

July 27, 1965

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3,196,789

SUBMARINE SIGNAL FUZE

Filed Feb. 10, 1964

3 Sheets-Sheet 1

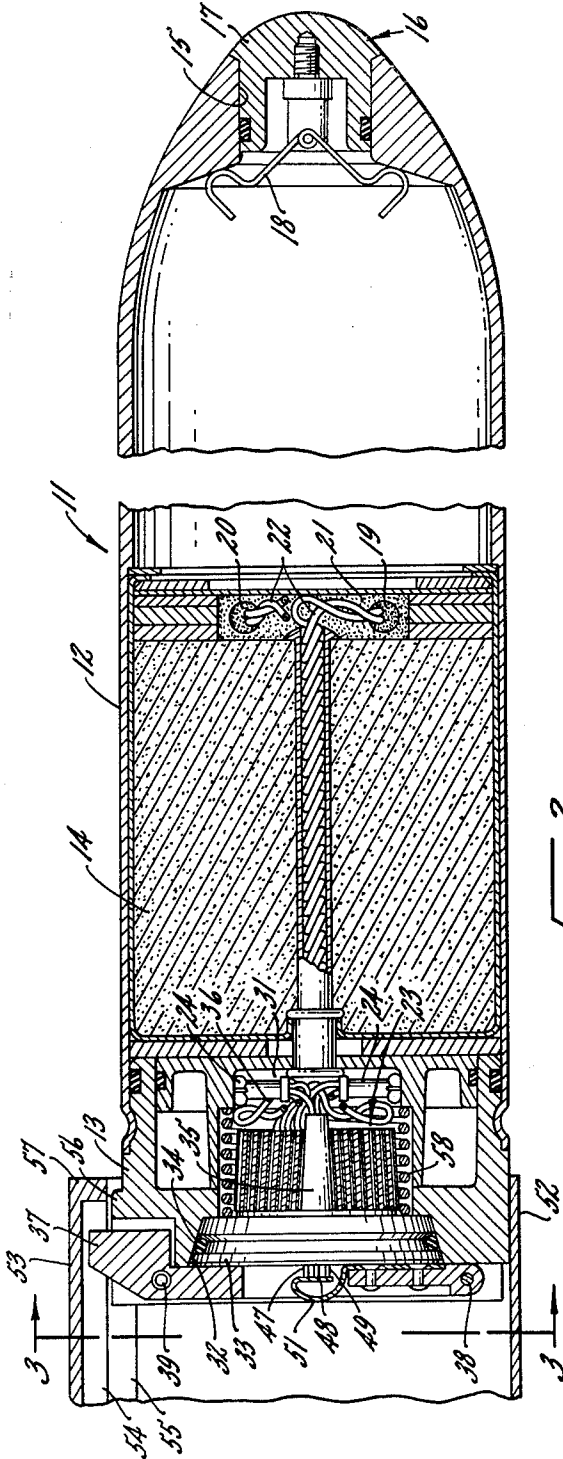


fig. 2.

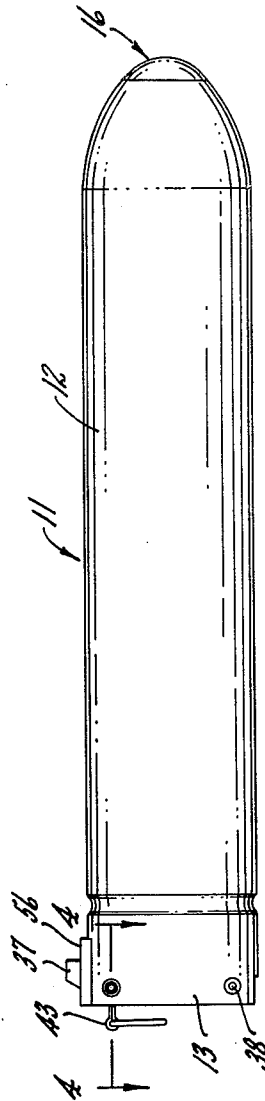


fig. 1.

