Aug. 21, 1962 R. F. HERETH ETAL 3,049,976

ARMING SYSTEM

Filed Oct. 11, 1960 4 Sheets-Sheet 1

FIG. 1

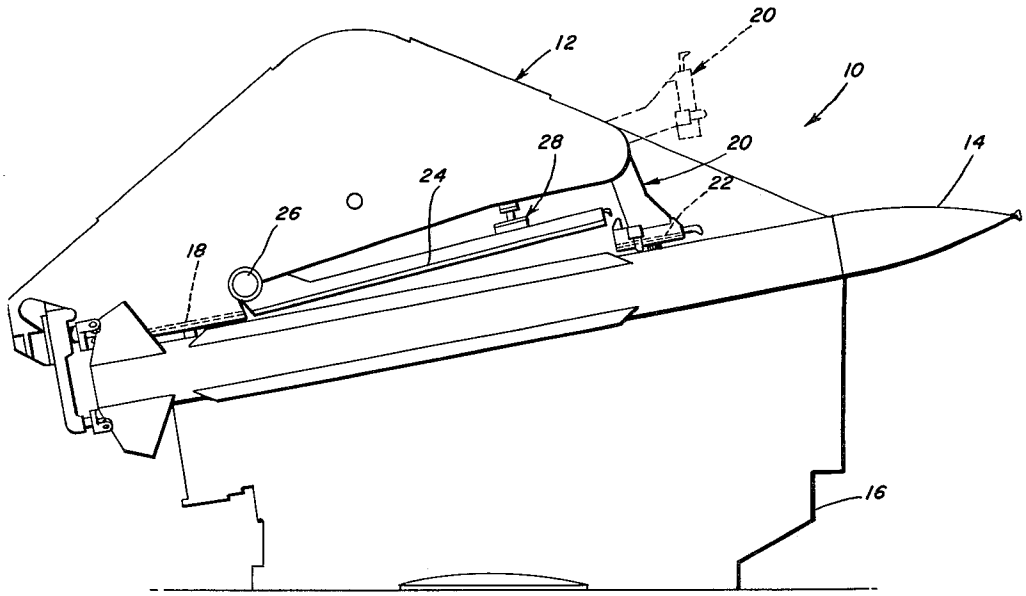


FIG. 6

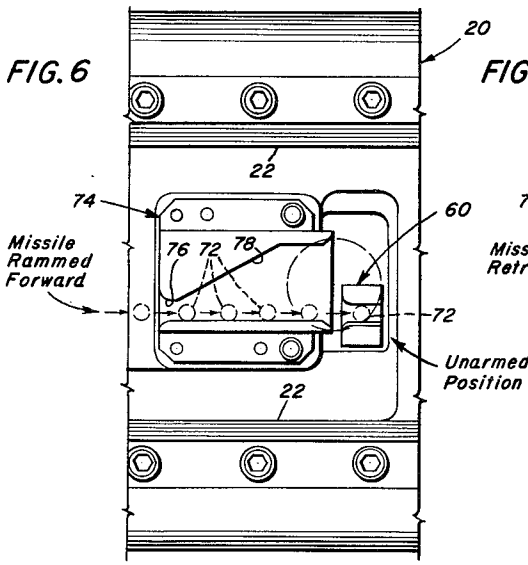
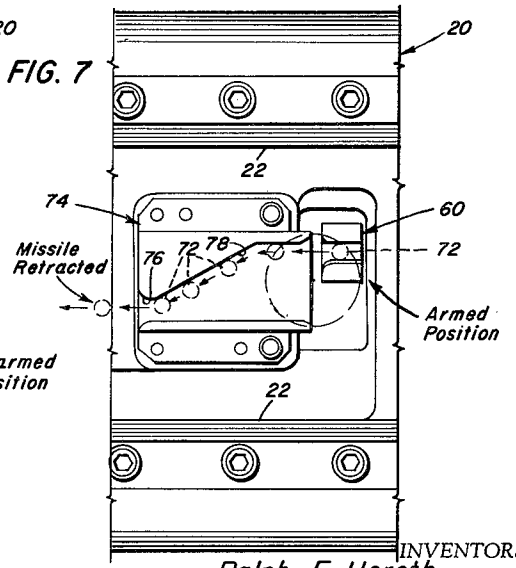


