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FORWARD FLOTATION MEANS FOR A WATER-LAUNCHABLE MISSILE

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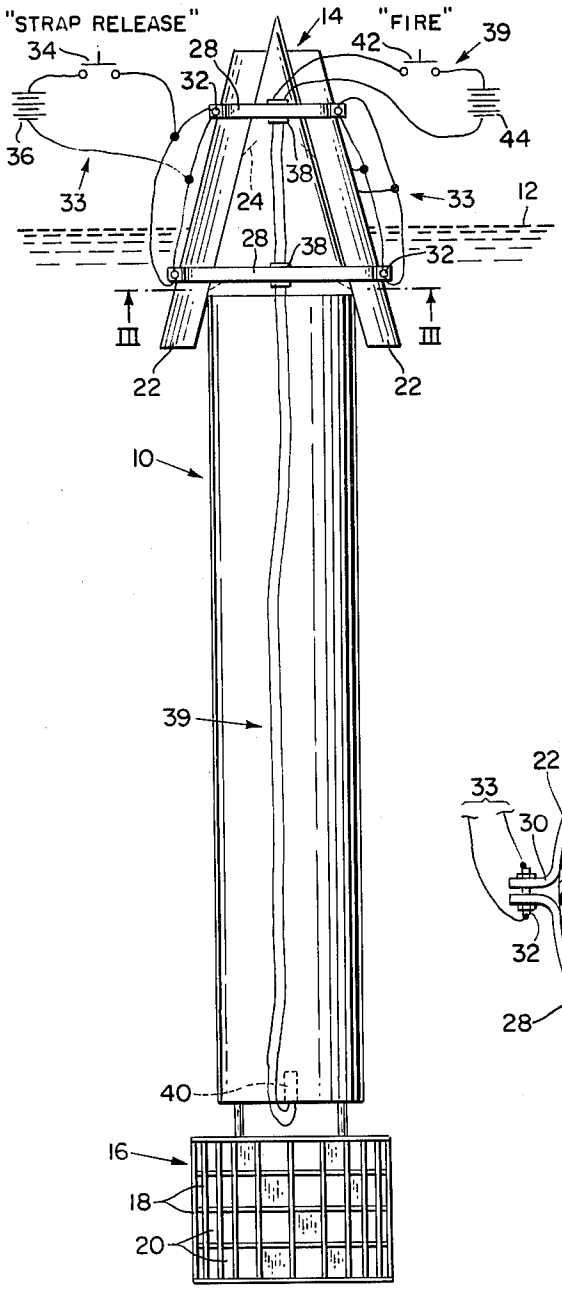


Fig. 1

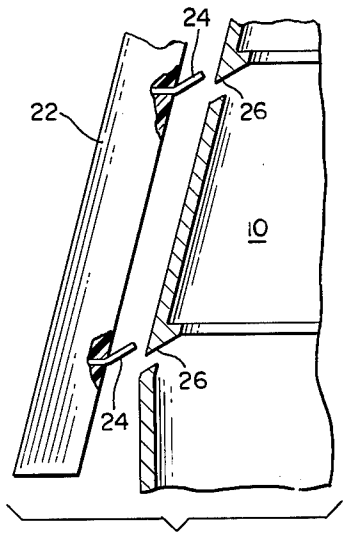


Fig. 2

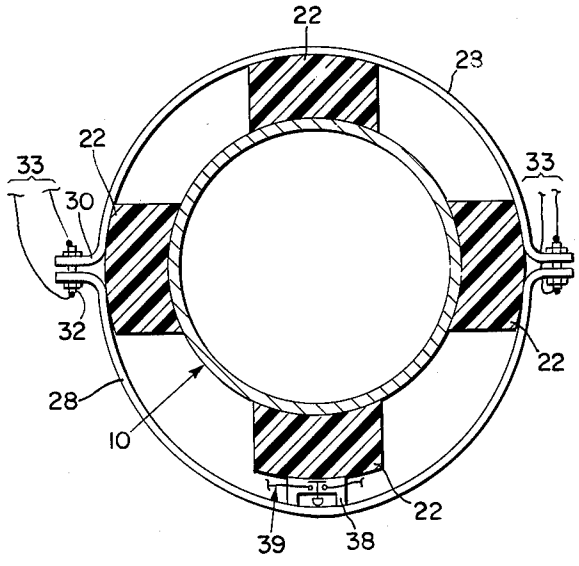


Fig. 3

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FORWARD FLOTATION MEANS FOR A WATER-LAUNCHABLE MISSILE

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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 flotation means and more particularly to a flotation means suitable for handling a missile to be launched from a body of water at which time the flotation means is separable from the missile.

The "Hydra" concept of launching a missile in a floating condition from a body of water, is exemplified by U.S. Patent No. 3,077,143 issued to Draim and Stalzer, and the advantages of this type of missile launching are fully described therein.

