June 8, 1965 R. CROMWELL ETAL 3,187,631

MISSILE LAUNCHER DETENT

Filed May 28, 1963 2 Sheets-Sheet 1

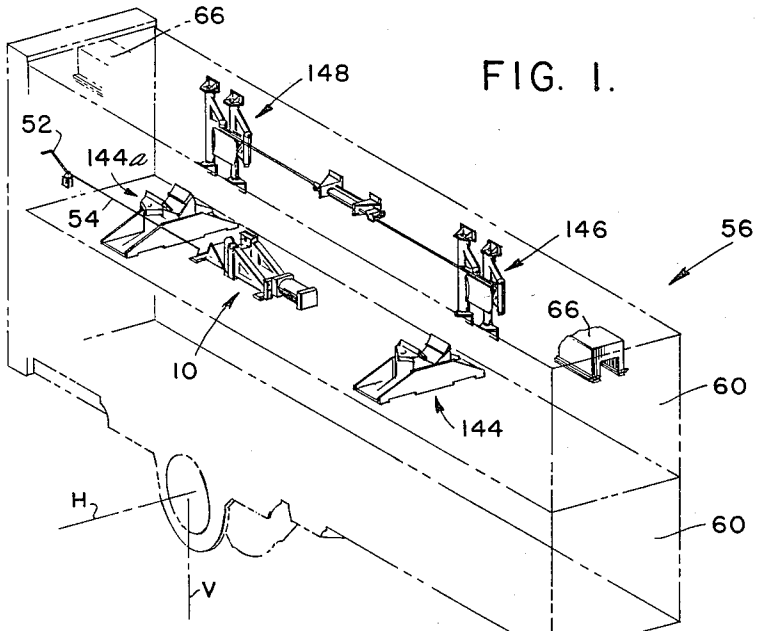


FIG. 1.

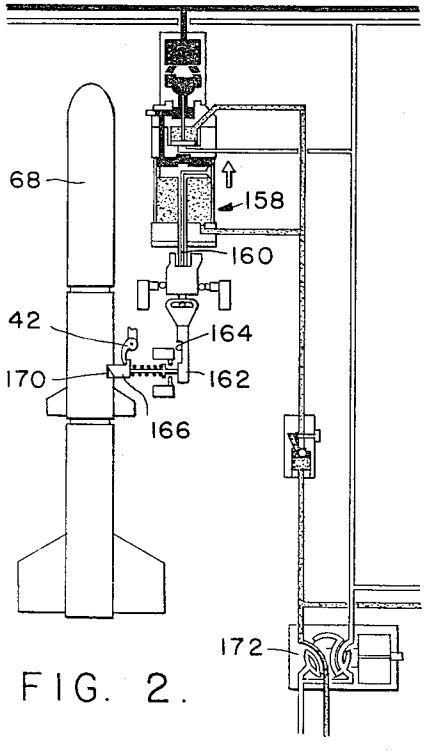


FIG. 2.

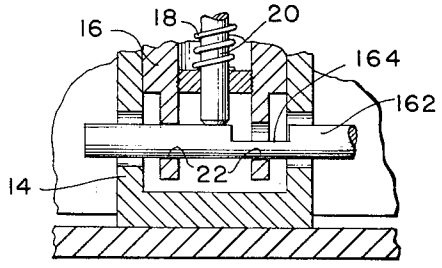


FIG. 5A.

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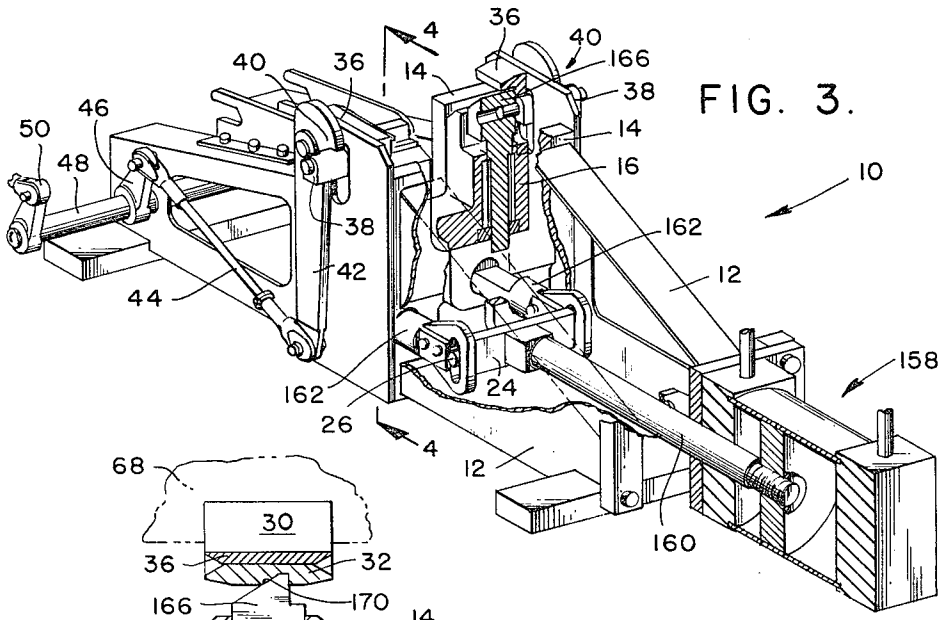


