April 25, 1961 A. H. MILLER, JR., ET AL 2,981,152

MISSILE HANDLING AND LAUNCHING DEVICE

Filed March 5, 1959 3 Sheets-Sheet 1

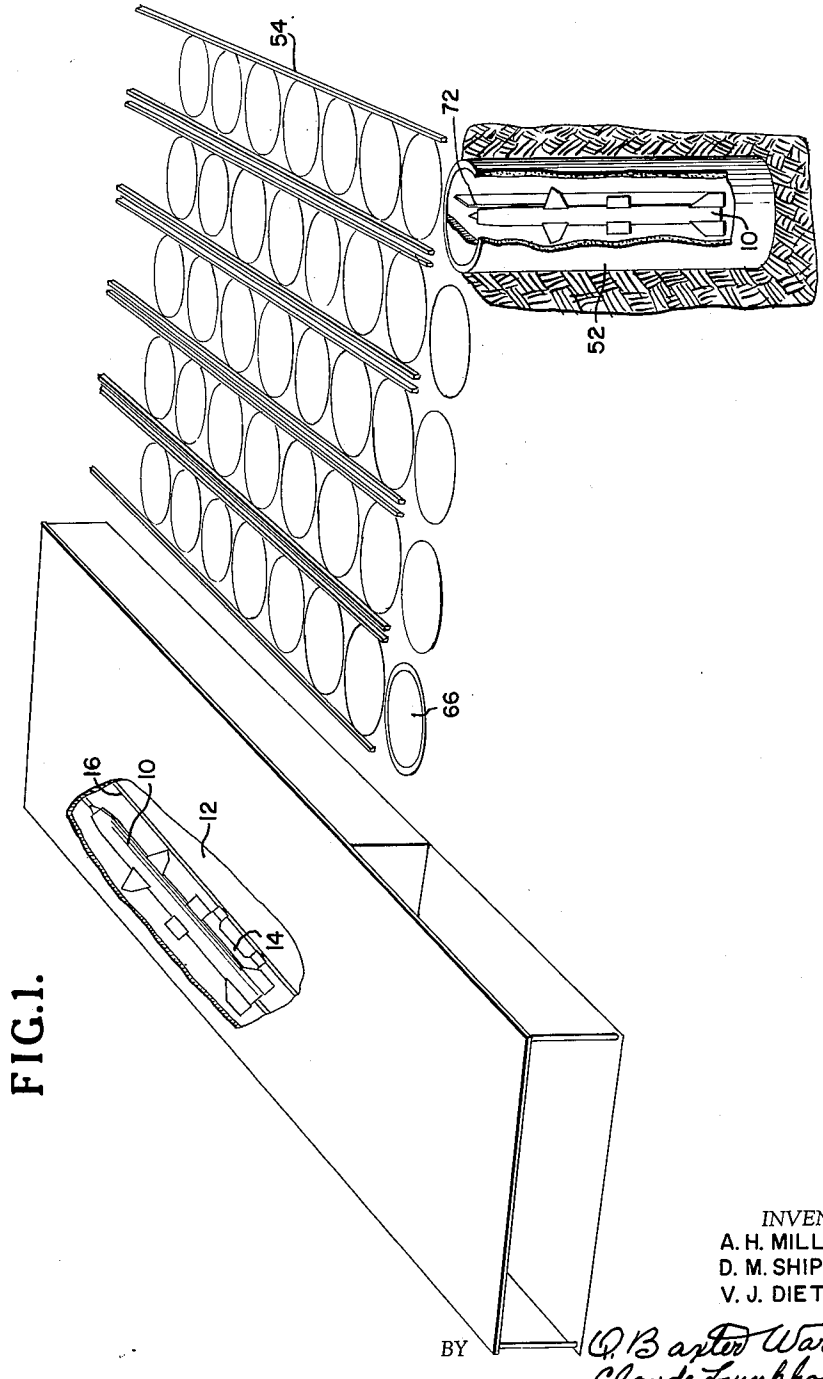

FIG.1.

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FIG.2.

