

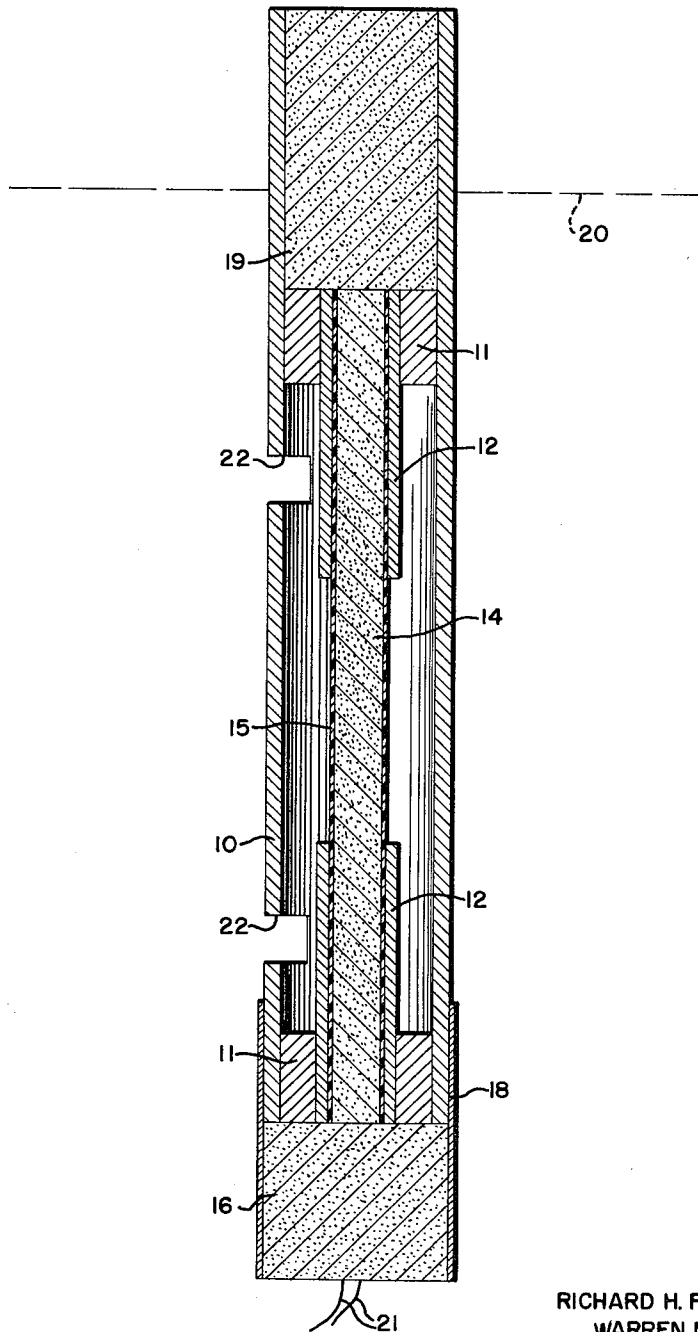
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WATER CONFINEMENT ARMING DEVICE

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WATER CONFINEMENT ARMING DEVICE

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5 Claims. (Cl. 102-27)

(Granted under Title 35, U.S. Code (1952), sec. 266)

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 to arming devices, and more particularly to a simple explosive train having no moving parts and capable of arming underwater ordnance items merely by immersion in water.

In the past many methods have been proposed for effectuating the arming of underwater explosive devices. These prior art methods have included various types of electrical circuitry as well as mechanical devices energized by the action of water pressure on diaphragms, bellows, or pistons. Adequate safety and reliability of hydraulically actuated arming devices require relatively expensive, precision fabrication. When operation at shallow depths is contemplated, the need for precision operation is accentuated. Manifestly, it would be highly desirable if an arming train could be provided which did not rely upon moving parts and which was capable of functioning in water at various depths.

It is therefore a primary object of the present invention to provide an arming train for underwater ordnance items which will render the items safe in air and armed by the mere immersion of the items in the water.

It is another object of this invention to provide an arming train for underwater explosive devices which has no moving parts.

It is a further object of this invention to provide an arming train for underwater ordnance items which possesses the advantages of low cost, small size and high reliability.

With these and other objects in view, the present invention contemplates an arming train comprising an ignition charge, a base charge for detonating the main charge on the ordnance item, and a columnar transmission charge interconnecting the ignition charge and the base charge. The diameter of the transmission column is so chosen that it is less than the failure diameter when the column is surrounded by air and greater than its failure diameter when the column is surrounded by water. The transmission column is surrounded by a rigid tube spaced therefrom to define an annular cavity therebetween. The rigid tube is provided with a plurality of slots or apertures which serve to admit water into the annular cavity when the ordnance item including the arming train is immersed in water. A thin plastic tube within the rigid tube surrounds the transmission charge to preclude direct contact of water therewith.

