Feb. 23, 1965 J. W. ZIMMER ETAL 3,170,371

MISSILE SNUBBER MECHANISM

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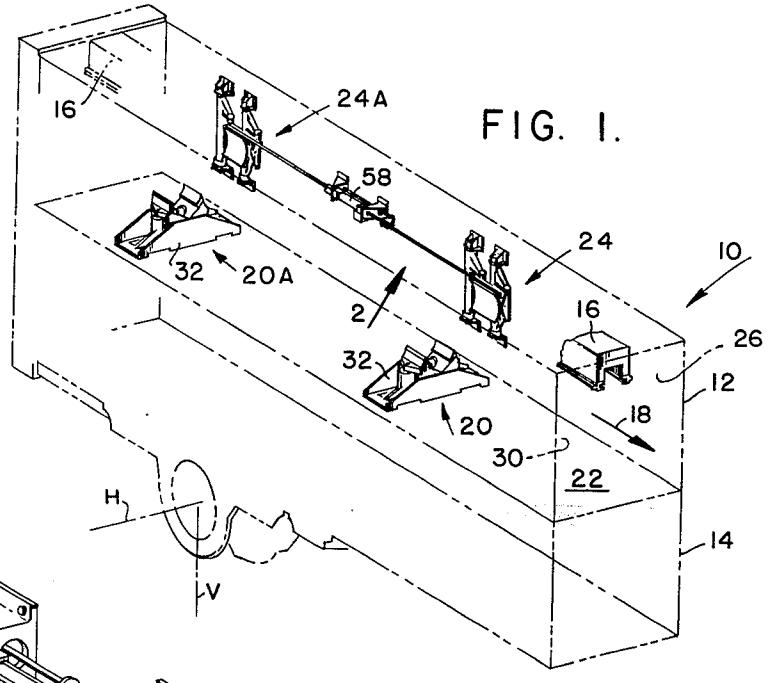


FIG. 1.

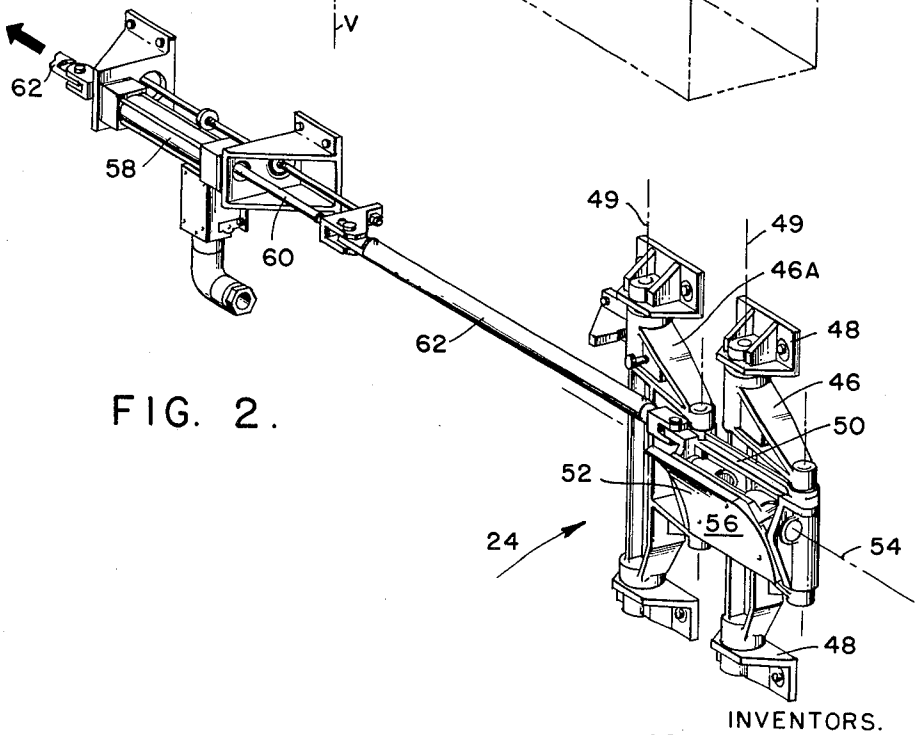


FIG. 2.

