

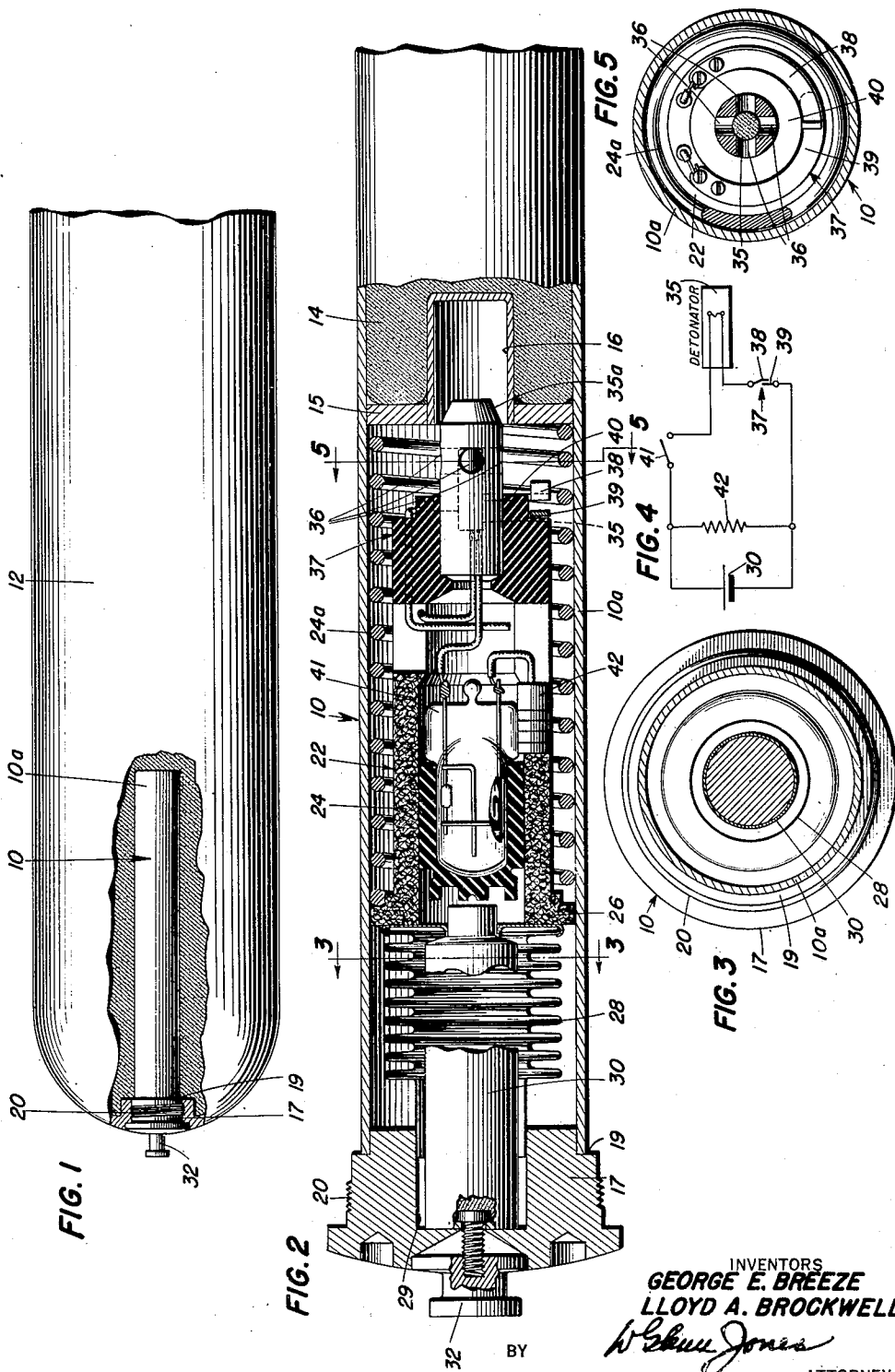
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G. E. BREEZE ET AL

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PRESSURE-ARMED IMPACT-FIRED FUSE

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PRESSURE-ARMED IMPACT-FIRED FUSE

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1 Claim. (Cl. 102—81)

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This invention relates to a water-armed fuze for detonating an explosive charge and is particularly directed to a novel water-armed fuze of the contact type for use below the surface of the water.

