June 2, 1964 V. J. MENICHELLI ETAL 3,135,204

MEANS FOR EXPLOSIVELY REMOVING THE NOSE CONE OF A MISSILE

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FIG.1.

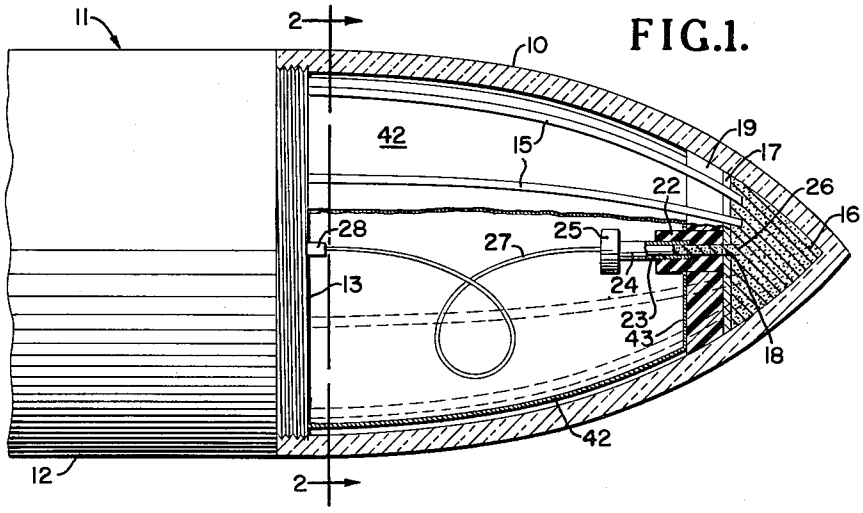

FIG.2.

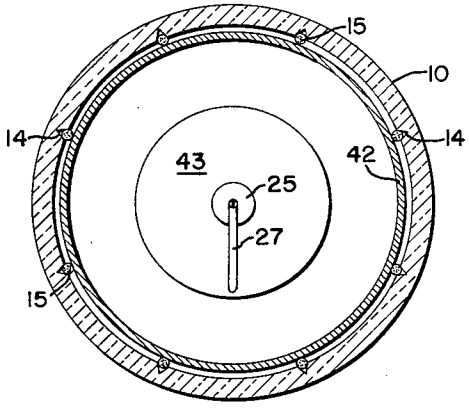

FIG.4.

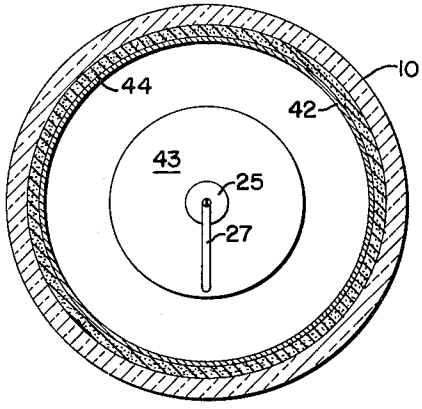

FIG.6.

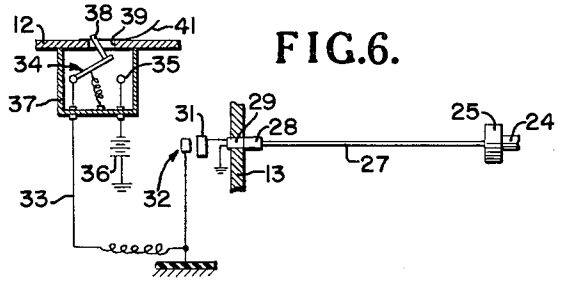

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FIG.3.

