Sept. 18, 1962 R. E. CARLBERG 3,054,330

MISSILE LAUNCHING SYSTEM

Filed July 31, 1959 5 Sheets-Sheet 1

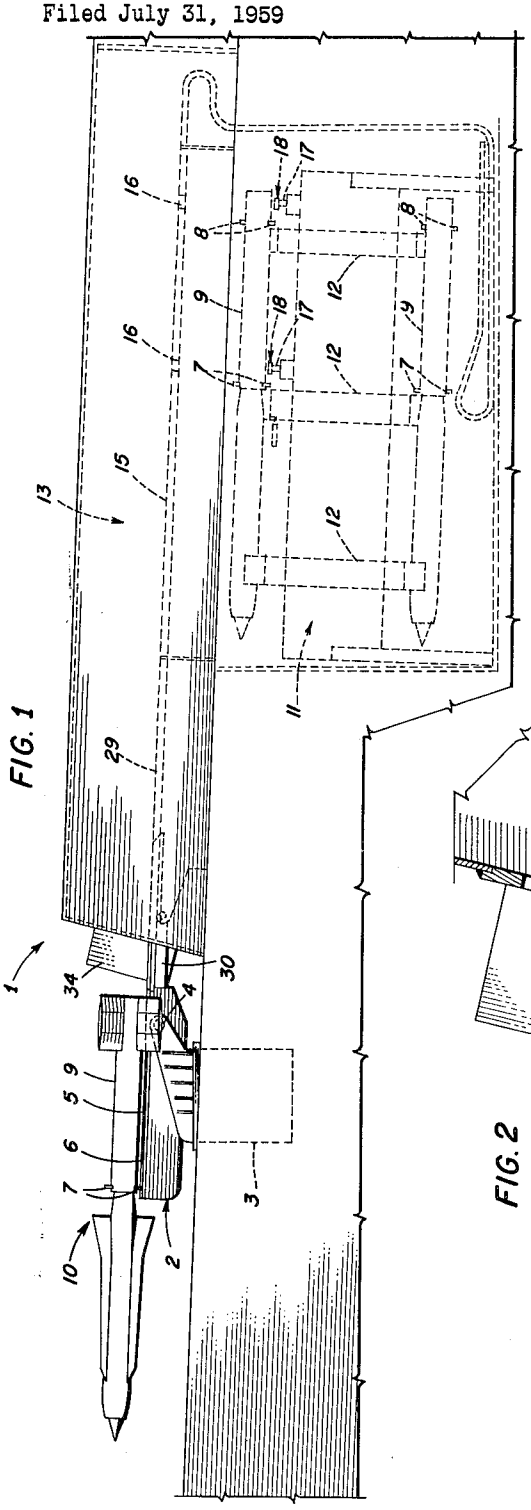


FIG. 1

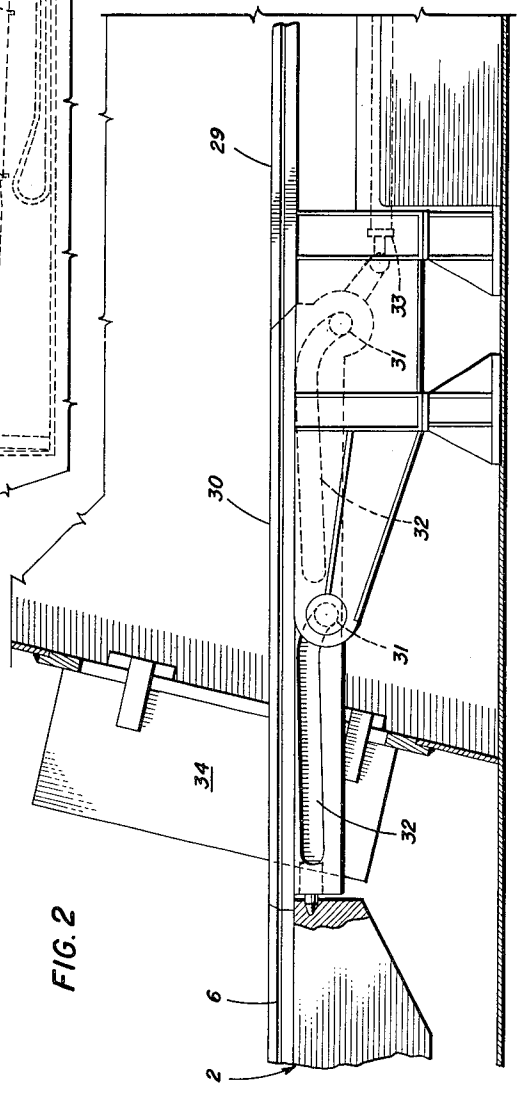


