June 2, 1964 N. KAMALIAN 3,135,162

WATER-BORNE MISSILE LAUNCHER

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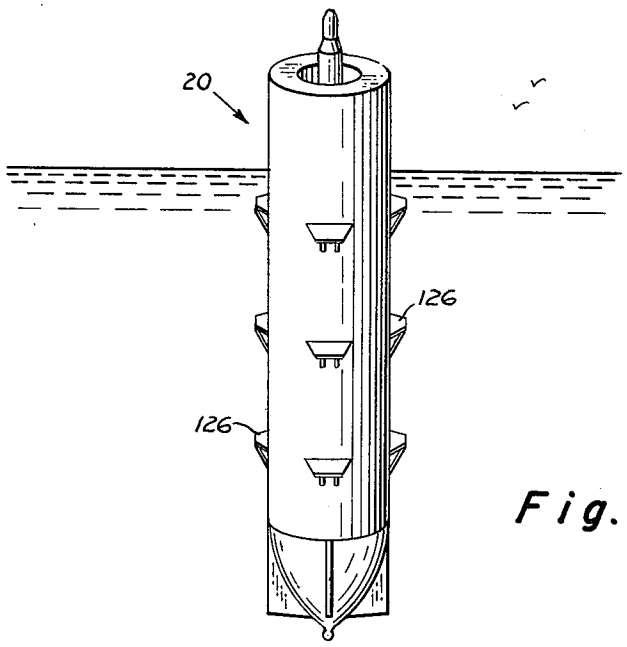
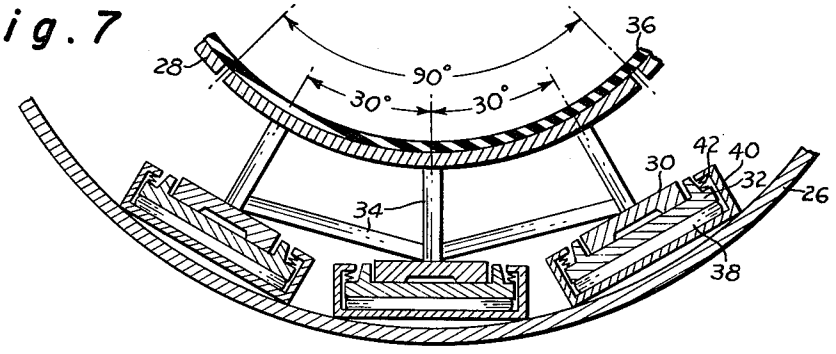


Fig. 1

Fig. 7



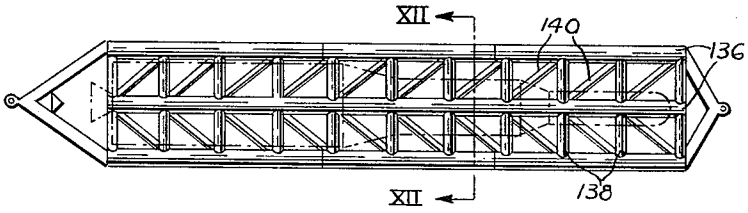
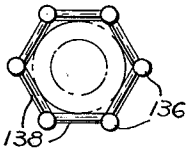