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3 Sheets-Sheet 2

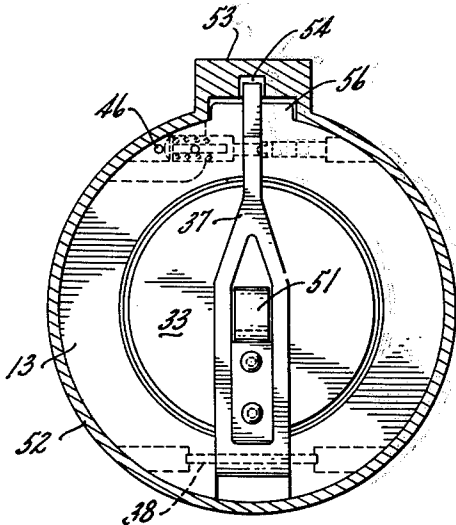


Fig. 3.

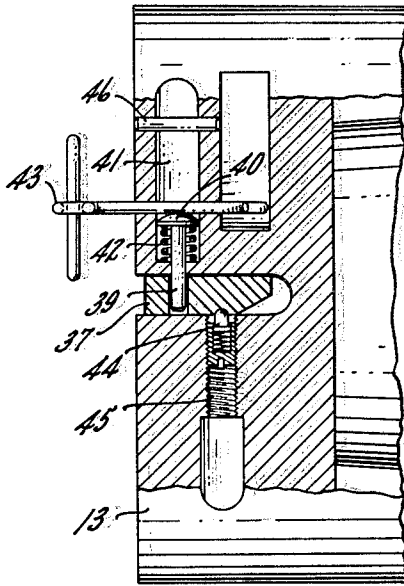


Fig. 4.

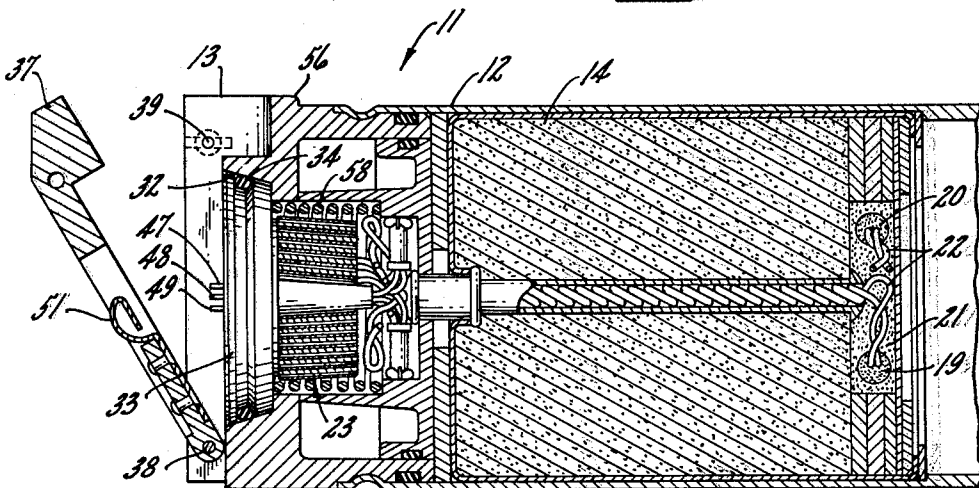


Fig. 5.

