United States Patent [19]

Murray

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[45] **July 8, 1975**

[54] **MISSILE LAUNCHER GUIDE ASSEMBLY**

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[73] Assignee: **The United States of America as represented by the Secretary of the Navy**, Washington, D.C.

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[21] Appl. No.: **410,847**

[52] **U.S. Cl.** **89/1.801**; 89/1.806; 89/1.807

[51] **Int. Cl.** **F41f 3/02**

[58] **Field of Search** 89/1.8, 1.806, 1.807, 1.813, 89/1.814, 1.816–1.819, 1.805

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Attorney, Agent, or Firm—R. S. Sciascia; Charles D. B. Curry

[57] **ABSTRACT**

A missile launcher guide assembly including a housing for containing a missile. A removable launch rail is attached to the missile prior to loading the missile into the housing. To stow the missile in the launcher the missile and removable launch rail are slidably moved into the launcher and into alignment with a fixed launch rail mounted at the forward end of the housing. To ready the missile for firing the missile is initially moved a short distance backwards with a missile actuating mechanism that is not subject to missile blast. This rearward movement of the missile simultaneously applies electrical power and control signals to the missile, actuates a replaceable missile arming cam, connects the missile firing contact to the launcher assembly probe and disengages the launcher assembly latch mechanism that mechanically restrained the missile. When the missile is fired a shear pin in the missile actuating mechanism shears and releases the missile when the missile thrust reaches a predetermined value. After firing the missile, the expendable components including a male plug assembly, the shear pin and the arming cam are replaced.