Fig. 11

Fig. 12



INVENTOR.
NEUBAR KAMALIAN
BY Erwin T. Johnston
George J. Rubens
ATTORNEYS

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3 Sheets-Sheet 2

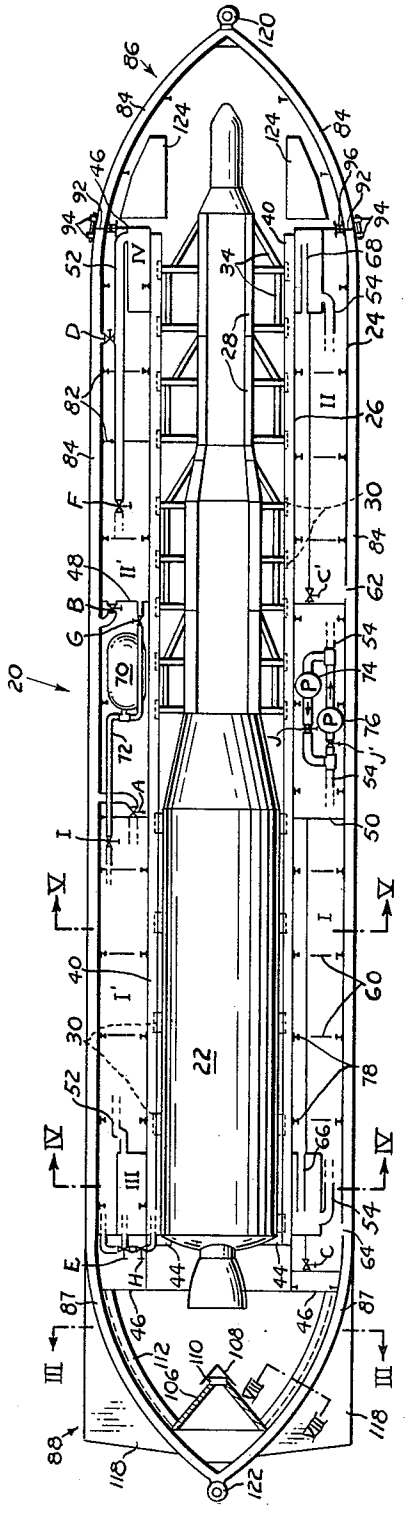


Fig. 2

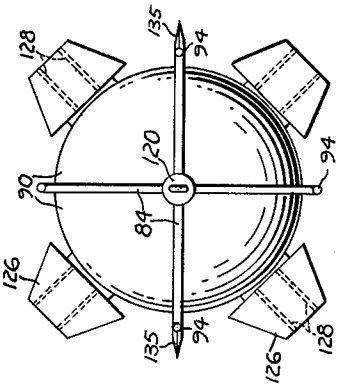


Fig. 6

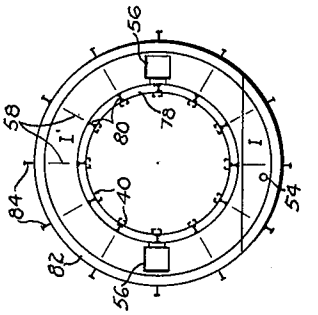


Fig. 5

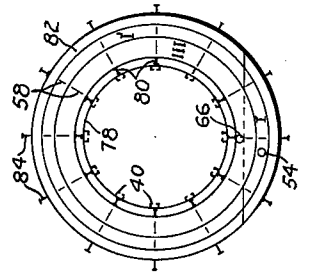


Fig. 4

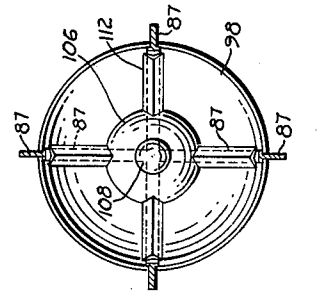


Fig. 3

INVENTOR.
NEUBAR KAMALIAN
BY Ervin A. Johnston
George J. Rubens
ATTORNEYS

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WATER-BORNE MISSILE LAUNCHER

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3 Sheets-Sheet 3

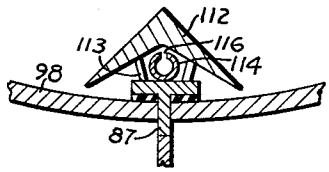


Fig. 8

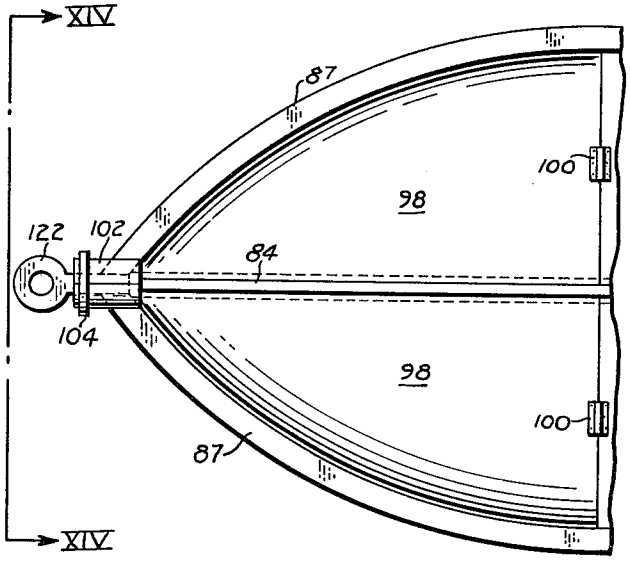


Fig. 13

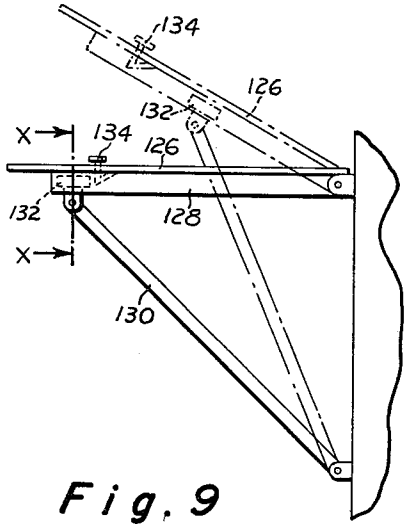


Fig. 9

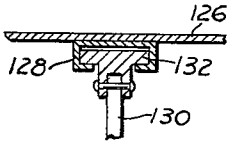


Fig. 10

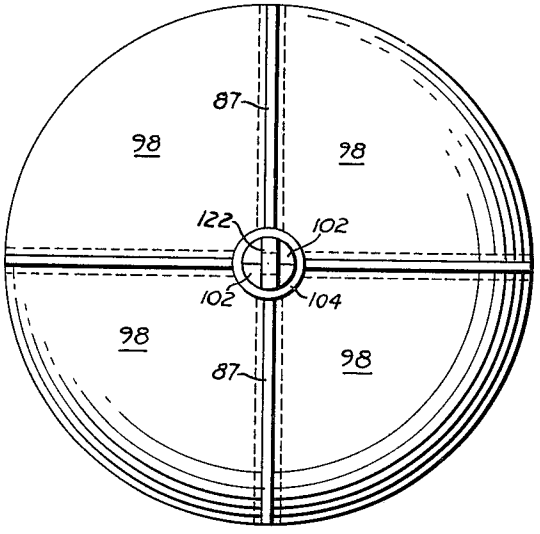


Fig. 14

INVENTOR.
NEUBAR KAMALIAN
BY Erwin T. Johnston
George J. Rubens
ATTORNEYS

United States Patent Office 3,135,162 Patented June 2, 1964

3,135,162

WATER-BORNE MISSILE LAUNCHER

Neubar Kamalian, 1260 S. Westgate, Apt. 2, Los Angeles 25, Calif.

