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TORPEDO MOTOR MOUNTING STRUCTURE

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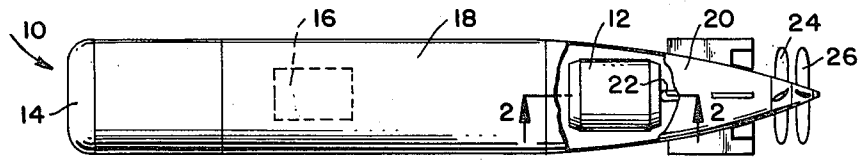


FIG. 1.

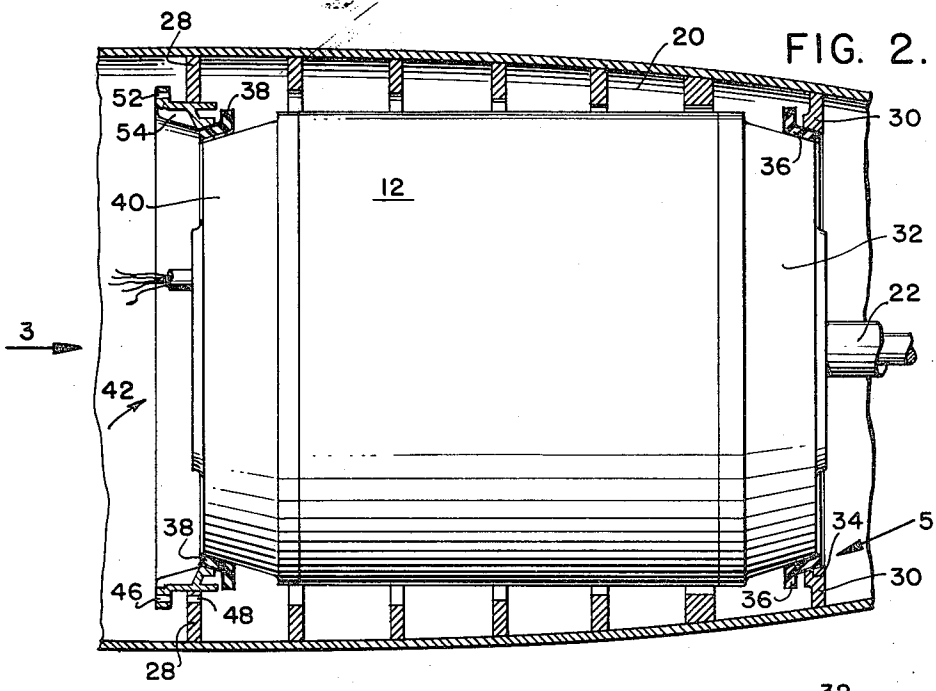


FIG. 2.

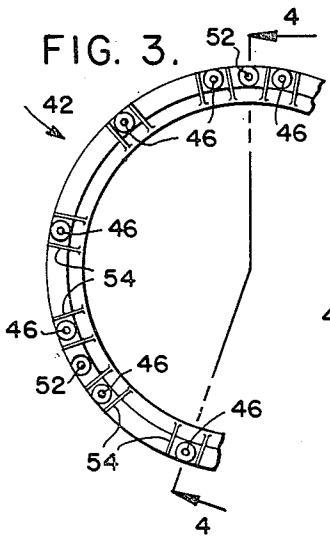


FIG. 3.

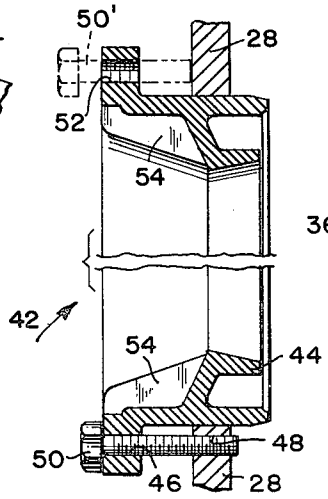


FIG. 4.

