

[54] **MISSILE LAUNCHING CANISTER**

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89/1.817**

[58] Field of Search ..... **F41f/3/04; 89/1.8,  
89/1.806, 1.807, 1.815-1.819**

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*Primary Examiner*—Samuel W. Engle

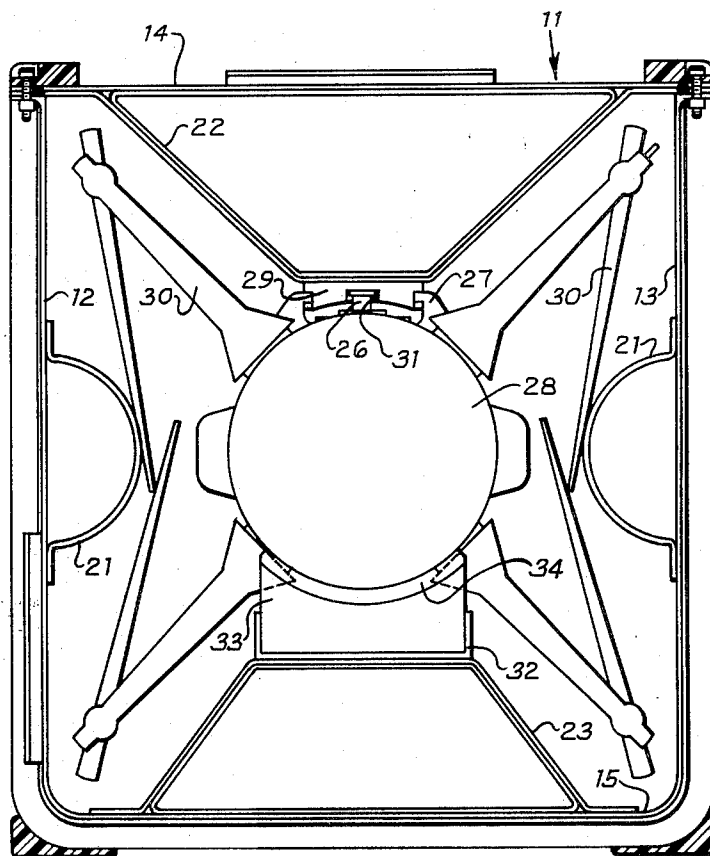
*Attorney*—R. S. Sciascia et al.

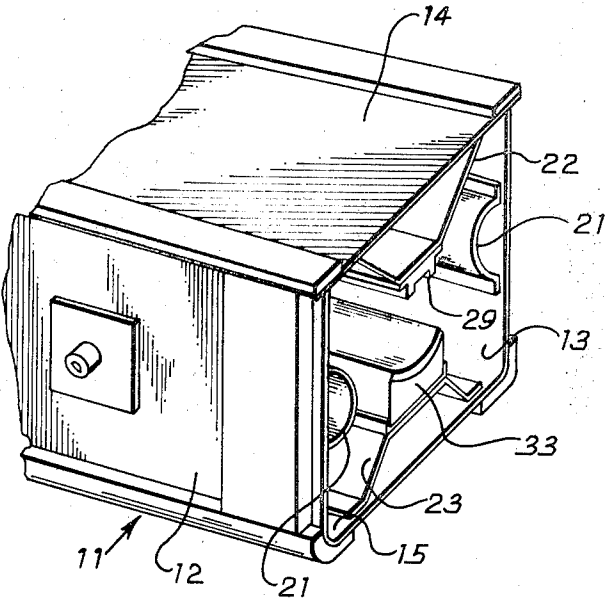
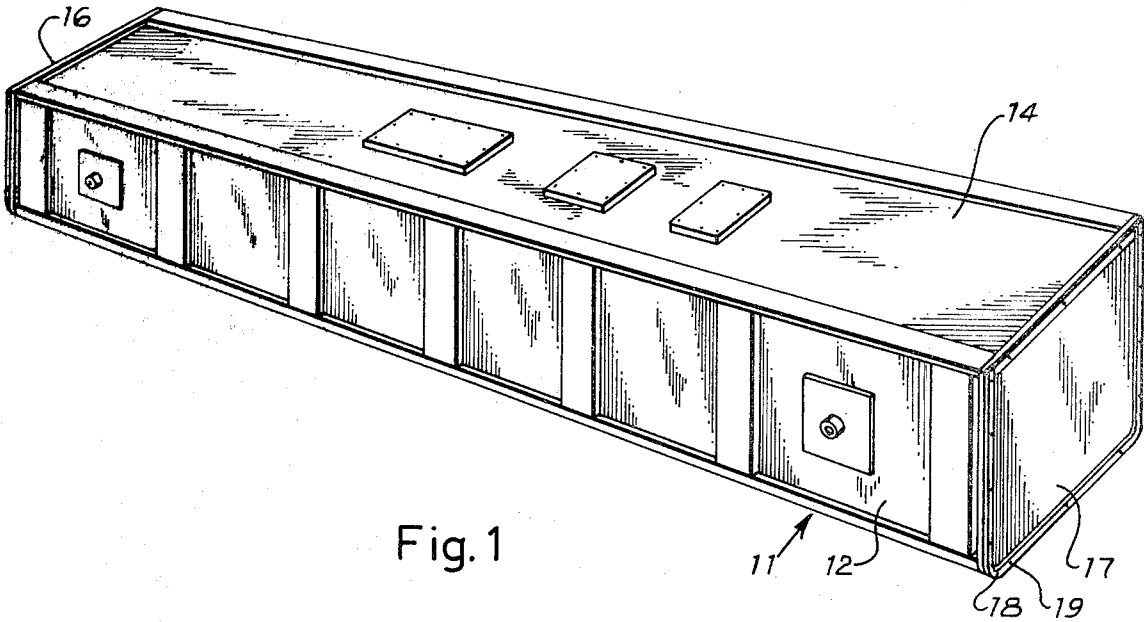
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**ABSTRACT**