Filed Nov. 27, 1961, Ser. No. 155,215
21 Claims. (Cl. 89—1.7)
(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 water-borne missile launcher and more particularly to a missile launcher which is capable of orientating the missile for handling purposes such as towing and uprighting the missile in the water for launch purposes.

It has been found that in launching missiles from the sea that it is desirable that the missile be protected structurally from the damaging effects of wave action, that it be protected from the corrosive environment of the salt water and that there be a means of allowing a checkout of the various stages of the missile just prior to its launch. Further, it is desirable to be able to orientate the missile in various positions for towing and launching purposes. The present invention provides a launching device which will orient the missile in a horizontal position for towing purposes and in an upright position for launching purposes through the selective control of ballast tanks by an operator either at the launching device or at some remote station. In the preferred embodiment of the invention the launching device provides a structural protection for the missile, provides for a last-minute checkout of the various stages of the missile by inspection access passages outside the missile and further provides for the protection of the missile from the corrosive environment of the sea until just prior to its launching. Accordingly, the preferred embodiment of the invention now makes it feasible to launch liquid-propellant rockets from the sea.

In the preferred embodiment of the invention an inner tube is used to house the missile and an outer tube is spaced from the inner tube to house ballast tanks and other hardware. The top and bottom ends of the tubes are closed off by separable closures which are removed at the time of launch. In the other embodiment a plurality of cylindrical tubes are individually spaced about the missile and each tube has compartments which are adapted to be ballasted so as to orient the missile at any desired position in the water. Both embodiments employ track-train combinations between the tube in the preferred embodiment and the tubes in the other embodiment which will guide the missile toward an intended trajectory after launch. In order to cushion the missile within the tube or tubes an air bladder made of rubberized fabric runs the full length of each track which upon inflation will pneumatically protect the missile. A thrust deflector is provided on the bottom end of the launching device of a particular size and shape so that upon firing the missile the exhaust from the rocket motor will impinge upon the thrust deflector and provide a downward force on the launching device which is equal to the weight of the missile, thus causing the launching device to maintain its position in the water when the missile commences to leave the launching device. The spaces between the tubes in the preferred embodiment or the tubes themselves in the other embodiment are divided into trim tanks which are located at least one forward and one aft of the launching device and roll tanks which are located to one side of the missile with means for selectively taking on and discharging ballast so that the missile can be oriented. In the preferred embodiment there are access passages housed between the inner and outer tubes and

from the passages there are inspection hatches at which all missile interstage locations can be inspected for thrust-vectoring alignment. Further, in the preferred embodiment the bottom end of the launching device is ogive-shaped and is divided into a plurality of doors which are frangibly held together so that upon launching the missile the exhaust force therefrom will break the frangible connection and open the doors to allow the exhaust from the missile to be impinged directly into the water. Also, the preferred embodiment has water-cooling means at the bottom end to protect the thrust deflector and supporting framework.

An object of the present invention is to provide a device for launching a missile from water which will orient the missile in a horizontal position for towing purposes and an upward position for launching purposes.

Another object is to provide a device for launching a missile which will structurally protect the missile prior to launch whether on land or at sea.

A further object is to provide a device of minimum size which will protect a large missile from corrosive environments of water and at a preselected time allow the launch of the missile.

Still a further object of the invention is to provide a device which will facilitate the handling and launching of a missile from water.

Still another object is to provide a device which will support a missile in water and upon launch of the missile will guide the missile from the device.

Yet another object is to provide a device for launching a missile from water which will allow a last-minute checkout along the full length of the missile just prior to launching.

A still further object is to provide a compact device for launching a missile from water, which device will be reusable after the launching of the missile.

Other objects and many of the attendant advantages of this invention will be readily appreciated as the same become better understood by reference to the following detailed description when considered in connection with the accompanying drawings in which like reference numerals designate like parts throughout the figures thereof and wherein:

FIG. 1 is a perspective view of the missile ready for launch from the preferred embodiment of the invention.

FIG. 2 is a diagrammatic view partially in cross section of the preferred embodiment of the invention.

FIG. 3 is a cross section taken along line III—III of FIG. 2.

FIG. 4 is a cross section taken along line IV—IV of FIG. 2.

FIG. 5 is a cross section taken along line V—V of FIG. 2.

FIG. 6 is a top view of the preferred embodiment of the invention.

FIG. 7 is a cross-sectional view of the track-train combination usable in both embodiments.

FIG. 8 is a cross-sectional view taken along line VIII—VIII of FIG. 2.

FIG. 9 is a side view of one of the dampening plates.