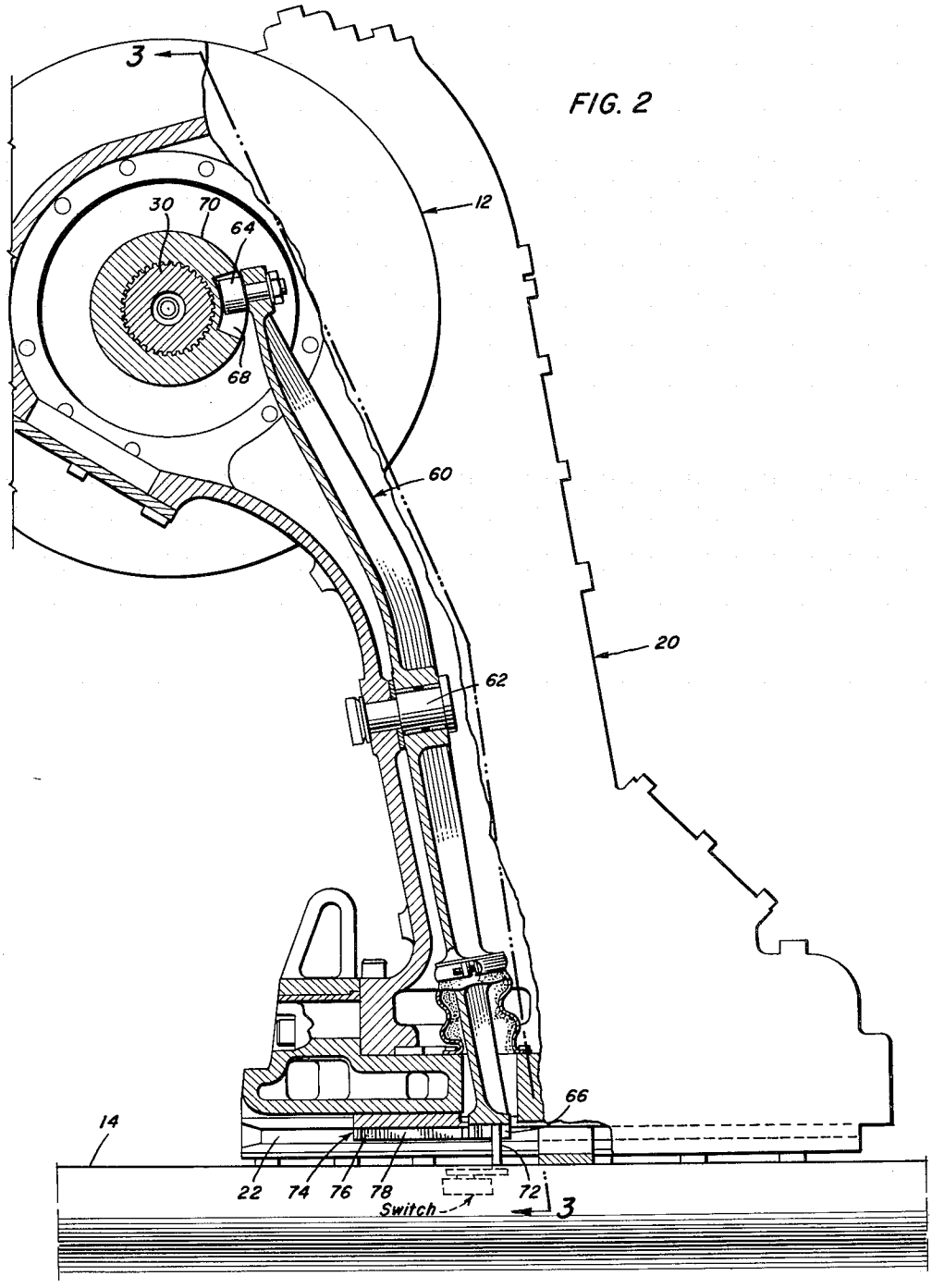
FIG. 7



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