The above identified patent application is available for licensing. Requests for information should be addressed to:

OFFICE OF NAVAL RESEARCH
DEPARTMENT OF THE NAVY
CODE OOCC
ARLINGTON VA 22217-5660
TO ALL WHOM IT MAY CONCERN:

BE IT KNOWN THAT (1) JEFFREY L. CIPOLLA, citizen of the United States of America, employee of the United States Government, and resident of Newport, County of Newport, State of Rhode Island, has invented certain new and useful improvements entitled as set forth above, of which the following is a specification.

ROBERT W. GAUTHIER, ESQ.
Reg. No. 35153
Naval Undersea Warfare Center Division, Newport
Newport, RI 02841-1708
TEL: 401-832-4235
FAX: 401-832-1231
Navy Case No. 78450

MISSILE SUPPORT AND ALIGNMENT ASSEMBLY

STATEMENT OF GOVERNMENT INTEREST

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.

BACKGROUND OF THE INVENTION

(1) Field of the Invention

The invention relates to missile launch systems and is directed more particularly to a missile support and alignment assembly for use on a moving vehicle, such as a submarine, having a fixed missile launch tube.

(2) Description of the Prior Art

Submarines are provided with fixed launch tubes for torpedoes and other missiles and ordnance. The tubes penetrate the pressure hull of the vessel. The launch tubes are arranged in a manner consistent with safety, the architecture of the vessel, and watertight integrity. Proximate the tubes is disposed an arrangement of shelf or frame-like structures for storage of the missiles and/or other ordnance, and a handling system for selecting a weapon, aligning the selected weapon with a selected launch tube, and for feeding the selected weapon into the selected launch tube.
Because of the length-to-diameter ratio of the weapons, and their relative fragility, tolerance on the alignment of weapon and tube during loading is critical. Consequently, current designs for storage, handling and loading systems employ structures securely fixed to the hull, and are aligned with the launch tubes during construction. Such structures do not themselves provide significant shock and acoustic isolation from the hull. Accordingly, considerable effort and expense is devoted to design and analysis of the rigidly fixed structure and to partially isolating substructures to ensure adequate vibration and acoustic isolation. There is, accordingly, a need for a missile support assembly which is resiliently mounted in the submarine so as to “float” relative to the hull.

It is apparent that such a “floating” structure would not maintain a supported missile in alignment with a launch tube at all times. There is accordingly a further need for an alignment assembly which is operative on such a “floating” support to align a missile with a launch tube.

SUMMARY OF THE INVENTION

It is, therefore, an object of the invention to provide a missile support system for a vehicle having a fixed missile launch tube, the system including a missile support which is fixed to the vehicle by resilient mounts which permit the missile support to move relative to the vehicle.

It is a further object of the invention to provide a missile alignment system for use in conjunction with the aforementioned missile support system for aligning a missile retained by the
missile support with the fixed missile launch tube, such that the
missile may be pushed into the launch tube.

With the above and other objects in view, as will
hereinafter appear, a feature of the present invention is the
provision of a missile support assembly for use on a vehicle
having a fixed missile launch tube, the assembly comprising a
loading tray for supporting a missile, a storage structure for
supporting the loading tray, and mounts resiliently connecting
the storage structure to the vehicle.

In accordance with a further feature of the invention, there
is provided a missile alignment assembly for use on a vehicle
having a fixed missile launch tube, and in conjunction with a
missile support assembly resiliently mounted on the vehicle, the
alignment assembly comprising indicator means on the launch tube,
a missile retaining tray mounted on the support assembly, at
least one sensor on the missile retaining tray for reading a
position of the indicator means, the sensor being adapted to send
a signal indicative of the position of the tray, and thereby a
missile retained by the tray, relative to the indicator means,
and thereby the launch tube, a control device adapted to receive
the sensor signals and compute movement of the tray necessary to
align the missile with the launch tube, the control device being
operative to send corrective signals, and alignment means mounted
on the missile support assembly for receiving the corrective
signals from the control device and operative in response thereto
to move the tray widthwise of the launch tube to bring the
missile on the tray into alignment with the launch tube.
The above and other features of the invention, including various novel details of construction and combinations of parts, will now be more particularly described with reference to the accompanying drawings and pointed out in the claims. It will be understood that the particular device embodying the invention is shown by way of illustration only and not as a limitation of the invention. The principles and features of this invention may be employed in various and numerous embodiments without departing from the scope of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