A flotation means is necessary for conducting a "Hydra" type missile launch for one or more of several reasons. Firstly, especially with extremely large type missiles, it may be desirable, if not necessary, to tow the missile through the water to the launching site. The flotation means can be one of two types, namely, a forward flotation means attached to the forward or nose end of the missile, and an aft flotation means attachable to the motor end of the missile. Both the forward and aft flotation means enable the missile to be towed in substantially a horizontal position, which is the preferred towing orientation.

The present invention concerns the forward flotation means. Another purpose for the forward flotation means is to float the missile in the water in the desired upright position for launching, which is required for those missiles having a specific gravity greater than one, and which otherwise would sink in the water.

The forward flotation means differs from the aft flotation means primarily in the manner of separation from the missile at the time of launching. The aft flotation is usually appended to the nozzle end of the missile where it is used for both flotation purposes during towing, and, thereafter, for ballasting the missile upright in the launching position. Separation of the aft flotation may be by separable connectors i.e. explosive bolts or by the force of rocket exhaust blast, and since it does not lie directly in the path of the missile presents no unique problem.

However, the forward flotation means does represent a problem since it lies in the path of the missile and must be separated from the missile at the time of launch in a manner that will not adversely affect the launching operation and guidance of the missile in flight.

In Patent 3,077,143 there is disclosed two types of forward flotation means. One type is a doughnut-shaped float on which the missile rests by means of a plurality of spaced leg braces mounted on the missile. Another type of float illustrated in the aforesaid patent is a jacket formed in two halves which encompasses the forward end of the missile and is maintained in position around the missile by frangible connectors i.e. explosive bolts. The explosive bolts are energized at the time of firing to release the float at time of missile launching.

Another technique for maintaining the floats around the missile nose is by nylon straps which were released just prior to launch. If the operation was cancelled it is necessary manually to reapply the nylon straps in a very difficult and dangerous environment. One critical disadvantage of the prior art devices is that the missile could be launched with the forward flotation means inadvertently attached.

The present invention provides a separable forward flotation means for a water launchable missile which incorporates non-stretchable locking straps and an electrical inter-lock circuit which controls the firing circuit of the missile. By the invention device the missile firing circuit is maintained in a de-energized condition until the straps are physically separated and the flotation means unlocked from the missile. This result is achieved by providing "on-off" switches associated with the straps, which switches are connected in the missile firing circuit. The switches are depressed to an "off" position by the pressure of the straps. The straps are detachably locked around both the flotation means and the missile by explosive bolts or the like which are remotely controlled by a suitable electrical circuit.

One object of this invention is to provide an improved forward flotation means for a water launchable missile which will provide a more positive control over missile launching.

Another object is to provide a forward flotation means that will prevent missile launching unless the flotation means are separated from the missile.

A further object is to provide an electrical interlock in the missile firing circuit that will maintain the firing circuit in an "open" condition until the flotation means are separated.

Other objects are to provide a flotation means that will prevent a principle cause of aborted missile launching; and that is simple and inexpensive in construction.

Other objects, advantages and novel features of the invention will become apparent from the following detailed description of the invention when considered in conjunction with the accompanying drawings wherein:

FIG. 1 is an elevation view of a missile having an aft flotation means floating in a launching position in a body of water;

FIG. 2 is an enlarged exploded view of one of the forward flotation members and the missile skin, partially in section, showing the hook means for connection; and

FIG. 3 is a cross-section taken along line III—III of FIG. 1.

Referring to the drawing where like reference numerals refer to similar parts throughout the figures there is shown in FIG. 1 a missile **10**, of the "Hydra" type capable of being launched from a body of water **12**. The missile is provided with a forward flotation means **14** which is detachably secured to the nose or forward end of the missile, and possibly with an aft flotation means **16** which forms no part of this invention. The forward and aft flotation means **14** and **16**, respectively, are used for two reasons, namely, for handling the missile in the water and for stabilizing the missile for launching, as previously described.

The aft flotation means **16** illustrated comprises a cage structure **18** in which is captivated in inflatable rubber bag **20**. Bag **20** can be remotely inflated with air when buoyancy is desired, or deflated for ballast purposes by a suitable mechanism, not shown.

Forward flotation means **14** comprises a plurality of flotation members **22**, which may be generally rectangular block-shaped, constructed of foam plastic or the like designed to provide the necessary flotation for the particular missile involved. Four flotation members are illustrated equally disposed around the missile nose, although it is obvious that more or less could be utilized. Each flotation member **22** is positively connected to the missile nose by two or more hooks **24** inclined upward and fitting into corresponding recesses **26** in the missile (FIG. 2). The weight of the missile acting downwardly and the buoyancy factor of the flotation members acting upward-

ly maintains the hooks in engagement with the recess. However, when the missile is launched in an upwardly direction the flotation members are automatically unhooked and individually fall freely to one side of the missile in the water without adversely effecting the missile trajectory.

Flotation members 22 are also mechanically secured to the missile nose by a pair of straps 28, preferably constructed of metal or other non-stretchable material. The straps are constructed preferably in two or more pieces, each half illustrated provided with lugs 30 at their ends which are secured together under pressure around the missile by an explosive bolt 32 or the like. Explosive bolts 32 are electrically connected together in a circuit 33 which includes a "fire" button 34 and a power source 36 whereby the straps can be separated at a remote control station.