5 Claims, 8 Drawing Figures

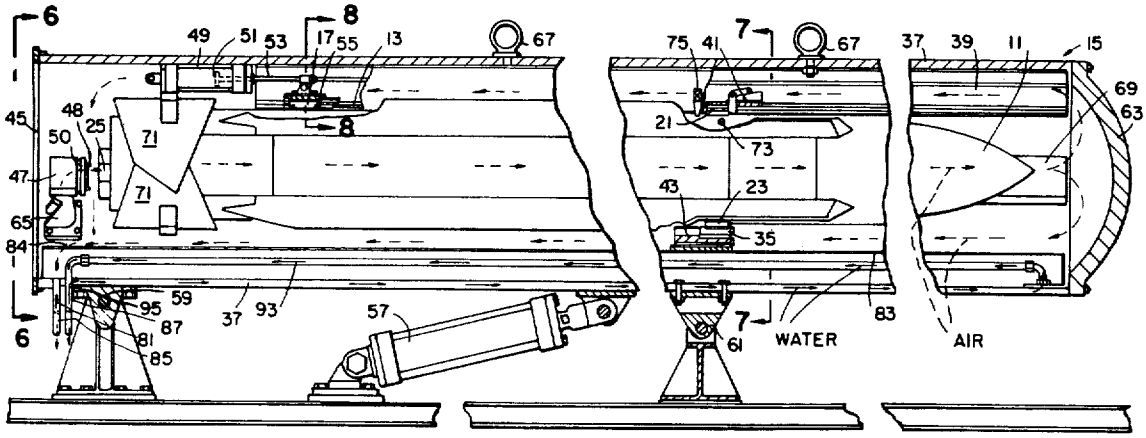


FIG_1

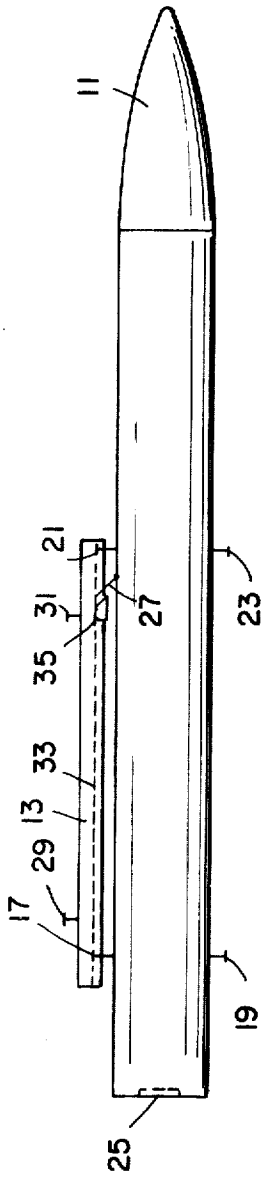


FIG_2

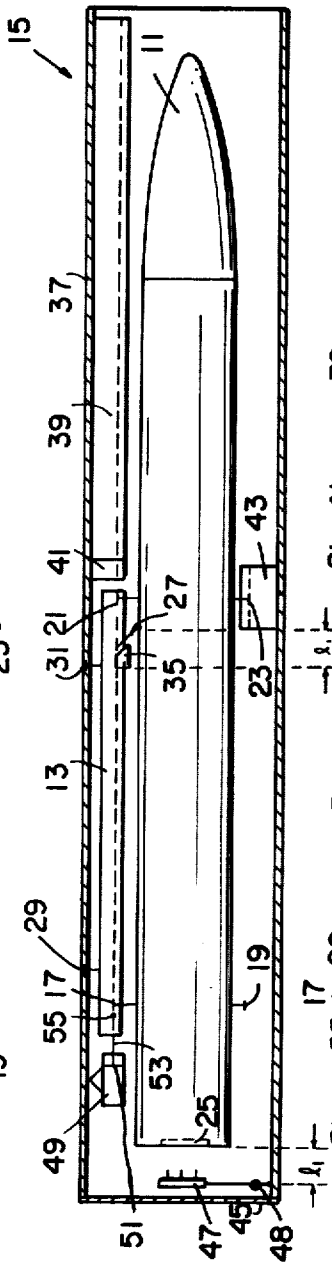


FIG_3

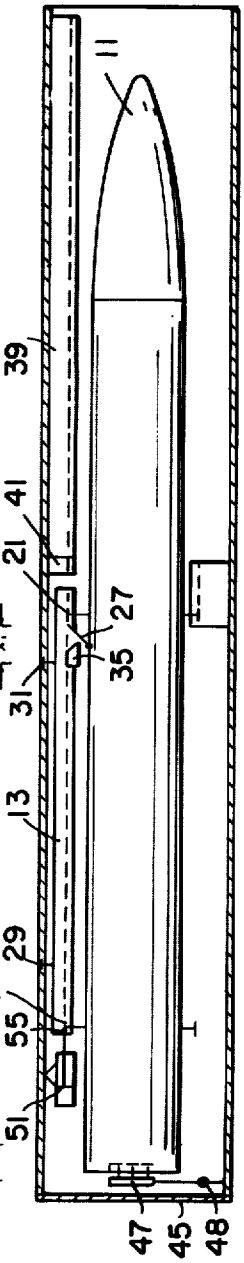
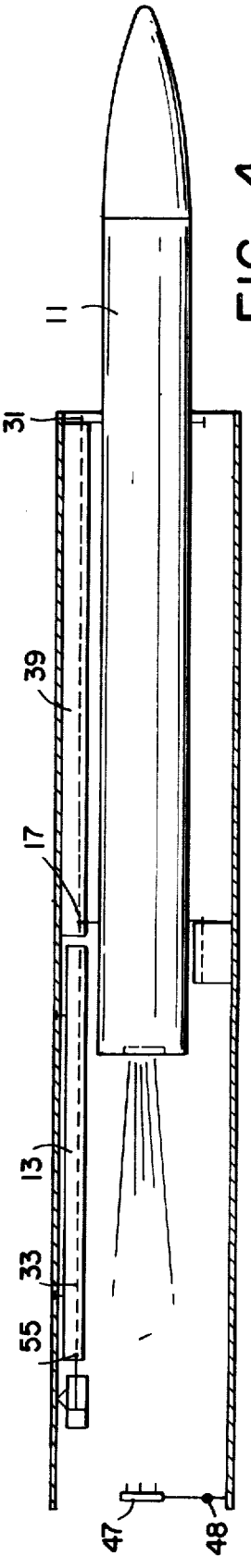