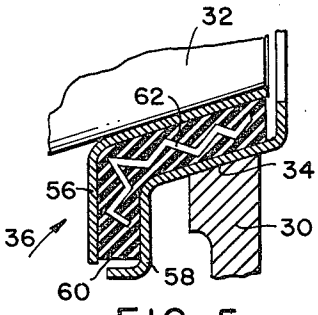


FIG. 5.

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TORPEDO MOTOR MOUNTING STRUCTURE

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The present invention relates to torpedoes, and more particularly to a new and improved torpedo propulsion motor mounting structure which provides noise-isolation and facilitates motor installation and removal.

The invention is directly intended for use in torpedoes of acoustic-homing type wherein transmission of propulsion motor noise energy, in any manner, to the electro-acoustic transducer which is generally mounted in the nose section, causes serious reduction of the maximum range at which target submarine signals can be detected by the acoustic-homing torpedo. While various other noise-isolation mountings have been proposed heretofore, they have not been entirely satisfactory from the standpoint that they impose disadvantageous design limitations upon the propulsion motor and the torpedo section (generally the tailcone section) in which the motor is mounted. Such limitations arose from the need, in earlier practice, to provide accessibility to the mountings aft of the comparatively large, high-powered propulsion motor, for the motor is short-period-rated and must frequently be removed for inspection and maintenance purposes as necessary after testing or proofing the torpedoes before placing them in warshot readiness.

It is an object of the invention to provide a noise-isolating torpedo motor mounting structure which eliminates any need for motor and tailcone section design compromises to provide for accessibility to aft mounts.

It is another object of the invention to provide a noise-isolating torpedo motor mounting structure which effects significant reduction of the normally considerable circumferential clearance between a torpedo tailcone section and the propulsion motor which it carries.

Another object is to provide a noise-isolating torpedo motor mounting structure which facilitates motor installation and removal operations.

A further object of the invention is to provide a noise-isolating torpedo motor mounting structure which yields improved noise-isolation and shock-protection characteristics.

Other objects, features and attendant advantages accomplished and provided by the present invention will become apparent as the invention becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawing in which like reference numerals designate like parts throughout the figures thereof and wherein:

FIG. 1 illustrates generally and schematically an acoustic-homing torpedo and the general locations therein of the propulsion motor and other torpedo components;

FIG. 2 is an enlarged sectional view of the torpedo tailcone section and the propulsion motor as mounted therein, taken along the line 2—2 of FIG. 1;

FIG. 3 is a partial face view of a clamp-ring member forming part of the mounting structure, taken in the direction indicated by arrow 3 in FIG. 2;

FIG. 4 is an enlarged sectional view of the clamp-ring members, taken along the line 4—4 as indicated in FIG. 3; and

FIG. 5 is an enlarged sectional view of a noise-isolation and shock protection member forming part of the motor mounting structure, taken in the region indicated by arrow 5 in FIG. 2.

In the exemplary embodiment incorporating principles of the present invention, as next described in greater detail,

the frame or casing of the torpedo propulsion motor is provided with end-bells having generally frusto-conical surfaces, and the torpedo tailcone section is provided with a pair of forward and aft ring-shaped ribs located at the motor end-bell stations. The motor mounting structure further includes a pair of noise-isolation ring-shaped members which are tapered to seat upon the end-bells of the motor, and a clamp-ring member which is removably secured to the forward rib in a manner to clamp the propulsion motor and its noise-isolation members between the clamp-ring member and the aft rib.