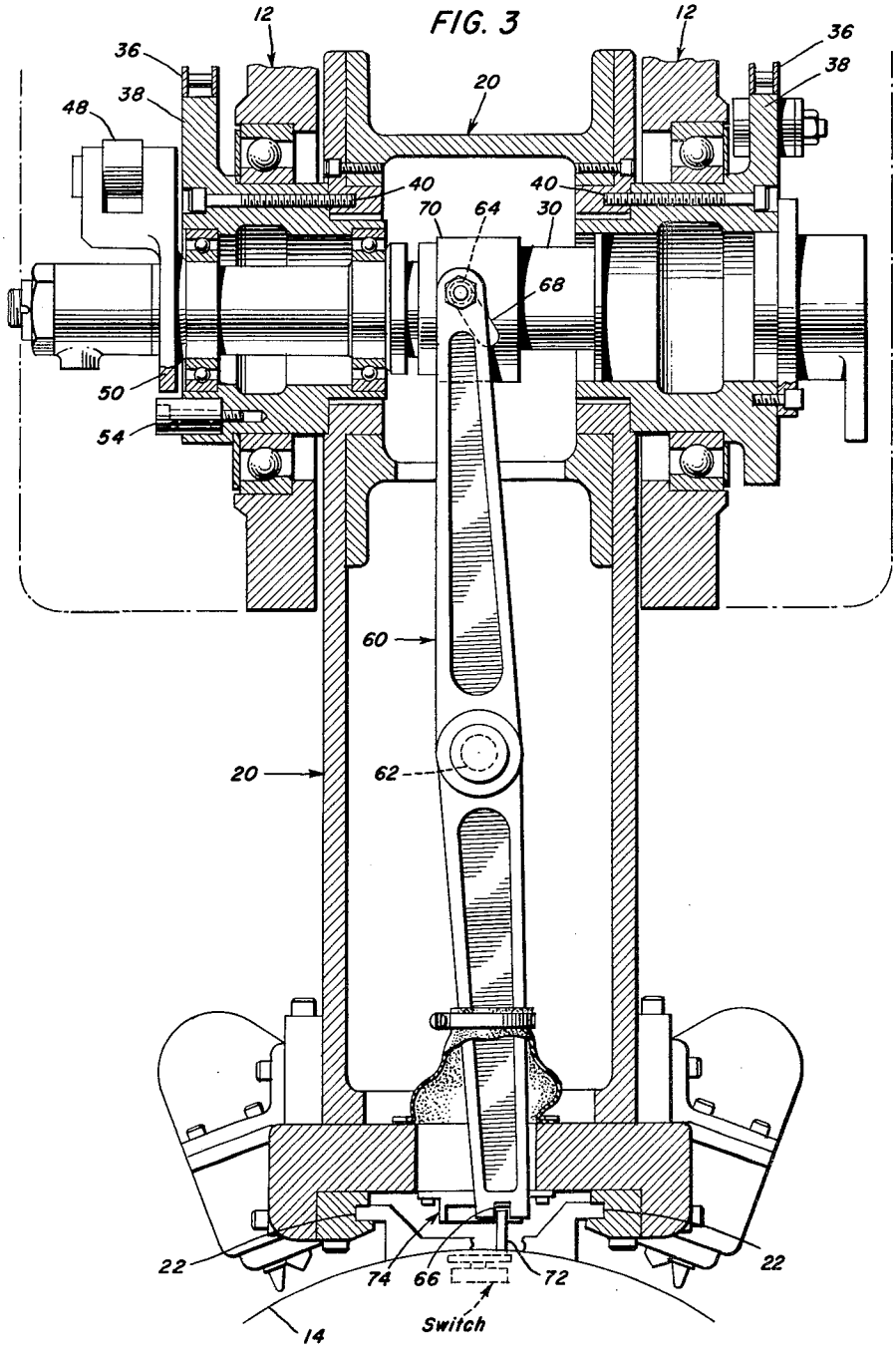
FIG. 2



