

AN OBJECT LAUNCHER

FIELD OF INVENTION

This invention relates to launchers for launching objects. Particularly, this invention relates to inclined launchers mounted on a shipboard.

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BACKGROUND OF THE INVENTION

A missile is a fuel propelled projectile, propulsion being engineered by the reaction of rearward discharged gases, liberated with great force when the fuel is combusted.

10 Missiles need to be supported for launching and in this specification; these supports are referred to as launchers. These launchers are capable of locating, holding and launching a plurality of missiles. The type of launcher is chosen depending upon desired capability.

The missile launching system consists of systems that are deck mounted or that are
15 enclosed by the vessel wherein the launching system is enclosed by the hull of the ship. When the weapons are fired from a hull enclosed launching system, the exhaust gas from the rocket motor has to be conveyed out of the launcher space and discharged into the atmosphere. Conveying exhaust gas out of the launcher is an important aspect of designing this type of missile launcher. This type of launching system also has to be
20 provided with openings in the deck to accommodate the components of the launcher and also for safely conveying the exhaust gases. This is possible only on custom built ship as the reduction in the flexural and torsional rigidity of the ship can be offset by considerable reinforcement of the deck. In a deck mounted launch system there is no need to provide an opening on the deck to accommodate the launcher and therefore the
25 structural rigidity of the ship is not compromised. Deck mounted launching system can be retrofitted on an existing ship with least amount of alterations.

In a deck mounted launcher missiles are either stowed in canisters, ready to fire in the launcher, or stowed in the weapons magazines below or beside the launcher. If the
30 weapons are not stowed ready to fire, machinery is used to load the missiles into the launcher prior to use or to reload after firing.

An inclined launcher typically comprises a structural framework assembly mounted on the vessel, such as a combatant ship. The ship in which the launcher is installed is often subjected to severe movements or shocks, apart from the normal rolling and pitching of the ship. Missiles by their nature are sensitive pieces of equipment and often contain electronic circuitry that may not be able to withstand even moderate shocks. Also the firing of a missile causes severe recoil which must be compensated for. For all these reasons it is necessary to provide means to protect missiles from shock and vibration in its rest state and ready to launch state.

The missile being canister launched applies a thrust of 70 Tonnes on the launcher which is required to be transferred to the ship deck. Also the launcher has to withstand the side thrusts of 14 Tonnes and acceleration loads due to ship motions.

U S Patent 6,283,005 discloses an "Integral ship-weapon module" that reduces the reinforcement needs of mating a launching system to a ship, and reduces stress concentration and foundation movements created by the launching system launching launchable devices. This disclosure is for a hull enclosed launching system and involves considerable alterations to the deck plates and not suitable for a deck mounted launcher.

U S Patent 7,313,995 discloses an "Inclinable munitions launcher". This deck-mounted inclined munitions launcher includes a platform, two pivotally-coupled munitions canisters, and a drive system. The canisters lay flat, side-by-side, in a pre-launch position and the drive system engages the exhaust end of each munitions canister to raise the munitions canisters to an inclined launch position. The canisters are pivotally coupled and the pull of the drive system on the exhaust end of the canisters causes the launch end of each canister to rise in a scissoring motion. Device disclosed in this disclosure does not hold the missiles in ready to launch configuration. The drive system has to be operated to elevate the missiles from a substantially flat pre launch position to an inclined ready to launch position, adding to the time taken to initiate a strike or a counter strike. Also the reaction to the thrust load caused by the missile launch will be transferred to the drive unit leading to failure of the components in the drive unit.

There is a need for inclined launchers that eliminates the above disadvantages and is adapted to withstand and transfer the thrust load of the launcher to the ship deck.

OBJECTS OF THE INVENTION

- 5 One of the principle objects of the present invention is to develop a launcher for launching objects.

Another object of the present invention is to develop a method of assembling a launcher for launching objects.