FIG. 3.

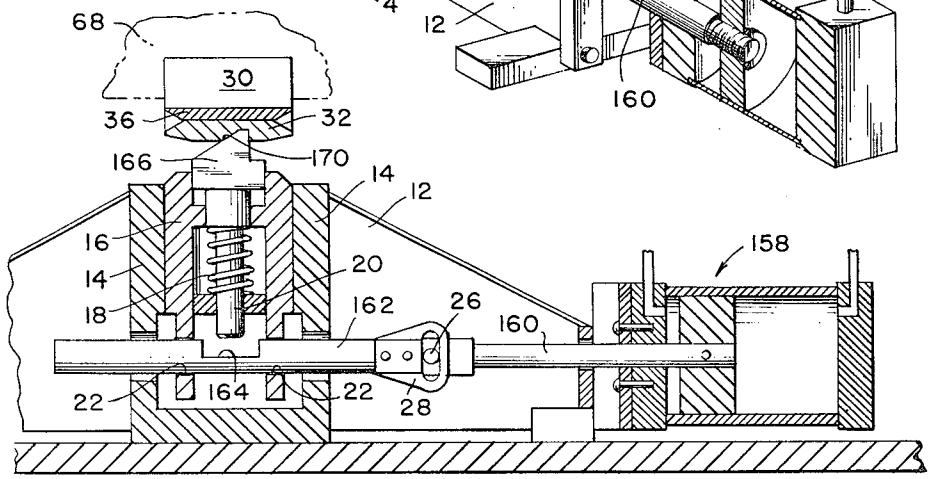


FIG. 5.

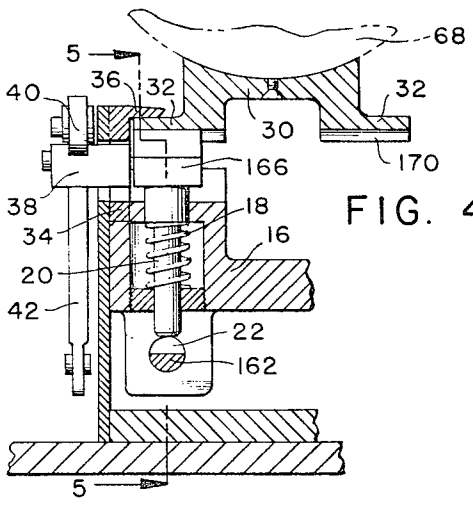


FIG. 4.

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MISSILE LAUNCHER DETENT

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Filed May 28, 1963, Ser. No. 284,303
3 Claims. (Cl. 89—1.7)

This invention relates to missile launcher components and more particularly to the detent system, which forms a part of the missile restraining mechanism, disclosed in patent application of Earl E. Biermann and Melvin Appelman, Serial No. 93,820, filed March 6, 1961, for "Launcher," now Patent No. 3,106,132.

In the application referred to and in the application of Josef W. Zimmer, John T. Bratton and Melvin Appelman, Serial No. 284,304, filed May 28, 1963, for "Missile Snubber Mechanism," there is disclosed certain missile snubber mechanism which restrains a missile in a fixed position in a shipboard launcher cell and which obviates transmission of undesired ship roll and pitch forces to the launching lugs which support the missile on a missile launching rail. While such snubber mechanism applies some restraint to longitudinal movement of the missile, its principal purpose is to restrain movement in all lateral directions of the missile. When such snubber mechanism is disengaged from the missile, just prior to the time of launching, the longitudinal restraint is thus removed and it is essential that other longitudinal restraint be provided until the missile is launched.

One of the objects of this invention is to provide a detent system which will positively lock a rocket propelled missile against longitudinal movement along its launching rail until the missile is ready to be launched, thereby retaining the missile in the launcher in the event of unauthorized premature firing of the missile thrust motor.