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FIG. 3



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FIG. 4

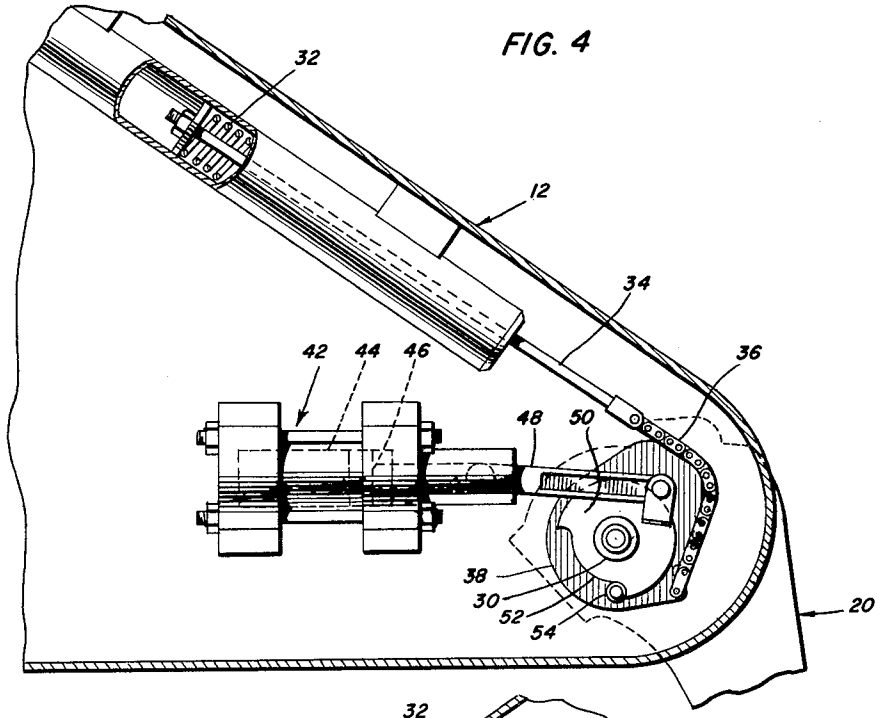
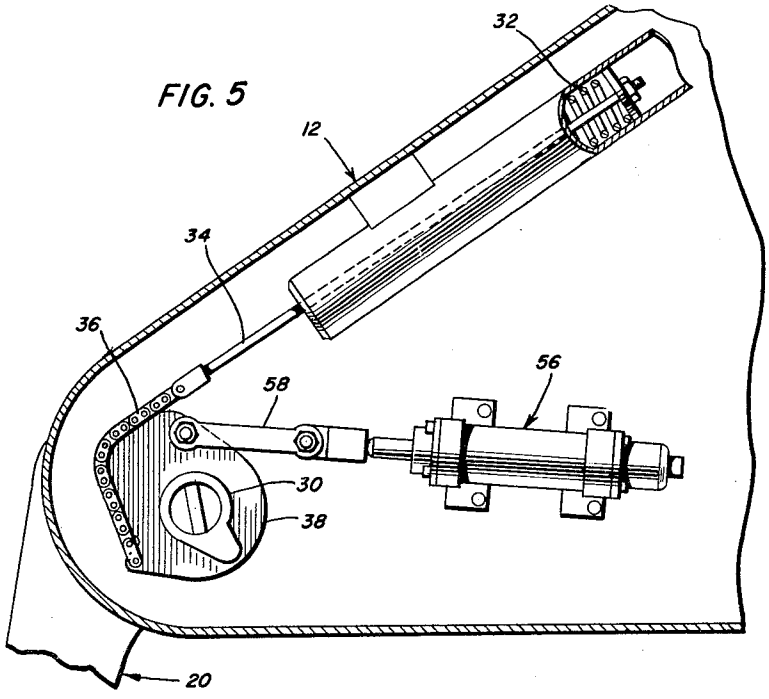


FIG. 5



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ARMING SYSTEM

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8 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.

The present invention relates to missile launchers and more particularly to an arming device for completing the firing circuits of a missile after the missile is placed on the launcher.

In the launching of certain missiles, it has been the practice to complete the firing circuit of the missile prior to the time that the missile is placed on the launcher. For safety reasons, this action is undesirable since the subsequent handling of the armed missile is extremely dangerous. An armed missile could be fired or ignited by shock or some other means and this possibility of pre-ignition increases the hazards of missile handling both as to equipment and personnel. For the aforementioned reasons, it is desirable to postpone arming of the missile until all phases of handling of the missile have been carried out and the missile is in position for launching.

The present invention contemplates the provision of a missile launcher arm constructed in such a manner that the aforementioned difficulties will not be encountered. To attain this desired result, the launcher arm of the present invention is provided with an arming device which will operate to complete the firing circuit of the missile after the missile is rammed onto the launcher arm.