FIG. 10 is a cross-sectional view taken along line X—X of FIG. 9.

FIG. 11 is another embodiment of the invention.

FIG. 12 is a cross-sectional view taken along line XII—XII of FIG. 11.

FIG. 13 is an enlarged side view of the bottom end of the preferred embodiment of the invention.

FIG. 14 is an end view of the preferred embodiment of the invention taken along line XIV—XIV of FIG. 13.

Referring now to the drawings wherein like reference numerals designate like or corresponding parts through-

out the several views there is shown in FIG. 2 a launching device **20** containing a three stage missile **22**. The launching device has an outer tube **24** which is spaced from an inner tube **26**, the inner tube also being spaced from the outer surface of the missile. The missile **22** is supported in a horizontal position within the inner tube **26** by a plurality of cradles **28**, each of which has a plurality of trains **30** for riding in tracks **32**, the details of which are shown in FIG. 7. Each of the cradles **28** extends along the missile and a little less than 90° thereabout resulting in four cradles about the missile as seen in any cross section of the missile and launching device. The cradles for the second and third stages of the missile are fixed to the trains **30** by support members **34**.

The missile is cushioned within the inner tube **26** by a cushion **36** between the cradles **28** and the missile and by an air bladder **38**, the latter being made of material such as rubberized fabric. Each track **32** and air bladder **38** combination is contained within a formed metal housing **40** which is fixedly attached to the inner tube **26**. Each track is resiliently biased away from the missile by a series of compression springs **42** and each of the tracks are resiliently biased toward the missile by the air bladders **38** when they are filled with air. Accordingly, upon loading the missile within the launching device or when launching the missile from the launching device all air is exhausted from air bladder so that the trains **30** will travel easily with respect to the tracks **32** and when the missile is to be transported or positioned for launching the air bladder is filled with air so as to hold the track and train combination rigid and yet give a resilient support to the missile. It is intended that either the trains **30** or tracks **32** be surfaced with a good slidable material such as Teflon. As seen from FIG. 2 the cradles for the first stage of the missile require no support members **34** because of their proximity to the inner surface of the inner tube **26**. The bottom end of the inner tube **26** has an inwardly-directed annular lip **44** which extends a sufficient distance to adequately support the missile in an upright position within the launching device **20** as shown in FIG. 1. Accordingly, the missile can be supported in all positions from a horizontal to a vertical position within the launching device **20**.

The space between the outer tube **24** and the inner tube **26** is sealed by top and bottom annular ring plates **46** and this space is divided into an upper space by an annular ring plate **48** and a lower space by another annular ring plate **50**. The upper and lower spaces are again divided into substantially identical ballasting tanks, the details for the lower space being shown in FIGS. 4 and 5. The upper space has a large annular tank II' which corresponds to a large annular tank I' of the lower space. Imposed within the tanks I' and II' are annular trim tanks, IV within the upper space and III within the lower space, these trim tanks III and IV communicating with one another through conduits **52** and **54** both of which extend along the launching device. Further imposed within the annular tanks I' and II' are roll tanks II within the upper space and I within the bottom space. Extending a good portion the length of the missile are access passages **56** having ladders (not shown) and access hatches (not shown) for conducting a last-minute checkout of the missile prior to launch. Disposed with the tanks are longitudinally extending baffles **58** and transverse baffles **60**.

The roll tanks I and II are in communication with the exterior of the launching device via openings **62** and **64** within the outer tube **24**. The tank I' is in communication with the exterior of the launching device **20** by a solenoid-operated valve A and the tank II' is in communication with the exterior of the launching device in the same manner by a solenoid-operated valve B. Tank I communicates with tank I' through a solenoid-operated valve C and tank II communicates with tank II' through a solenoid-operated valve C'. Tank III communicates with tank I' through a conduit **66** and tank IV communicates with tank II' through a conduit **68** and both tanks III and IV are in communication with the exterior of the launching device **20** by a solenoid-operated valve D. Located in the space between the tanks I' and II' is a high-pressure air tank **70** which has an air line **72** capable of delivering air to tanks I' and II', trim tanks III and IV and the air bladders **38**. A solenoid-operated valve E controls the air to trim tanks III and IV and a solenoid-operated valve F controls the communication between tanks III and IV. A solenoid-operated valve G controls the introduction of air from tank **70** into tank II' and a solenoid-operated valve H controls the introduction of air from the tank into the air bladders **38**. Located within the air line **72** is a solenoid-operated valve I which will allow the selective control of air to tank I' and trim tanks III and IV. Interposed in the conduit **54** are a pair of centrifugal pumps **74** and **76** which are capable of pumping in opposite directions with respect to the longitudinal axis of the missile, these pumps having corresponding solenoid-operated valves J and J' for controlling the transfer of ballast between the trim tanks III and IV.

The inner tube **26** is made structurally rigid by a series of circular I-beams **78** around its circumference and a series of I-beams **80** along its length, the I-beams **78** being sectioned between the I-beams **80**. The outer tube **24** is made structurally rigid by a series of I-beams **82** about its circumference and a series of I-beams **84** along its length.

