April 30, 1963 R. D. RUNG ETAL 3,087,386

ADAPTER FOR MISSILE LAUNCHER

Filed March 23, 1961 2 Sheets-Sheet 1

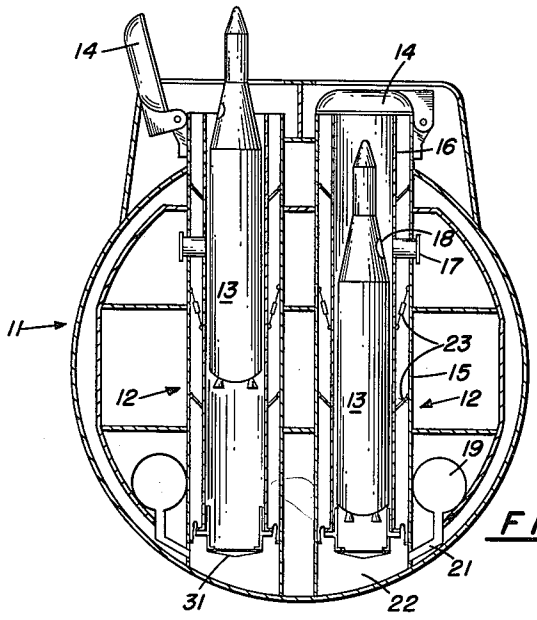


FIG. 1

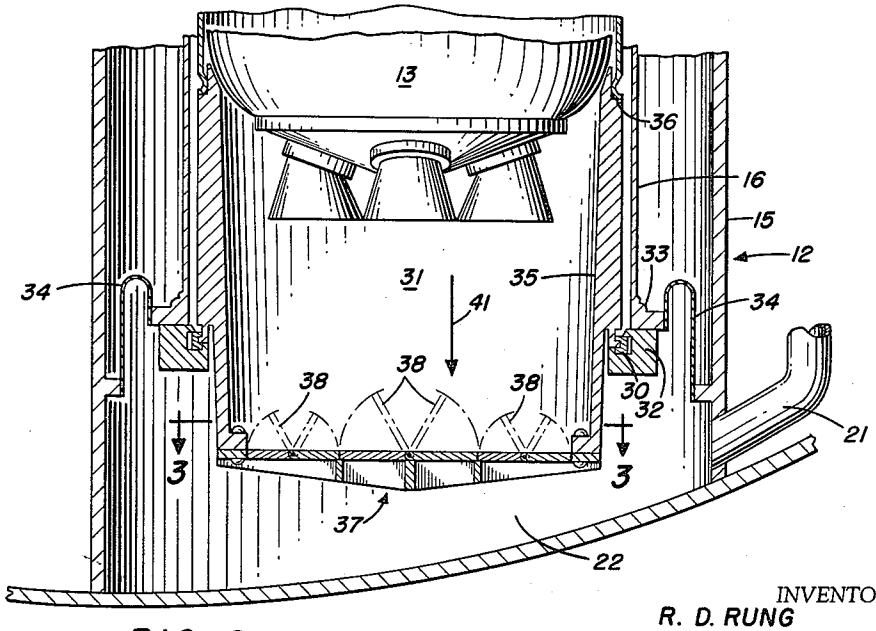


FIG. 2

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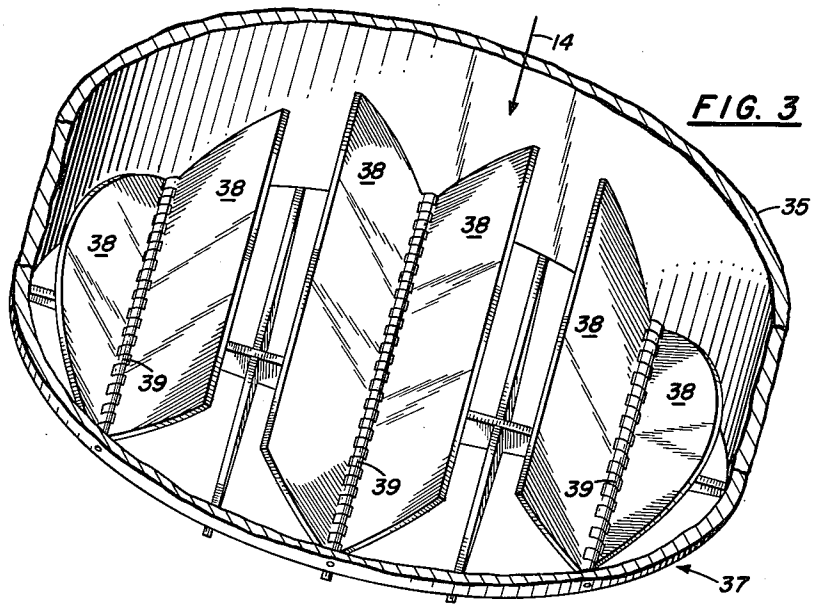