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3 Sheets-Sheet 3

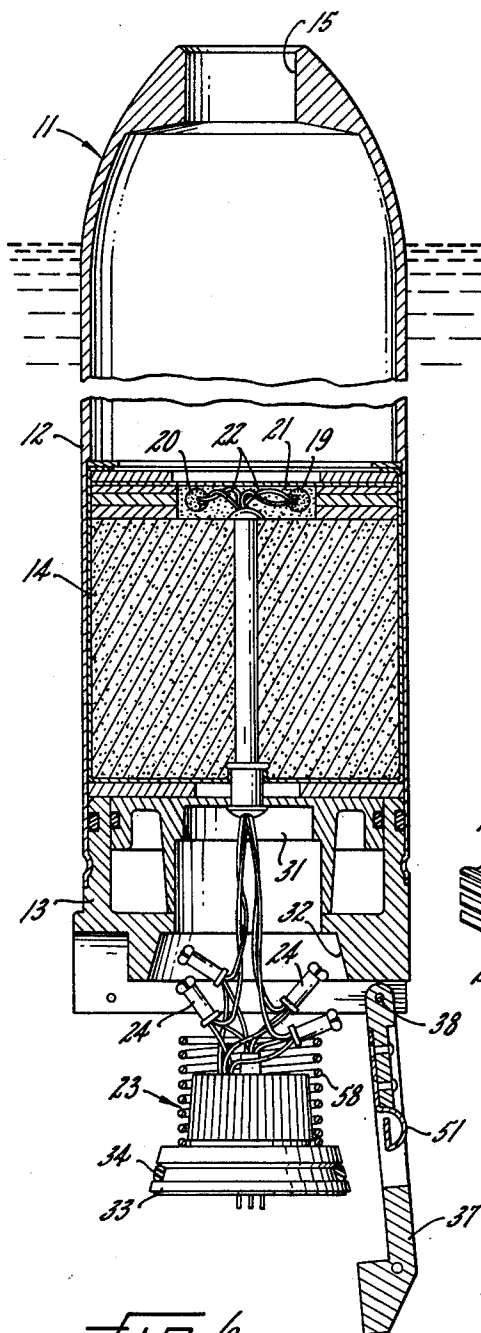


Fig. 6.

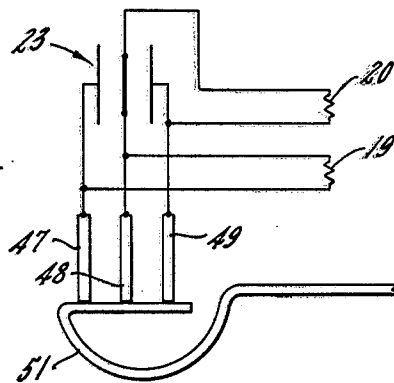


Fig. 7.

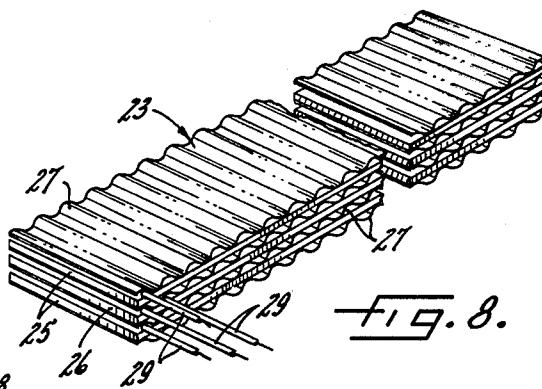


Fig. 8.

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3,196,789

## SUBMARINE SIGNAL FUZE

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Filed Feb. 10, 1964, Ser. No. 343,903

1 Claim. (Cl. 102—7)

(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.

The present invention relates to a submarine signalling device and more particularly to a signalling device containing a pyrotechnic composition and which is launched from a submerged submarine whereupon the pyrotechnic composition is ignited when the signalling device reaches the surface.

Submarines have used pyrotechnic signals as a means of providing a mark on the ocean surface in order to show the relative position of the submarine to surface ships. Heretofore, most signal devices have been provided with a fixed time delay which permits the signal to rise to the surface before the pyrotechnic is ignited. However with the advent of nuclear submarines, which can operate faster and at greater depths, the fixed time delay device is no longer adequate as the submarine may travel a great distance between the time of launch and the time of ignition of the pyrotechnic device.

In order to overcome the disadvantages of the fixed time delay type device, devices have been provided that operate by pressure and are actuated upon reaching a predetermined depth. One such device is shown in United States Patent 3,048,111 which issued August 7, 1962 to Baker et al. This patent shows an arming and firing mechanism which operates through progressive steps and is actuated by changing pressure of the water medium through which it is launched. A relatively high hydraulic pressure is first used to align a portion of a firing pin and then a low pressure is used to actuate another portion of the firing pin which then strikes that portion which was placed in alignment.

While this patent does provide the desired function, that is, the pyrotechnic is ignited upon the signal fuze reaching the surface, nevertheless the complicated mechanism is expensive to build and the complicated mechanism can result in malfunctioning.

The present invention functionally operates similar to the Baker et al. device in that the pyrotechnic composition is not ignited until the signal reaches the surface of the water. A sea water battery is provided and, upon the signal reaching the surface, the battery is ejected into the sea and the water, acting as an electrolyte, energizes the battery plates. Various safety devices are provided to insure that the pyrotechnic composition is not ignited prior to the signal reaching the surface.