Four of the I-beams **84** are curved to form a frame for a nose end **86** of the launching device and curved T-beams **87** integral with the I-beams **84** are extended to form a bottom end **88** of the launching device. The nose end **86** is enclosed by curved plates **90** which are located between the I-beams **84**. The I-beams **84** are broken and abut one another at joints **92** and are releasably attached together at the joint by bolted dogs **94** so that the nose end **86** can be removed from the remainder of the launching device. Two of the circular I-beams **82** are located adjacent the joint **92** and a gasket **96** such as rubber is interposed between the flanges of each of the I-beams so as to provide a sealing engagement between the nose end **86** and the remainder of the launching device when the nose end is bolted down.

The bottom end **88** of the launching device has four dome-shaped plates **98**, each of which is interposed between the T-beams **87** so as to conformably mate against the flanges thereof and each is hinged to the outer tube **24** by a hinge **100**. The aft end of each plate **98** has a quarter-section hub **102**. About the quarter-section hub **102** is a frangible strap **104** which presses the quarter-section hubs **102** together so as to retain the plates **98** in a closed position. Fixedly attached to the T-beam **87** structure is a hollow frustum exhaust deflector **106**. A conical-shaped exhaust deflector **108** is rigidly attached to the exhaust deflector **106** by rods **110**. Extending along the inside flange of each of the T-beams **87** is a triangular protective cap **112**, the details of which are shown in FIG. 8. The protective caps are fixedly spaced from the T-beams **87** by rods **113** and have their ends fixed to the plate **46** and the exhaust deflector **106**. A pipe **114** having a series of openings **116** extends along between each protective cap **112** and T-beams **87** combination. The pipe **114** extends through the exhaust deflector **106** and is supported thereby and has open ends for the passage of water therethrough.

Fixedly attached to each of the T-beams **87** at the bottom end **88** is a fin **118** and attached to the extreme ends of the I-beams **84** and the T-beams **87** are eyes **120** and **122** respectively for towing the missile in the water. Towing from the nose end **86** can be further facilitated by tow lines attached to the webs of the I-beams **84** aft of the joints **92**, these lines being brought together to an eye forward of the eye **120**. Located in the nose end **86**

are air conditioners **124** for maintaining a constant temperature within the launching device.

As shown in FIGS. 1 and 6 a plurality of dampening fins **126** are rotatably mounted on the exterior of the outer tube **24**, the details of these fins being shown in FIGS. 9 and 10. Each dampening fin is supported by tracks **128**, each track in turn being positioned by a brace member **130**. Each brace member **130** has a train **132** which rides in a corresponding track **128** so that the dampening fin **126** can be raised and lowered with respect to the outer tube **24**. A spring clip **134** mounted inside each track **128** retains the dampening fin **126** in a lowered position. Hydro-fins **135** are rotatably mounted one on each side of the launching device for controlling the attitude of the device when towing it in a horizontally submerged condition. Motors for driving the hydrofoils can be located within the nose end **86**.

Another embodiment of the invention is shown in FIGS. 11 and 12 wherein six tubes **136** are axially aligned with the missile and are joined together by cross members **138** and brace members **140**. The removal of the nose end, the arrangement of the tanks, the exhaust reflectors, the valving and the pumps for this embodiment are essentially the same as shown for the preferred embodiment.

In the operation of the preferred embodiment the missile is loaded into the launching device in a horizontal position with the cradles **28** in place on the missile and then the trains **30** are slid along the tracks **32**. After the loading of the missile in the launching device the nose end **86** of the launching device is positioned and the dogs **94** are bolted on so as to completely seal the missile within the launching device. The solenoid-operated valve H is then opened so as to allow air to enter the air bladders **38** so that the missile will in effect "ride on air" within the launching device. The missile is then ready for transportation on land or in water and for launching from a water site. To float the launching device with the missile in the water in a horizontal position valves D, C, C′ and F are open so that water will enter through openings **62** and **64** thus allowing roll tanks I and II to fill up with the air exhausting through valve D. After a sufficient amount of weight has been added to the launching device by the taking on of water these valves are then closed so as to maintain the launching device at a predetermined depth in the water. The launching device with the missile therein is then towed to a suitable launching location in the water and is then uprighted by opening valves A, C, C′ and G. The opening of G puts air into tank II′ which in turn communicates with tank II through valve C′ so as to drive the water through opening **62**, thus lightening the load at the nose end of the launching device. At the same time the bottom end of the launching device takes on water through opening **64** by allowing air to be discharged through valve A. After a sufficient amount of water has been taken on and discharged all of these valves are then closed. The nose end **86** is then removed from the launching device and the dampening fins **126** are put into a horizontal position so that the launching device and missile will appear essentially as that shown in FIG. 1. Just prior to launch the missile can have last-minute checkouts by personnel making their checks along the missile by climbing along the access passages **56**. At a preselected time the missile is then fired with the exhaust from the nozzle of the missile impinging downwardly into the bottom end **88**. The force of the exhaust of the missile immediately breaks the frangible strap **104**, thus releasing the quarter-section hubs **102** and forcing the plates **98** to rotate on their hinges **100** and spread apart. The force of the exhaust is then directed on the exhaust deflectors **106** and **108** and into the water. Because of the shape of the thrust deflectors the downward force on the launching device due to the exhaust of the missile impinging upon the deflectors causes the launching device to retain its position in the water rather than riding up by its own buoyancy as the missile moves away. Cooling action commences immediately at the bottom end **88** of the launching device by the surrounding water being forced up by a venturi effect into the exhaust deflector **106** and against the inside of the exhaust deflector **108** after which it is deflected back over the exterior surface of the exhaust deflector **106**, thus cooling the surface which is exposed to a tremendous heat. Also, by the venturi effect water is drawn up into the pipe **114** and is sprayed out through openings **116** against the protective cap **112** after which the water is deflected back over the flange of the T-beam **84**.