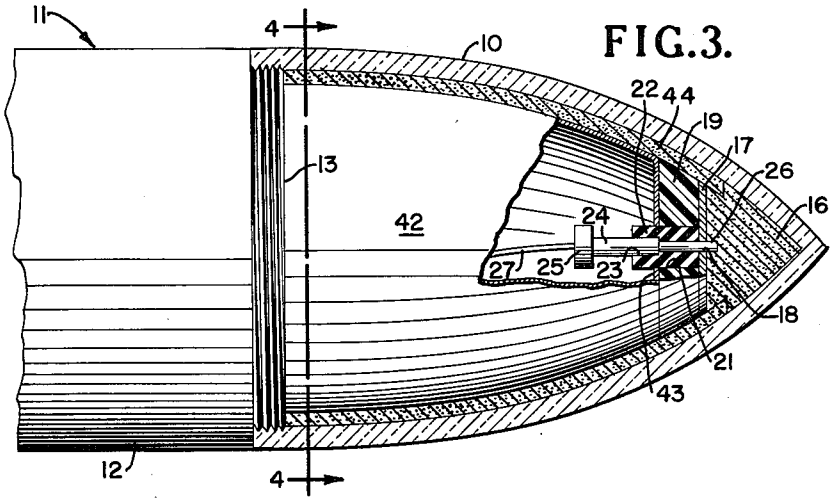
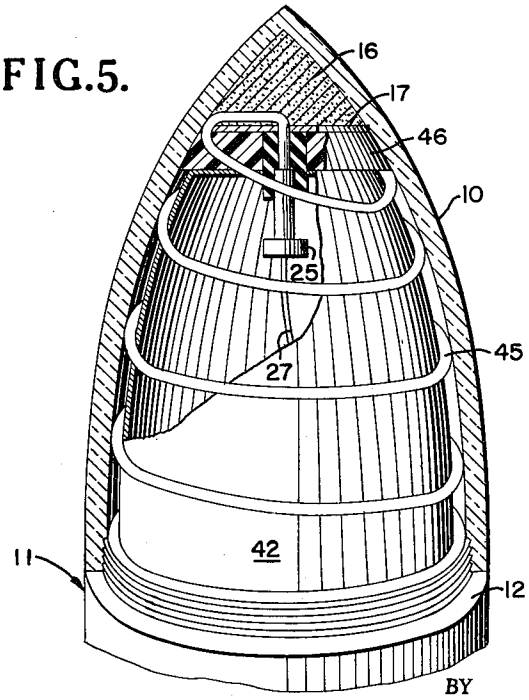


FIG.5.



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3,135,204
MEANS FOR EXPLOSIVELY REMOVING THE NOSE CONE OF A MISSILE

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4 Claims. (Cl. 102—54)
(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 explosive means for detaching the nose from a missile and, more particularly, to means for explosively removing the nose from a mine, depth charge, or the like, dropped from an aircraft in flight as the missile enters the surface of a body of water within which the missile is to be planted.

In devices of this type heretofore devised, it has been the usual practice to disengage the nose of the missile at water impact by the force of the impact of the nose against the surface of the water. In other devices the nose has been constructed and arranged to be deformed by the impact thereof with the surface of the water. Such devices have depended for their operation on the basis of the velocity of the missile at the moment of impact for the removal or deformation of the nose. In certain cases, therefore, under the conditions of use, the nose may fail to be detached from the missile or deformed in such a manner as not to provide the desired underwater flight characteristic.

The present invention possesses all of the desirable characteristics of the prior art devices and none of the foregoing disadvantages.

In accordance with the teaching of the present invention this desirable result is achieved by providing a frangible nose of suitable aerodynamic configuration secured to the nose of the missile to be dropped from the airplane, or otherwise shot into the water at a high velocity from an elevated position with respect thereto and the provision of a relatively small quantity of electrically detonated explosive disposed within the nose for detaching and shattering the nose during entry of the missile into the body of water.

One of the objects of the present invention is to change the aerodynamic configuration of a missile to a predetermined hydrodynamic configuration by explosively removing a frangible nose detachably secured to the forward end of the missile as the missile enters a body of water from an elevated position with respect thereto.

Another object is to explosively remove the nose portion of a missile as the missile enters the surface of a body of water.

Still another object is to provide means for explosively removing the nose of an underwater, air-borne weapon as the weapon enters the water wtihout adversely impairing the effectiveness of the weapon for its intended use.

Still other objects, advantages and improvements will be apparent from the following description taken in connection with the accompanying drawings of which:

FIG. 1 is a view partially in section and partially broken away of a device of the present invention secured to a missile in accordance with a preferred form thereof;

FIG. 2 is a view taken along the line 2—2 of FIG. 1;

FIG. 3 is a view similar to FIG. 1 of the device in accordance with an alternative form thereof;

FIG. 4 is a view taken along the line 4—4 of FIG. 3;

FIG. 5 is a view in section of another alternative device similar to FIG. 1; and

FIG. 6 is a firing circuit suitable for use with the present invention.