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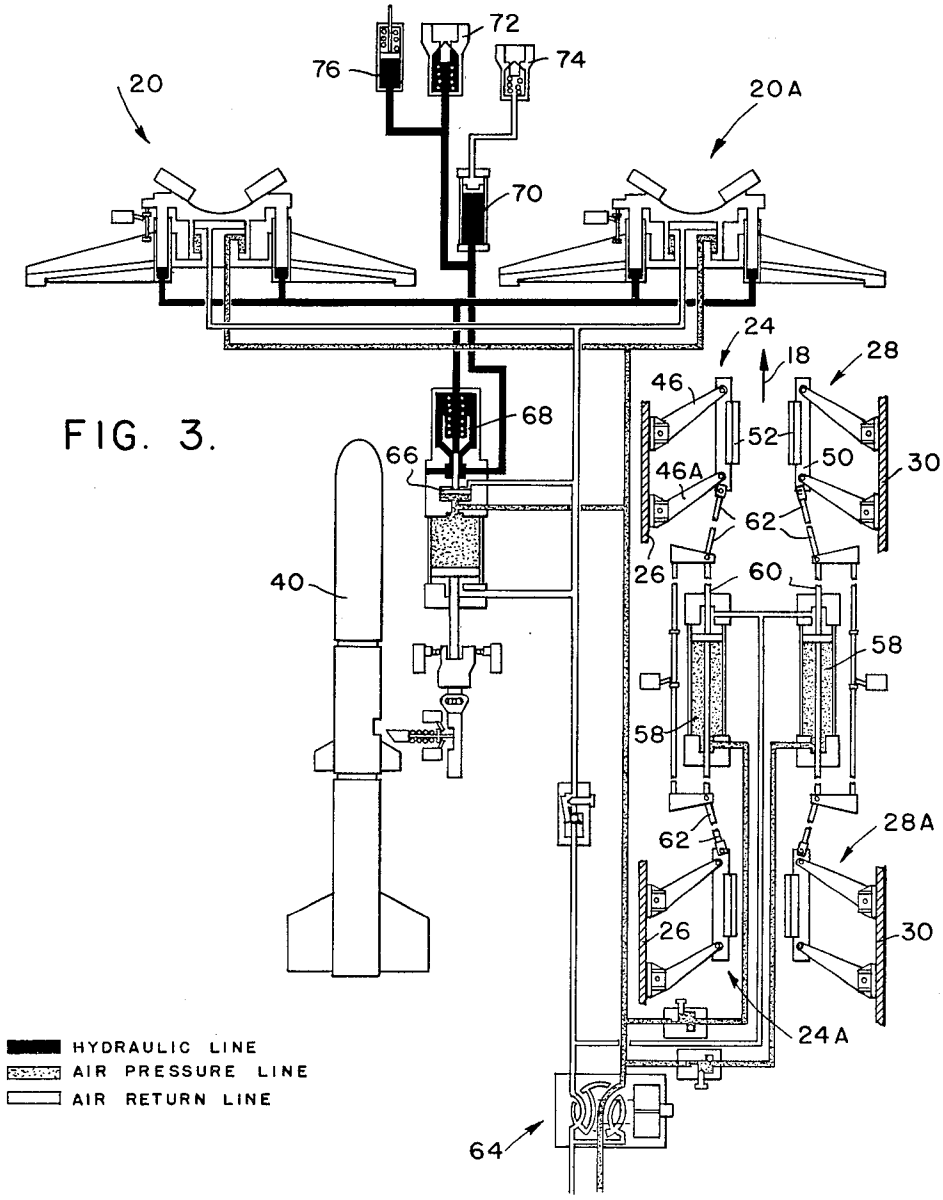
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FIG. 3.



