Oct. 1, 1968 R. H. FOSLER ET AL 3,403,624

EXPLOSIVE ORDNANCE LAUNCHING AND ACTUATION ARRANGEMENT

Filed April 20, 1967

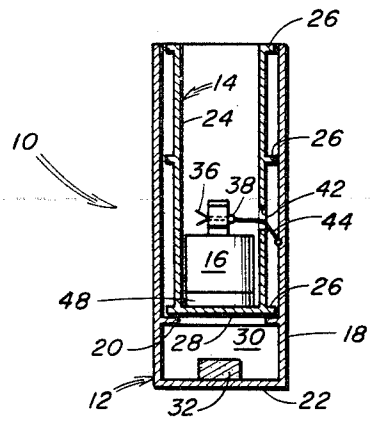


Fig. 1a

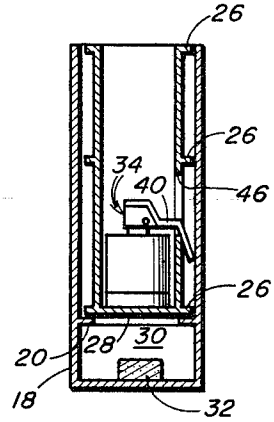


Fig. 1b

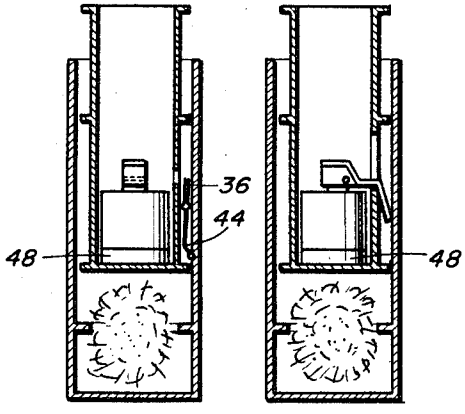


Fig. 2a Fig. 2b

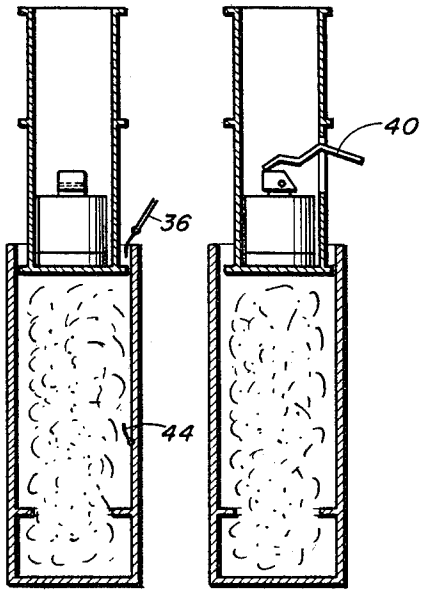


Fig. 3a Fig. 3b

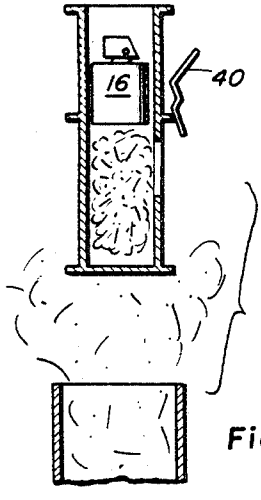


Fig. 4

INVENTORS
Robert H. Fosler
Edward W. Rollman

BY J. O. Tresansky
ATTORNEY
L. J. Santisi
AGENT

United States Patent Office

3,403,624

Patented Oct. 1, 1968

3,403,624

EXPLOSIVE ORDNANCE LAUNCHING AND ACTUATION ARRANGEMENT

Robert H. Fosler, Baltimore, and Edward W. Rollman, Cockeysville, Md., assignors, by mesne assignments, to the United States of America as represented by the Secretary of the Navy

Filed Apr. 20, 1967, Ser. No. 634,035
5 Claims. (Cl. 102—8)

ABSTRACT OF THE DISCLOSURE

An explosive ordnance launching and actuating device providing a bore riding feature within the launch tube to prevent actuation of the ordnance device, even if the safety pin is removed, until the ordnance device is completely ejected from the launch tube.

Background of the invention

The invention relates generally to launched explosive ordnance devices and more particularly to an ordnance device and launching system therefor having positive interlocking safety features to preclude inadvertent detonation of the associated ordnance device.

The present invention is concerned primarily with an anti-personnel type ordnance device such as a mine, wherein upon actuation the ordnance device is launched some distance into the air and there detonated to disperse its explosive force. Inherent in such devices is the requirement for easy ejectability and actuation.

