time the delay train is actuated, comprising

an elongated body adapted to be secured to a carrier body and having an open-ended piston chamber therein and an axial bore extending from the closed end of said chamber,

a piston in said chamber having a piston rod connected thereto and positioned within said bore,

an explosive charge in said chamber adjacent the side of said piston remote from said piston rod,

a detonator for said explosive charge,

means closing the open end of said chamber,

means for initiating said detonator,

a rupture disc closing the end of said bore remote from the end thereof receiving said piston rod,

means for securing the arming device to said elongated body at the end thereof containing the bore, rupture disc and the piston rod,

and said elongated body being provided with a stress notch adjacent the explosive charge therein,

whereby when said detonator is initiated, the explosive charge explodes, driving the piston rod through said rupture disc to strike a stabber contained within the arming device, and the resulting high pressure gases within the piston chamber, in conjunction with the impact force of the piston as it bottoms in the chamber, causes structural failure of the elongated body in the area of said stress notch to release the arming device from the carrier body.

2. An explosive driver and release mechanism for actuating a stab-initiated explosive delay train in the arming device of a depth bomb or the like and for releasing the bomb from a carrier body substantially at the same time the delay train is actuated, comprising

an elongated body adapted to be secured to a carrier body and having an axial bore and a counterbore therein extending substantially through the length of said body,

a piston in said counterbore having a rod portion integral therewith and extending into said bore,

an explosive charge in said counterbore of said body adjacent the side of said piston remote from said rod,

a plug for closing said counterbore at one end of said body,

electro-responsive means contained within the plug for detonating said explosive charge,

means for securing the arming device to said elongated body at the other end thereof,

and said elongated body having an annular stress notch about the outer peripheral wall thereof opposite said explosive charge,

whereby when said explosive charge is detonated, said piston rod is caused to strike a stabber contained within the arming device and the impact force of the piston as it bottoms in the counter-bore, in conjunction with the high pressure gases produced therein by the explosive charge, detaches the elongated body in the area of said stress notch from the carrier body.

3. The mechanism of claim **2** wherein said arming device is threadably engaged with said elongated body.

4. The mechanism of claim **2**, further including sealing means between said piston and said elongated body.

5. The mechanism of claim **2**, further including sealing means between said elongated body and said arming device.

6. The mechanism of claim **4** wherein said sealing means comprises an O-ring positioned in an annular groove provided in the peripheral wall of said piston.

7. The mechanism of claim **2** wherein the axial bore within said elongated body is closed at said other end of said body by a thin rupturable portion thereof.

No references cited.

BENJAMIN A. BORCHELT, *Primary Examiner.*

S. W. ENGLE, *Assistant Examiner.*