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MISSILE SNUBBER MECHANISM

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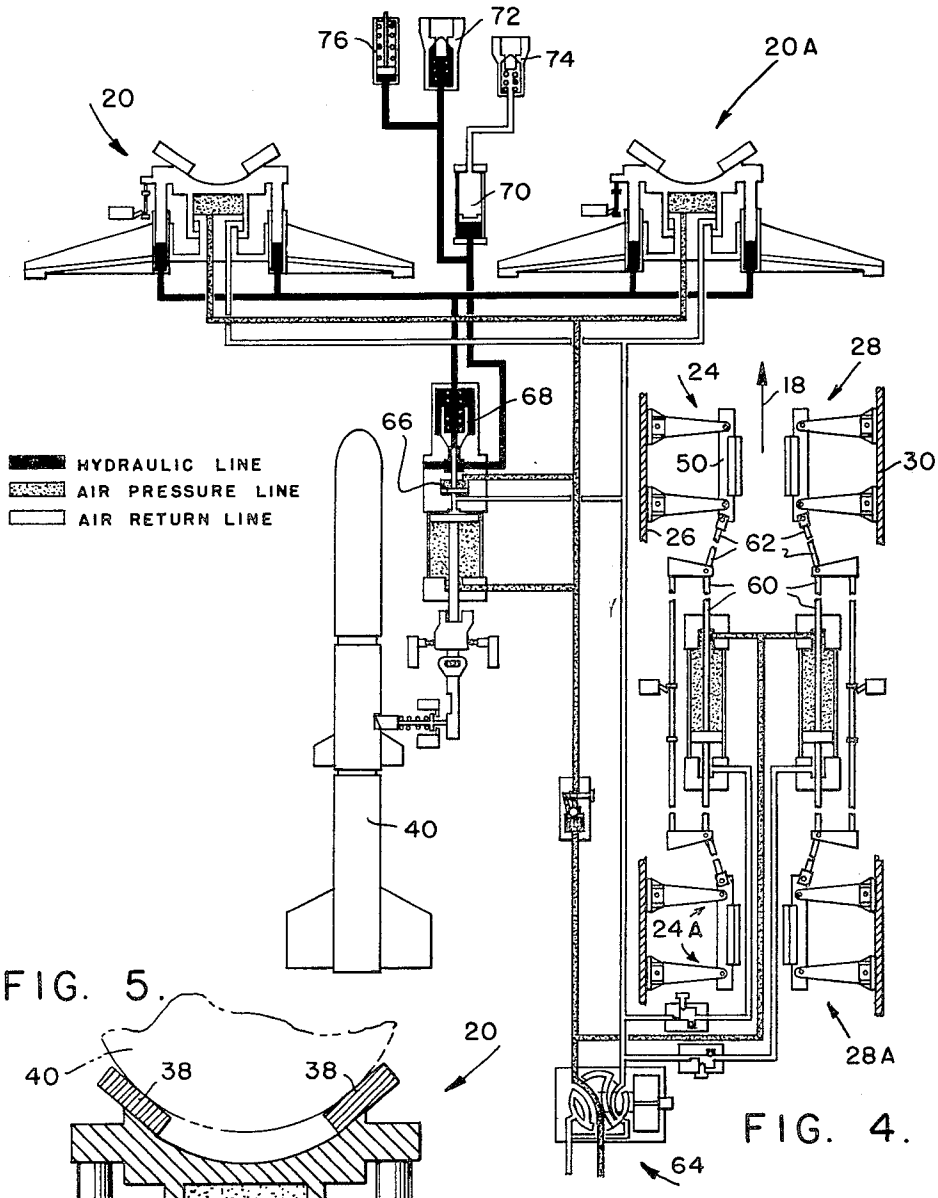
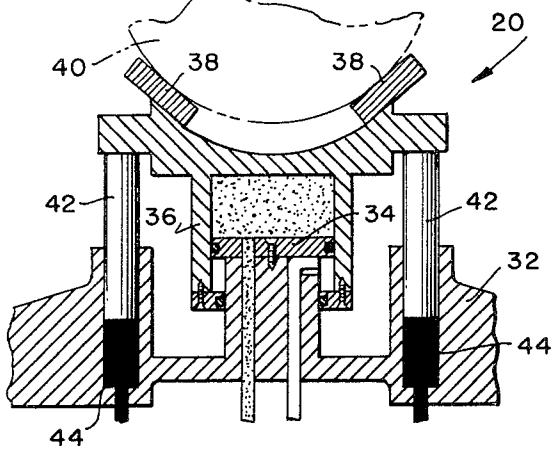


FIG. 4.

FIG. 5.



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MISSILE SNUBBER MECHANISM

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Filed May 28, 1963, Ser. No. 284,304
9 Claims. (Cl. 89—1.7)

The invention relates to missile launcher components and more particularly to the unclaimed missile snubber apparatus disclosed in patent application of Earl E. Bierman and Melvin Appelman, Serial No 93,820, filed March 6, 1961, for "Launcher," now Patent 3,106,132, and also to certain modifications to such disclosure.