The fuze of the present invention is of the type disclosed in Patent No. 2,419,815 issued to George E. Breeze et al. The type of fuze there shown comprises a detonator normally disposed in a safe, spaced relation to a booster but movable into a recess in the booster when the fuze is armed, the desired movement being effected by a piston operable under the pressure of the water. It has been found that occasionally fuzes of this type do not arm properly because the detonator is out of alignment with the booster recess and therefore cannot slide home into the booster. Also, the piston sometimes binds in its cylinder and thereby impedes the arming action. Fuzes of this type, as made heretofore, have the additional disadvantage that a considerable overall length is required to space the booster and the detonator sufficiently for safety in the unarmed position.

One object of the present invention, therefore, resides in the provision of a novel fuze which overcomes these disadvantages of prior fuzes of the type described.

Another object of the invention is to provide a fuze of novel construction in which a substantially continuous barrier is interposed between the detonator and the booster in the unarmed position, whereby the fuze may be made in a more compact form.

These and other objects of the invention may be better understood by reference to the accompanying drawing, in which

Fig. 1 is a side elevation of a projectile having one form of the new fuze, part of the projectile being broken away to show the fuze;

Fig. 2 is an enlarged longitudinal sectional view of the fuze;

Fig. 3 is a sectional view on the line 3—3 in Fig. 2;

Fig. 4 is a wiring diagram showing the electric detonator circuit, and

Fig. 5 is a sectional view on line 5—5 in Fig. 2.

Referring now to Fig. 1, it will be seen that the fuze 10 is located in the nose portion of the projectile 12 and that its axis coincides with that of the projectile. The explosive charge (not shown) lies around and behind the fuze.

The fuze as shown in Fig. 2 comprises a housing in the form of a cylindrical tube 10a, which may be made of brass or other suitable material. A

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booster charge 14 is located in the rear end portion of the housing and is retained in place by a relatively thick metal ring 15 brazed to the inside of the housing. The central opening in the ring receives the open end of a thin walled cup 16 which extends rearwardly into the booster, the cup being brazed to the ring and having a form such that the detonator 35 may move into the cup, as will be described in detail presently.

The tube 10a is open at its nose end to receive the fuze parts, and when the parts are assembled in the tube, its nose end is closed with a cap 17 which is tightly wedged into the tube until a shoulder 19 on the cap engages the tube end, and is soldered thereto to form an airtight cell. The fuze is retained in the projectile 12 by external threads 20 on the cap which are received in a correspondingly threaded opening in the nose of the projectile casing.

To support the operating parts of the fuze and permit movement of the detonator into the booster, a subassembly generally indicated at 22 is provided. The subassembly includes a fiber, resin impregnated cylinder 24 having on its nose end an external annular flange 26 which fits loosely in the housing. Adjacent the nose end of cylinder 24 is an expansible bellows 28, the bellows being secured at its closed end to the cylinder and at its open end to the cap 17, where the bellows communicates with a central opening 29 in the cap.

The detonator 35 is electrically fired by current from a water activated sea cell 30 mounted inside the bellows 28 and movable with the cylinder 24. The nose end of the cell 30 has a protruding shank on which is threaded a cap nut 32 seated in a central opening in the cap. In arming the fuze, the nut 32 is removed, taking with it the threaded shank and thus pulling off the nose end of the cell. As a result, the cell is exposed to sea water which causes it to become activated and generate an electro-motive force. The nut 32 forms a tight seal with cap 17 and prevents the sea cell 30 from becoming activated if the projectile is accidentally flooded with water.

