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SUPPORT SYSTEM FOR TUBE LAUNCHED MISSILE

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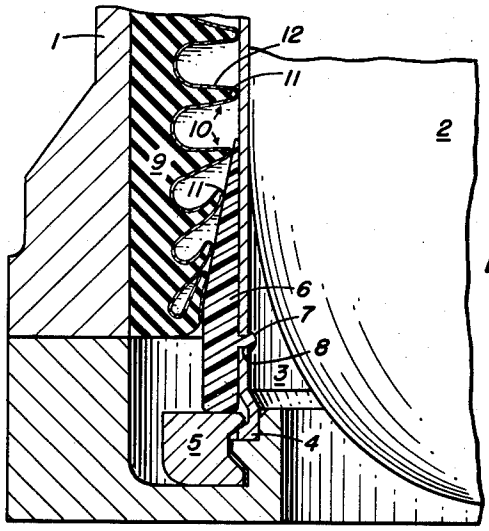


FIG. 1

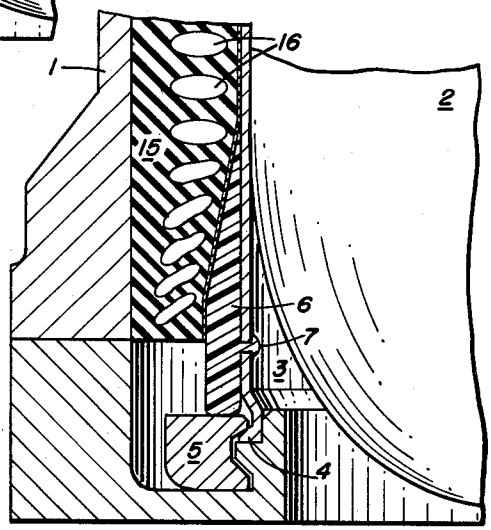


FIG. 3

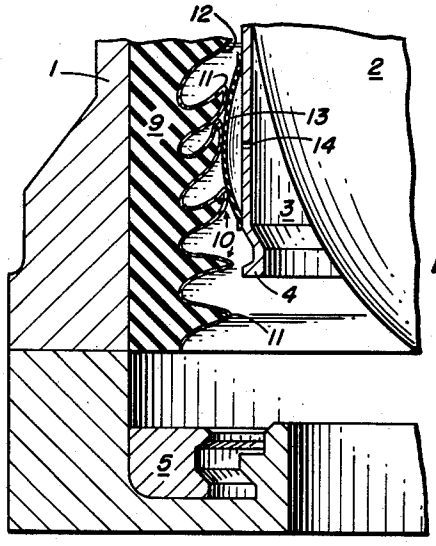


FIG. 2

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SUPPORT SYSTEM FOR TUBE LAUNCHED MISSILE

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9 Claims. (Cl. 89—1.7)

This invention relates to a cylinder that is utilized to contain a missile during logistic, pre-launch and launch phases, and more particularly it relates to a container lined with a flexible mat.

The complete missile package consists of an outer tube containing a suspension system which supports an inner tube, which latter tube directly contains the missile. The present invention deals primarily with the inner tube of this missile package.

This inner tube, usually of non-corrosive aluminum alloy, must be protected from direct contact with the missile. The method most prominently utilized is to surround the missile at a plurality of points along its vertical exterior with hard rubber stowage and launching supports or adapters. These adapters separate from the missile after ejection from the launch tube. Although such supporting means have served the purpose, they have not proved entirely satisfactory under all conditions of service for the following reasons:

(1) Underwater collision of missiles and adapters from prior launchings.

(2) Fall back of adapters on the submarine or ship during surface launching.

(3) Unknown contribution of the adapters to the cavitation about the missile during separation.

(4) Support at spaced points along missile allowed flexing of the missile.

Accordingly, it is an object of the present invention to provide a simple, reliable, soft support system for missile containers and launch tubes.

Another object is the provision of a support system which transfers external loads to missiles over large areas during logistic, pre-launch and launch phases.

Yet another object is the provision of a support system that remains fixed to the container and launch tube thus eliminating collisions and fall back, and which greatly simplifies rearming the missile system.

Still another object is to provide a support for tube-launched missiles which will give superior load distribution during transportation and storage, especially during depth charge shocks.

Another object is to provide improved missile environment during launch ejection, eliminating danger of high local stresses.

Yet another object is to eliminate improper adapter location.

Still another object is the provision of a support system compatible with all modes of transportation and with both surface and underwater tube ejection launchings.

Another object is to provide a soft support system for tube launched missiles that assures damping of missile motion caused by shock and vibrations.

Other objects and many of the attendant advantages 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 in which like reference numerals designate like parts throughout the figures thereof and wherein FIGS. 1 through 3 show longitudinal sectional views of the inner container and the missile.