Because of the arrangement of the valving of the launching device the missile can be oriented in any position that is desired within the water. For instance, to sink the launching device and missile valves A, B, C, C′, D and F would be open and after sinking a predetermined distance the sinking action can be neutralized by closing valves A, B, D and opening valves C, C′, E and F. If it were desired then to go from a neutral position to a sinking position once again valve E would be closed and valves C, C′, D and F would be open. In order to surface the launching device valves A, B and D would be closed and valves C, C′, E, G, F and I would be opened. If it is desired to trim the launching device in a horizontal position valves A, B, C, C′ and D would be closed and either valve J or J′ would be open with the corresponding pump **74** or **76** in operation. This would result merely in the transfer of ballast between the tanks III and IV as desired. In order to trim the launching device in a vertical position the same valves J or J′ would be opened with their corresponding pumps in operation. In order to go from a vertical position to a horizontal position valves A and F would be closed and valves C, C′, D and I would be opened. The operation of the other embodiment shown in FIGS. 11 and 12 would be essentially the same as that described for the preferred embodiment. The operation of the valves and the pumps can be controlled at some remote station (such as a towing ship) through an umbilical cord or radio control.

It is now readily apparent that the present invention solves many of the problems of launching a missile from water such as structurally protecting the missile, providing the missile with protection from the corrosive environments of the sea, enabling last-minute checkouts of the missile prior to launch, easy transportation of the missile over the water and great flexibility in handling and launching the missile in the water.

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.

I claim:

1. A device for launching an elongated missile which has a nose end, a base end with an exhaust nozzle and a side extending between said nose and base ends, said device comprising means for supporting the missile along its side so that the missile can be oriented in a horizontal position, means connected to the side supporting means for supporting the missile at its base end so that the missile can be oriented in an upright position, the base end supporting means being located outside of the path of exhaust gases from said nozzle so that upon firing the missile pressure from the exhaust gases is not confined thereby, means included in the side supporting means for guiding the missile in the direction in which the nose end is pointed upon firing the missile from the device, a plurality of tanks attached to the supporting means with an aggregate volume which will displace enough water to float the device while it is supporting the missile in the water, means for selectively ballasting said tanks, at least a portion of said tanks being positioned from one another lengthwise with respect to the missile when the missile is

supported by the launching device so that upon selectively ballasting these tanks the launching device will cause the missile to assume various attitudes with respect to the earth's surface whereby upon launching the missile in a desired attitude the guide means will direct the missile from the launching device in a direction in which the nose end of the missile is pointed.

2. A device as claimed in claim 1 wherein the tanks further have a weight and an aggregate volume with respect to the weight of the missile in combination with the launching device such that when the tanks are completely filled with water the missile and launching device will sink in the water.

3. A device as claimed in claim 1 including another portion of said tanks located off to one side of the missile when the device is supporting the missile so that upon ballasting said latter portion of tanks roll of the missile can be controlled when the missile is oriented on its side in the water.

4. A device as claimed in claim 1, including means capable of receiving a blast from the motor nozzle end upon launching the missile for exerting a force on the launching device substantially equal to the weight of the missile.

5. A device for launching a missile which has a reaction-type motor in which exhaust gases are produced during operation, the missile having a nose end and a motor nozzle end and being launchable in an upward position from a body of water, said device comprising means adapted to at least partially contain the missile and support the missile between an upright position and a horizontal position with respect to the earth's surface, said container means having an open bottom end with a separable closure member, means destructible by the force of the exhaust gases for closing the bottom end with said closure member, means for free floating only the launching device with the missile contained therein in a body of water with the bottom end submerged in the water whereby upon firing the missile the exhaust gases destroy the closing means and open the bottom end of the container allowing the exhaust gases to emit into the body of water so that the force of the exhaust gases is dissipated therein without damage to the missile or the launching device, said floating means comprising a plurality of tanks which have an aggregate volume which will displace enough water to float the launching device containing the missile in the water, at least a portion of said tanks being positioned in different locations along a dimension parallel to the longitudinal axis of the missile when supported by the device and means for selectively ballasting these tanks so that the missile can be made to assume various depths within the water.

6. A device as claimed in claim 5 wherein at least a portion of the tanks are located to one side of the missile when supported by the device and means for ballasting and discharging these tanks whereby the missile can be made to float on its side.