Prior are devices utilizing actuation devices to eject and arm an ordnance device such as an anti-personnel mine have suffered from the lack of effective safety measures to preclude inadvertent actuation or arming of the mine device. Necessarily, mines of an anti-personnel nature must be limited in size and thus complex safety devices are prohibitive. Further, since mines of the anti-personnel type are deployed to be actuated at some indeterminate future time it is desirable to make the actuator and accompanying safety devices as simple and uncomplex as possible to increase reliability and yet satisfy needs for effectiveness.

Accordingly, it is an object of the present invention to provide a new and improved launching and actuation arrangement for an anti-personnel ordnance device of a simple and reliable design.

Another object is to provide a mine launching and actuation arrangement incorporating interlocking safety features.

A further object is to provide a novel launcher for an explosive ordnance device.

Summary of the invention

Briefly, in accordance with one embodiment of the invention, these and other objects are obtained by providing a cylindrical container to house the mine and the actuation means wherein the cylindrical container cooperates with a bore rider arm on the mine to prohibit actuation of the mine until the mine has been completely ejected from the cylindrical housing. The mine carries a further safety feature in that it has a firing pin that is not removed until the mine begins its movement in the housing.

Brief description of the drawing

Other objects and many of the attendant advantages thereof will be readily appreciated as the same become better understood by reference to the following detailed description when considered in connection with the accompanying drawing wherein:

FIG. 1*a* is a view, partly in section, along a longitudinal axis of the mine prior to actuation;

FIG. 1*b* is a view, partly in section, similar to FIG. 1*a* but on a longitudinal axis disposed 90° from the axis of FIG. 1*a*;

FIG. 2*a* is a view along the same axis as in FIG. 1*a* showing the mine in a first state of actuation;

FIG. 2*b* is a view taken along the same axis as FIG. 1*b* and showing the same state of actuation as FIG. 2*a*;

FIG. 3*a* is a view along the same axis as FIGS. 1*a* and 2*a* showing the mine in an intermediate stage of actuation;

FIG. 3*b* is a view along the same axis as FIGS. 1*b* and 2*b* and showing the same stage of actuation as FIG. 3*a*; and,

FIG. 4 is a view showing the mine in a final stage of actuation.

Description of the preferred embodiment

Referring now to the drawing, wherein like reference characters designate like or corresponding parts throughout the several views there is shown in FIGS. 1*a* and 1*b* an explosive ordnance launching and actuation device **10** having a main housing **12**, enclosing a piston **14** that is slidably disposed within housing **12** and an ordnance device, such as a mine or the like, **16**, slidably disposed within piston **14**. The main housing **12** includes a substantially straight cylindrical side wall **18** with an internal annular flange **20** located slightly above the bottom wall **22** of the housing to provide a stopping surface for the sliding piston **14** above the bottom wall **22**. The piston **14** includes a substantially straight cylindrical wall **24** having an external diameter less than the internal diameter of the housing side wall **18**. The piston wall **24** has arranged on its external circumference a series of built up rings **26** that have an external diameter only slightly less than the internal diameter of the main housing **12** to provide a sliding fit between the piston and the housing. The lower portion of side wall **18** and the bottom wall **22** along with bottom wall **28** of the piston, where it abuts the stopping flange **20** of the housing, forms a propellant chamber **30**. A propellant charge **32** is disposed in the chamber **30**, is suitably connected to an initiating means (not shown) and provides the ejecting force to initiate the piston movement and ultimately actuation and detonation of the mine **16**.

The mine **16** may be any type ordnance item desired and is fuzed with a conventional hand grenade fuze **34** of a well known type with a safety pin **36**, pull ring **38** and spring urged firing lever **40** such that when the safety pin **36** is removed the fuze is armed and when the lever **40** is allowed to spring outward the fuze is activated.

The fuze **34** is located on a central axis of the mine **16** and is placed within the piston **14** such that the pull ring **38** is initially located adjacent an opening **42** in the piston wall **24**. A lanyard **44** is affixed to the pull ring and extends through opening **42** and secured at its other end to the interior portion of housing wall **18** such that any upward movement of the piston within the housing will cause the lanyard to pull the safety pin **36** from the fuze.

It is to be understood that the lanyard **44** may also be extended through housing wall **18** and secured to the outside surface and still function in the desired manner.

The firing lever **40** is shaped to extend radially outward from the mine **16** through an opening **46** in piston wall **24** and then is shaped to extend downward along the side of the piston wall **24** such that it abuts against housing wall **18** and is forced to remain in the inactive non-firing position. Thus even though the firing pin **36** may be removed the fuze **34** cannot be completely activated until the mine **16** clears the housing **12** and the

firing lever **40** is allowed to spring outward and actuate the fuze.

The mine **16** is further equipped with a launching charge **48** that is activated by the fuze **34** before the main explosive charge of the mine so that when the piston **14** is ejected from the housing **12** and the fuze has detonated the activation charge in the mine is initiated first expelling the mine from the piston and then when the mine is clear the main explosive charge is initiated.