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STATEMENT OF INVENTION

- Accordingly the present invention provides a launcher for launching objects, said launcher comprising: base frame (1) fixed to a platform; launcher structure (3) mounted on the base frame (1), wherein said launcher structure (3) is a welded structure with support legs (4) mounted permanently onto the base frame; clamping arrangement (5) to clamp at least one canister (6) onto the launcher structure (3), said canister (6) has a bottom resting unit (50) on its rear end; and thrust bearing unit (100) mounted on the platform at rear end of the mounted canister (6) to transfer thrust load to said platform caused during launching of the object; the present invention also relates to a method of assembling a launcher, said method comprising: fixing base frame (1) onto a platform; mounting launcher structure (3) onto the fixed base frame (1) using support legs (4); mounting at least one canister (6) on top of the launcher structure (3) along with bottom resting unit (50) at its rear end; fastening mounted canister (6) using clamping arrangements (5); and fixing thrust bearing unit (100) on the platform at rear end of the mounted canister (6) to transfer thrust load to said platform caused during launching of the object.

BRIEF DESCRIPTION OF DRAWINGS

- The invention will now be described with respect to the accompanying drawings in which:

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Figure 1 is a perspective view of the deck mounted inclined launcher;

Figure 2 is a side elevation of the thrust bearing unit of the launcher as shown in figure 1;

Figure 3 is a sectional elevation of the thrust bearing unit along section line A-A of figure 2;

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Figure 4 is an elevation of the thrust bearing unit and launcher base structure of the launcher as shown in figure 1;

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Figure 5 is a perspective view of the clamp assembly used for clamping canisters to the launcher as shown in figure 1;

Figure 6 is a side elevation of the bottom resting unit and thrust bearing unit of the launcher as shown in figure 1; and

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Figure 7 is a sectional view of the bottom resting unit of the launcher as shown in figure 1.

DETAILED DESCRIPTION OF INVENTION

The primary embodiment of the present invention is a launcher for launching objects, said launcher comprising: base frame (1) fixed to a platform; launcher structure (3) mounted on the base frame (1), wherein said launcher structure (3) is a welded structure with support legs (4) mounted permanently onto the base frame; clamping arrangement (5) to clamp at least one canister (6) onto the launcher structure (3), said canister (6) has a bottom resting unit (50) on its rear end; and thrust bearing unit (100) mounted on the platform at rear end of the mounted canister (6) to transfer thrust load to said platform caused during launching of the object.

In yet another embodiment of the present invention the platform is preferably a ship deck.

30 In still another embodiment of the present invention the launcher structure (3) comprises box sections (3A, 3B) welded to each other.

In still another embodiment of the present invention the support legs are preferably eight in number.

In still another embodiment of the present invention the support legs (4) are mounted permanently onto the base frame (1) using bolts.

- 5 In still another embodiment of the present invention the clamping arrangements are at least at three places to clamp the canisters (6) to the launcher structure (3).

In still another embodiment of the present invention the clamping arrangements (5) comprises bottom half (5A) permanently bolted to the launcher structure (3) and a
10 removable top half (5B).

In still another embodiment of the present invention the thrust bearing unit (100) comprises external plate members fixed by internal plate members to form a predetermined shape.

- 15 In still another embodiment of the present invention the external plate members fixed on the platform comprising: back plate (9), front plate (12) aligned with top T beam section (15) of the platform; top plate (11) is fixed perpendicular to said front plate (12), at least two side plates (8) fixed at extreme ends of the front plate (12) and the back plate (9); and
20 plurality of support plates (14) mounted with the front plate (12) for providing support to the thrust bearing unit.

In still another embodiment of the present invention the front plate is inclined at an angle 15 degree with respect to vertical axis of the thrust bearing unit.

- 25 In still another embodiment of the present invention the front plate consists of lower plate (12A) and an upper plate (12).