A canister for a foldable-wing missile serving a dual function of providing an environmental container and a launching tube. Upper and lower guide rails are provided in the canister for supporting the missile during storage and during launch, and a pair of horizontal guides are attached one each to the sides of the canister to serve as stiffeners and guides for folded missile wings. Frangible covers are provided for closing the front and aft of the canister and locking devices are provided on the canister to lock a missile in position until launch.

**2 Claims, 9 Drawing Figures**





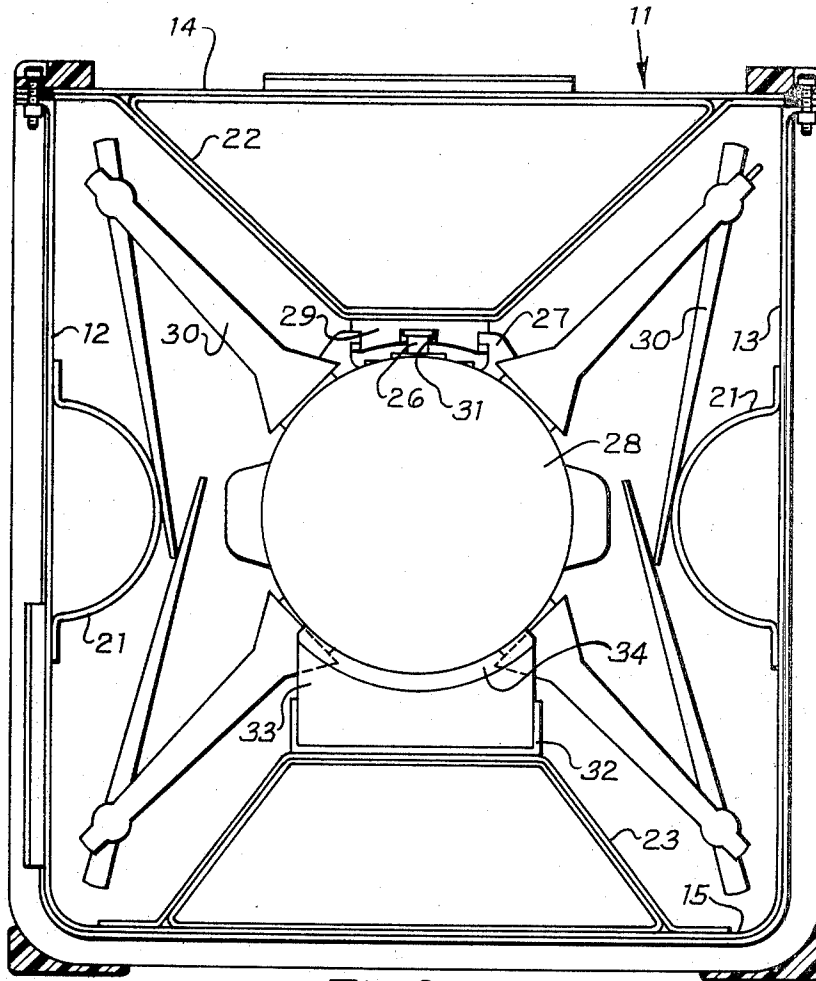