The invention is employed within a shipboard launcher cell which may be elevated and trained in azimuth, like a deck gun. The cell is provided with an internal launcher rail from which a rocket propelled missile is suspended by a pair of longitudinally spaced lugs and along which the lugs may slide during launching. These lugs, while of adequate strength to serve their intended purpose during launching, are too fragile to support the heavy missile when the ship pitches and rolls in a heavy sea.

The principal object of the invention is to provide a retractable snubber system which engages a missile and rigidly restrains it in fixed position within a launcher cell until the missile is to be launched, which mechanism relieves the lugs from undesired damaging forces resulting from ship movement.

Other objects, advantages, and salient features will become more apparent from the description to follow, the appended claims, and the accompanying drawing, in which:

FIG. 1 is a phantom view of a launcher cell, upper snubbers on one side of same being omitted;

FIG. 2 is an enlarged side elevation as viewed in the direction of arrow 2, FIG. 1;

FIG. 3 diagrammatically illustrates all snubbers in retracted position;

FIG. 4 similarly illustrates all snubbers in extended or missile engaging position; and

FIG. 5 is a transverse section through a lower snubber, shown in simplified form.

Referring now in detail to the drawing, the environment in which the invention is employed, comprises a launcher housing 10 having upper and lower cells 12, 14, the housing being mounted for rotation about a horizontal axis H and the entire cell also being mounted for rotation about a vertical axis V. Such housing is one of four adjacent housings as more fully disclosed in the above identified patent application. At the top of each cell is disposed a longitudinally extending launcher rail 16 which supports a rocket propelled missile which may be launched in the direction of arrow 18.

The snubber system which forms the subject of the invention comprises fore and aft lower snubbers 20, 20A mounted on floor 22 of cell 12 and upper or side snubbers 24, 24A mounted on a side wall 26 of the cell. Like upper or side snubbers 28, 28A, shown in FIGS. 3 and 4 but omitted in FIG. 1, are mounted to opposite side wall 30.

As best shown in FIG. 5 each lower snubber comprises a base member 32 having a piston 34 which sealingly fits within the bore of a double acting cylinder 36, the cylinder carrying a pair of shoes 38, forming a V block, which engages a lower portion of a cylindrical missile 40. A pair of cylindrical guide pins 42 are also affixed to the cylinder which may slide in guide holes 44 in the base member. The guide pins serve the dual function of maintaining the cylinder and its carried shoes in

rectilinear motion and for hydraulically locking same in extended position as will subsequently appear.

As best shown in FIG. 2 each side snubber comprises fore and aft arms 46, 46A, the upper and lower ends of each being pivotally carried by brackets 48 secured to a cell side wall and rotatable about vertical axes 49. A shoe support member 50 is pivotally secured to the outer ends of each arm and, as best shown in FIG. 3 or 4, the distance between its pivotal axes on the arms is the same as the distance between pivotal axes with the brackets so that member 50 forms the link of a parallelogram linkage which always moves to a position parallel with any other position. Member 50 pivotally carries a shoe 52 which has limited rotation about axis 54, this movement permitting the shoe to rock slightly so that its missile engaging surface 56 may fully engage the cylindrical surface of the missile.

A double acting pneumatic cylinder 58 is secured to each cell side wall, opposite ends of its piston rod 60 being connected to fore and aft shoe support members 50 by links 62.

In operation of the apparatus the position of parts will first be described for the retracted position of all snubbers during which time a missile may be loaded onto the launcher rail or launched along the rail. Referring to FIG. 3, a suitable selector valve 64 has been positioned to deliver air under pressure to the rear ends of both side snubber operating cylinders which has moved all side snubber shoes forwardly and outwardly out of abutting relation with the missile. The air pressure has also been applied to the annular spaces below pistons 34 of the fore and aft lower snubbers, which has moved the lower snubber cylinders to their lowermost and retracted position out of engagement with the missile. Air pressure has also forced actuator piston 66 to a position forcing a check valve 68 off of its seat which communicates guide holes 44 with an accumulator 70, maintained under pressure by nitrogen.