FIG_4



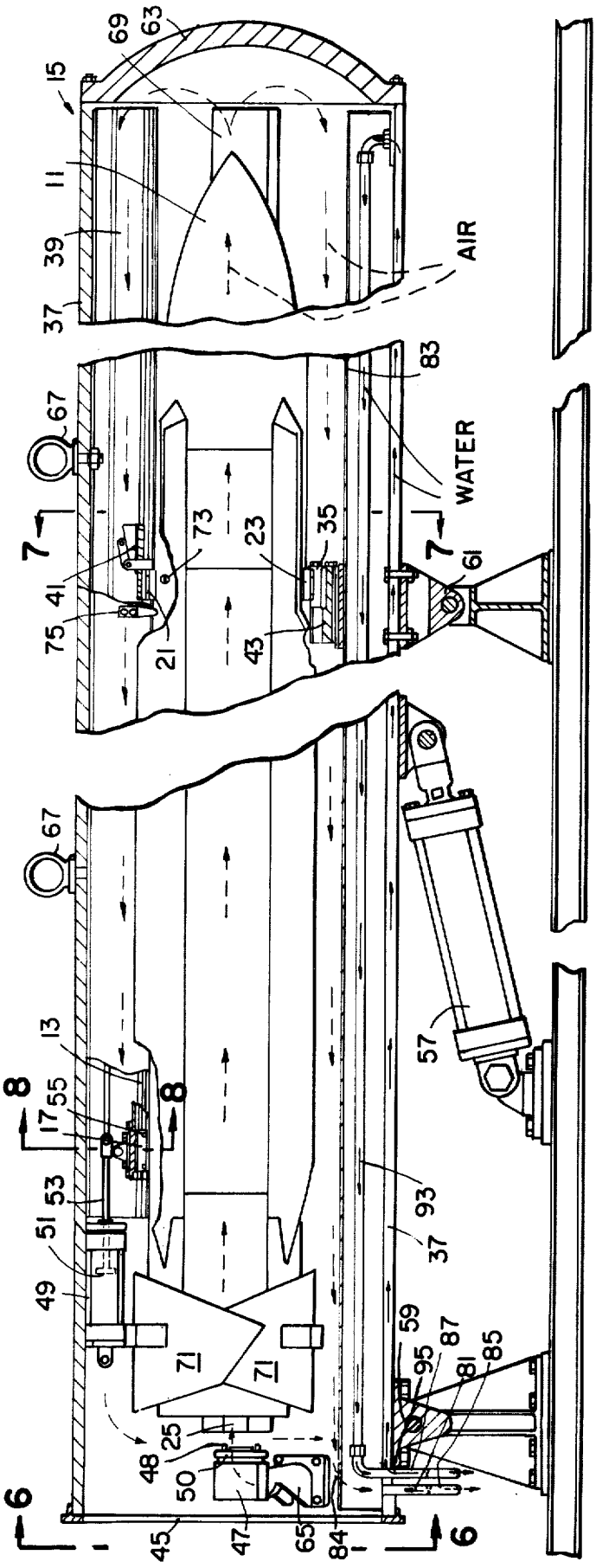

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WATER
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FIG_5