Fig. 3

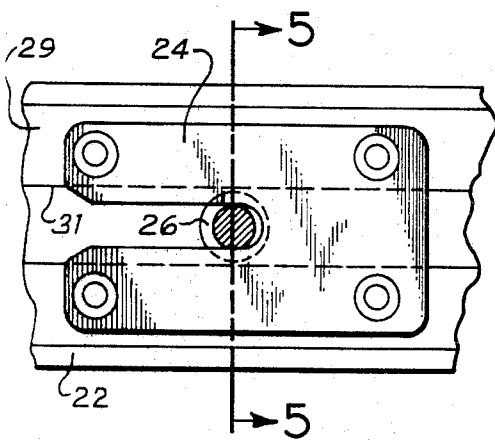


Fig. 4

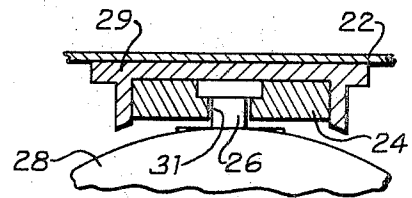


Fig. 5

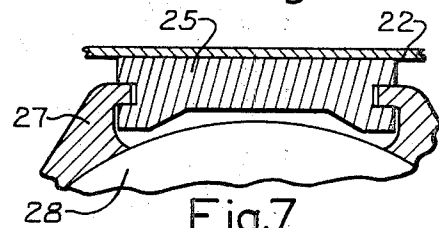
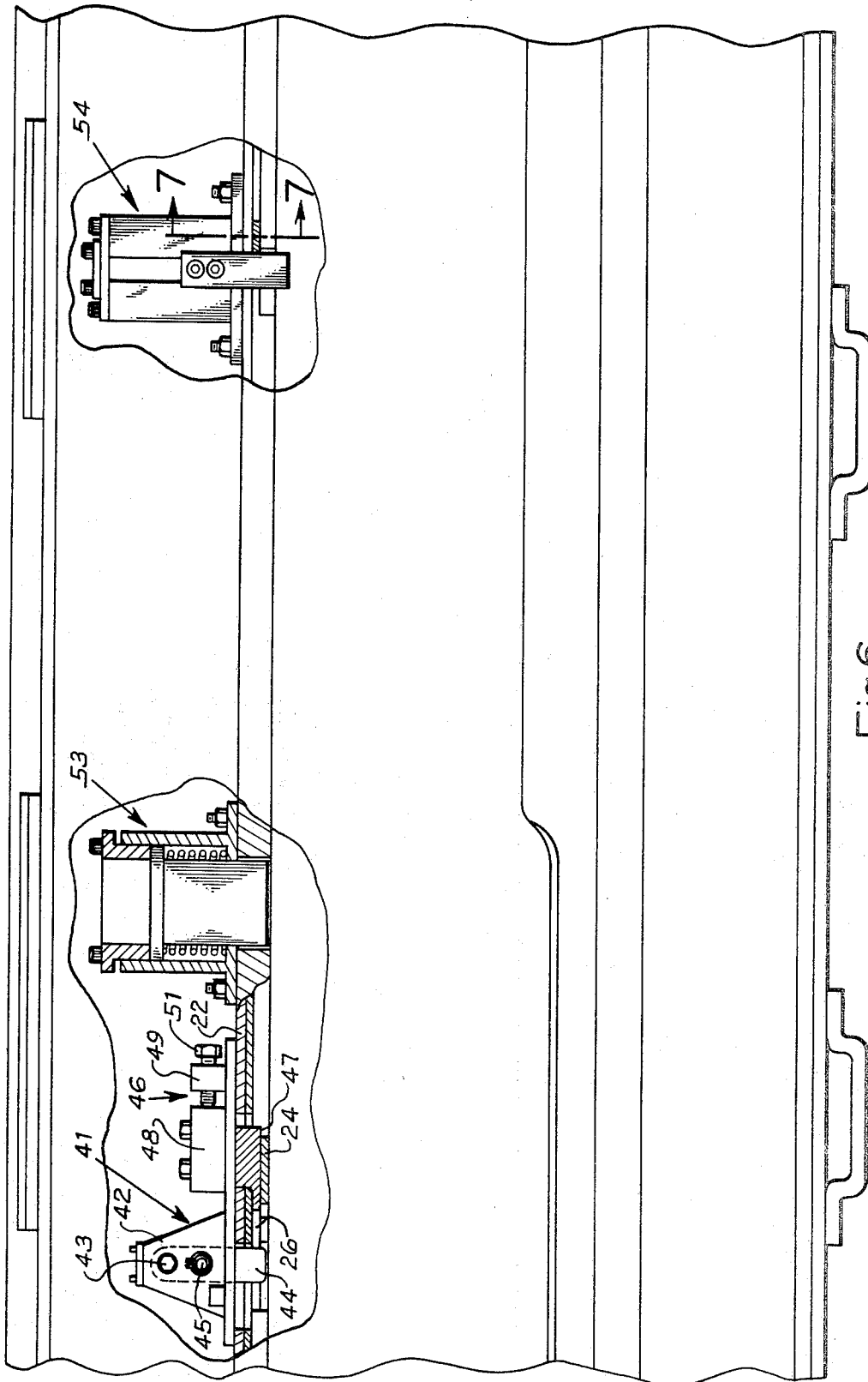
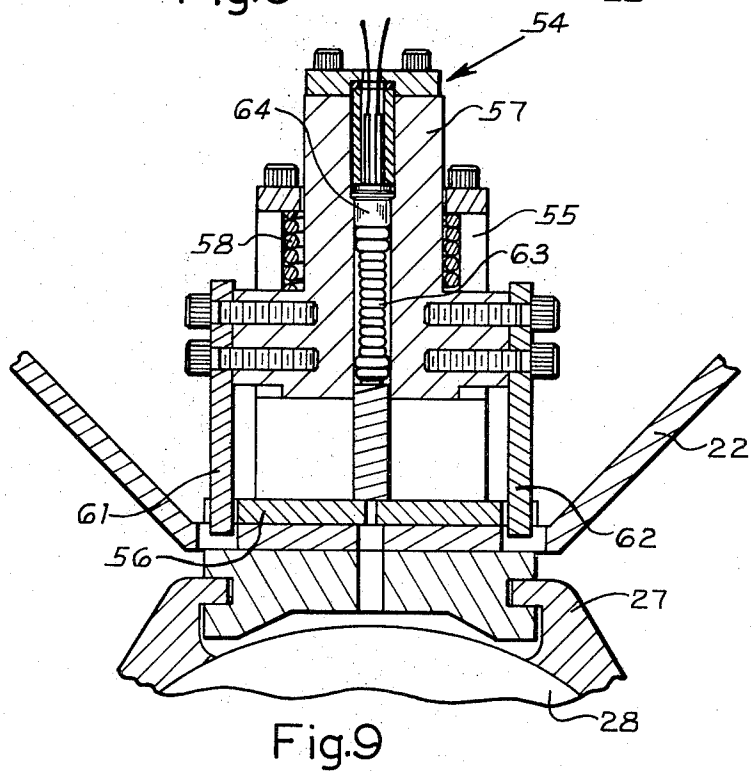
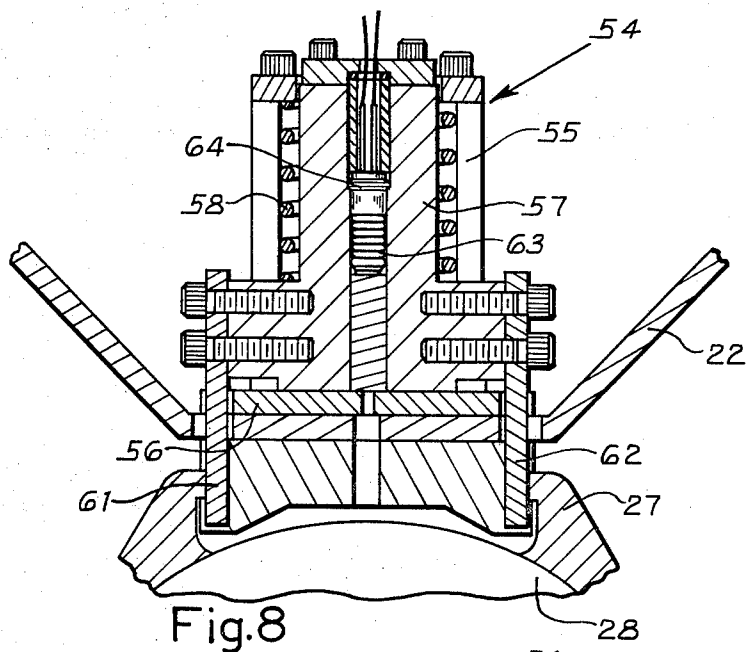