Accordingly, it is an object of the present invention to provide a missile launcher onto which a missile is rammed in an unarmed condition and which arms the missile after it is rammed into position for launching.

Another object of the present invention is to provide a missile launcher on which a missile is armed immediately prior to launching.

A further object of the invention is to provide a missile launcher onto which a missile can be rammed or returned to the ready service mechanism only in an unarmed condition.

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 side elevation view of a missile launcher embodying the instant invention;

FIG. 2 is an enlarged side elevation view of the front guide of the launcher with portions broken away to show interior elements;

FIG. 3 is a sectional view taken substantially on the line 3—3 of FIG. 2 and illustrating portions of the front guide and associated mechanisms;

FIG. 4 is a sectional view of one side of the launcher arm showing means for rotating the front guide to up and down positions;

FIG. 5 is a sectional view of the opposite side of the launcher arm showing means for buffering the front guide during upward movement;

FIG. 6 is a plan view as seen beneath the front rail section and illustrates the safety device and actuating arm in an unarmed position; and

FIG. 7 is a view similar to FIG. 6 but illustrates the safety device and actuating arm in an armed position.

Referring now to FIG. 1 of the drawings, the missile launcher 10 comprises a launcher arm 12 movable in elevation to align the missile 14 thereon with the target in this plane of movement. It will be understood that the base portion 16 of the missile launcher is mountable on the deck structure of a ship (not shown) or any other suitable structure for movement in 360° of train to align the missile carrier by the launcher arm with the target in this plane of movement. It will be understood that the missile launcher has a second arm (not shown) substantially identical to launcher arm 12 except that they are assembled in opposite hand relationship.

A rear rail section 18 is fixedly mounted on the lower rear portion of launcher arm 12 as seen in FIG. 1. A front guide 20 is mounted on the front portion of the launcher arm for movement between an "up" position illustrated by the broken line showing and a "down" position illustrated by the full line showing in FIG. 1. The front guide has a front rail section 22 fixedly mounted thereon. A center rail section 24 is mounted on the launcher arm to span the gap between the rear rail section 18 and the front rail section 22 when the front guide is in the "down" position. The center rail section 24 is movable between an "up" position wherein the center rail section is out of alignment with the front and rear rail sections and a "down" position wherein it is in alignment with the front and rear rail sections.

The center rail section 24 is fixed to the launcher arm 12 by pivot pin 26 at one end and by a hydraulic piston and cylinder assembly 28 at the other end. It will be understood that when the piston of assembly 28 is extended the center rail section is moved about pivot pin 26 to the "down" position aforementioned and when the piston is retracted the center rail section is moved to the "up" position. Since it is desirable that the front and rear lugs leave the launcher arm at substantially the same instant and that the length of travel of the two lugs in contact with the launcher arm be substantially equal, the center rail section is placed in the "up" position prior to launching of the missile and is moved to the "down" position only during the ramming of a missile onto the launcher arm.

The front guide 20 is mounted on the launcher arm by a pivot shaft 30 about which the front guide is rotatable. Compression springs 32 which are mounted on each side of the launcher arm and are connected to the front guide by means of connecting rods 34, link chains 36 and torque arms 38 bias the front guide to the "up" position. The torque arms 38 are fixed to the front guide by any suitable means such as bolts 40 and rotate therewith about the pivot shaft 30.

As shown in FIG. 4, a hydraulic piston and cylinder assembly 42 comprising a cylinder 44 and a piston 46 connected to the front guide through link 48 and swivel head 50 moves the front guide to the "down" position against the action of the springs 32. The swivel head 50 is connected to the front guide by means of a cut-out portion 52 therein and a drive pin 54 fixed to one of the torque arms 38. The forward edge of the cut-out portion 52 engages the drive pin 54 as the piston 46 is extended in the cylinder 44 and rotates the torque arm 38 and hence the front guide about the pivot shaft 30 to the "down" position. The cut-out portion 52 is of sufficient length to allow the piston 46 to be retracted while the front guide 20 is held in the "down" position by suitable locking means (not shown) such as that described in the copending application Serial No. 49,107, filed August 11, 1960. The hydraulic piston and cylinder assembly 42 moves the front guide to the "down" position prior to the ramming of a missile onto the launcher arm and holds the front guide in this position until the missile is in position for launching on the launcher arm rail sections. As the front lug of the

missile moves into position on the front rail section 22, the locking means (not shown) is engaged and holds the front guide in the "down" position while the front lug is in contact with the front rail section 22. After the locking means has been engaged, the piston 46 is retracted to its initial position in the cylinder 44 leaving the front guide in the "down" position.