FIG. 2

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MISSILE LAUNCHING SYSTEM

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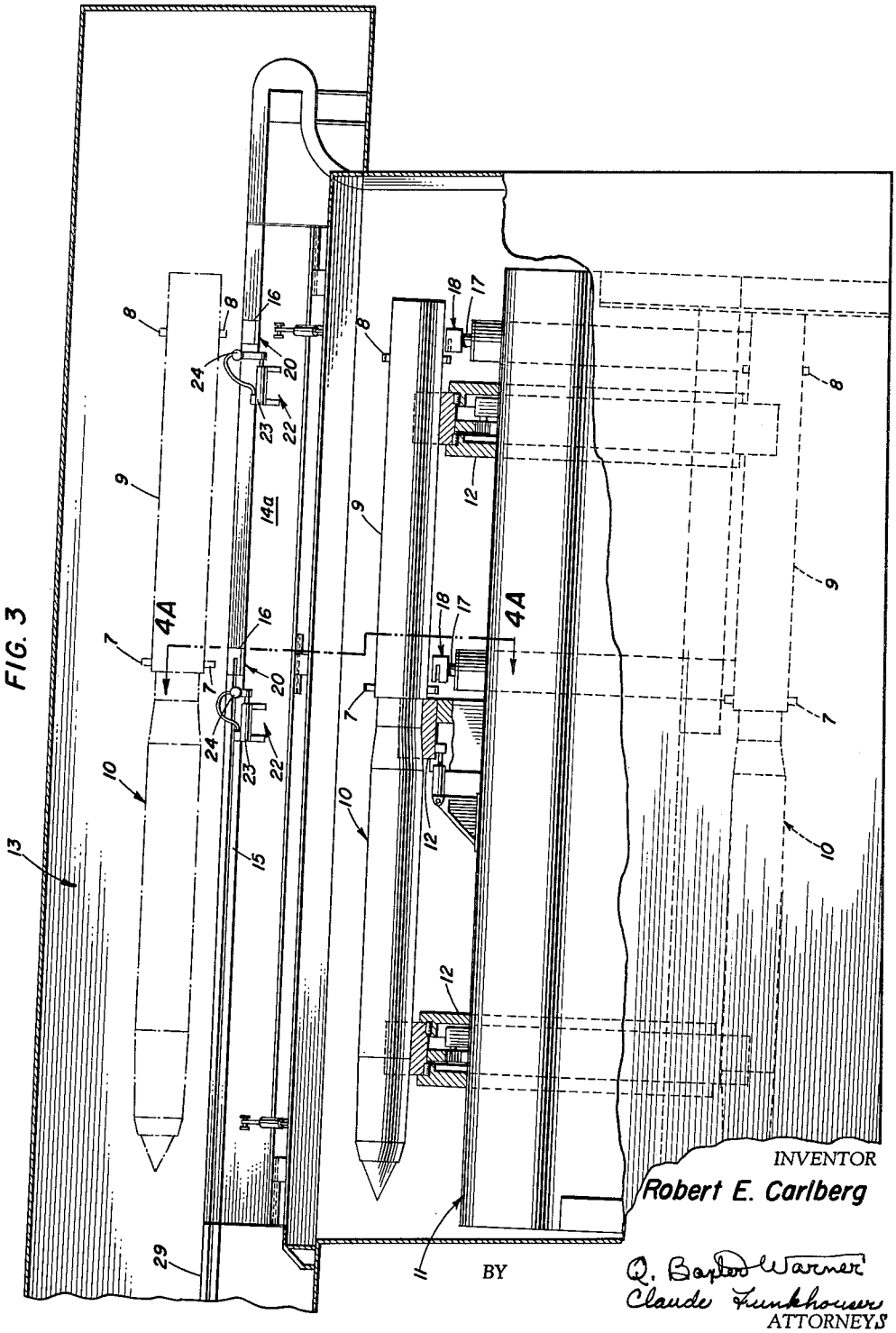