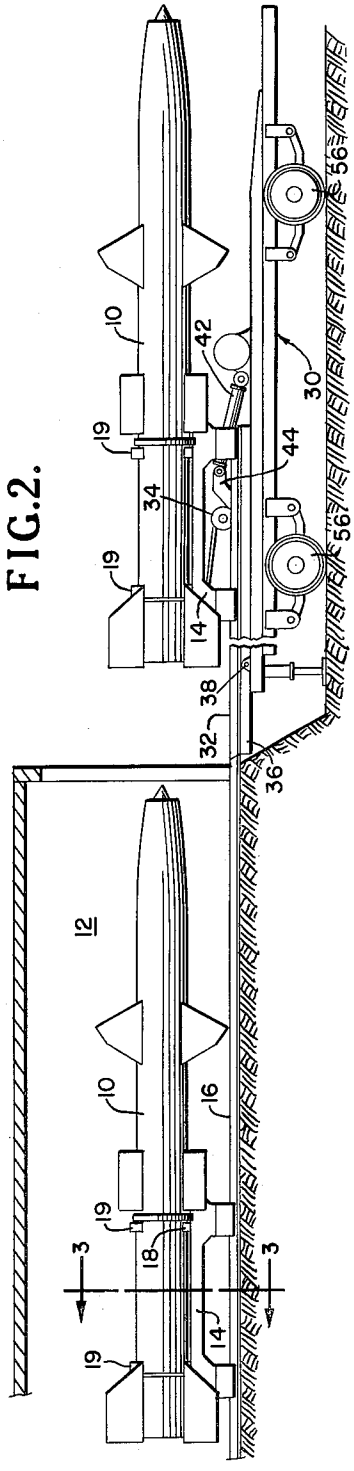

FIG.4.

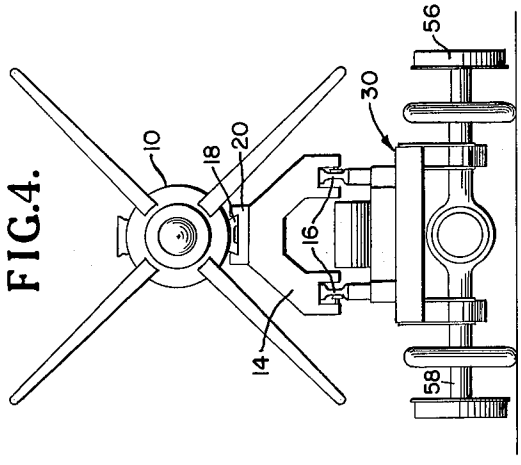

FIG.3.

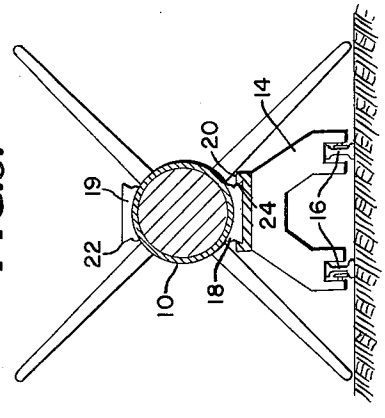

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FIG.5.