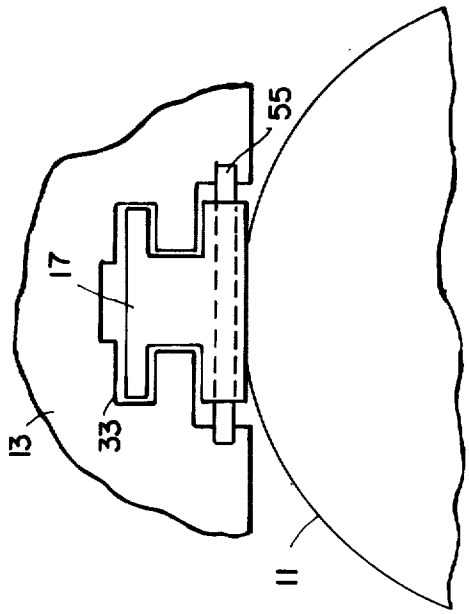

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11

FIG_8

FIG_6

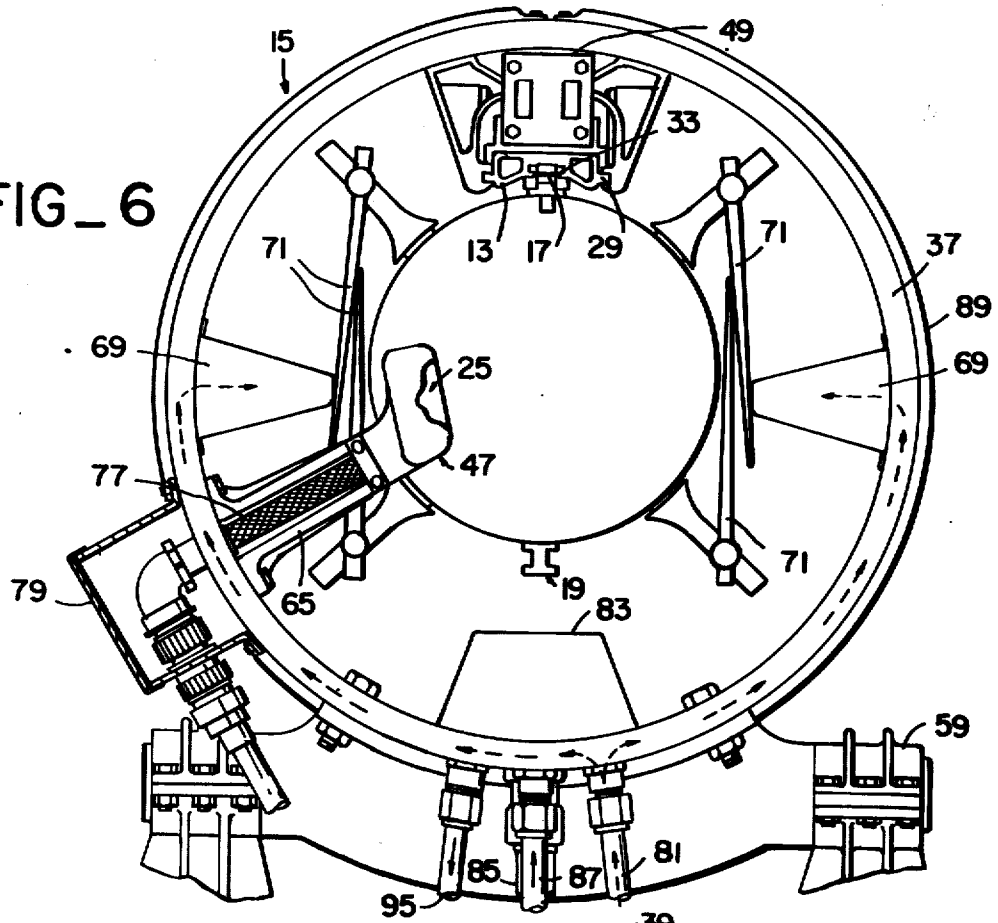
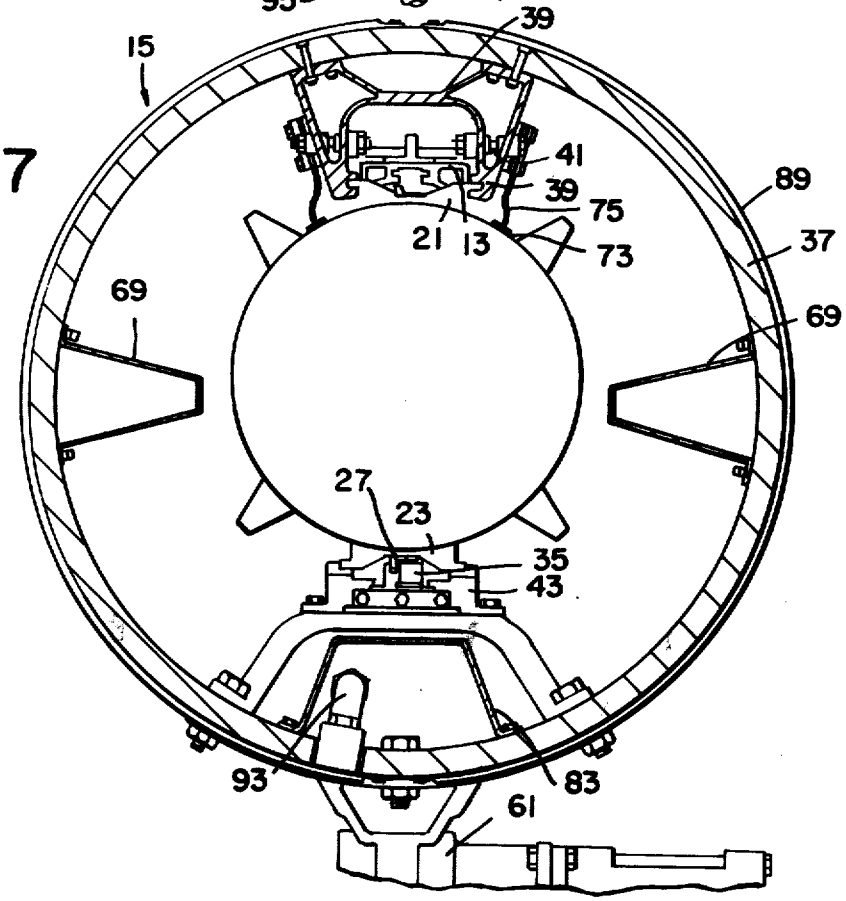