Referring now to FIG. 1 of the drawings for a more complete understanding of the invention, there is shown thereon a frangible nose 10 composed of material suitable for the purpose, for example, as Fiberglas, and secured to the forward end of a missile 11 having a casing 12 of generally cylindrical configuration and adapted to be planted within a body of water from an aircraft in flight. The missile is provided with a bulkhead 13 on the forward end thereof to which is secured in any suitable manner, as by threading the parts together, the nose 10. It will be understood that the nose 10 may, if desired, be secured to the casing 12 by other means, such as a plurality of shearable screws, if desired. The nose 10 is provided with a plurality of uniformly spaced grooves 14, FIG. 2, arranged interiorly therein throughout substantially the length of the nose to provide weakened portions and thereby facilitate shattering of the nose as the nose is detached from the missile. Each of the notches 14 is provided with a length of mild detonating fuze 15 cemented thereto throughout the length thereof. The rear end of each of the lengths of fuze substantially abuts the forward end of the missile when the nose is assembled thereon and the forward end of the fuze terminates within a quantity of granular explosive 16 which may be of any type suitable for the purpose, such, for example, as PETN disposed in the apex portion of the nose and retained therein by an aluminum disc 17 having an aperture 18 centrally disposed therein and a retaining member 19 composed preferably of epoxy resin having an aperture 21 centrally disposed therein, the aluminum disc and retaining member being secured to the inner surface of the nose 10 in any suitable manner as by cementing the parts together. An arrangement is thus provided for retaining the explosive 16 in tightly packed condition within the apex portion of the nose 10.

A grommet 22 is snugly fitted within the aperture 21 and provided with an enlarged cylindrical bore 23 for supporting a tubular member 24 of sufficient rigidity to carry and support an electro-responsive detonator 25 affixed to the outer end thereof. The detonator is in operative communication with a length of mild detonating fuze 26 which may, if desired, be similar to the lengths of fuze 15 thereby to establish an explosive train between the detonator and the explosive 16. The detonator is connected by a flexible twin conductor cable 27 to a plug 28, FIG. 6, adapted to be inserted into a complementary jack 29 extending through the bulkhead 13 of the weapon.

The jack completes a circuit from one of the conductors within cable 27 to ground and a second circuit from the other one of the conductors in cable 27 to a contact 31 of inertia switch 32 as the switch is closed by the impact of the weapon against the surface of a body of water. The moving element of the inertia switch is connected by conductor 33 to an arming switch 34 spring-biased to engage normally open contact 35 thereof as the switch is closed and apply current from battery 36 to the detonator thereby to explode the charge 16 and lengths of mild detonating fuze 15 connected thereto to shatter and remove the nose from the missile. The safety switch 34 is disposed within a water-tight compartment 37 secured to the casing 12 of the weapon and is provided with a locking member 38 disposed within a slot 39 within the casing 12 and having an aperture therein through which is threaded an arming wire 41 secured to the aircraft in such manner that the arming wire is removed from the switch 34 as the weapon is

dropped therefrom causing the switch to be moved to closed position and thereby arm the nose.

There is also preferably provided a rigid liner **42** generally cup-shaped and configured to fit snugly within the nose **10** with the bottom **43** thereof in abutting engagement with the retaining member **19**, the bottom portion **43** having an aperture therein within which the grommet **22** is disposed when the liner is in the assembled position. If desired, the liner can be secured to the retaining member by cementing the parts together.

The device of FIG. 3 is generally similar to that of FIG. 2 except that the lengths of explosive **15** of FIG. 2 are replaced by a sheet of explosive **44** cemented to the interior of the nose **10** substantially as shown.

On FIG. 5 is shown still another embodiment of the invention generally similar to the device of FIG. 1 except that the lengths of mild detonating fuze **15** have been placed by a single length of mild detonating fuze **45** configured spirally within the nose **10** and cemented thereto, the fuze being additionally held in position by the liner **42**. In this embodiment of the invention the retaining member **19** is replaced by a member **46** generally similar thereto but provided with an additional aperture through which the fuze **45** extends from the explosive **16** to the after part of the nose.