Fig. 7





## MISSILE LAUNCHING CANISTER

### BACKGROUND OF THE INVENTION

The present invention relates to a canister which is used to transport a foldable-wing missile and which also serves as a launcher.

Various types and sizes of missiles are presently used by the military as surface to air, or surface to surface weapons. Frequently, missiles are launched from naval vessels and are directed at other naval vessels or land targets. A basic missile launcher uses a launching assemblage for aiming a missile in both train and elevation and also provides a steering or guiding device for stabilizing the missile during its early time of flight and during the initial acceleration period.

One such launching device is shown in U. S. Pat. No. 3,331,279, entitled, "Launching Assemblage For Rocket Missiles", which issued July 18, 1967, to H. W. Aldrin et al. This launching assemblage has an upright stand which is mounted to the deck of a naval craft, and the stand supports a member which is rotatable about a perpendicular axis in reference to the deck. A mounting bar is attached to the rotatable member and a gear arrangement is provided to pivot the mounting bar about a horizontally disposed shaft. Thus a missile supported by the mounting bar can be aimed in both azimuth and elevation.

Another launching device is shown in U. S. Pat. No. 3,044,362, entitled, "Below Deck Shipboard Missile Launching System", which issued July 17, 1962, to Robert E. Carlberg. In this device, the launching system is stowed beneath the deck of a vessel and a launcher supporting means is extendable outwardly through the hull of the vessel to a firing position. The launcher supporting means is movable in train and elevation for aiming a missile prior to its launch. This movable launching system permits a missile to be protected from adverse weather until time of launch.

In U. S. Pat. No. 3,106,132, entitled, "Launcher", which issued Oct. 8, 1963, to Biermann et al, another launching system is disclosed which is designed to protect a plurality of missiles from adverse weather. In this patented device, four rectangular housings are mounted on a power operated torque shaft which, in turn, is mounted to a rotatable mount, thus permitting the housing to be moved in azimuth and elevation. The housings are closed at the front end by a pair of pivoted doors and at the rear by a rupturable diaphragm.

### SUMMARY OF THE INVENTION

The present invention relates to a canister for a foldable-wing missile which serves as a container for transportation, a housing during storage aboard a vessel, and a launching tube for launching a missile. The canister is provided with upper and lower guide rails which support a missile during storage and which are used to direct the missile during its initial period of acceleration during launch. Frangible covers are provided for closing front and aft openings of the canister and locking and safety devices are provided on the canister to lock a missile in position until the desired time of launch.

### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a preferred embodiment of the present invention showing front and aft covers thereon;

FIG. 2 is a partial perspective view of the preferred embodiment of FIG. 1, only showing the front cover removed;

FIG. 3 is a front view showing a folded-wing missile in place in a canister;

FIG. 4 is a partial bottom view, partly in section, showing a forward missile lug in a support plate;

FIG. 5 is a sectional view taken on line 5—5 of FIG. 4;

FIG. 6 is a side view, partly in section, showing locking arrangements for forward and aft launch hooks on a missile;

FIG. 7 is a partial sectional view taken on line 7—7 of FIG. 6;

FIG. 8 is a sectional view of a holdback mechanism shown in a holding position; and

FIG. 9 is a sectional view of a holdback mechanism shown in a released position.

### DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, there is shown a canister 11 having parallel sides 12 and 13, a top 14 and a bottom 15. A frangible aft cover 16 and forward cover 17 are provided to close canister 11 and these covers are maintained in position by retaining bars 18 and screws 19. By way of example, covers 16 and 17 might be constructed of lightweight polyurethane hard foam. As best shown in FIGS. 2 and 3 of the drawings, a pair of curved guides 21 are inside canister 11 and attached one each to the sides 12 and 13. Curved guides 21 serve to stiffen sides 12 and 13 and, in addition, provide slides for the folded wings during launch.

An upper rail 22 is fastened to the inner side of top 14 and also a lower rail 23 is fastened to the inner side of bottom 15. As best shown in FIGS. 5 and 7 of the drawings, steel support plates 24 and 25 are attached to top support rail 22 and engage, respectively, with forward lug 26 and aft lug 27 on a missile 28. A guide rail 29 is also attached to upper rail 22 and, as best shown in FIG. 3 of the drawings, guide rail 29 has a center slot 31 for guiding forward lug 26 as missile 28 moves forward during a launch. Also the width of guide rail 29 is such that it provides guidance to aft lug 27. Missile 28 is provided with foldable wings 30 which press against curved guides 21, and these curved guides 21 provide a slide for the folded wings during launch.

A U-shaped bracket 32 is attached to lower rail 23 and a launch adapter pad 33, which might be made of hard closed cell polyurethane foam molded to the contour of missile 28 is provided to slide in U-shaped bracket 32. A flexible foam pad 34 is provided at the interface of missile 28 and pad 33. Launcher adapter pads 33 and 34 support missile 28 during launch, partially support missile 28 during shipping and storage, provides vibration dampening, and helps to guide missile 28 from the canister 11. Pads 33 and 34, which could be bonded together, are launched with missile 28 and as missile 28 emerges from canister 11, aerodynamic drag separates these pads from missile 28. Various cavities are provided in these foam pads for accommodating the various protrusions on missile 28.

Referring now to FIG. 6 of the drawings, there is provided on upper rail 22 a latching mechanism 41 which is used to momentarily restrain missile 28 at launch until missile 28 builds up sufficient thrust to clear canister 11 and maintain a flight trajectory. Latching mecha-

nism 41 consists of a frame 42, pivot pin 43, latch 44 and shear pin 45. Shear pin 45 is placed in double shear between frame 42 and latch 44 when the forward lug 26 on missile 28 pushes against the lower end of latch 44. By way of example, shear pin 45 might be designed to fail when a force of 1200 pounds is applied and, when pin 45 fails, missile 28 starts its flight from canister 11. A positioning mechanism 46 is provided to position forward lug 26 against latch 44. This positioning mechanism 46 consists of a slide 47, slide cap 48, nut plate 49, and adjusting screw 51 which threadedly passes through nut plate 49. Slide 47 is attached through a slot in base plate 52 to slide cap 48, and nut plate 49 is attached to base plate 52 whereby adjusting screw 51 can be turned to move slide 47 against forward lug 26 until forward lug 26 engages latch 44. An umbilical plug assembly 53 is provided for supplying power to missile 28 until missile 28 is launched, whereupon the umbilical plug separates from missile 28.

A holdback mechanism 54 is provided as a safety device which will restrain missile 28 in case of an inadvertent firing and also serves to restrain missile 28 in a longitudinal direction during shipment in conjunction with latching mechanism 41. A cylinder block 55 is attached to a base plate 56 which is attached to upper rail 22. A piston 57 is slidably positioned in cylinder block 55 and spring 58 is provided to bias piston 57 downwardly so that stops 61 and 62 which are attached to piston 57 extend into the path which aft lug 27 will travel thereby preventing forward movement of missile 28. A bellows actuator 63 is positioned in a bore 64 in piston 57 and bellows actuator 63 contains a gas producing mixture and a squib which can be detonated by an electrical current. As best shown in FIG. 9 of the drawings, detonation of the squib causes an expansion of gases inside the bellows, and the contracted bellows expands longitudinally to raise piston 57. As stops 61 and 62 are attached to piston 57, raising of piston 57 will raise stops 61 and 62 so that they will no longer prevent forward movement of missile 28. Bellows actuators are commercially available and one source of supply is Hercules, Inc., Wilmington, Delaware.