Another object is to restrain the missile in the launcher, when ready to be launched, unless its motor develops thrust in excess of a predetermined amount.

A further object is to ensure that a missile, if launched, will travel a sufficient distance from the launching ship to ensure that the launching ship is not endangered by explosion of the missile warhead.

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

FIG. 1 is a phantom view of a launcher cell, in which environment the subject of the invention is employed;

FIG. 2 illustrates the invention in diagrammatic form;

FIG. 3 is an isometric view of the detent system;

FIG. 4 is a section taken on line 4—4, FIG. 3;

FIG. 5 is a section taken on line 5—5, FIG. 4, and

FIG. 5A is a section like FIG. 5 with parts in a different position.

Referring in detail to the drawing, the environment of the invention comprises a launcher housing 56, divided into upper and lower cells 60, 60, the housing being one of four adjacent housings which are supported by a horizontal torque shaft (not shown) and which may be selectively clutched to the torque shaft for rotation about horizontal axis H. The plurality of housings are supported by a mount (not shown) which may rotate the housings about a vertical axis V. Each cell is provided with fore and aft snubbers 146, 148 affixed to opposite side walls of the cell, only one pair of which are illustrated, and fore and aft lower snubbers 144, 144*a* which may be raised and lowered into and out of engagement with a missile 68 supported by suitable launching lugs which may slide along a launching rail 66. When the pairs of side

snubbers are moved inwardly to missile engaging position and the lower snubbers are raised to missile engaging position the missile is securely held within the cell. Opposite motion releases the missile for launching along the launching rail.

The detent system 10 comprises a welded frame 12, affixed to the floor of a cell, the central portion of the frame having a rectangular guideway formed by parallel plates 14, 14. A floating block 16 is slideably disposed within the guideway and carries a pair of detents 166, each of which is urged toward the missile by a spring 18 which surrounds a stem 20 forming a part of the detent. A locking pin 162 is slideably carried in apertures 22, in the block, the pin having a notch 164. In the position of parts shown in FIG. 5, stem 20 may be moved downwardly into notch 164 but when pin 162 is moved to the position shown in FIG. 5A, in which the notch is out of register with the stem, downward movement of the stem is blocked. Movement of pin 162 is effected by a double acting pneumatic actuator 158, the piston rod 160 of which is connected to both of pins 162 by a cross head 24 having ends 26 which engage slotted members 28 affixed to each of pins 162. As will be apparent, as best shown in FIGS. 3 and 5, the sliding block, the detents carried by the block and pins 162 may float as a unit relative to piston rod 160 which latter moves along a fixed axis.

As best shown in FIGS. 4 and 5, a lug 30 is secured to the lower portion of the missile and is provided with oppositely extending ears 32, the lower surface of each having a notch 170 into which a detent 166 extends. A plate 34, having a laterally extending camming ear 36, is secured to each side of the floating block and floats with the block. The purpose of the floating block is to permit capture of an ear 32 between detent 166 and camming ear 36, irrespective of tolerance buildups in the positioning of the detent system relative to ears 32 on a missile. As will thus be apparent the position of ears 32 relative to the fixed launching rail and fixed detent system may vary somewhat yet permit ears 32 to be captured between detents 166 and camming ears 36.

Under certain conditions, as will hereinafter appear, it becomes necessary to unload a missile from the launcher. For this purpose a manual control is provided for depressing the detents out of engagement with lug 30. This apparatus comprises a laterally extending pin 38, secured to each detent, which is engaged by a camming end 40 of a pivotally mounted lever 42. Lever 42 is connected by a pair of links 44 to lever arms 46 secured to a cross shaft 48 which may be rotated by an arm 50, which is connected to a pivoted control lever 52 by cable 54.

The movement of pins 162 may be under any control desired, however in the particular launcher disclosed it is preferred to control their movement under the same control which operates the snubbers. As illustrated in FIG. 2, and as more fully disclosed in Patent No. 3,106,132, a pneumatic system is provided for operating the piston of actuator 158. Under control of multiposition valve 172 pins 162 are in blocking position relative to detents 166 when the snubbers are engaged with the missile, as shown in FIG. 5A, and in non-blocking position when the snubbers are disengaged, as shown in FIG. 5.

