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 order to avoid any dangerous activities depth charge systems wherein a number of explosive depth bombs are releasably carried by a 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 stubber pin to initiate an explosive delay element in the arming device, while the high pressure resulting from the expulsive 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 the 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 conjunction with the accompanying drawings illustrating a fragmentary longitudinal section 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 numeral 20. The explosive driver and release mechanism 20 comprises a body 12 having a bore 13 and a counterbore 14 therein, a piston 15 slidable 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 fitted 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 an 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 stubber 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 aforesaid explosive driver mechanism in combination with a stress notch 31 provided in the outer peripheral wall of body 12 and longitudinally positioned thereon opposite the explosive charge 17 therewith.

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 of 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 aforesaid 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 an 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.

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