When the missile is launched, the front lug moves out of contact with the front rail section and releases the locking means allowing the front guide to be returned to the "up" position by the springs 32. A buffer 56, FIG. 5, is connected by link 58 to the torque arm 38 on the opposite side of the front guide from the torque arm carrying the drive pin 54. The buffer 56 acts as a brake to slow the front guide as it approaches the "up" position to reduce the shock of any sudden stops.

An arm 60, FIG. 3, is mounted within the front guide 20 by a pivot pin 62. The arm 60 has a cam follower 64 fixed at one end thereof and a notch 66 cut in the other end. The cam follower 64 is received in a cam slot 68 cut in a sleeve 70 which is fixed on shaft 30 for rotary movement therewith. The arm 60 is of sufficient length so that the end having the notch 66 therein is in position to receive the arming lever 72 on the missile 14.

A safety device 74, FIGS. 6 and 7, is mounted on the bottom of front guide 20 to the rear of the arm 60. In this position, the safety device 74 is located between the arm 60 and the ready service mechanism (not shown). The safety device 74 is provided with a slot 76 cut therein. The slot 76 is constructed in such a manner that it is just wide enough to allow entrance of the arming lever 72, in the unarmed position, at the opposite end of the safety device from the arm 60 and closest to the ready service mechanism. At the other end of the safety device, the slot 76 is wide enough for the arming lever 72 to enter the slot whether in the armed or unarmed position. If the missile is to be returned to the ready service mechanism and the arm 60 does not move the arming lever 72 back to the unarmed position, the arming lever will enter the slot 76 in the armed position. In such an event, the cam portion 78 of the slot 76 will cam the arming lever 72 to the unarmed position. Thus, the missile 14 may not be returned to the ready service mechanism in an armed condition.

In operation, the missile launcher guide arm 12 is moved in elevation and the missile launcher base 16 is moved in train to the loading position. Upon arrival at this position, the piston 46 in the cylinder 44 is extended and rotates the front guide 20 through the swivel head 50, drive pin 54 and torque arms 38 to the "down" position against the action of springs 32. As the swivel head 50 is rotated by the piston 46, it rotates the shaft 30 and the sleeve 70 fixed thereon. The cam slot 68 cams the cam follower 64 to the left, as seen in FIG. 3, which pivots the arm 60 about the pin 62 and moves the notched end 66 to the right. The arm 60 is then in position to receive the arming lever 72 of the missile 14 through the slot 76.

With the front guide 20 in the "down" position, the piston in the piston and cylinder assembly 28 is extended thereby pivoting the center rail section 24 about the pin 26 into alignment with the front and rear rail sections 22 and 18, respectively. The missile 14 is rammed onto the rail sections of the launcher arm with the front lug being positioned on the front rail section 22 and the rear lug being positioned on the rear rail section 18.

As the front lug of the missile moves onto the front rail section it engages the locking means (not shown) which holds the front guide in the "down" position until the front lug leaves the front rail section. The center rail section is moved to the "up" position as soon as the missile is in position for launching on the launcher arm.

While the locking means is holding the front guide 20 in the "down" position against the action of springs 32, the piston 46 is retracted in the cylinder 44 rotating the swivel head 50 in a counterclockwise direction. The shaft 30 and sleeve 70 will also be rotated and the cam slot 68 cams the cam follower 64 to the right as seen in FIG. 3. The arm 60 is pivoted about the pin 62 and moves the notched end 66 to the left. As the notched end 66 moves, it carries the arming lever 72 therewith rotating the arming pin which actuates the switch (shown dotted in FIGS. 2 and 3) to complete the firing circuit of the missile 14. The missile is then in condition for launching and may be aligned with the target and launched.