7. A device for launching an elongate missile which has a nose end and a motor nozzle end said device comprising an elongate tube adapted to be spaced about the missile and extending therealong with top and bottom ends corresponding to the nose end and nozzle end respectively of the missile, means located near the bottom end of the tube adapted to support the missile from its motor nozzle end so that the missile can be stood upright within the tube, a plurality of track-train combinations located in the space between the tube and the missile when the device is supporting the missile, means for mounting the tracks longitudinally along an inner wall of the tube, means between the mounting means and the track for biasing the track toward the tube, means between the tube and the track for adjustably biasing the track resiliently toward the missile when the device is supporting the missile so that the adjustable biasing means can be relaxed when the missile is being placed within the tube and tensed to hold the missile in place and cushion it from shock, a plurality of cradles shaped to the outer surface of the missile and fixedly attached to the trains for supporting the missile within the tube whereby the missile can be transported with safety by tensing the adjustable biasing means and can be launched from the tube by relaxing the adjustable biasing means and then firing the missile with the missile being guided by the guide means in the direction in which it is pointed.

8. A device as claimed in claim 7 including means for floating the missile when supported by the device in a body of water and means for selectively varying the center of gravity of the device so that the missile can be positioned in any position from upright to upside down in the water and means for maintaining roll stability of the apparatus when the missile in positioned horizontally by the device so that the missile can be easily towed in the water.

9. A device as claimed in claim 8 wherein the floating means includes a second tube spaced from an outside wall of the first-mentioned tube and substantially aligned therewith, means for sealing off the space between the tubes, said means for varying the center of gravity including means for dividing said space into a plurality of tanks which are positioned in different locations along a length of the missile when supported by the device, means for taking on and discharging water from each tank and said roll stabilizing means including means for forming within said space a tank to one side of the missile and means for taking on and discharging ballast from the tank to one side of the missile.

10. A device as claimed in claim 9 including means capable of being opened by an exhaust from the missile upon firing for enclosing the bottom end of the first tube so as to seal off a bottom end of the space between the first tube and the missile when the missile is supported by the device.

11. A device as claimed in claim 10 wherein the means for enclosing the bottom end of the first tube is a dome-shaped member split through the apex of the dome into at least two sections, means for hinging each section to the second tube and means breakable by the exhaust upon firing the missile for retaining the sections in a closed dome-shaped position.

12. A device as claimed in claim 11 including a hollow frustum having opposite open ends, means for fixing the frustum member to the second tube with its virtual apex adapted to be pointed toward the nozzle end of the missile and with its central axis adapted to be substantially aligned with the longitudinal axis of the missile, a hollow cone-shaped member having its base open, means for fixing the cone-shaped member to the frustum member with its apex adapted to be pointed toward the nozzle end of the missile and with its central axis adapted to be substantially aligned with the longitudinal axis of the missile and said latter means also positioning the cone-shaped member so that it has a base edge spaced from an exterior surface of the frustum member and so that the virtual apex of the frustum member is located within the hollow space of the cone-shaped member whereby after firing the missile water can be drawn through the frustum member and deflected back by the cone-shaped member over the exterior surface of the frustum member so as to provide cooling.

13. A device as claimed in claim 12 wherein the frustum member and the cone-shaped member are of such a size and shape that upon firing the missile from the device in upright position in the water the exhaust impinging on the members will exert a downward force component substantially equal to the weight of the missile so that upon the missile commencing to depart from the first tube on its own power the remainder of the apparatus will substantially maintain its depth in the water.

14. A device as claimed in claim 13 wherein the means for fixing the frustum member to the second tube are T-

beams curved to conform to the dome-shaped member and positioned with the flanges of the beams facing inwardly so that the web of the beam and the flange will provide a seat on each side of the web for said sections of the dome-shaped member and a gasket material between the flange and the sections for providing a seal.

15. A device as claimed in claim 14 including a deflector for each T-beam having a curve conforming to the curve of the beam and means for mounting the deflector so that it is spaced substantially equally along one side thereof from the flange of the T-beam and a conduit having open ends extending along in the space between the flange and the deflector, said conduit having a plurality of openings facing toward the deflector whereby after firing the missile water is drawn up in the conduit and is discharged through said openings and is deflected back over the T-beams for cooling purposes.

16. A device for handling and launching an elongate missile from a body of water wherein the missile has a nose end, a base end with an exhaust nozzle and a side extending between said nose and base ends comprising: means for supporting the missile along its side so that the missile can be oriented in a horizontal position; means connected to the side supporting means for supporting the missile at its base end so that the missile can be oriented in an upright position; the base end supporting means being located outside of the path of exhaust gases from said nozzle so that upon firing the missile pressure from the exhaust gases is not confined thereby; and said device having means for floating the device with said missile in the body of water and orienting the missile in the upright position; whereby the missile can be oriented in the horizontal position for handling purposes and launched vertically from the water while oriented in the upright position.

17. A device for handling and launching an elongate missile from a body of water wherein the missile has a nose end, a base end with an exhaust nozzle and a side extending between said nose and base ends comprising: means for supporting the missile along its side so that the missile can be oriented in a horizontal position; means connected to the side supporting means for supporting the missile at its base end so that the missile can be oriented in an upright position; the base end supporting means being located outside of the path of exhaust gases from said nozzle so that upon firing the missile pressure from the exhaust gases is not confined thereby; said device having means for floating the device with said missile in the body of water and orienting the missile in the upright position; and means included in said side supporting means for guiding the missile vertically when said missile is oriented in the upright position, whereby the missile can be oriented in the horizontal position for handling purposes and launched vertically from the water while oriented in the upright position.