It is therefore, a general object of the present invention to provide an improved submarine signal fuze that can be launched from various depths but will not be ignited until the signal fuze reaches the surface.

Another object of the present invention is to provide a submarine signal fuze that is actuated upon a battery being ejected into the sea whereupon sea water energizes the battery.

Other objects and advantages of the present invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

FIGURE 1 is a side view showing a preferred embodiment of the present invention;

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FIGURE 2 is a partial sectional view of a signal fuze showing the fuze in a launching tube;

FIGURE 3 is a sectional view taken on line 3—3 of FIGURE 2;

FIGURE 4 is an enlarged sectional view taken on line 4—4 of FIGURE 1;

FIGURE 5 is a partial sectional view similar to FIGURE 2 only showing the signal having left the launching tube and being in an armed condition;

FIGURE 6 is a partial sectional view showing the battery ejected into the sea;

FIGURE 7 is a diagrammatic view of a wiring diagram; and

FIGURE 8 is a perspective view showing a battery.

Referring now to the drawings and particularly to FIGURES 1 and 2, there is shown a submarine signal fuze 11 consisting of a projectile shell 12 and a fuze body 13. Shell 12 is attached to fuze body assembly 13 as by crimping, or the two units 12 and 13 may be threadedly attached, as shown in United States Patent 3,048,111. Shell 12 contains a pyrotechnic composition 14 in the end that is attached to fuze body 13 and an aperture 15 is provided on the opposite end of shell 12 to permit the escape of the products of combustion when pyrotechnic composition 14 is ignited. By way of example, a black smoke composition might be comprised of fifteen parts by weight of magnesium, 22 parts by weight of anthracene, and 63 parts by weight of hexachloroethane. Red, yellow, green, and other colored smoke compositions, well-known in the art, might also be employed as the pyrotechnic composition 14. A nose plug assembly 16, which consists of a nose plug 17 and spring means 18, is provided to seal shell 12 during its travel through the water. A pair of electric squibs 19 and 20 are provided near the top surface of the pyrotechnic composition 14, and a first fire composition 21 is provided around these squibs to facilitate ignition. By way of example, a first fire composition might be comprised of six parts by weight of lead peroxide, eight parts by weight of silicon powder, and six parts by weight of cupric oxide. Wires 22 connect squibs 19 and 20 to the lead wires of a sea water battery assembly 23 through connectors 24.

By way of example, battery assembly 23 might be comprised of two positive plates 25 and a negative plate 26, with the plates being separated by a spacer 27, as best shown in FIGURE 8 of the drawings. The negative plate 26 might be of magnesium, the positive plates of silver that have a film of silver chloride thereon, and the spacer might be of plastic, such as polyvinylchloride. The battery lead wires 29 are preferably spot welded to the battery plates and then the portions that are welded are covered by a heavy coat of cement, such as Pliobond which is a proprietary product of Goodyear Tire and Rubber Co., Inc., Akron, Ohio.

Fuze body 13 is provided with an inner chamber 31 and an opening 32 is provided therein. A valve 33 seats in opening 32 and an O ring 34 is positioned on valve 33 to provide a watertight seal. A stem 35 is attached to valve 33 and this stem protrudes within the inner chamber 31, and battery assembly 23 is wrapped around and secured to valve stem 35. Wires 22 that connect battery assembly 23 to squibs 19 and 20 are arranged in reverse folds 36 so that the battery assembly can be ejected into the sea. A tripping lever 37 is pivotally connected to fuze body 13 by means of pin 38 and when lever 37 is locked in opening 32 so that the inner chamber 31 is sealed.

Referring now to FIGURE 4 of the drawings, there is shown a locking pin 39 that engages lever 37 to prevent rotation of lever 37 about pin 38. Locking pin 39, which is provided with a head 40, is positioned in bore 41 and spring 42 will tend to bias locking pin 39 away from and

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out of engagement with lever 37. A safety pin 43 is provided to prevent movement of locking pin 39 until it is desired to launch the signal fuze. A detent 44 is provided in bore 45 to engage lever 37 in order to retain lever 37 until it is actuated. By way of example, detent 44 might be a threaded spring plunger manufactured by Vlier Engineering Corporation, Los Angeles, California, and bore 45 would be threaded. A pin 46 is positioned transverse through bore 41 to prevent locking pin 39 from leaving bore 41 in the event that it is desired to relock lever 37 after safety pin 43 has been removed.