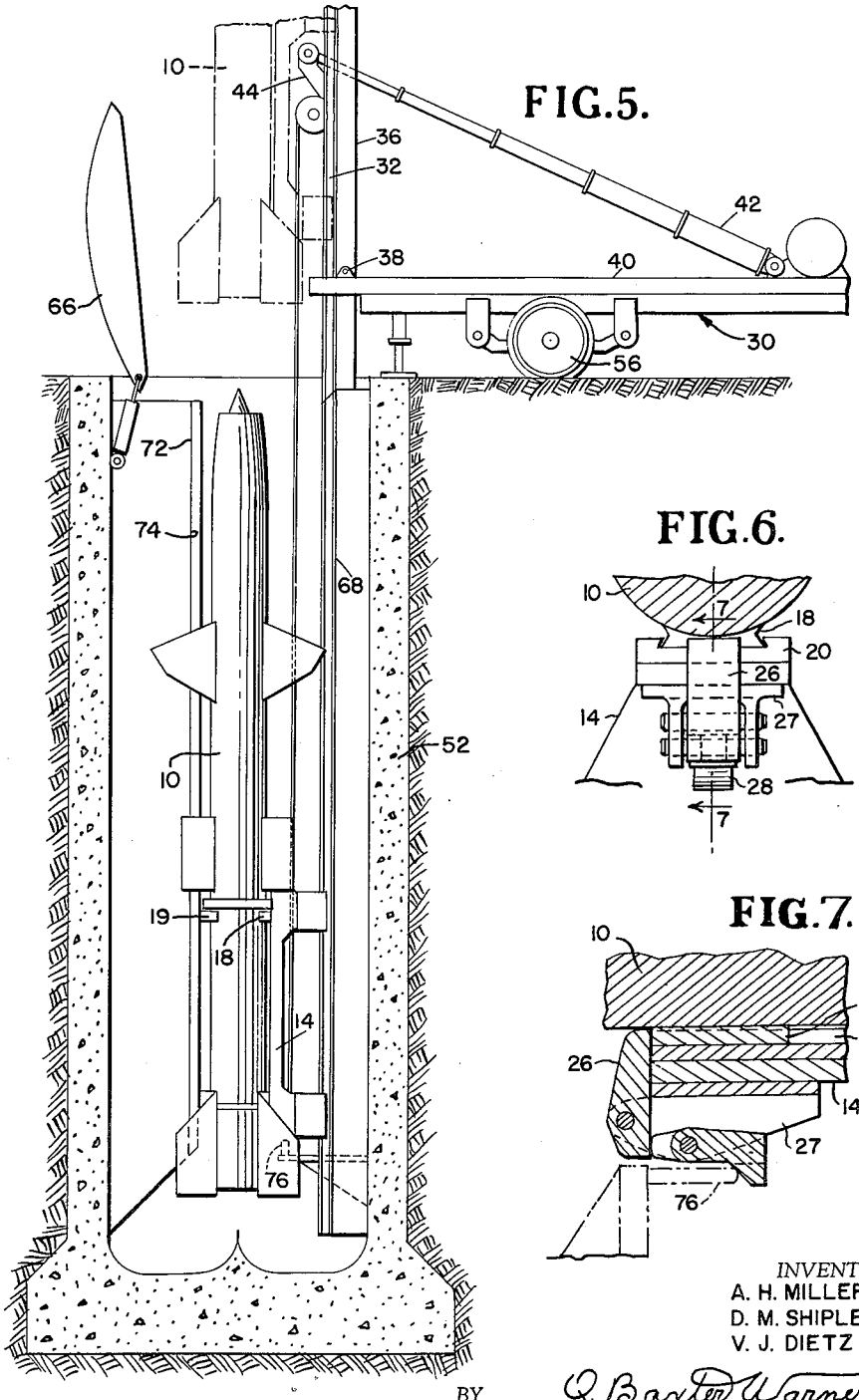

FIG.6.

FIG.7.

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MISSILE HANDLING AND LAUNCHING DEVICE

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5 Claims. (Cl. 89—1.7)

The present invention relates to a missile handling and launching system, and more particularly to such a system in which novel handling equipment is integrated with a novel arrangement of multiple launchers.

The inherent advantages of multiple launcher systems over single firing units are well known and include increased fire power, reliability, reservation until the last possible instant for choice of type missile, high degree of automaticity, etc. The present invention utilizes all these advantages in providing a missile handling and launching system including a plurality of underground launchers and offers, additionally, the feature of safe ready stowage which enables the missiles to be safely stored underground in a maximum degree of readiness since warmup power can be supplied directly to the missiles in their respective launchers. The underground aspect of this system also allows each launcher to act as its own dud disposal area. In the unlikely chance of a dud, no action by anyone is necessary to dispose of it and another missile may be launched immediately.

It will therefore be recognized as the object and purpose of the present invention to provide a missile handling and launching system of underground launchers which, by novel integral handling means, will permit, with a minimum personnel requirement, a high degree of fire power, last minute selectivity of type missile to be fired, safe storage in a maximum state of readiness, and minimum effort for the disarming and removal of duds.

Other objects and many of the attendant advantages of this invention will be readily appreciated as the same becomes understood by reference to the following detailed description when considered in connection with the accompanying drawings.

Briefly, the present invention contemplates a handling and launching system in which an aerial missile is carried on a unique dolly through various final assembly stages in a ready area. When the missile has been completely assembled, the dolly and missile are drawn onto a novel vehicle for transfer to a vertically disposed underground launching capsule. Means are provided on the vehicle for tilting the dolly and missile into a vertical attitude and for lowering the dolly and missile into the launching capsule. In the launching capsule, means are provided for automatically disengaging the missile from the dolly in order that the dolly may be retrieved.