In still another embodiment of the present invention the lower plate (12A) is thinner as
30 compared to the thicker upper plate (12).

In still another embodiment of the present invention the internal plate members comprises: interconnected plurality of vertical plate members (16, 17) fixed to the front plate (12); interconnected horizontal plates (18, 19) connected to the vertical plates (16,

17) using four arm machined connector piece, said horizontal plates (18, 19) are fixed to the front plate (12); and back cover plates (24, 25) fixed to the front plate (12).

5 In still another embodiment of the present invention the bottom resting unit comprises dished end (30) bolted to a shell (31) bolted, said shell (31) is bolted to the canisters and removable eye bolts (33) is provided for safe handling and placing of the dished end (30).

10 In still another embodiment of the present invention a locking arrangement 34 is placed at a hinge 39 of the thrust bearing unit, said locking arrangement is provided to hold the bottom resting unit against the front plate (12).

In still another embodiment of the present invention the locking unit consist of a center piece (37) connecting threaded eye bolts (35, 36).

15 Another embodiment of the present invention is a method of assembling launcher, said method comprising: fixing base frame (1) onto a platform; mounting launcher structure (3) onto the fixed base frame (1) using support legs (4); mounting at least one canister (6) on top of the launcher structure (3) along with bottom resting unit (50) at its rear end; fastening mounted canister (6) using clamping arrangements (5); and fixing thrust
20 bearing unit (100) on the platform at rear end of the mounted canister (6) to transfer thrust load to said platform caused during launching of the object.

In yet another embodiment mounting launcher structure (3) using support legs (4), said support legs (4) are mounted permanently onto the base frame using bolts.

25 In still another embodiment fastening using the clamping arrangements comprises bottom half (5A) permanently bolted to the launcher structure (3) and a removable top half (5B) on top surface of the canister (6).

30 In still another embodiment a locking arrangement (34) is placed at a hinge (39) of the thrust bearing unit, said locking arrangement is for holding the bottom resting unit against the front plate (12).

Referring to the accompanying drawings the launcher according to this invention is indicated generally by the reference numeral 10.

5 The launcher 10 consists of different components to effectively locate, hold and launch a plurality of missiles and transfer the loads to the ship deck.

Referring to figure 1, the launcher 10 consists of a launcher base frame 1. The base frame 1 is the interface between the launcher structure 3 and the ship deck (not specifically shown). The launcher base frame 1 is welded to the ship deck. Launcher
10 Structure 3 is a welded structure constructed out of box sections 3A, 3B. The launcher structure 3 is provided with eight support legs 4, which are bolted permanently to the base structure 3 using bolts at each support leg 4. The launcher structure 3 is provided with clamping arrangements 5 at three places to clamp the canister 6. The clamp assemblies are in two halves. Bottom halves 5A are permanently bolted to the launcher
15 structure 3. Top halves 5B are removable. Typically the launcher structure 3 supports two canisters 6. An optical measuring device (not specifically shown) is mounted on the launcher structure 3 to measure the alignment of the canister 6 with respect to the ship axes.

20 Referring to figure 2, the thrust bearing unit is indicated generally by the reference numeral 100. The thrust bearing unit 100 is welded to the top deck 7 of the ship. This unit transfers the load due to launch of the missile to the top deck 7 of the ship. The thrust bearing unit consists of two side plates 8, a back plate 9, a top plate 11, a front plate 12, connecting plate 13 and two support plates 14. The front plate consists of a thinner lower
25 plate 12A welded to a thicker upper front plate 12. The back plate 9 and the front plate are aligned accurately with the upper deck T beam sections 15 of the ship.