FIG. 3

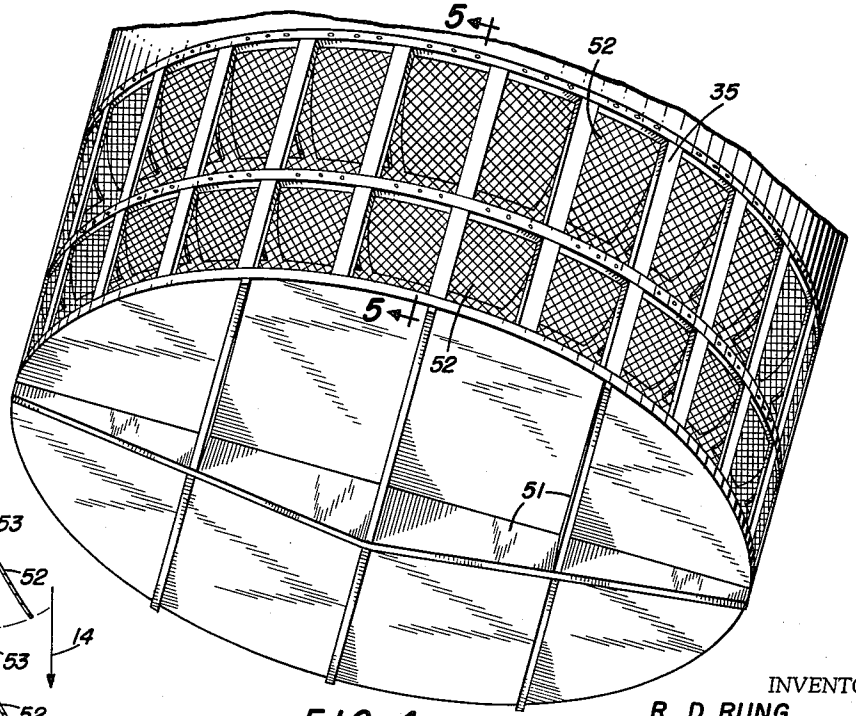


FIG. 4

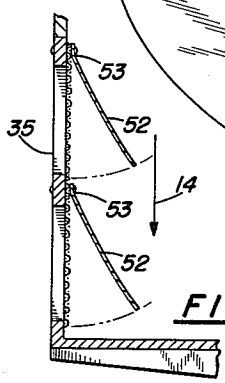


FIG. 5

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ADAPTER FOR MISSILE LAUNCHER

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The present invention relates generally to missile launchers and more specifically to means for adapting a launcher to missiles of various sizes.

With the advent of ballistic missiles came the need for the method of making the missile launching complex invulnerable to surprise attack by enemy missiles and aircraft. Without such invulnerability it would be possible for ballistic missile capability to be completely destroyed before missiles could be launched in a retaliatory action. Further, without means to protect these launching complexes from destruction by enemy attack, they would be unable to fill the primary function of acting as a deterrent to possible enemy surprise attack.

Accordingly, several expedients have been the subject of extensive research and development. The three most prominent of these are firstly, the hardening of launching sites as, for example, by building concrete silos below ground level; secondly, by launching the missile from an airborne aircraft; and thirdly, by launching the missile from a moving ship or land vehicle. This invention finds use primarily in missile launchers of the third category. However, it cannot be said that this invention is inapplicable to the other two categories as it is possible that such a device could be uilized in conjunction with the launching of any ballistic or guided missile.