FIG. 3

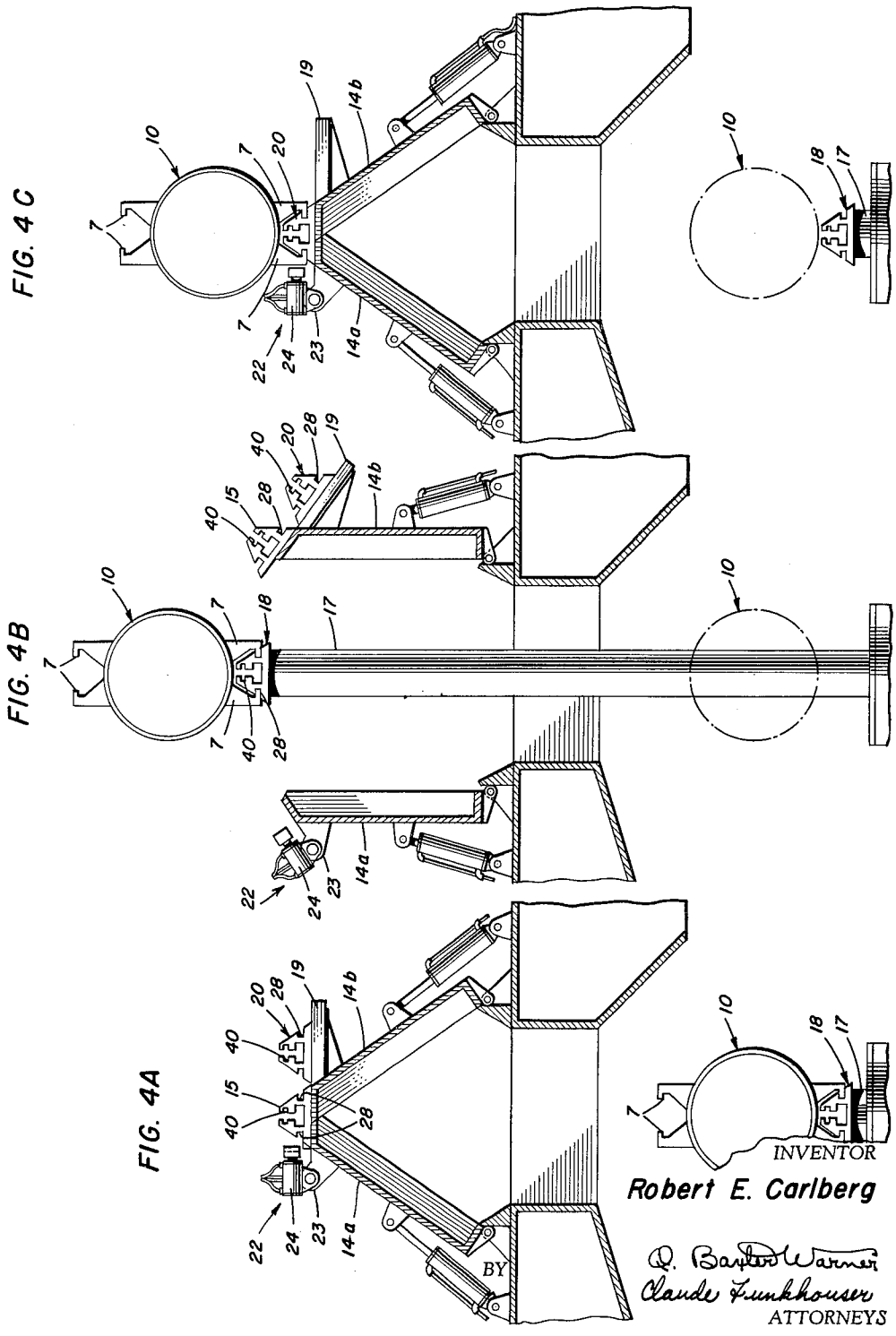
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MISSILE LAUNCHING SYSTEM