Referring now to the drawings in order:

FIG. 1 shows the inner tube 1 of cylindrical cross

section. Centrally disposed within tube 1 is a missile 2 of cylindrical shape surrounded at its lower end by a skirt 3 of cylindrical shape. The lower end of skirt 3 has a shoulder 4 which is engaged by a yielding hold-down device 5. The skirt can be flared to spread the mat to insure an air seal during launch and to prevent flexing during insertion by being surrounded by a sectional plastic ring 6 which is attached to skirt 3 by means of a latch 7 which fits into a slot 8 on skirt 3. The inner tube 1 is continuously covered by a rubber mat 9 having a large number of parallel ring protrusions 10 resulting in lips 11 which contact and support the missile along its exterior in a direction normal to its vertical axis. The outside face of the mat may be coated with a sheet 13 of low friction material such as Teflon or nylon.

FIG. 2 shows an alternate means of spreading the lips 11 of flexomat 9 during insertion or ejection wherein an inflatable reinforced torus 13 is attached to skirt 3 and is inflated by means of eject air (from a source not shown) through a plurality of holes 14 in skirt 3.

The lips can be of various shapes such as slightly conical, cylindrical or with thickened edge. FIG. 3 shows a flexomat 15 wherein the lips are joined together to form a closed flexomat 15 containing circumferential air pockets 16.

Sectional shape of the rings is selected to assure a good seal against launch eject pressure and to give acceptable missile support. The normal height and/or stiffness of the rubber rings adjacent to the missiles' critical loading sections and at the top of the tube may be reduced to permit passage of exterior missile proturberances.

When the missile container is subjected to lateral shock or vibratory motion the entire missile undergoes a lateral displacement relative to the container. Each rubber ring adjacent to the missile motors imposes a certain force essentially normal to the missile axis. Rings in the various portions of the container may have different spring rates in order to reduce bending loads on the missile. The missile is protected at the fore and aft ends of the container by conventional shock absorbing devices.

Though the outer container forms no part of this invention, it is necessary to describe it to show the full advantages and operation of the disclosed invention. The outer container shell or capsule contains access ports and provisions for system checkout of the missile through umbilical plugs. The re-entry body segment of the capsule is removable. The inner container when necessary has sealable access ports and umbilical plugs to match those of the outer container. The portion of the inner tube that encloses the missile re-entry body is also removable, thus allowing separate mating of missile and re-entry body. A swivel gland is provided in the base of the inner tube to automatically mate with the eject-air inlet tube.

The outer container holds the inner tube by means of a set of air springs which consist of a pair of cylindrical pad-type springs which give transverse support to the inner liner and a pair of torroidal air springs to provide axial support in the container. These pad-type transverse springs are faced with nylon sheeting to prevent scuffing and to permit sliding into the shipping container or the outer container of the submarine launch system.

The design of this system thus allows the use of the inner liner as a shipping container and launch tube since it can be designed with all the necessary hardware and transferred from an outer shipping container to the outer tube of the launching package; or the inner liner can be left in place and another missile inserted into it.

The use of an attached support in the inner tube eliminates the time consuming, critical locating of the hard point guides and seals during insertion of the missile into the inner tube.

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. As a soft-support system for tube-launched missiles, the combination of a cylindrical missile, a tube and a resilient, annular mat secured within said tube, said cylindrical missile being releasably retained within said tube and mat, said mat having attached thereto a plurality of flexible ring protrusions, which ring protrusions are normal to the axis of said missile and are in circumferential contiguity with said missile whereby tendencies toward excessive movement of a stowed missile within the launching tube is retarded and possible damage to the missile as a result of externally applied shocks and vibrations is obviated.

2. The comination of structure of claim 1 wherein the mat comprises rubber.

3. The combination of structure of claim 2 wherein the missile engaging surface of the mat is coated with a material selected from the group consisting of Teflon and nylon.

4. As a soft support system for tube launched missiles, the combination of a missile, a tube, a flexible mat, a missile skirt and spreading means, wherein a substantially cylindrical missile is centrally disposed within an inner tube of a missile package, said inner tube having secured therewithin and being substantially interiorly covered with a flexible mat which circumferentially engages and supports said missile, said missile being surrounded at its lower portion by a missile skirt to protect the missile motors and nozzles, means to spread said mat and increase the compression thereof interposed between and contiguous with both said missile skirt and said mat so as to insure an air seal during ejection of the missile from the tube.

5. The combination of claim 4 wherein the spreading means comprises a sectioned ring attached to said skirt and having a diameter decreasing in the eject direction.

6. The combination of claim 4 wherein the spreading means comprises an inflatable torus attached to said skirt and inflated by means of eject air communicated through holes in said skirt.

7. In an inner tube of a missile package for launching missiles terminating in a skirt section, the improvement comprising a flexible, generally cylindrically-shaped mat permanently fixed to the inner surface of said inner tube so as to exert a cushioning force normal to the axis of a missile when the same is disposed within said tube and mat, and independent spreading means having a diameter decreasing in the eject direction of a missile during launching and interposed between and sealingly engaging said mat and said skirt so as to insure an air seal during ejection and to prevent ring flexing during insertion of a missile into said tube.

8. The improvement according to claim 4 which contains a plurality of mutually spaced, annular protrusions.

9. The improvement according to claim 4 which contains a plurality of mutually spaced, generally annular chambers.

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