The missile launching system which is mounted in a vehicle, such as a submarine or truck, is usually provided with a supply of missiles supported in a position which permits rapid firing. Such a vehicle may have a tube launching system which includes one or more missile launching tubes, each having a missile positioned therein. The tube acts as a storing and conveying means as well as launcher. Such launching systems may be constructed in a manner to permit the launching of a relatively large long range missile. However, in certain instances it is desirable for the launching system to launch a missile having a shorter range. Consequently, these missiles are lighter in weight and have a configuration which is shorter than the longer range missiles. Such a missile is constructed with the same diameter of the large missile in order that it may be properly ejected from the missile launching tubes. However, since these missile launching tubes have access doors which are designed to provide an access to the missile guidance package it is necessary to provide means which will raise the smaller missile from the lower end of the launching tube in order that access doors may be aligned with the guidance package of the smaller missile. Further, when the launching vehicle is a submarine, submerged below the surface of the water, it is necessary to constantly maintain the center of gravity of the ship at a common point. Normally, the sea water which fills the tube system subsequent to the launching of a large missile adequately compensates for the weight of the missile. However, when using a smaller missile it is necessary to take aboard a smaller amount of ballast in order not to over-compensate for the weight of the missile.

Accordingly, an object of the present invention is to provide an improved launching system which will permit the launching of various size missiles.

Another object of the present invention resides in the provision of a means which will compensate for a missile height differential in a missile launching system.

Still another object of the present invention is to provide a missile launching system which compensates for the differential in weight between various size missiles.

A further object of this invention is to provide a missile launcher which will compensate for weight and height differentials in various missiles.

A further object of this invention is to provide a compensating means which is simple in construction, relatively inexpensive in cost, and reliable in operation.

Other objects and many of the attendant advantages of this 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:

FIG. 1 is a transverse cross-sectional view of a typical ballistic missile launching vehicle;

FIG. 2 is a sectional view of the lower portion of a launching tube system;

FIG. 3 is a view partially in section taken substantially along the line 3—3 of FIG. 2;

FIG. 4 is a perspective view of another embodiment of the present invention; and

FIG. 5 is a sectional view taken substantially along the line 5—5 of FIG. 4.

FIG. 1 illustrates one embodiment of the present invention and, more specifically, it discloses a cross-sectional view of a ballistic missile launching submarine **11**. As each of the missile launching systems **12** in the submarine **11** are identical, the description which follows hereinafter will describe a single launching system.

A missile **13** is positioned in the launching system **12** which has its upper portion covered by a hatch **14**. Missile launching system **12** includes an outer tube **15** which has resiliently mounted therein an inner tube **16**. The inner tube **16** and the outer tube **15** are provided with an opening **17** which is utilized to gain access to the missile guidance package through opening **18** in the missile skin. The missile **13** is ejected from the inner tube **16** when high pressure fluid is released from a fluid flask **19**. This fluid pressure is controlled by a fluid valve system, not shown, positioned in the conduit **21** which connects the fluid flask **19** with the chamber **22** in the lower portion of the launching system **12**. Hydraulic springs **23** resiliently support the inner tube **16** within the outer tube **15** thereby isolating the missile **13** from sudden and severe shocks as, for example, from shocks created by the detonation of depth charges.

FIG. 2 illustrates in greater detail the adapter **31** which is utilized to adapt the launching system **12** to accommodate a small missile **13**. Missile **13** is shorter in height and lighter in weight than the largest missile which may be launched by system **12**. The inner tube **16** has a support ring **32** positioned adjacent its lower end **33**. Sealing means **34** forms a fluid tight chamber **22** below the missile and assures that the entire fluid pressure from fluid flask **19** will be utilized to eject the missile **13** from the inner tube **16**. The adapter stool **31** comprises a short tubular shaped section **35** having a flange portion **36** at its upper end. The flange portion **36** supports the missile **13**. The adapter stool **31** is in turn supported by the support ring **32**. The clamps **30** are utilized to lock the adapter stool **31** to the support ring **32**. The support ring **32** is resiliently connected to the inner tube **16** by any suitable means.

FIGS. 2 and 3 illustrate the one-way valve means **37** of the adapter stool. The flapper valves **38** are hinged at **39** to permit the upward passage of eject air. However, when fluid attempts to pass downwardly through the valve means **37** in the direction of arrow **41**, the valves **38** automatically close and substantially prevent the passage of fluid therethrough.

FIGS. 4 and 5 illustrate another embodiment of the

present invention. Only the lower portion of the adapter stool apparatus is illustrated. Ribs **51** are provided on the lower end of the stool to provide structural support therefor. Flapper valves **52** are pivoted about axis **53** and permit the passage of fluid therethrough in an upward direction but substantially prevent the flow of fluid in the downward direction as indicated by arrow **41**.