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MISSILE LAUNCHING SYSTEM

Filed July 31, 1959 5 Sheets-Sheet 4

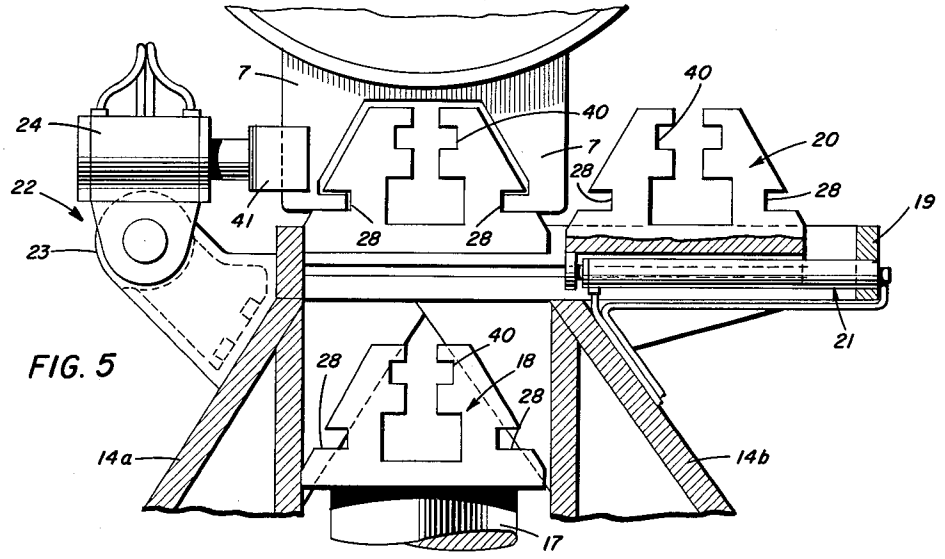


FIG. 5

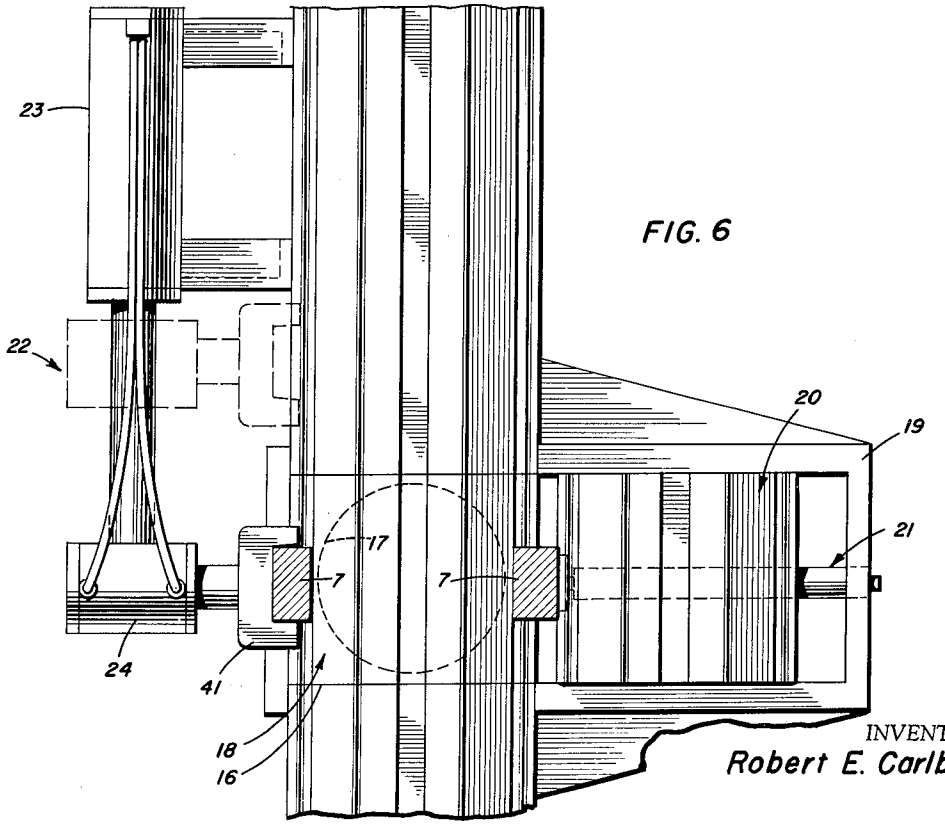


FIG. 6

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MISSILE LAUNCHING SYSTEM

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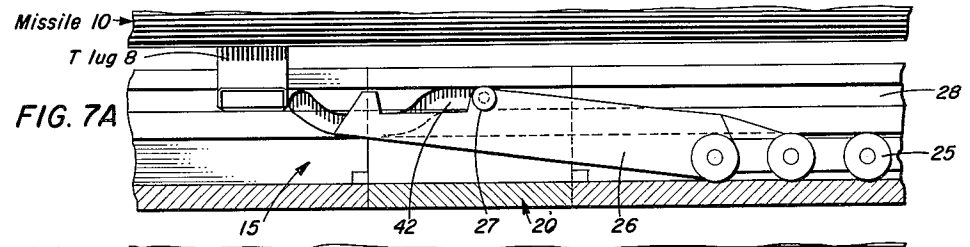