In the drawings:

Fig. 1 is a perspective showing the general arrangement of the present invention;

Fig. 2 is an elevation view of a missile and dolly after completion of the final assembly stage in the ready area, and a second missile and dolly after having been drawn onto the transfer vehicle;

Fig. 3 is a cross section on lines 3—3 of Fig. 2;

Fig. 4 is a right end view of the loaded transfer vehicle; and

Fig. 5 is an elevation view, partly in cross section, showing the missile and dolly after having been lowered into the launching capsule; shown in phantom is the missile and a portion of the transfer vehicle in raised position in preparation for the lowering operation.

Fig. 6 is an end elevation of the releasable clamping means on the dolly;

Fig. 7 is a section taken on line 7—7 of Fig. 6.

Referring now to the drawings in greater detail, Fig. 1 shows the general layout of the missile handling and launching system constituting the present invention in which missiles 10 are assembled in a ready area 12. The ready area 12 is generally surrounded by appropriate walls and a roof conforming to certain provisions of established military safety standards. In Fig. 2, it can be seen that each of the missiles 10 are carried horizontally through the final assembly phases on a dolly 14 that rides on tracks 16. The tracks 16 are secured to the floor of the ready area 12 and are formed from I-beams. As best seen in Fig. 3, the wheels of the dolly ride between the upper and lower flanges of the track so that the dolly is constrained to move longitudinally of the tracks 16.

The missile 10 is held in coupled relationship with the dolly 14 by a pair of shoes 18 on the missile which engages a rail 20 on the dolly. The pair of shoes 18 is conventionally provided on the periphery of the missile to facilitate handling and launching and comprises a fore and an aft shoe. A similar pair of shoes 19 is positioned diametrically opposite the pair 18 and likewise is provided for handling and launching purposes. Each shoe of the pairs 18 and 19 is provided with outwardly depending flanges 22, those of the pair 18 engaging longitudinal slots 24 in the rail 20 to constrain the missile 10 to longitudinal movement with respect to the dolly 14. For the purpose of controlling this longitudinal movement, a simple releasable clamp 25, shown in Figs. 6 and 7, is provided on the rear of the rail 20 which engages one of the rear shoes 18 on the missile 10 and comprises an arm 26 pivotally mounted in a bracket 27 and a tripping lever 28

When the missile 10 is completely assembled, it and the dolly 14 are moved to a loading platform in the ready area 12 in preparation for removal therefrom by a transfer vehicle 30. Referring once again to Fig. 2, it is seen that the vehicle 30 is a modified standard truck chassis and carries tracks 32 which mate with the tracks 16 of the ready area 12. For the purpose of drawing the dolly 14 and missile 10 directly onto the vehicle, a power winch 34 is provided on the vehicle. The tracks 32 are mounted on a bed 36 which is pivotable in a vertical plane about a shaft 38 journalled in frame 40 of the vehicle 30, so that the missile 10 and dolly 14 can be elevated into a vertical attitude by a hydraulic lift 42. As can be seen in the drawings, the hydraulic lift 42 is similar to the type used in dump trailers and is mounted on the frame 40 of the vehicle 30, one end of the lift engaging a bracket 44 on the pivotable bed 36.

After the missile 10 and dolly 14 are drawn onto the transfer vehicle 30, they are transported to a launching area 50 comprising a plurality of vertically disposed underground launching capsules 52. As seen in Fig. 1, the launching capsules 52 are arranged preferably in a plurality of rows, each row being centered between tracks 54, which, as will be seen, aid in positioning the transfer vehicle 30 over the capsules.

As shown in Fig. 4, the vehicle 30 is provided with a second set of wheels 56 which are mounted on axle extensions 58 outboard of the vehicle's regular wheels. The wheels 56 may be standard railroad wheels or otherwise flanged so that they will engage the tracks 54 to guide the vehicles 30 in position over the launching capsules 52.

Referring to Fig. 5, it can be seen that the launching capsules 52 are located underground in a vertical position, each being provided with a hinged counter-balanced

cover 66. The walls of the capsule 52 may be fabricated of steel plate or, as shown in the drawings, formed of concrete. For the purpose of inducing the most efficient flow of exhaust gases from the capsule 52 at launch, the bottom of the capsule is provided with a cross section substantially in the form of a double concave surface.

In order that the missile 10 and dolly 14 may be guided into the capsule 52, handling tracks 68 are secured longitudinally to the inner wall of the capsule and are of the same cross section as the tracks 32 on the vehicle 30. The upper end 70 of the tracks 68 are cut at an angle complementary to the end of the tracks 32 so that when the latter is pivoted into the vertical attitude the ends of the two tracks will mate thereby allowing the missile 10 and dolly 14 to be lowered into the proper position in the capsule 52.