Referring to figure 3, the thrust bearing unit 100 is constructed of plates of different thickness. The sequence of welding of plates to each other is pre decided to obtain
30 maximum radiograph able weld to ensure defect free welding. The two internal vertical plate members 16 are welded to the front plate 12. Then the horizontal plates 18 and 19 are welded to the vertical plate 16 and front plate 12. At this stage two of the other

vertical plates 17 are aligned accurately and welded. These internal plates are interconnected to each other by a four arm machined connector piece 20. Stiffeners 21 are provided to strengthen the load bearing elements of the thrust bearing unit and transfer the load to the top deck support of the ship. Top plates 11 and 22 are welded perpendicular to the front plate 12. Back top cover plates 24 and 25 are also welded. All the above welds are subject to radiographic examination of the welded areas to ensure defect free weld joint.

At this stage the partly assembled thrust bearing unit is transported to the ship deck, positioned at the desired location and the ship deck contour was transferred to the vertical plates 16 and 8 by trimming excess length provided on these plates. The thrust bearing unit is then welded to the ship deck stiffeners through connector piece 20. Use of connector piece 20 to join plate by welding permits radiographic examination of the welded area to ensure defect free weld joint. Radiographic examinations of welds improve the joint efficiency and reduce the thickness of plates required to withstand the severe load conditions encountered in launching a missile.

After the thrust bearing unit is welded to the ship deck as above, back cover plates 23 and 24 are finally welded to complete the assembly. The front plate 12 is inclined to the vertical axis at an angle of 15 degree and welded to the internal members. Thrust bearing unit 100 is welded to the launcher base frame 1 by using plates 13 and 14. This ensures accurate distance between launcher support legs 4 and front plate 12 of the thrust bearing unit 100.

Figure 4 shows the thrust bearing unit and the base frame 1 as welded to the top deck 7 of the ship.

Referring to figure 5 the clamping arrangement 5 used to clamp the canister 6 to the launcher structure 3 consists of bottom half 5A bolted permanently to the launcher structure 3 and a top half 5B removably bolted to the bottom half 5A. Three sets of clamps are used to bolt the canisters to the launcher structure 3.

Referring to figures 6 and 7 a bottom resting unit 50 to locate the bottom of the canister 6 consists of a dished end 30, bolted to a shell 31. The shell 31 is bolted to the canister 6. Removable eye bolts 33 are provided for safe handling and locating of the dished end 30 and the bottom resting unit 50 during assembly to the launcher 10. Linear motion locking arrangements 34 are provided to hold the bottom resting unit 50 against the front plate 12. The linear motion locking arrangement 34 consists of threaded eye bolts 36 and 36 having left hand and right hand threads respectively. A centre piece 37 having two connected threaded elements provided with threads complementary to eye bolt 36 on one end and to eye bolt 37 on the other end is provided. Rotating the centre piece 37 either pushes apart or pulls towards each other the eye bolt centers depending upon the direction. The linear motion locking arrangement 34 holds the missile canister in longitudinal direction while the ship is in motion and during the launch.

While considerable emphasis has been placed herein on the various components of the preferred embodiment, it will be appreciated that many alterations can be made and that many modifications can be made in the preferred embodiment without departing from the principles of the invention. These and other changes in the preferred embodiment as well as other embodiments of the invention will be apparent to those skilled in the art from the disclosure herein, whereby it is to be distinctly understood that the foregoing descriptive matter is to be interpreted merely as illustrative of the invention and not as a limitation.

CLAIMS:

1. A launcher for launching objects, said launcher comprising:
 - a. base frame (1) fixed to a platform;
 - b. launcher structure (3) mounted on the base frame (1), wherein said
5 launcher structure (3) is a welded structure with support legs (4) mounted permanently onto the base frame;
 - c. clamping arrangement (5) to clamp at least one canister (6) onto the launcher structure (3), said canister (6) has a bottom resting unit (50) on its rear end; and
 - 10 d. thrust bearing unit (100) mounted on the platform at rear end of the mounted canister (6) to transfer thrust load to said platform caused during launching of the object.
2. The launcher as claimed in claim 1, wherein the platform is preferably a ship deck.
- 15 3. The inclined launcher as claimed in claim 1, wherein the launcher structure (3) comprises box sections (3A, 3B) welded to each other.
4. The inclined launcher as claimed in claim 1, wherein the support legs are preferably
20 eight in number.
5. The inclined launcher as claimed in claim 1, wherein the support legs (4) are mounted permanently onto the base frame (1) using bolts.
- 25 6. The inclined launcher as claimed in claim 1, wherein the clamping arrangements are at least at three places to clamp the canisters (6) to the launcher structure (3).
7. The inclined launcher as claimed in claim 1, wherein the clamping arrangements (5) comprises bottom half (5A) permanently bolted to the launcher structure (3) and a
30 removable top half (5B).

8. The inclined launcher as claimed in claim 1, wherein the thrust bearing unit (100) comprises external plate members fixed by internal plate members to form a predetermined shape.
- 5 9. The inclined launcher as claimed in claims 1 and 8, wherein the external plate members fixed on the platform comprising:
- a. back plate (9), front plate (12) aligned with top T beam section (15) of the platform;
 - b. top plate (11) is fixed perpendicular to said front plate (12),
 - 10 c. at least two side plates (8) fixed at extreme ends of the front plate (12) and the back plate (9); and
 - d. plurality of support plates (14) mounted with the front plate (12) for providing support to the thrust bearing unit.
- 15 10. The inclined launcher as claimed in claims 1 and 9, wherein the front plate is inclined at an angle 15 degrees with respect to vertical axis of the thrust bearing unit.
11. The inclined launcher as claimed in claim 9, wherein the front plate consists of lower plate (12A) and an upper plate (12).
- 20 12. The inclined launcher as claimed in claim 11, wherein the lower plate (12A) is thinner as compared to the thicker upper plate (12).
13. The inclined launcher as claimed in claims 8 and 9, wherein the internal plate members comprises:
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- a. interconnected plurality of vertical plate members (16, 17) fixed to the front plate (12);
 - b. interconnected horizontal plates (18, 19) connected to the vertical plates (16, 17) using four arm machined connector piece, said horizontal plates (18, 30 19) are fixed to the front plate (12); and
 - c. back cover plates (24, 25) fixed to the front plate (12).

14. The inclined launcher as claimed in claim 1, wherein the bottom resting unit comprises dished end (30) bolted to a shell (31) bolted, said shell (31) is bolted to the canisters and removable eye bolts (33) is provided for safe handling and placing of the dished end (30).

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15. The inclined launcher as claimed in claim 1, wherein a locking arrangement 34 is placed at a hinge 39 of the thrust bearing unit, said locking arrangement is provided to hold the bottom resting unit against the front plate (12).

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16. The inclined launcher as claimed in claim 21, wherein the locking unit consist of a center piece (37) connecting threaded eye bolts (35, 36).

17. A method of assembling a launcher, said method comprising:

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- a. fixing base frame (1) onto a platform;
- b. mounting launcher structure (3) onto the fixed base frame (1) using support legs (4);
- c. mounting at least one canister (6) on top of the launcher structure (3) along with bottom resting unit (50) at its rear end;
- d. fastening mounted canister (6) using clamping arrangements (5); and
- e. fixing thrust bearing unit (100) on the platform at rear end of the mounted canister (6) to transfer thrust load to said platform caused during launching of the object.

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18. The method as claimed in claim 17, wherein mounting launcher structure (3) using support legs (4), said support legs (4) are mounted permanently onto the base frame using bolts.

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19. The method as claimed in claim 17, wherein fastening using the clamping arrangements comprises bottom half (5A) permanently bolted to the launcher structure (3) and a removable top half (5B) on top surface of the canister (6).

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20. The method as claimed in claims 17 and 21, wherein a locking arrangement (34) is placed at a hinge (39) of the thrust bearing unit, said locking arrangement is for holding the bottom resting unit against the front plate (12).