FIG. 7A

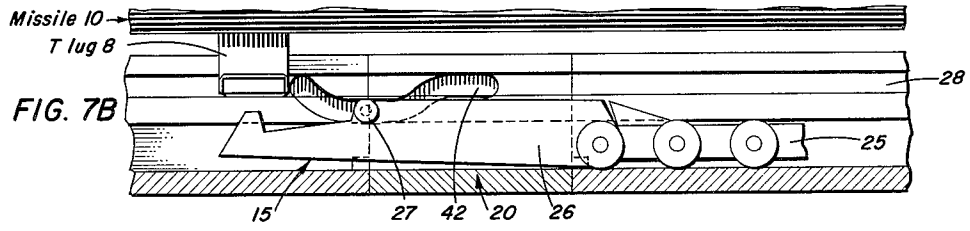


FIG. 7B

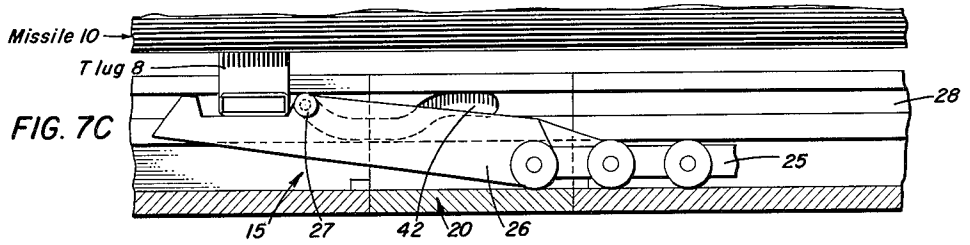


FIG. 7C

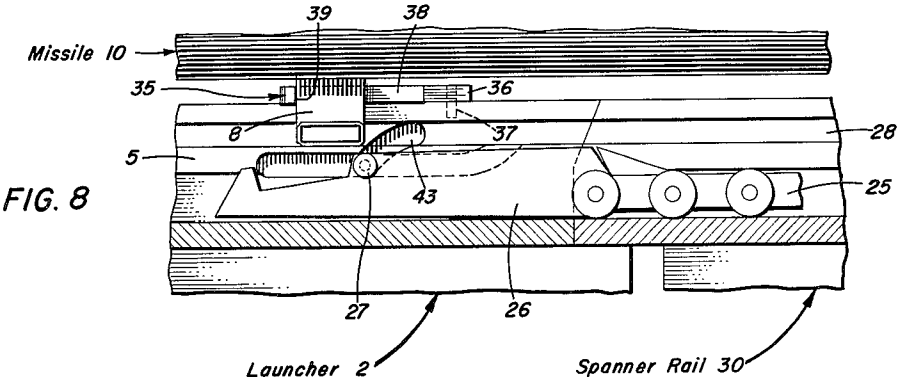


FIG. 8

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MISSILE LAUNCHING SYSTEM

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6 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.

This invention relates to a shipboard missile launching system, and more particularly to a missile handling arrangement for use with relatively small armed naval vessels of the destroyer type.

More specifically, this invention is directed toward a compact under rail type missile handling system to provide a missile launching capability for this type of vessel with a maximum utilization of existing missile launching mechanisms. Prior types of missile launchers have incorporated dual head launchers of the general character shown in the patent to F. J. Schiavi, Patent No. 2,826,-960, wherein two missiles are handled and launched from dual launching arms which are movable in train and elevation.

A prior type of missile handling system including facilities for storage and loading of missiles to be launched from a launching head of the foregoing character is shown in the copending application of Robert E. Carlberg and Sven Landstrom, Serial No. 769,044, filed October 22, 1958, for Missile Launching System.

Another type of launching system wherein the missiles are handled in a vertical disposition prior to loading on the launching rail is shown in the copending application of Garold A. Kane et al., Serial No. 506,392, filed May 5, 1955, for Method and Apparatus for Handling Missile.

The instant launching system is distinguished from both of the afore-mentioned types in that, among other features, the missile rides on top of the launcher rail or stated conversely the launcher rail is designated as an under rail type. An automatic missile handling and loading system utilizing this arrangement may be fabricated into a unit which is dimensionally suitable for installation on destroyer type vessels, either by conversion of such vessels to a missile launching capability or by the design of new vessels which fall within this size category. The embodiment of a launching system of the type described herein requires a single handling system and a single launching rail, consuming proportionately less space than that required for the accommodation of conventional dual arm launchers and equipment associated therewith. If an under rail launching head of the character herein disclosed were combined with a vertically disposed ready service transfer mechanism as shown in the afore-mentioned Kane et al. application, the resulting overall mass and size would require a shipboard space allocation unattainable in the class of vessels for which this system is designed. Therefore, an improved simplified handling system is provided by the invention.