Assuming now that it is desired to engage the snubbers with the missile, valve 64 is positioned to permit the air under pressure in all cylinders to exhaust, and simultaneously admit air under pressure to the opposite ends of all cylinders. As shown in FIG. 4 the side snubbers have now moved rearwardly and inwardly to an "over center" self-locking position to engage the missile and the lower snubber cylinders have been elevated to missile engaging position. Piston actuator 66 has also been moved by air pressure to a position permitting check valve 68 to seat. As the lower cylinders move upward, liquid from accumulator 70 is delivered through the check valve to guide holes 44 and, when upward motion ceases, the check valve closes, trapping liquid in the guide holes and providing a positive lock against retrograde movement of the lower snubbers. As a comparison with the above identified application will reveal, the present application provides for operation of the lower snubbers by pneumatic pressure, rather than by hydraulic pressure, and utilizes the guide pins as hydraulic locks rather than guide pins, only.

Ancilliary apparatus employed with the hydraulic system may include a liquid filling check valve 72, a nitrogen charging check valve 74 and a liquid gauge 76.

Since the launcher cell is subject to being elevated and the ship is subject to pitch and roll, it will be apparent that "horizontal" or "vertical," as hereinafter set forth in the claims, have no fixed position in space during such motions. It is to be understood, accordingly, that these terms shall relate to a fixed reference position during which the launcher rail axis is in a lowered horizontal position and the ship is stationary without pitch or roll.

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 shipboard missile launcher of the type comprising an elongated cell having a longitudinally extending launcher rail disposed therewithin at the top thereof from which a missile is adapted to be suspended by missile suspension lugs and along which the lugs are adapted to slide during launching of the missile, the improvements, in combination, comprising;

(*a*) a pair of longitudinally spaced lower snubbers disposed in the cell beneath the missile having missile engaging members mounted by guide means for restraining said members to upward rectilinear movement into engagement with the missile,

(*b*) longitudinally spaced pairs of upper side snubbers, each pair cooperating with a lower snubber, the snubbers of a pair being disposed, one on each side of the missile, below said rail and equiangularly spaced from the aril, and mounted by means permitting movement into engagement with the missile, and

(*c*) means for moving all members into engagement with the missile for securing the missile in a fixed position within the cell, whereby ship pitch and roll forces tending to act on the missile lugs are absorbed by the snubbers.

2. Apparatus in accordance with claim 1 wherein the means for moving all members comprises

(*d*) pneumatically operated piston-cylinder actuators.

3. Apparatus in accordance with claim 2 wherein each lower snubber includes

(*e*) guide pins for rectilinearly guiding its missile engaging member.

4. Apparatus in accordance with claim 3 wherein

(*f*) said guide pins are slideably disposed in guide pin cylinders, and

(*g*) means for delivering liquid to the guide pin cylinders for locking the guide pins against retrograde movement when the missile engaging members of the lower snubbers are in missile engaging position.

5. Apparatus in accordance with claim 2 wherein

(*h*) the missile engaging member of each upper snubber is mounted to a link of a parallelogram linkage which may move to parallel positions including a self-locking position with the missile.

6. Apparatus in accordance with claim 1 wherein each lower snubber comprises

(*i*) a base member affixed to the cell and having a stationary piston affixed thereto,

(*j*) an actuator cylinder slideable relative to the piston forming chambers on each side of the piston,

(*k*) the missile engaging member being affixed to the actuator cylinder, and

(*l*) means for selectively delivering gas under pressure to either of said chambers, to thereby move the actuator cylinder and its affixed missile engaging member into or out of engagement with the missile.

7. Apparatus in accordance with claim 6 including

(*m*) a pair of guide pins carried by said actuator cylinder and slideable in guide pin cylinders disposed in the base member, and

(*n*) means for delivering liquid to the guide pin cylinders during movement of the actuator cylinder toward missile engaging position and for trapping same therein after movement to missile engaging position for preventing retrograde movement of the actuator cylinder.

8. Apparatus in accordance with claim 7 wherein the last named means includes

(*o*) a check valve, and

(*p*) pneumatically operated means for opening the check valve to permit retrograde movement of the actuator cylinder.

9. Apparatus in accordance with claim 1 wherein each upper snubber comprises

(*q*) a pair of spaced arms rotatable about spaced vertical axes,

(*r*) its missile engaging member being connected to the free ends of the arms and rotatable about other spaced vertical axes and forming a link of a parallelogram linkage adapted to move to parallel positions,

(*s*) the missile engaging member being pivoted for movement about a horizontal axis, to permit same to rotate and conform to the shape of the missile.

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