In operation, when it is desired to launch a relatively large missile from the launching system, the adapter stool **31** is completely removed by retracting the clamping means **30** and vertically removing the adapter stool **31** from the launching system **12**. The large missile is lowered directly into the inner tube **16** and is supported directly by the support ring **32**. However, when a smaller missile is to be launched by the system **12**, the adapter stool **31** is placed in the inner tube **16** adjacent to and supported by the support ring **32** in a manner shown in FIG. 2. This support ring compensates for the varying height of the smaller missile by moving it upwardly by an amount necessary to insure that the guidance package opening **18** in the missile **13** can be reached through the access **17**. In order to compensate for the weight differential between the smaller and larger type missile, the adapter stool provides valve means **37** which function as a false floor in the launching system to decrease the amount of ballast water taken into the launching system after the ejection of a missile. That is, after the missile is ejected, sea water completely fills the inner tube **16** but is prevented from reaching the chamber **22** by the one-way valve means illustrated in FIGS. 2 and 4. By taking aboard an amount of water which is equal in weight to that of the ejected missile the submarine substantially maintains the same center of gravity after launch that it had before launch and, therefore, its stability remains substantially constant.

It is pointed out that should the missile launching system be mounted in a truck where it is not absolutely necessary to compensate for the difference in weight, the one-way valve means could be eliminated. Further, the length of the tubular shaped section **35** above the support ring **32** can be varied in order to compensate for any height differential between the larger and smaller missiles. Still further, the amount of ballast which is taken aboard subsequent to missile launching can be varied by positioning the one-way valve means anywhere within the height of the tubular shaped section **35**. That is, the valve could be lowered in the adapter stool to permit more ballast water or raised to permit less ballast water to be taken aboard. It is only necessary that the valve means **37** not have its operation obstructed by the lower end of the missile **13**. The valve need not be completely fluid tight because after the missile is launched the ballast water quickly fills the inner tube **16** and the hatch **14** is immediately thereafter closed. Should the ballast water then seep down through the valve means this would not alter the weight of the ballast, as the hatch is closed tight, or effectively change the center of gravity of the submarine.

Both of the above-described embodiments of the present invention permit the launching system to eject both large and small missiles having varying weight and height. It is seen that this invention can be utilized in situations where it is necessary to compensate for only one of these two factors. That is, the adapter stool can be used to compensate for height differential, weight differential or both of these differentials.

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.

What is claimed is:

1. In a missile system mounted in a submarine and operable while submerged to vertically launch a large missile, said system comprising an outer tube vertically mounted in said submarine, an inner tube resiliently mounted within said outer tube, said tubes having their upper ends projecting outwardly from said submarine, a hatch operable to open and close said upper ends of said tubes, a support ring adjacent and resiliently supported by the lower end of said inner tube, said support ring being operable to vertically support said large missile, an access pasageway through said tubes operable to permit access to the guidance opening of said large missile, an air eject system operable to eject said large missile from said inner tube, said eject system including a chamber below the lower ends of said tubes; the combination of an adapter stool operable to convert said system in a manner to permit the launching of a small missile, said small missile being shorter in height and lighter in weight than said large missile, said adapter stool being operably interposed between said support ring and small missile in a manner to compensate for the difference in height of said small missile in a manner to permit alignment of said access passageway with the guidance opening of said small missile, said adapter having a one-way valve means operable to permit eject air to pass therethrough from said chamber to eject said small missile and to prohibit fluid flow reversely therethrough.

2. A missile launching apparatus for missiles of varying length and identical diameter comprising a vertically disposed outer tube, a second inner tube of a diameter substantially less than said outer tube, the inner diameter of said inner tube being substantially equal to the diameter of the missiles, said inner tube terminating short of the bottom of said outer tube, a sealing means between said inner and outer tubes located substantially at the bottom of the inner tube to provide a cylindrical compartment below said inner tube of a size to regulate the water taken in after firing the missile, said water serving as ballast to equal the weight of the fired missile, said water normally filling said inner tube and said cylindrical compartment after firing the longest possible missile, a support ring secured to the lower end of said inner tube to support the longest possible missile, and a removable adapter stool fitting within said inner tube and seated on said support ring and projecting downward below the bottom of said inner tube, said stool also extending upward within said inner tube to support missiles of a length less than the longest missile, said adapter stool having means permitting fluid flow upward within said inner tube and restricting fluid flow downward from said inner tube to restrict the flow of ballast water and prevent said ballast water from entering said cylindrical compartment after firing a missile shorter than the longest possible missile.

3. A missile launching apparatus according to claim 2 and including an external shoulder on said adapter stool, said shoulder engaging the support ring to support said adapter stool a predetermined distance below the bottom of said inner tube to limit the weight of water admitted as ballast, in the inner tube and the adapter stool.

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