The instant invention forms a compact unit that is well adapted for installation within the confines of a single deck level. A particular advantage of this invention resides in the utilization of a magazine handling mechanism of the rotary drum type wherein a plurality of missiles in ready service condition are stowed in a horizontally disposed cylindrical type magazine incorporating a power driven indexing mechanism and a self-contained elevating mechanism for moving a selected missile from its preindexed position in the ready service magazine to a

transfer position for ramming onto the launcher rail. This ready service magazine is to be distinguished from permanent stowage facilities from which the missile is withdrawn for loading in the ready service magazine.

Accordingly, it is an object of the instant invention to provide a missile launching system for medium and small sized armed vessels wherein the launching takes place from an under rail launcher of a character adapted for movement in train and elevation with a missile disposed on the launching rail thereof.

Another object of the invention resides in the provision of a launcher installation featuring a high degree of mechanical simplicity consistent with an operational requirement of maximum safety and handling ease.

Another object of the present invention resides in the provision of a launching system for vessels of the character described wherein a maximum utilization is made of missile handling components of a character compatible with other more massive launching systems.

Another object of the invention is to provide a launching system for destroyer type vessels and which has substantially all of the desirable features of shipboard launching systems heretofore or now in general use while obviating many of the shortcomings thereof incident to use on vessels of the afore-mentioned type.

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 view in elevation of a shipboard missile launching system in accordance with the instant invention;

FIG. 2 is a fragmentary view of the launching system showing blast doors and spanner rail extended to the launcher;

FIG. 3 is a partial sectional view of the magazine, magazine doors, and rammer rail;

FIG. 4A is a vertical sectional view, taken substantially on line 4A—4A, of FIG. 3, illustrating the magazine doors in closed position with the missile in position for hoisting;

FIG. 4B is a changed-position view of FIG. 4A illustrating the magazine doors in open position, and with the missile and magazine hoist in fully elevated position;

FIG. 4C is a changed-position view of FIG. 4B illustrating the magazine doors in closed position, and with the missile on the rammer rail ready for ramming;

FIG. 5 is a transverse sectional view of the magazine doors in closed position and supporting a missile on the rammer rail, the hoist being shown in a partially retracted position;

FIG. 6 is a top plan view of the rammer rail of FIG. 5;

FIG. 7A is a longitudinal vertical section view of the rammer head prior to picking up the missile on th ramming stroke, the guide pin being illustrated as it enters the cam groove;

FIG. 7B is a view similar to FIG.7A except with the rammer head depressed below the missile T-lug;

FIG. 7C is a view similar to FIG. 7A except with the rammer head and T-lug in locked position for ramming; and

FIG. 8 is a longitudinal vertical section view of the T-lug released from the rammer head, in drop-off position on the launcher arm.

Referring now to the drawings wherein like reference numerals refer to like parts throughout the several drawings, the launching system according to the instant invention is generally indicated at 1 for incorporation in substantially an above deck arrangement on a destroyer type vessel. The launching head comprises a mount 2 in which the drive mechanisms 3 for train and elevation

thereof are suspended below the deck surface. The portion protruding above the deck surface comprises a rotatable support member carrying an adjustable elevation mechanism including trunnions 4 and a launching rail 5. The location of the trunnion axis with respect to the configuration of the launcher head is such as to not only permit a low profile for the launcher vehicle but also enables the launcher to attain a high angle of elevation.

The under rail launching arm is provided with missile lug engaging elements 6 of complementary configuration to mate with the forward and aft lugs 7 and 8, respectively, of the missile booster portion 9 of the overall missile or weapon combination 10.

The ready service magazine 11 has a plurality of missiles in ready service condition exclusive of the wing and fin elements therefor. Each misile in the ready service magazine is supported in a separate cradle arrangement 12 which is disposed parallel to the axis of the magazine cylinder and at an equal distance radially removed therefrom, whereby a missile in an uppermost position on the cylinder is in a position to be hoisted vertically into the assembly area 13 of the system as will become more apparent as the description proceeds.