A device of the character described finds use as an anti-personnel mine on land or in water where it is particularly useful to eject a submerged mine up to the level of a pier above the water before detonation.

In operation the mine is initially unarmed as shown in FIGS. 1*a* and 1*b*. Upon activation by either a contact means or some remote activation method the propellant charge **32** is ignited as shown in FIGS. 2*a* and 2*b* causing the piston **14** to rise within the housing **12** and the lanyard **44** to pull the safety pin **36** from the fuze. The mine cannot be detonated as yet since the firing lever **40** is constrained from any movement as it is riding in the bore of the housing **12**. When the mine and piston reach the position shown in FIGS. 3*a* and 3*b* the mine has cleared the housing **12** and the firing lever **40** is free to spring outward thus actuating the fuze. The actuated fuze causes the launching charge within the mine to ignite and as shown in FIG. 4 the mine is expelled from the piston and then at a predetermined time thereafter the main explosive charge is detonated.

Obviously, numerous modifications and variations of the present invention are possible in view of the above teachings. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described herein.

We claim:

1. Ordnance apparatus comprising:

a first housing having a first generally cylindrical elongate cavity therein;

a second generally cylindrical elongate housing slidably positioned in said first cavity thereby forming a first expansible chamber in said first housing, and having a second generally cylindrical elongate cavity therein and at least one opening therein;

first propellant means in said first expansible chamber for selectively ejecting said second housing from said first cavity;

an explosive ordnance device slidably positioned in said second cavity thereby forming a second expansible chamber in said second housing, and having

a main explosive charge,

second propellant means adjacent said second expansible chamber for selectively ejecting said explosive ordnance device from said second cavity, and

fuse means for activating said second propellant means and simultaneously therewith starting a delayed activation of said main explosive charge; and

means for actuating said fuse means in response to a first predetermined axial displacement of said second housing with respect to said first housing.

2. The ordnance apparatus of claim **1** wherein said means for actuating said fuse means comprises:

a lever extending through an opening in said second housing and having one end thereof pivotally secured to said explosive ordnance device and resiliently urged radially outward therefrom and the other end thereof bearing against said first housing,

whereby said lever is restrained from radial movement about its pivot point, and actuation of said fuse means is thereby prevented, until said lever clears said first housing.

3. The ordnance apparatus of claim **1** wherein said fuse means is initially unarmed and said apparatus further comprises:

means for arming said fuse means in response to a second predetermined axial displacement of said second housing with respect to said first housing less than said first predetermined displacement.

4. The ordnance apparatus of claim **3** wherein said arming means comprises:

a safety pin slidably positioned in said fuse means and protruding therefrom and

a lanyard extending through an opening in said second housing and having one end thereof secured to said safety pin and the other end thereof secured to said first housing.

5. Ordnance apparatus comprising:

a first housing having a first generally cylindrical elongate cavity with one open end and one closed end;

an internally disposed radially extending annular flange on said first housing in said cavity near said closed end thereof,

a second generally cylindrical elongate housing slidably positioned in said first cavity and bearing against said internal flange thereby forming a first expansible chamber in said first housing, and having a second generally cylindrical elongate cavity therein and a plurality of openings therein;

a plurality of externally disposed radially extending annular flanges axially displaced along said second housing and having outside dimensions closely approximating the inside dimensions of said first cavity in said first housing;

first propellant means in said first expansible chamber for selectively ejecting said second housing from said first cavity;

an explosive ordnance device slidably positioned in said second cavity thereby forming a second expansible chamber in said second housing, and having

a main explosive charge,

second propellant means adjacent said second expansible chamber for selectively ejecting said explosive ordnance device from said second cavity, and

fuse means for activating said second propellant means and simultaneously therewith starting a delayed activation of said main explosive charge;

means for actuating said fuse means in response to a first predetermined axial displacement of said second housing with respect to said first housing including

a firing lever extending through a first opening in said second housing and having one end thereof pivotally secured to said explosive ordnance device and resiliently urged radially outward therefrom and the other end thereof bearing against said first housing,

whereby said lever is restrained from radial movement about its pivot point, and actuation of said fuse means is thereby prevented, until said lever clears said first housing; and

means for arming said fuse means in response to a second predetermined axial displacement of said second housing with respect to said first housing less than said first predetermined displacement including

a safety pin slidably positioned in said fuse means and protruding therefrom and

a lanyard extending through a second opening in said second housing and having one end thereof secured to said safety pin and the other end thereof secured to said first housing.

References Cited

UNITED STATES PATENTS

1,416,545	5/1922	Brondby	102—65.2
3,267,810	8/1966	Lancaster	89—1.816
3,307,283	3/1967	Cox	42—1

SAMUEL W. ENGLE, *Primary Examiner.*