Valve 33, which is preferably made of an insulating material such as nylon, is provided with three shorting rods 47, 48, 49 that each extend through both ends of valve 33. A shorting spring 51 is attached, as by riveting, to lever 37 and when lever 37 is in a locked position, as shown in FIGURE 4 of the drawings, shorting spring 51 engages each of the shorting rods 47, 48, and 49. As shown in FIGURES 2 and 7 of the drawings, the leads of battery 23 are connected to squibs 19 and 20 through shorting rods 47, 48, and 49, and when spring 51 is in contact with rods 47, 48, and 49, battery 23 will be shorted.

Operation

In operation, the submarine signal fuze 11 is placed in a launching tube 52 which consists basically of a tube that extends through the hull of a submarine. Launching tube 52 is provided with an enlarged portion 53 that has a narrow slot 54 and a broad slot 55 therein. When signal fuze 11 is placed within launching tube 52, lever 37 extends into the narrow slot 54 and boss 56 on fuze body 13 extends into and is guided by broad slot 55. Broad slot 55 is continuous throughout the length of launching tube 52, but narrow slot 54 stops short of the outer end of launching tube 52 to provide an end portion 57.

Immediately prior to placing signal fuze 11 into the launching tube, safety pin 43 is removed from fuze body 13 and spring 42 moves locking pin 39 out of engagement with lever 37. However, lever 37 is maintained in a stationary position due to detent 44 which is engaged with lever 37. By way of example, signal fuze 11 may be expelled by a compulsion firing method in which a quantity of high pressure air is released to the inside of launching tube 41 which drives signal fuze 11 out the outer end of launching tube 41. As submarine signal fuze 11 reaches the outer end of the launching tube, lever 37 strikes end portion 57 which will cause lever 37 to be rotated about shaft 38. As shorting spring 51 is attached to lever 37, rotation of lever 37 causes spring 51 to pivot away from shorting rods 47, 48, and 49, and thus battery 23 is no longer shorted.

Spring 58, which surrounds battery 23, tends to push valve 33 outwardly, however, the pressure of the sea water against valve 33 will keep valve 33 seated to close opening 32 until the force of spring 58 exceeds the force of the sea pressure. At this time the submarine signal fuze 11 will be at or near to the surface of the water and will be in a position for ignition. As valve 33 is expelled from its seat by the force of spring 58 into the sea, battery 23 is also pulled into the sea, as battery 23 is attached to stem 35 of valve 33, and the sea water acts as an electrolyte to energize battery 23. The power from battery 23 will, in turn, ignite or explode squibs

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19 and 20 to ignite the pyrotechnic composition 14. The products of combustion from the pyrotechnic composition 14 will increase the pressure within shell 12 until the force of spring 18 of the nose plug assembly 16 is exceeded whereupon nose plug assembly 16 will be ejected from shell 12 and the smoke from the pyrotechnic composition will then be emitted through aperture 15.

It can thus be seen that the present invention provides an improved submarine signal fuze that can be launched from various depths and upon reaching the surface of the water a battery is ejected into the water whereupon it is energized to ignite a pyrotechnic composition within the signal fuze.

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

What is claimed is:

A submarine signaling device adapted to be launched in a body of sea water beneath the surface thereof comprising:

- a fuze body having an inner chamber therein, an opening in one end of said fuze body communicating with said inner chamber,
- a valve of insulating material positionable in said opening for sealing said inner chamber from said body of sea water,
- a plurality of rods of conducting material extending through said valve,
- a projectile shell attached to said fuze body and containing a pyrotechnic composition therein,
- at least one squib adjacent said pyrotechnic composition for igniting said pyrotechnic composition,
- a sea water battery attached to said valve and positionable within said inner chamber and electrically connected to said squib and said plurality of rods,
- a lever pivotally connected on the outside of said fuze body for maintaining said valve means in a closed position until said signaling device is launched in a body of sea water,
- spring means of conducting material attached to said lever and engageable with said plurality of rods for shorting said sea water battery until said signaling device is launched,
- and spring means within said inner chamber for ejecting said valve means and said battery into said body of water when the pressure applied to said valve means by said body of water has been reduced to a predetermined value.

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