The instant system incorporates a pair of magazine doors 14*a* and 14*b* which are configured and so disposed to close in a non-planar relationship as shown in FIG. 4A. It will be noted that the doors 14 in their closed position are configured to provide a bridge or support for rammer track 15 which is integral with one of the doors 14*b*. When doors 14 are moved to their open position the opening is of sufficient dimensions to permit hoisting of a missile 10, from the magazine disposed immediately therebelow, upwardly to a position slightly above the normal or closed position of the magazine doors, as is best illustrated in FIG. 4B.

The hoist comprises two extendible posts 17 that are contained within, and form a part of, the aforesaid magazine 11. A missile lug coupling 18 of a cross-sectional configuration similar to the rammer rail 15, is attached to the top of each hoist post 17.

The magazine doors 14*a* and 14*b* are provided with suitable slots 16 for permitting passage of elements of the hoist system with the missile engaged thereon, upwardly above the doors 14. Thus, the doors may be swung to a closed position about the hoist members 17 with the missile supported thereabove, FIG. 4C. Two brackets 19 are attached to door 14*b*. Each bracket 19 is adjacent to its respective slot 16 and supports a segment of the rammer rail 20. These segments are movable transversely from a position clear of the slot 16 to a position in the slot 16 and in alignment with the rammer rail 15 by means of fluid actuated piston and cylinder mechanisms 21. These movable segments enable the magazine doors 14 to close about the hoist members 17 when the latter are in an elevated position. Door 14*a* has attached thereto two auxiliary rammers 22 actuated longitudinally by fluid actuated piston and cylinder mechanisms 23 and transversely by fluid actuated mechanism 24. A folded-chain type rammer 25 is provided to transfer the missile from a position on the rammer rail into a firing position on the launching rail 5. The rammer head comprises a pickup latch 26, and a spring loaded guide pin 27 that normally rides in groove 28 of the rammer track 15.

The fixed spanner rail 29 secured to the ship's structure is matingly aligned with the rammer rail 15 attached to door 14*b*, when in a closed position, and is located forward therefrom. An extendible spanner rail 30 positioned between the fixed spanner rail 29 and the launcher rail 5 in FIG. 2 is supported by two rollers 31 riding in cam tracks 32, and is positioned by a fluid actuator 33.

Blast doors 34 are provided to close the opening in the deck structure through which the missile is rammed to the launcher rail 5, when the extendible spanner rail 30 has been retracted.

A fire-throgh latch 35 is located on the launcher rail 5,

as viewed in FIG. 8, to lock the T-lug 8 of the missile in place, when released by the rammer head 26 at its drop-off point on the launcher rail 5. This latch 35 comprises a spring loaded cutout plate 36 disposed to rotate about pin 37. The forward motion of T-lug 8 acting upon cam surface 38 rotates the latch to permit passage of the T-lug to the cutout portion, whereupon the missile lug 8 is securely locked against rearward movement. Cam surface 39 permits the T-lug 8 of the missile, when actuated by the firing of the missile, to again rotate the plate 36 about pin 37 to release the T-lug 8.

In operation the magazine 11 is indexed to rotate the selected missile to a position above hoist posts 17. Magazine doors 14*a* and 14*b* are then opened and the missile is freed from its cradle and hoisted to a position (FIG. 4B) above the magazine doors. Doors 14*a* and 14*b* thereupon close about posts 17, and the hoist is partially retracted to align the missile lugs 7 and 8 with their respective grooves 28 and 40 on rammer track 15. Next, actuating cylinder 23 moves the auxiliary rammer 22 rearwardly and actuating cylinder 24 moves the auxiliary rammer 22 inwardly to lock arm 41 about U-lug 7, whereupon cylinder 23 moves the missile to a position forward of slots 16, hoists 17 retract fully, and magazine 11 may be indexed to any succeeding position. Then actuator 21 moves rammer rail segment 20 into alignment with rammer rail 15 and fins are attached to the missile by any suitable means.