The operation of the device will now be described with particular reference to FIG. 1 although the operation is the same for either FIG. 2 or FIG. 3. Let it be assumed, by way of example, that the missile **12** is a cylindrical mine carried by an aircraft in flight for planting within a body of water. As the mine is dropped from the aircraft the arming wire **41** is removed from locking member **38** causing the arming switch **34** to close its contacts. The nose is now armed. As the mine strikes the surface of the water the set forward force applied thereto by the water causes the inertia switch **32** to close its contacts and fire detonator **25** when the mine has just entered the water. This causes the detonation of explosive **16** and the firing of the lengths of mild detonating fuze **15**. The detonation of explosive **16** causes the forward end of the nose to be blown free and the firing of the lengths of mild explosive fuze **15** causes the remaining portion of the nose to be shattered along the weakened lines or notches **14** and be driven outwardly from the path of travel of the mine before the mine has become fully submerged within the water, the detonator and plug **28** being disconnected from the jack **29** and falling away free from the mine concurrently therewith. When this occurs the force of impact of the missile against the water is greatly reduced, the frangible nose facilitating flight through the air is detached and the hydrodynamic nose, in the illustrated case, the forward end of the bulkhead, now being exposed to the action of the water to effect a hydrodynamic control on the mine during its descent therein.

The operation of the device shown on each of the FIGS. 3 and 5 is the same as the operation of the device of FIG. 1 and therefore will not be described in further detail.

Whereas the missile has been illustrated as having a flat nose portion when the frangible nose is removed therefrom, it will be understood that this has been done merely by way of example and that various other configurations of the hydrodynamic nose of the missile may be employed, if desired, to achieve a desired hydrodynamic control thereof as the missile travels downwardly within the water. Furthermore, the missile may, if desired, be an underwater weapon other than a mine, such, for example, as a torpedo or depth charge and the missile may be launched from an underwater launching station such as a submarine in which the missile rises and travels a substantial distance through the air before striking the water on its way to the target zone. When launched from a torpedo tube of a submerged submarine the arming switch may conveniently be constructed and arranged to be closed as the conventional safety bar is detached from the missile upon exit from the launching tube.

Whereas the invention has been described with reference to three examples thereof which give satisfactory results, it is not so limited, as various changes and modifications may be made by one skilled in the art, after understanding the invention, without departing from the spirit and scope thereof and it is intended, therefore, in the appended claims, to cover all such changes and modifications.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

1. A missile adapted to impact the surface of a body of water during a launching operation thereof comprising
   a cylindrical shell enclosing the missile,
   a hollow frangible ogival nose cone secured to the forward end of said shell for improving the aerodynamic characteristics of the missile,
   explosive means disposed within said nose cone for shattering and removing the nose cone from the missile as the explosive means is detonated,
   an electro-responsive detonator,
   a normally open inertia responsive switch constructed and arranged to be closed in response to the shock received as the missile enters the body of water,
   and a firing circuit interconnecting the detonator and inertia switch whereby the detonator is fired as the switch is closed for explosively removing the nose cose from the missile as the missile enters the water.

2. A missile according to claim 1 in which the explosive means is composed of a quantity of PETN explosive confined within the forward end portion of said nose and
   a plurality of uniformly spaced lengths of mild detonating fuse in communication at one end thereof with the PETN explosive and extending longitudinally along the inner surface of the nose core and in contact therewith.

3. A missile according to claim 1 in which the explosive means is composed of a quantity of PETN explosive confined within the forward end portion of said nose cone and a length of mild detonating fuze secured spirally to the inside surface of the nose cone throughout the length thereof and having an end portion thereof in communication with the PETN explosive and extending axially in a rearward direction within the spirally configured fuze for connection to said electro-responsive detonator.

4. A missile according to claim 1 in which the explosive means includes
   a quantity of PETN explosive disposed in the forward end portion of the nose cone and
   a sheet of explosive material in communication with the PETN explosive covering the inner surface of the nose cone and secured in contact therewith.

References Cited in the file of this patent

UNITED STATES PATENTS

1,290,829	Carpentier	Jan. 7, 1919
2,782,716	Johnston	Feb. 26, 1957
2,993,442	Vining et al.	July 25, 1961
2,996,985	Kratzer	Aug. 22, 1961