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FIG_7


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MISSILE LAUNCHER GUIDE ASSEMBLY

BACKGROUND OF THE INVENTION

1. Field of the Invention.

The present invention relates to a missile launching guide assembly and more particularly to the missile support and activating system of a missile launching guide assembly.

2. Description of the Prior Art.

Present missile launchers are rather complex having large number of actuating mechanisms for arming, restraining and firing functions. Many of these mechanisms are subject to missile blast which impairs their reliability due to excessive heating, forces and the coating of parts with exhaust materials. The present invention overcomes these disadvantages by providing a relatively simple launcher using expendable components. To improve reliability these expendable components are replaced after missile launch.

SUMMARY OF THE INVENTION

Briefly, the present invention comprises a missile launcher guide assembly including a housing for containing a missile. A removable launch rail is attached to the missile prior to loading the missile into the housing. To stow the missile in the launcher the missile and removable launch rail are sildably moved into the launcher and into alignment with a fixed launch rail mounted at the forward end of the housing. To ready the missile for firing the missile is initially moved a short distance backwards with a missile actuating mechanism that is not subject to missile blast. This rearward movement of the missile simultaneously applies electrical power and control signals to the missile, actuates a replaceable missile arming cam, connects the missile firing contact to the launcher assembly probe and disengages the launcher assembly latch mechanism that mechanically restrained the missile. When the missile is fired a shear pin in the missile actuating mechanism shears and releases the missile when the missile thrust reaches a predetermined value. After firing the missile, the expendable components including a male plug assembly, the shear pin and the arming cam are replaced.

STATEMENT OF THE OBJECTS OF THE INVENTION

An object of the present invention is to provide a relatively simple and inexpensive missile launcher guide assembly;

Another object of the present invention is to provide a missile launcher guide assembly that employs certain expendable parts.

Still another object of the present invention is to provide a missile launcher guide assembly that completely readies the missile for firing by a single rearward movement of the missile in the launcher.

Other objects, advantages and novel features of the present invention will become apparent from the following detailed description of the invention when considered in conjunction with the accompanying drawings wherein:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic drawing of the missile and the removable launch rail attached thereto;

FIGS. 2 through 4 are schematic drawings of the sequence of operation of the launching of the missile by the launcher guide assembly of the present invention;

FIG. 5 is a detailed drawing of the side elevation, partly in section, of the missile and launcher guide assembly;

FIG. 6 is a cross-section of the missile and launcher guide assembly taken at section 6—6 of FIG. 5;

FIG. 7 is a cross-section of the missile and launcher guide assembly taken at section 7—7 of FIG. 5; and

FIG. 8 is a cross-section of shear release section of the missile and launcher guide assembly taken at section 8—8 of FIG. 5.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The following description is primarily directed to the missile launcher guide assembly **15** of the present invention. The missile **11**, the broad features of the launcher guide assembly **15** and the launching sequence are shown in FIGS. **1** through **4**. The detailed features of the launcher guide assembly **15** and the specific cooperating features of the missile **11** are shown in FIGS. **5** through **8**.