Reference is made to the accompanying drawings in which is shown an illustrative embodiment of the invention, from which its novel features and advantages will be apparent, wherein corresponding reference characters indicate corresponding parts throughout the several views of the drawings and wherein:

FIG. 1 is a diagrammatic perspective view of one form of a missile support assembly illustrative of an embodiment of the invention; and

FIG. 2 is similar to FIG. 1, but illustrative of an alignment assembly mounted on the support assembly of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1, it will be seen that a preferred storage structure assembly 20 includes a loading tray 22 for supporting a missile M for alignment with a launch tube T. The tray 22 is supported by a frame structure 24 which is resiliently connected to a submarine, or other vehicle S, by mounts 26.
Referring to FIG. 2, it will be seen that a preferred alignment assembly 28 includes indicator means 30 on launch tube T and tray 22, and sensor means 32 on tray 22. Each sensor means 32 is adapted to read at least one target indicator means 30 and to send a signal indicative of the position of the indicator means relative to the sensor means, and thereby the position of launch tube T relative to missile M.

The indicator means 30 may be in the form of markings or structure, such as fins or pins, or the like, on the launch tube T and, optionally, on tray 22, or active optical or electromagnetic emitters, such as light beam emitters, or the like, on the launch tube and/or tray. The sensor means 32 are adapted to read the markings or target structure, or a beam emitted by a beam emitter.

The alignment assembly 28 further includes a control device 34 which is adapted to receive signals from the sensors 32 and compute or otherwise indicate movement of tray 22 necessary to align missile M with launch tube T. Further included in alignment assembly 28 are alignment motors 36 mounted on frame structure 24 for moving tray 22 to align missile M with launch tube T. The alignment motors 36 may be configured to receive corrective signals directly from control device 34 and in response thereto move the tray as appropriate to align missile M with launch tube T. Alternatively, control device 34 may provide an indication to a human operator who performs final alignment of missile M and tube T by manual control of alignment motors 36.

In operation, when it is desired to initiate a missile launch, the alignment assembly 28 is energized. The sensors 32
signal control device 34 as to the position of tube T, relative
to missile M. The control device 34 computes movement of tray 22
required to align missile and tray and sends signals to alignment
motors 36 instructing the required movements. The alignment
motors 36 operate to move tray 22 to bring the missile M into
alignment with the launch tube T. A ram means (not shown), well
known in the art, moves the missile axially into the launch tube.
The alignment assembly 28 operates continuously from energization
to launch tube loading to maintain proper alignment between
missile M and launch tube T.

Alternatively, control device 34 provides a continuous
indication of the required movements to a human operator. The
operator manually controls alignment motors 36 to align missile M
and launch tube T.

There is thus provided a missile support assembly which is
resiliently mounted in a submarine or other vehicle, and an
alignment assembly operative to align a missile resting on the
support assembly with a launch tube.

It will be understood that many additional changes in the
details, materials, steps and arrangement of parts, which have
been herein described and illustrated in order to explain the
nature of the invention, may be made by those skilled in the art
within the principles and scope of the invention;

For example, while in the above description
the use of the assembly described herein is set forth with regard
to submarines, and while it is contemplated that the assembly
will find substantial use in submarines, it will be apparent that
the invention has applications in other marine vehicles, air
transport vehicles, and in land-based vehicles, such as railroad
cars having launch tubes mounted thereon, or where alignment
between separately supported structures is critical and the
alignment is subject to movement of the structures relative to
one another.
ABSTRACT OF THE DISCLOSURE

A missile support and alignment assembly for use on a moving vehicle having a fixed missile launch tube mounted thereon. The assembly comprises a missile support assembly including (i) a loading tray for supporting a missile, (ii) a storage structure for supporting the loading tray, and (iii) mounts resiliently connecting the storage structure to the vehicle. The missile support and alignment assembly further comprises an alignment assembly including (i) indicator means on the launch tube, (ii) a sensor on the tray for reading a position of the indicator means, the sensor being adapted to send a signal indicative of position of the tray, and thereby a missile on the tray, relative to the indicator means, and thereby the launch tube, (iii) a control device adapted to receive the sensor signals and compute movement of the tray necessary to align the missile with the launch tube, the control device being adapted to send corrective signals, and (iv) alignment motors mounted on the storage structure for receiving the control device signals and for moving the tray relative to the launch tube to bring the missile in the tray into alignment with the launch tube.