Launcher mount 2 is rotated and depressed to align launcher rail 5 with the fixed spanner rail 29. Blast doors 34 are opened, and fluid actuator 33 moves extendible spanner rail 30 into position between the fixed spanner rail 29 and launcher rail 5. Rammer 25 moves forward to the pickup position as shown in FIG. 7A whereupon spring loaded guide pin 27 slips into cam groove 42 to depress pickup latch 26 then raise it to lock about T-lug 8 when guide pin 27 enters groove 28. Rammer 25 then drives the missile 10 over the rammer rail 15, fixed spanner rail 29, and extendible spanner rail 30, onto the launcher rail 5 to the drop-off point (FIG. 8), where the guide pin 27 slips into cam groove 43, depressing the pickup latch 26 and releasing T-lug 8. Fire-through latch 35 closes about T-lug 8 and the extendible spanner rail 30 is retracted, whereupon the launching head 2 may be trained and elevated, and fired after the blast doors 34 are closed. Blast doors 34 are closed to protect personnel and equipment in the assembly area 13 from the firing blast of the missile. After the blast doors 34 have been closed the hoisting of the next missile through the mgazine doors 14 onto the rammer track 15 may be accomplished in the manner aforesaid. It is to be understood that structure on the launching rail may include suitable detachable electrical contacts to provide electrical warm up and booster power for the missile's electronic components, as well as conventional electrical firing circuits for the launching of the missile. Such structure is not shown since it forms no part of the instant invention and is well known in the art.

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. An elevatable and trainable under rail launcher head having attached thereto a launcher rail suitably configured to matingly engage and slidably receive lugs of a missile booster for launching a missile, a magazine door mounted for movement between an open and closed position, a rail member mounted on said door and of a configuration suitable for supporting and permitting sliding movement of missile lugs thereover, a missile spanning rail mounted between said rail member and said launcher rail, ramming means for advancing a

missile from a position on said rail member to said launcher rail, a linearly movable hoist means for engaging one of a plurality of missiles disposed in cylindrical array below said magazine door, and elevating said missile therethrough when said door is in open position to a position above the position of the magazine door when it is in closed position.

2. A missile handling system for moving missiles from a horizontally disposed cylindrical storage magazine to a launcher head having a launcher rail mounted thereon and comprising hoisting means, a plurality of magazine doors, rail means mounted on one of said doors for receiving missile lugs preparatory to ramming the missile onto the launcher, and an extendible spanning rail mounted to be matingly aligned between said rail means and the launcher rail on said launcher head when the doors are in a closed position.

3. A missile handling system for moving missiles from a horizontally disposed cylindrical storage magazine to a launcher head having a launcher rail mounted thereon and comprising hoisting means, a plurality of magazine doors configured to matingly close about said hoisting means when the latter is extended in an elevated position therethrough, a rail member mounted on one of said doors, and an extendible spanning rail mounted to be matingly aligned between said rail member and the launching rail on said launcher head when said doors are in a closed position.

4. A missile handling system for moving missiles from a horizontally disposed cylindrical storage magazine to a launcher head having a launcher rail mounted thereon and comprising hoisting means, a plurality of magazine doors swingably mounted on a substantially horizontal deck structure to swing in an elevated arc and forming, when closed, an inverted V-shaped flame-tight seal, a rail member mounted on one of said doors, and an extendible spanning rail mounted to be matingly aligned between said rail member and the launching rail on said launcher head when said doors are in a closed position.

5. A missile handling system for moving missiles from a horizontally disposed cylindrical storage magazine to a launcher head having a launcher rail mounted thereon and comprising a hoisting means, a plurality of horizontally disposed magazine doors mounted to swing in an elevated arc and forming, when closed in a noncoplanar relationship, a flame-tight seal about said hoisting means when the latter is in an elevated position, closure means for maintaining said seal when said hoisting means is withdrawn from the region of said doors, a rail member mounted on one of said doors, an extendible spanning rail mounted to be matingly aligned between said rail member and the launching rail on said launcher head when said doors are in a closed position, and ramming means for advancing a missile from a position on the rail which is mounted on one of said doors to said launching head.

6. A shipboard missile launching system for launching guided misiles and comprising, in combination, magazine means for storing a plurality of missiles, closure means thereover for isolating said magazine means from the remainder of the system, a launching head disposed above and forwardly of said magazine means and including a launcher rail, means movable to hoist a missile from said magazine means through said closure means to a position for ramming onto said launching rail on said launcher head, a rammer mechanism, said rammer mechanism including a fixed rail section aligned with said launcher rail, a first movable rail section mounted between the launcher head and said fixed rail section and movable to matingly align therewith, and a second movable rail section adjacent said fixed section and mounted on said magazine closure means, said closure means being movable to an open position to permit the passage of a hoisted missile therethrough and to a closed position, said second movable rail section being in alignment with the fixed and movable sections of the rammer rail whereby a hoisted missile may be disposed thereon and rammed thereover onto said launching head.

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