18. A device for handling and launching an elongate missile from a body of water wherein the missile has a nose end, a base end with an exhaust nozzle and a side extending between said nose and base ends comprising: means for supporting the missile longitudinally along its side at a plurality of locations about the missile so that the missile is substantially confined transversely and can be oriented in a horizontal position; means connected to the side supporting means for supporting the missile at its base end so that the missile can be oriented in an upright position; the base end supporting means being located outside of the path of exhaust gases from said nozzle so that upon firing the missile pressure from the exhaust gases is not confined thereby; a plurality of tanks connected to the side supporting means; means for selectively ballasting said tanks; said tanks being located on the supporting means so that the device while supporting the missile can be floated in the water and located so that upon selectively ballasting the tanks the missile can be positioned either horizontally or in an upright position in the water; and means included in said side supporting means for guiding the missile vertically when said missile is fired in the upright position, whereby the missile can be oriented in the horizontal position for handling purposes and launched vertically from the water when fired in the upright position.

19. A device for handling and launching an elongate missile from a body of water wherein the missile has a nose end, a base end with an exhaust nozzle and a side extending between said nose and base ends comprising: a plurality of elongate tubes; means connecting the tubes parallel to one another and spaced from one another about a central axis so as to receive and support the missile along its side in a horizontal position; means connected to the tubes for supporting the missile at its base end so that the missile can be oriented in an upright position; the base end supporting means being located outside of the path of exhaust gases from said nozzle so that upon firing the missile pressure from the exhaust gases is not confined thereby; means compartmenting the tubes into a plurality of tanks; means for selectively ballasting said tanks; and said tanks being located so that the device while supporting the missile can be floated in the water and located so that upon selectively ballasting the tanks the missile can be positioned either horizontally or in an upright position in the water; whereby the missile can be oriented in the horizontal position for handling purposes and launched vertically from the water when fired in the upright position.

20. A device for launching an elongated missile which has a nose end, a base end with an exhaust nozzle and a side extending between said nose and base ends, said device comprising means for supporting the missile along its side so that the missile can be oriented in a horizontal position, means connected to the side supporting means for supporting the missile at its base end so that the missile can be oriented in an upright position, the base end supporting means being located outside of the path of exhaust gases from said nozzle so that upon firing the missile pressure from exhaust gases is not confined thereby, means included in the side supporting means for guiding the missile in a direction in which the nose end is pointed upon firing the missile from the device, a plurality of tanks attached to the supporting means with an aggregate volume which will displace enough water to float the device while it is supporting the missile in the water, means for selectively ballasting said tanks, at least a portion of said tanks being positioned from one another lengthwise with respect to the missile when the missile is supported by the launching device so that upon selectively ballasting these tanks the launching device will cause the missile to assume various attitudes with respect to the earth's surface, means included in the side supporting means and positioned between the missile and the tanks when the launching device is supporting the missile for resiliently biasing the guide means toward said side of the missile in various degrees, whereby upon launching the missile in a desired attitude the guide means will direct the missile from the launching device in a direction in which the nose end of the missile is pointed.

21. A device for launching a missile which has a reaction-type motor in which exhaust gases are produced during operation, the missile having a nose end and a motor nozzle end and being launchable in an upward position from a body of water, said device comprising means adapted to at least partially contain the missile and support the missile between an upright position and a horizontal position with respect to the earth's surface, said container means including track-train means with the track substantially aligned with the longitudinal axis of the missile for guiding the missile upon launch in a direction in which its nose is pointed, said container means also including means adapted to resiliently bias the guide means toward the missile so as to hold the missile firmly in place in the launching device with a cushioning effect when the missile is to be transported or stored by the

launching device, said container means having an open bottom end with a separable closure member, means destructible by the force of the exhaust gases for closing the bottom end with said closure member, means for free-floating only the launching device with the missile contained therein in a body of water with the bottom end submerged in the water whereby upon firing the missile the exhaust gases destroy the closing means and open the bottom end of the container allowing the exhaust gases to emit into the body of water so that the force of the exhaust gases is dissipated therein without damage to the missile or the launching device.

References Cited in the file of this patent

UNITED STATES PATENTS

1,707,112	Browne	Mar. 26, 1929
2,198,907	Dunajeff	Apr. 30, 1940
2,817,272	Gunder	Dec. 24, 1957
2,844,073	Re et al.	July 22, 1958
2,989,899	Siegel et al.	June 27, 1961
3,074,321	Draim et al.	Jan. 22, 1963
3,077,143	Draim et al.	Feb. 12, 1963
3,080,583	Fuller	Mar. 12, 1963

FOREIGN PATENTS

1,110,465	France	Oct. 12, 1955

OTHER REFERENCES

Aviation Week, Sea Launch Studied for Space Vehicles, vol. 73, No. 24, pp. 69, 73, 75, 79, Dec. 12, 1960.

Aerospace Engineering, Vertical Floating Launch of Rocket Vehicles, vol. 20, No. 6, pp. 12, 13, 46 to 49, June 1961.