Other objects, advantages and novel features of the present invention will become readily apparent upon consideration of the following detailed description when taken in conjunction with the single figure of the accompanying drawing wherein is disclosed a preferred embodiment of the present invention. The arming train comprises a rigid metal tube 10 having a pair of supporting bushings 11 disposed therein. The supporting bushings 11 each mount a supporting sleeve 12 in a central aperture thereof. A transmission charge 14, of explosive material such as RDX, is suspended within the tube 10 by the sleeves 12 and is encased by a thin walled tube 15, of plastic material such as Mylar. The plastic tube 15 serves to confine the explosive material of the transmission charge 14, which may be at bulk density, and also serves to preclude direct

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contact of water within the tube 10 with the transmission charge 14.

An ignition charge 16, of a suitable explosive material such as lead azide, is mounted on one end of the rigid tube 10 by means of a sleeve 18 and in physical contact with one end of the transmission charge 14. A base charge 19, of explosive material such as RDX, is disposed within the opposite end of the tube 10 and in abutting relationship with the opposite end of the transmission charge 14.

Operation

In order that a better understanding of the invention might be had, its mode of operation will now be described.

The arming train is assembled in the ordnance item with the base charge 19 in physical contact with the main charge 20 of the ordnance item so that detonation of the base charge will in turn trigger the main charge. Electrical leads 21 of the ignition charge 16 are connected to any suitable source of a firing pulse, the specific nature of the firing mechanism being dictated by the type of ordnance item in which the arming train is to be utilized. The specific location of the arming train in any particular item is relatively unimportant and may be dictated by other design considerations. It is merely necessary that the base charge 19 be in contact with the main charge 20 and that the space within which the arming train is disposed to be in fluid communication with the exterior of the ordnance item.

Prior to the deposition of the ordnance item in the water, the annular cavity within the tube 10 surrounding the transmission charge 14 will be filled with air. The diameter of the transmission charge 14 is made sufficiently small so that a detonation wave will not be propagated along the column between the sleeves 12 when the annular cavity is filled with air. Consequently, inadvertent or accidental ignition of the charge 16 will not result in detonation of the main charge 20 as long as the ordnance item is not immersed in water. However, when the ordnance item is dropped into the water, water enters the tube 10 through slots 22 and fills the annular cavity surrounding the transmission charge 14. The diameter of the transmission charge 14 is such that a detonation wave will be propagated along the transmission charge 14 between the sleeves 12 when the annular cavity is filled with water. The greater confining action of the water is due to its much higher density as compared to air, and it is further enhanced by shock waves reflected from the inner walls of the tube 10. Consequently, ignition of the charge 16 will result in detonation of the main charge 20 whenever the ordnance item is disposed in water.

From the foregoing it will be readily apparent that the present invention provides an arming device possessing numerous advantages not found in prior art devices. The absence of moving parts enhances the reliability of the arming train as well as greatly simplifying the manufacture thereof as well as reducing the cost of such manufacturing. Certain variants of the disclosed embodiment immediately suggests themselves. For example, it may be possible to eliminate the plastic tube 15 if the nature of the explosive used to form the transmission charge 14 is such that it is impervious to water. Also, it is possible to eliminate the rigid tube 10 although, as pointed out above, the reflected shock waves supplement the confining action of the water column.

It is to be understood that the above described arrangements are simply illustrative of the principal features of the invention. Numerous other arrangements may be readily devised by those skilled in the art to achieve similar arrangements still embodying the principles of the present invention and falling within the spirit and scope thereof.

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What is claimed is:

1. An arming train for an explosive device comprising
an ignition charge,
a base charge,
and a transmission charge interconnecting said ignition 5
charge and said base charge, said transmission charge
having a cross-sectional configuration insufficient to
propagate a detonation wave when surrounded by a
gas but sufficient to propagate a detonation wave
when surrounded by a liquid. 10
2. An arming train as defined in claim 1 wherein said
transmission charge is surrounded by a rigid tube spaced
therefrom to define a liquid cavity.
3. An arming train as defined in claim 2 wherein said 15
rigid tube is provided with apertures to admit water when
said device is immersed.
4. An arming train as defined in claim 2 wherein said
transmission charge is encased within a thin plastic tube.
5. An explosive train for automatically arming an ex- 20
plosive device only when said device is immersed in water
comprising an ignition charge,
a base charge,

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a transmission charge interconnecting said ignition
charge and said base charge,
a thin plastic tube encasing said transmission charge,
and a rigid metal tube interconnecting said ignition
charge and said base charge, said metal tube being
coaxial with and spaced from said plastic tube to
define a liquid cavity therebetween, said transmis-
sion charge and said plastic tube defining an explosive
column and having a diameter less than the failure
diameter of said column in air and greater than the
failure diameter of said column in water.

References Cited by the Examiner

UNITED STATES PATENTS

2,133,119	10/38	Smith et al.	102—28
2,739,535	3/56	Rolland et al.	102—20 X
2,960,030	11/60	Semon	102—81 X

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