#### OPERATION

Canister 11 is designed to first serve as a shipping container and a missile 28 is preferably loaded into the canister at a facility or factory where missiles might be manufactured or overhauled. With forward and aft covers removed, missile 28 is loaded into the canister 11 so that forward lug 26 is engaged in the center slot 31 of support plate 24 and aft lug 27 is engaged with support plate 25. After missile 28 has reached its desired position in canister 11, holdback mechanism 54 is set so that stops 61 and 62 will prevent forward movement of aft lug 27 on missile 28. Shear pin 45 is installed to prevent pivoting of latch 44, and adjusting screw 51 is turned so that slide 47 engages forward lug 26. It can thus be seen that forward lug 26 is prevented from moving in either a forward or aft direction and aft lug 27 is prevented from moving in a forward direction. When missile 28 is being loaded into canister 11, adapter pads 33 and 34 can also be placed in position in bracket 32 and these pads also provide additional protection and support during shipping. The umbilical plug 53 is connected and then the forward and aft covers can be fastened in place.

When the loaded canister reaches its firing station, such as a naval vessel, it is mounted to an appropriate device which will permit the canister to be moved in elevation and azimuth, so that missile 28 can be launched in a desired direction.

When it is desired to launch missile 28, the sequence of operation is such that holdback mechanism 54 is retracted immediately prior to missile motor ignition. An electrical current fires the squib in bellows actuator 63 and bellows actuator 63 expands longitudinally to raise piston 57 and stops 61 and 62 which are attached to piston 57. In the event that there is an inadvertent firing of missile 28, stops 61 and 62 will serve to restrain missile 28. When the missile motor ignites, and thrusting force starts to build up, latch 44 will momentarily restrain missile 28 to permit a build-up of sufficient thrust to permit missile 28 to clear canister 11. When shear pin 45 fails, latch 44 pivots about pivot pin 43 and missile 28 moves forward and breaks through the frangible forward cover 17. The rearwardly directed gases from the missile motor will also rupture aft cover 16.

As missile 28 moves forward under its own power, guide rail 29 will serve as a steering guide for forward lug 26 and aft lug 27, as shown in FIG. 3 of the drawings. Additionally, the wings 30 on missile 28 will slide along curved guides 21 which will further stabilize missile 28 as it moves in canister 11. As missile 28 moves forward, it is supported by pads 33 and 34 which move forwardly with missile 28. In order to facilitate sliding of adapter pad 33 in U-shaped bracket 32, it may be desirable to coat the inner surface of bracket 32 with a suitable lubricant. As missile 28 emerges from canister 11, aerodynamic drag separates pads 33 and 34 from missile 28.

It can thus be seen that the present invention provides a canister which serves as a shipping container for a missile, provides protection for the missile from adverse weather condition during a pre-launch period, and serves as a launcher upon ignition of the missile.

We claim:

1. A canister for shipping and launching a folded-wing missile having forward and aft lugs thereon comprising,
  - a body having first and second sides, a top and a bottom,
  - a first support rail attached to said top and a second support rail attached to said bottom,
  - first and second support plates attached to said first rail adaptable for engaging said forward lug and said aft lug, respectively, on said missile,
  - a latch pivotally attached to said first support rail engageable with said forward lug and a shear pin adaptable for preventing pivoting of said latch until said shear pin is sheared by movement of said missile during launch,
  - means attached to said first support rail for latching said aft lug comprising a cylinder block attached to said first support rail, a piston slidably mounted in said cylinder block, first and second stops attached to said piston and engageable with said aft lug on said missile, and bellows longitudinally extendable by expanding gas for moving said piston whereby said stops are disengageable from said aft lug,
  - a longitudinally extending guide rail attached to said first support rail for guiding a forward lug and an aft lug of a missile during launch,

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a longitudinally extending bracket attached to said second support rail, and  
a pad of plastic material slidably mounted in said bracket for supporting a missile during launch whereby said pad of plastic material travels with said missile during launch and is separated from said missile by aerodynamic drag after said missile and pad leave said canister.

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2. A canister for shipping and launching a folded-wing missile as set forth in claim 1 wherein a curved guide is attached to the inner surface of each said side substantially the entire length thereof to stiffen said side and to provide a sliding surface for a folded-wing during launching of a missile.

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