In FIG. **1** is illustrated the missile **11** and removable rear launch rail **13** to which the missile is attached. The removable rear launch rail **13** is attached to the missile to provide support for the missile during storage and while the missile is positioned in the missile launcher guide assembly **15** prior to firing. When the missile is fired, the missile is guided by and breaks loose from rear launch rail **13** leaving the rear launch rail in the launcher assembly **15**. The rear launch rail is then removed from the launcher and replaced by a new missile and its attached rear launch rail.

In FIGS. **2** through **4** are illustrated the broad features and the launching sequence of missile **11** from the launcher guide assembly **15** which is part of an overall missile launching system, not shown. As shown in FIGS. **1** through **4**, rear launch rail **13** is removable from the launcher guide **15**.

In FIGS. **1** through **8** the missile is shown to include rear missile shoes **17** (see FIGS. **1** through **8**) and **19** and front missile shoes **21** and **23**. The missile also includes a female plug **25** and an arming lever **27**. In FIGS. **1** through **4** the arming lever **27** is shown at the top of the missile whereas in FIGS. **5** and **7** it is shown at the bottom of the missile as hereinafter described in detail. The rear launch rail **13** is shown in FIG. **1** as being removed from the launcher which is one of the primary advantages of the present invention. The rear launch rail includes rear lug **29** and forward lug **31**. The rear launch rail **13** also includes a missile shoe guide **33**, shown in dotted lines in FIGS. **1** through **4**, and an arming cam **35**. The missile shoe guide **33** is an elongated slot that extends the entire length of the rear launch rail **13** as best illustrated in FIG. **8**.

As generally depicted in FIGS. **2** through **4** and specifically depicted in FIGS. **5** through **8**, the launcher guide assembly **15** includes a housing **37** which may be of rectangular or circular cross section. Assembly **15** also includes front launch rail **39** that includes latch **41** that prevents inadvertent release of the missile. It is to be understood that latch **41** may be put on the rear launch rail **13** rather than front launch rail **39**. Missile snubber **43** interacts with front missile shoes **23** to prevent the missile from having any lateral motion. Shoe

23 does not provide any vertical or longitudinal restriction of the missile. Shoe 19 is provided to make it possible to mount the missile in a position 180° from that shown and to provide a uniform missile configuration. The launcher guide assembly 15 also includes a rear enclosure 45 that is preferably made of frangible material. The rear section of housing 37 includes a connector assembly 47 that cooperates with female plug 25 of the missile. Connector assembly 47 is preferably hinged at point 48 to permit missile loading from the rear. A missile actuating mechanism 49 is attached to the rear section of housing 37 and includes a piston 51 and rod 53. The piston and rod may be driven in the forward or rearward directions by means of external air pressure, not shown. One end of rod 53 is connected by means of a shear pin 55 to rear missile shoe 17. As shown in FIG. 2, the distance between engagement and nonengagement of female and male plugs 25 and 47 is 1_1 which may be about 3 inches, for example. Also the required travel for interaction of arming lever 27 and arming cam 35 is 1_1.

FIG. 2 represents the missile mounted in the launcher guide assembly 15 in the forward stow position. When it is desired to ready the missile for firing, it is necessary to interconnect female and male plugs 25 and 47 and to move arming lever 27 to the forward position. This readying of the missile for firing is achieved by actuation of missile actuating mechanism 49, as illustrated in FIG. 3.

In FIG. 3, piston 51 is shown as being forced to the rear of mechanism 49 which pulls missile 11 rearward such that the male and female plugs become engaged and arming lever 27 is moved forward, thereby arming the missile and making it ready to be fired. Also, when the missile is moved to the rear, latch 41 is retracted and the missile firing contacts 73, shown in FIGS. 5 and 7, are engaged with firing probes 75, shown in FIG. 7.

In FIG. 4 the missile has been fired by applying internal electrical power to the missile firing contacts. When this occurs, pin 55 is sheared, when a predetermined thrust is developed by the rocket motor, and the missile is launched.