If for some reason the missile is not launched and is to be returned to the ready service mechanism, the procedure which is followed is the reverse of that followed in the ramming of the missile onto the launcher arm. The piston 46 is extended thereby rotating the swivel head 50, shaft 30 and sleeve 70 and, in turn, moving the notched end 66 of arm 60 to the right, as seen in FIG. 3, to disarm the missile 14. The piston and cylinder assembly 28 moves the center rail section 24 into alignment with the front and rear rail sections and the missile is returned to the ready service mechanism. In the event that the piston 46 is not extended or if extended the arm 60 is not moved to disarm the missile, the cam portion 78 of slot 76 will cam the arming lever 72 to the right as seen in FIG. 3 and to an unarmed condition as shown in FIG. 7 thus disarming the missile.

It will therefore be understood that the missile 14 cannot be returned to the ready service mechanism in an armed condition. It will be further understood that the present invention provides structure whereby arming of the missile may be delayed until immediately prior to launching thereby obviating the danger of premature ignition which might cause injury to personnel and considerable damage to equipment.

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 arming system comprising, a missile having front and rear lugs, a firing circuit within said missile, a switch in said missile for completing or breaking said circuit, an arming lever fixed to said switch, a missile launcher having at least one launcher arm for reception of said missile, a front guide mounted on said launcher arm for pivotal movement between a lowered position wherein said front guide is in position for reception of the front lug of said missile and a raised position wherein said front guide is out of the path of travel of the rear lug of said missile as the same is launched, spring means biasing said front guide to said raised position, means on said launcher arm for moving said front guide to said lowered position against the action of said spring means, a secondary arm mounted on said front guide for pivotal movement between a first position wherein said secondary arm is adapted to engagingly receive said arming lever for movement therewith when the missile is received on said launcher arm and a second position removed from said first position, and means responsive to the action of said front guide moving means for moving said secondary arm between said first and said second positions whereby said arming lever actuates said switch for completing or breaking said firing circuit.

2. The structure as set forth in claim 1 wherein the means for moving said front guide comprises a hydraulic piston and cylinder assembly mounted on said launcher arm and connected to said front guide.

3. An arming system comprising, a missile having front and rear lugs, a firing circuit within said missile and including a switch for completing or breaking said circuit, an arming lever fixed to said switch, a missile launcher having at least one launcher arm for reception of said missile, a rear rail section mounted on one end of said launcher arm, a front guide mounted on the opposite end of said launcher arm from said rear rail section,

a front rail section mounted on said front guide, said front guide being pivotally mounted for movement between a lowered position wherein said front rail section is in alignment with said rear rail section and a raised position wherein said front rail section is out of alignment with said rear rail section, spring means for biasing said front guide to said raised position, means for moving said front guide to said lowered position against the action of said spring means, a secondary arm mounted on said front guide for movement to a first position wherein said secondary arm is adapted to receive said arming lever when the missile is received by said launcher arm and a second position removed from said first position, and means responsive to the action of said front guide moving means for moving said secondary arm between said first and second positions whereby the arming lever actuates said switch for completing or breaking said firing circuit.

4. The apparatus as set forth in claim 3 wherein said front guide moving means comprises a hydraulic piston and cylinder assembly mounted on said guide arm and connected to said front guide.

5. The apparatus as set forth in claim 4 wherein said secondary arm moving means comprises a rotary cam connected to said hydraulic piston and cylinder assembly and engaging said secondary arm whereby said cam is rotated by said assembly to move said secondary arm between said first and said second positions.

6. In a missile launcher having at least one launcher arm, a device for arming a missile having an arming switch comprising, a cam rotatably mounted on said launcher arm, a secondary arm having one end in engagement with said switch pivotally mounted on said launcher arm, a cam follower on said secondary arm and engaging said cam, and means on said launcher arm for rotating said cam whereby said cam will pivot said secondary arm and actuate said switch.

7. In a missile launcher having at least on launcher arm, a device for arming a missile having an arming switch comprising, a shaft having a cam slot therein rotatably mounted on said launcher arm, a secondary arm having one end in engagement with said switch pivotally mounted at a point intermediate of its ends on said launcher arm, a cam follower on the other end of said secondary arm and engaging said cam slot, and means on said launcher arm for rotating said shaft, whereby said cam slot will pivot said secondary arm and actuate said switch.

8. In the missile launcher of claim 7, wherein said shaft rotating means comprises a hydraulic piston and cylinder.

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