In the operation of the apparatus it will first be assumed that a missile is to be loaded onto the launcher rail. Suitable handling apparatus aligns the missile with the launching rail and rams it forwardly along the rail. Pins 162 are now in the position shown in FIG. 5. When the missile has been rammed to a short distance from its final position the forward chamfered edges of ears 32 on lug 30 enter the space between camming ears 36 and the detents. Further forward movement depresses the detents which finally engage in notches 170 which

thus captures lug **30** between the detents and camming ears **36**. The snubbers are next engaged with the missile and pins **162** are simultaneously moved to blocking position as shown in FIG. 5A. This position of parts will be maintained until it is desired to launch the missile. If prior to launching, however, a missile motor should be activated by unauthorized ignition it cannot be launched since detents **166** are blocked against release with notches **170** since pins **162** block movement of the detents. The thrust motor will thus burn out while the missile is retained in the launcher. It may then be released from the launcher by manual depression of the detents, as previously described, and removed from the launching rail by the ramming apparatus. Assuming, now, that the launcher has been properly aimed and a missile is to be launched, the snubber system is now moved to disengaged position and pins **162** are moved to the position shown in FIG. 5. The only restraint on the missile is now that imposed by the detents, the springs and camming surfaces of which are so designed to release the missile if it develops more than a predetermined minimum thrust. With the ASROC missile, having a normal thrust of 20,000 lbs., this thrust is 2000 lbs. which is sufficient to launch the missile a sufficient distance from the launching ship to place the latter out of danger in event the missile warhead should detonate. As will be apparent, any thrust between the predetermined minimum thrust of 2000 and the normal thrust of 20,000 lbs. may be considered a malfunction thrust of the motor. If the thrust is less than the predetermined minimum the missile will remain in the launcher and its motor will burn out, thus precluding launching within a distance which might endanger the launching ship. It may then be removed, as previously described and replaced with another missile.

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 launcher of the type having a launching rail along which a rocket propelled missile is slideably supported while being launched, the improvements, in combination, comprising:

(a) a missile restraining device having a frame rigidly affixed to the launcher at a substantially predetermined distance from the launching rail,

(b) a detent engaging member affixed to the missile, the position of which, relative to the rail and frame, may vary slightly with different missiles,

(c) and a floating member carried by said frame having a resiliently urged movable detent and a camming member,

(d) said floating member adapted to capture said detent engaging member when the missile is moved to its final loaded position on the rail, with said camming member engaging a surface of the detent engaging member and the detent engaging an opposed surface of same.

2. In a missile launcher of the type having a launching rail along which a rocket propelled missile is slideably supported while being launched, the improvements, in combination, comprising:

(a) a missile restraining device having a frame rigidly affixed to the launcher,

(b) a detent engaging lug affixed to the missile and having oppositely projecting ears with a notch in the same sides of each,

(c) a floating member carried by the frame,

(d) a pair of resiliently urged detents carried by the floating member,

(e) a pair of camming members, one affixed to each side of the floating member,

(f) said camming members having portions engageable with the same sides of the ears,

(g) the detents adapted to engage in the notches in the ears,

(h) and a blocking pin for each detent, slideably carried by the floating member, having a first position in which the detents may be moved out of the notches and a second position blocking their movement out of the notches, and

(i) manual apparatus for moving the detents out of the notches operable when said blocking pin is in said first position.

3. In a shipboard missile launcher of the type having a launching rail along which a rocket propelled explosive missile is slideably supported while being launched and aimably mounted on the ship for movement about horizontal and vertical axes, the improvements, in combination, comprising:

(a) a missile restraining device secured to the launcher and disposed adjacent the missile,

(b) said device having a movable detent for releasably engaging a restraining member secured to the missile,

(c) resilient means urging said detent into engagement with said restraining member with a force sufficient to restrain the missile from movement along the rail unless the missile motor develops at least a predetermined minimum but malfunction thrust, less than its maximum and normal thrust, to launch the missile to a predetermined malfunction distance from the launcher, at which distance the launching ship would not be endangered by unauthorized explosion of the missile.

(d) blocking means for blocking movement of the detent to prevent release of the missile, regardless of the thrust of the motor, and in event of premature unauthorized activation of the motor at all times prior to aiming the launcher and readying the missile for launching, whereby the motor may burn out with the missile restrained to the launcher,

(e) means for moving the blocking means to unblocked position, to thereby permit launching of the missile, when the launcher is armed and readied for launching,

(f) a plurality of snubbers for releasably engaging opposed sides of the missile for preventing movement of the missile in directions laterally of the launching rail,

(g) power operated means for moving the snubbers into and out of missile engaging position, and

(h) means operated by said power means for moving said blocking means to unblocked position when said snubbers are moved away from their missile engaging position, whereby said detent is free to move to release the missile if the motor develops at least said predetermined minimum thrust.

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