The steel case of detonator 35 is supported at its front end in the cylinder 24, while its rear end is tapered, as shown at 35a, and is in alignment with the booster cup 16. The rear end portion 35a of the detonator case is considerably thickened longitudinally and, when the fuze is unarmed, lies in the plane of the ring 15 to form with it a substantially continuous metal barrier between the detonator and the booster. This

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barrier prevents the booster from exploding if the detonator fires prematurely. The detonator is carried within the steel case and fires through lateral ports 36 when detonated. In the unarmed position of the fuze, the bellows 28 is collapsed and holds the cylinder 24 and detonator 35 in the safe position shown in Fig. 2, with the help of a spring 24a coiled around the cylinder and interposed between the flange 26 and the ring 15. When the cap nut 32 is pulled off, however, and the projectile enters the water, the water flows through the central opening in cap 17 and fills the bellows, thereby expanding it to force the cylinder 24 to the rear and move the detonator case home into the booster cup 16.

A normally open safety switch 37 carried by the cylinder 24 is closed at the time the cylinder moves the detonator to the armed position. The safety switch comprises a pair of spring contacts 38 and 39 (Fig. 4) normally open but pushed against each other due to engagement of the switch with the ring 15 by the bellows-actuated cylinder 24. Movement of the detonator case into the booster cup 16 is limited by a shoulder 40 on cylinder 24 which moves into engagement with the ring 15 and at the same time protects the switch arms 38 and 39. When the switch 37 is operated as described, the electric firing circuit for the detonator is partially closed (Fig. 4). The switch 37 per se forms no part of the present invention and, therefore, its details are not shown. However, the details of a switch suitable for the purpose are disclosed in Patent No. 2,419,815 issued to George E. Breeze et al.

The firing circuit includes the sea cell 30, the detonator 35, the switch 37, a preloading resistance 42, which speeds up activation of the sea cell, and a firing switch 41. This firing switch 41 comprises a pair of electrodes in a small glass envelope containing a large globule of mercury, a switch of this form being disclosed in the above-identified application of G. E. Breeze et al. When the projectile moving through the water makes contact with a target, the resulting jar or impact is sufficient to shake the mercury and momentarily close the switch 41. Since the sea cell will have become activated and the switch 37 closed by this time, energy will be supplied to the detonator to fire it. The force of the resulting explosion will fire the booster which, in turn, will set off the main explosive charge.

It will be apparent that the new fuze may be made in a relatively compact form and is safe to

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handle because of its multiple safety features. The extended rear end 35a of the detonator casing, together with the ring 15, provides a heavy barrier between the detonator and the booster sufficient to prevent explosion of the booster if the detonator should fire accidentally, and the booster can be exploded by the detonator only when the latter is moved into the booster cup 16 by operation of the bellows. By tapering the extended end 35a of the detonator casing, the casing is caused to move freely into the booster under action of the bellows without jamming, even when the casing is inaccurately aligned with the booster cup 16. The bellows 28 serves to move the sub-assembly 22 positively to its armed position without binding and also prevents water from reaching the fuze parts in the cylinder 24.

We claim:

In a fuze having a detonator and a booster, a metal casing for the detonator adapted to fit into a recess in the booster but normally withdrawn from the recess, the casing having a solid, extended and tapered end adjacent the booster and also having side walls containing lateral ports through which the detonator is operable to explode, a metal ring between the booster and the detonator and through which the casing is movable into the receptacle, the ring and said end of the casing normally forming a generally continuous barrier between the booster and the detonator, and means for moving the casing through the ring and into said recess, said tapered end of the casing being operable to guide the casing into the recess upon movement of the casing by said means.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
323,524	Paulus	Aug. 4, 1885
1,368,569	Minkler	Feb. 15, 1921
1,617,674	Dieter	Feb. 15, 1927
1,693,661	Ogden	Dec. 4, 1928

FOREIGN PATENTS

Number	Country	Date
117,106	Great Britain	July 5, 1918