An important aspect of this invention is to prevent launching of the missile with the flotation members intact being secured around the missile, which will cause an aborted or erratic flight. Such a condition is prevented by providing a convention "on-off" electrical switch 38 for each strap, the switches being electrically connected in the firing circuit 39 to rocket motor igniter 40. The firing circuit includes a firing button or switch 42 and a power source 44 for providing the necessary voltage to set off the igniter from the previously described remote station. Switches 38 may be secured to the missile, or preferably secured to the flotation members 22, and in either case are arranged to lie beneath straps. In this position the switches are depressed by the pressure of the straps to an "open" position, as shown schematically in FIG. 3. If either or both of switches 38 are in an "open" position, the firing circuit cannot be energized even if the "fire" button 34 is depressed, preventing missile launching. When the straps are successfully parted by explosive bolts 32, switches 38 are relieved of the strap pressure and are free to close under the spring bias built in the switch to complete firing circuit 39 when firing switch 42 is depressed the missile can be fired with assurance that the forward flotation members will fall free of the missile.

In the launching operation, straps 28 are explosively parted by depressing "strap release" switch 34 just prior to the launching operation. If the straps have been successfully broken apart interlock switches 38 are in a closed condition completing that portion of the firing circuit to "fire" switch 42. Missile igniter 40 will be ignited to launch the missile when "fire" button 42 is depressed. If for any reason any one of straps 28 have not been broken-apart by explosive bolts 32, the respective switch 38 will remain open to maintain the firing circuit in a de-energized condition even though the "fire" button may be depressed.

The present invention provides a simple and inexpensive device for floating a missile in the water during either handling and/or launching operations, and which will have a positive control over the launching operation. By providing an interlock in the firing circuit aborted flights by "hanging up" of the floation means will be avoided. Furthermore, the condition of the straps can be ascertained at a safe and remote location, avoiding the need for close and hazardous inspection just prior to launch.

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 claims the invention may be practiced otherwise than as specifically described.

We claim:

1. Apparatus for launching a missile from the surface of a body of water, said missile having a forward end and an aft end comprising:

forward flotation means for supporting the missile in an upright floating position;

said flotation means including a plurality of segments arranged around the exterior forward end of the missile;

strap-like means for securing said segments to the missile;

means for releasing said straps prior to launching and controllable from a remote firing station so that the flotation segments can be separated from the missile;

interlock means for preventing missile firing if the strap means has not released the flotation segments; whereby a positive control is maintained over the flotation means to prevent missile launching malfunctioning.

2. The apparatus of claim 1 wherein the flotation segments are supported to the missile by a supplement hook means separable by launching of the missile.

3. Apparatus for launching a missile from the surface of a body of water, said missile having a forward end and an aft end comprising:

forward flotation means for supporting the missile in an upright floating position;

said flotation means including a plurality of segments arranged around the exterior forward end of the missile;

non-stretchable strap-like means for securing said segments to the missile;

explosive means for releasing said straps prior to launching and controllable from a remote firing station so that the flotation segments can be separated from the missile;

interlock means for preventing missile firing if the strap means has not released the flotation segments; whereby a positive control is maintained over the flotation means to prevent missile launching malfunctioning.

4. Apparatus for launching a missile from the surface of a body of water, said missile having a forward end and an aft end comprising:

forward flotation means for supporting the missile in an upright floating position;

said flotation means including a plurality of segments arranged around the exterior forward end of the missile;

non-stretchable strap-like means for securing said segments to the missile;

explosive means for releasing said straps prior to launching and controllable from a remote firing station so that the flotation segments can be separated from the missile;

interlock switch means actuated by the strap means for preventing missile firing if the strap means has not released the flotation segments; whereby a positive control is maintained over the flotation means to prevent missile launching malfunctioning.

5. The apparatus of calim 4 wherein said interlock switch is connected in the missile launching firing circuit.

6. The apparatus of claim 4 wherein a plurality of straps are provided, and each strap is provided with an interlock switch.

7. Apparatus for launching a missile from the surface of a body of water, said missile having a forward end and an aft end comprising:

flotation means for supporting the missile in an upright floating position;

said flotation means including a plurality of segments arranged around the exterior forward end of the missile;

said flotation means having hooks for engaging the missile in a launch position only;

non-stretchable strap-like means for encircling and for supplementing the securing said segments to the missile;

explosive bolt means for releasing said straps prior to

launching and controllable from a remote firing station so that the flotation segments can be separated from the missile;

interlock switch means actuated by the strap means and connected in the launching firing circuit for preventing missile firing if the strap means have not separated;

whereby a positive control is maintained over the flotation means to prevent missile launching malfunctioning.

8. The apparatus of claim 7 wherein said explosive bolt is electrically connected in a strap-release circuit for controlling the igntion at a remote station.

No references cited.

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