In FIGS. 5 through 8 are shown the details of the launcher guide assembly 15 of the present invention. The following description of FIGS. 5 through 8 will describe additional features of the launcher guide assembly of the present invention. The launch guide assembly 15 may be elevated or lowered by means of actuator 57 which pivots the launcher guide assembly 15 about trunion 59. A stow pin and assembly 61 is provided to lock the guide assembly in a fixed horizontal position. Front cover 63 is provided which may be of the removable or of the frangible type. As best depicted in FIG. 5 male plug 47 is held in position by support 65 that is attached to housing 37. The male probes 48 extend through a protective wafer 50 and into female plugs in connector assembly 47. After launch the male probes 48 and protective wafer are replaced. Handling rings 67 are provided to lift the launcher guide assembly 15. As best depicted in FIG. 6, fin restraining members 69 are attached to housing 37 to keep the missile control fins 71 in a folded position prior to and during launch. Referring to FIG. 5, latch 41 retains the missile in the stow position as shown. As previously explained, latch 41 is moved upwards by cam action when the missile is moved rearwards by missile actuating mechanism 49. It is to be understood that the arming cam 35 of FIG. 5 can be put on removable rear launch rail 13, as shown diagramatically in FIGS. 1 through 4. The missile arming lever 27, that is actuated by cam 35, is best depicted in FIG. 7. Arming cam 35 is preferably made of a plastic material and is replaced after each missile launching. As depicted in FIG. 6, the electrical connectors of connector assembly 47 are carried in cable 77 through cable cover 79 to a remotely located control panel, not shown.

As best depicted in FIGS. 5, 6 and 7, dry air under pressure, shown in dotted line arrows, is supplied to the assembly 15 though conduit 81, which is connected, by conduits not shown, to the interior of fin restraining members 69, which have a plurality of orifices located in the front section thereof. The air exits through the orifices and flows rearward between the missile 11 and the housing 37 and enters a plurality of orifices 84 located in the rear section of air duct 83. The air in air duct 83 is vented to atmosphere through conduit 85.

It is generally desirable to maintain the missile 11 within a predetermined temperature range. To achieve this a heating and cooling system is provided. The exterior of the launcher guide assembly 15 is heated or cooled by hot or cold liquid depending on the atmospheric temperature conditions encountered. As best depicted in FIGS. 5, 6, and 7 this liquid, shown in solid line arrows, is supplied through inlet conduit 87 and is transferred to head exchange panels 89 which are formed around the perimeter of housing 37 as shown in FIGS. 6 and 7. For simplicity of illustration these heat exchange panels are not shown in FIG. 5. However, in FIG. 5 the solid line arrows depicting the inlet liquid are shown passing through the housing 37. The liquid is returned through conduit 93, which is located within duct 83, and then exits through outlet conduit 95.

What is claimed is:

1. A missile launcher guide assembly for launching a missile having forward and rearward shoes for supporting the missile comprising:

a. a housing having forward and rearward sections;

b. a longitudinally extending fixed launch rail being operatively connected to the forward section of said housing for slidably guiding the forward and rearward shoes of a missile;

c. a longitudinally extending removable launch rail for retaining and slidably guiding the forward and rearward shoes of said missile;

d. a longitudinally extending launch rail support member operably connected to the rearward section of said housing;

e. said launch rail support member having longitudinally extending slots for slidably receiving and supporting said removable launch rail;

f. one end of said longitudinally extending removable launch rail abuting one end of said fixed launch rail and being in axial alignment with said fixed launch rail when mounted in said launch rail support member;

g. said longitudinally extending removable launch rail being slidable through the rear end of said housing;

h. a missile activating means operatively connected to said housing; and

i. a missile actuating mechanism operatively connected to said housing for sliding a missile rearward on said removable launch rail and into contact with said missile activating means.

2. The assembly of claim 1 wherein:
a. said missile activating means includes connector assembly, connector, an arming cam and firing contacts.
3. The assembly of claim 2 wherein:
a. said connector assembly is operatively connected to the rear end of said housing.
4. The assembly of claim 3 wherein:
a. said connector assembly is hinged to permit entry of a missile through the rear end of said housing.
5. The device of claim 3 wherein:

a. said missile actuating mechanism includes a shear release element; and
b. said shear release element is operatively connected to said missile; whereby
c. when said missile is moved rearward by said missile actuating mechanism into contact with said connector assembly, said missile is activated and said shear element shears when the thrust of said missile reaches a predetermined value.

* * * * *