Located diametrically opposite the tracks 68 in the capsule 52 is a launching rail 72 that is rigidly secured to the inner wall of the capsule 52. The launching rail 72 is provided with slots 74 which engage the flanges 22 of the missile shoes of the pair 19 in the same manner as the slots 24 of the rail 20 on the dolly 14 engage the shoes of the pair 18. Thus in addition to being supported by the dolly 14, the missile 10 is also supported in the capsule 52 by the launching rail 72.

The lowering of the missile 10 into the launching capsule 52 is accomplished by first bringing the loaded vehicle 30 into position at the capsule, this being considerably simplified by the fact that the tracks 54 in the launching area 12 guide the vehicle along one centerline of the capsule. Next, the pivotable tracks 32 on the vehicle 30 and bearing the missile 10 and dolly 14 are elevated into a vertical attitude by the hydraulic lift 42. Final positioning is done by moving the vehicle 30 along the tracks 54 to bring the pivotable tracks 32 into aligned mating position with the handling tracks 68 in the launching capsule 52. The dolly 14 carrying the missile 10 and which is now suspended on the vertically inclined pivotable tracks 32 by the winch 34 on the vehicle 30, is lowered into the launching capsule 52 by the same winch. By virtue of the alignment of the two tracks 32 and 68, the loaded dolly 14 is transferred smoothly from the vehicle 30 to the capsule 52.

It is seen that as the missile 10 enters the capsule 52, the shoes 19 on the missile engage the launching rail 72 in the capsule to afford concurrent support of the missile. This then permits the dolly 14 to be relieved of its burden once it has served its purpose of lowering the missile 10 into position in the capsule 52. To effectuate this, a member 76 is provided in the capsule 52 and is so located that just as the missile 10 is arriving at its final position in the capsule, the member will engage the tripping lever 28 of the releasable clamp 25 of the dolly 14 to uncouple the missile 10 from the dolly. Once having been thus freed from the missile 10, the dolly 14 may be withdrawn from the capsule 52 by the same means that was used for lowering it into the capsule, namely, the winch 34. The dolly 14 and the vehicle 32 are then available for handling and loading another missile into another launching capsule.

Provision is also made in each of the launching capsules 52 for additional conventional associated equipment such as warm-up power and launching power sources, arming mechanisms, etc., in order that the capsule 52 may function as a launcher. In addition to its prime role as a launcher, the capsule 52 also functions as a safe ready storage means for the missile. Also, should the unlikely possibility of a dud occur, the capsule may act as its own dud disposal area.

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 an underground missile launching system including a missile having a plurality of pairs of flanged launching shoes thereon, a tube vertically disposed in the ground for launching said missile, said tube having a launching rail therein and engageable with one pair of said launching shoes, said launching system also including a vehicle for transporting and loading said missile into said tube; the combination therewith of an improvement, comprising, a dolly for carrying said missile and having a support rail fixed thereon, said support rail being engageable with another pair of said launching shoes to secure said dolly and missile in lateral locked relationship, releasable clamping means on said dolly for controlling longitudinal movement of said missile relative to said dolly, wheels on said dolly, handling tracks on said vehicle and engageable with said dolly wheels to maintain said vehicle and dolly in lateral locked relationship, said tracks being pivotable into a vertical attitude, restraining means on said vehicle and engageable with said dolly to control longitudinal movement of said dolly relative to said handling tracks, second handling tracks in said tube and engageable with said first handling tracks in aligned relationship, said second handling tracks also being engageable with said dolly wheels in the same manner as said first handling tracks, and means in said tube and engageable with said releasable clamping means to release said dolly for longitudinal movement relative to said missile.

2. The combination as recited in claim 1 wherein said dolly support rail includes a longitudinal slot to receive the flanges of said missile launching shoes to maintain said missile and dolly in lateral locked relationship.

3. The combination as recited in claim 1 wherein each of said first and second handling tracks include upper and lower flanges to form a channel therebetween to receive said dolly wheels whereby said dolly is maintained in lateral locked relationship with said handling tracks.

4. The combination as recited in claim 1 wherein said restraining means includes a cable winch on said vehicle, the free end of the cable winch being engageable with said dolly.

5. The combination as recited in claim 1 wherein said last-mentioned means includes a member fixedly mounted in said tube and engageable with said releasable clamping means on said dolly.

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