Referring first to FIG. 1 which illustrates the exemplary embodiment in a general manner as to the overall configuration of an acoustic-homing torpedo 10 employing a propulsion motor 12, the torpedo may of course be entirely conventional, except for the manner in which the motor 12 is mounted in accordance with the present invention to provide noise-isolation and facilitate motor mounting, demounting and remounting operations. The torpedo is structurally sectionalized as indicated, and provided with means (not shown) for releasably joining the several sections so that they may be disengaged and separated when necessary for inspection, maintenance or other purposes. Mounted at the forward end of the acoustic-homing torpedo 10 is its electro-acoustic transducer 14. The associated electronic apparatus 16, which functions to provide target detection and homing control, may be carried by the intermediate section 18 as indicated. The tailcone section 20 accommodates the propulsion motor 12, the drive shaft assembly 22, other driven elements (not shown) including conventional noise-isolation couplings, also actuator mechanism (not shown) for providing torpedo steering in response to control signals delivered by the electronic apparatus 16. For the purpose of substantially eliminating counter-torque forces, the torpedo 10 may include counter-rotating propellers 24, 26 as indicated, in which instance motor 12 is preferably of a conventional type wherein both the rotor and field structures (not shown) are arranged to rotate, in opposite directions within the motor casing, to drive the propellers 24, 26 through concentric shafts of drive shaft assembly 22. It is also preferable, for the purpose of enabling motor 12 (when demounted) to be removed from the torpedo tailcone section 20 without first requiring removal of the propellers 24, 26 or other components, to conventionally include a splined or other slipjoint type of coupling (not shown) in the motor drive system, for example simply at the motor end of drive shaft assembly 22.

Referring now to the enlarged sectional view of the exemplary motor mounting structure shown in FIG. 2, secured to the tailcone section 20 of the torpedo are a pair of forward and aft ring-shaped ribs 28 and 30, respectively, which serve to strengthen the tailcone section and also form part of the motor mounting structure. The aft end-bell 32 of the motor casing is tapered to provide a generally frusto-conical surface, and the aft rib 30 is provided with a like-tapered seat 34. Ring-shaped member 36, shown as having a substantially L-shaped cross-section and sandwiched between seat 34 of aft rib 30 and the frusto-conical surface of end-bell 32, comprises a noise-isolation and shock-absorption material such as a rubber compound preferably having substantially the same strengths in compression and tension. A noise-isolation member 38 of like configuration is provided for use at the forward end of motor 12, fitting against the conically-tapered surface of the forward end-bell 40. Continuing with reference additionally to FIGS. 3 and 4, the noise-isolating motor mounting structure is completed by a generally cylindrical clamp-ring member 42 which makes sliding fit with forward rib 28, as shown, to seat the annular conically-tapered flange 44 of clamp-ring member 42 against the noise-isolation member 38 and to clamp-

ingly mount motor 12 in the tailcone section 20. The conically-tapered configuration of the several parts of the mounting structure effect automatic alignment of the motor in the tailcone section. Clamp-ring member 42 is provided with bolt-clearance holes 46, and threaded holes 48 having like spacing are provided in forward rib 28 for engagement by clamp-ring bolts 50. For use in the course of motor removal operations, clamp-ring member 42 may also be provided with jack-screw holes 52 into which, after disengaging the clamp-ring bolts 50 from the forward rib 28, the same or other bolts 50' may be threaded to be forced against the forward rib 28 and thus free the clamp ring 42 and motor 12 from binding engagement effected by the conically tapered configuration. Reinforcing gussets 54 may also be provided, as shown, to strengthen the clamp ring member 42 in the regions where it will experience greatest stress.

As detailed in FIG. 5 which is directed to the aft noise-isolation member 36 in particular, the noise-isolation members include inner and outer metal collars 56 and 58, respectively, also generally L-shaped in cross-section, the resilient noise-isolation and shock-absorption material 60 being sandwiched between and bonded to these collars. The resilient material of the noise-isolation members may further be formed to provide a suitably shaped cavity 62 therein, for example having a corrugated channel configuration as seen in cross-section, to provide excellent noise-isolation characteristics during torpedo running, but to become voidless during shock loading so that it resists damage which might otherwise be experienced during transportation or water-entry of the torpedo.

Because of the laminated ring configuration, and the distribution of tensile, compressive and shear loads by the resilient material of L-shaped cross-section, a load applied in say a radial direction is opposed by the entire noise-isolation member, rather than locally, and is absorbed identically for any direction of such radial load. The L-shaped cross-section also provides the strength necessary to oppose radial distortion of the laminated structure. The transmission characteristics of the resilient material, the laminated structure, the ring configuration, and the L-shaped cross-section thus coact to provide significantly improved strength, noise-isolation and shock-protection characteristics.

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 the invention may be practiced otherwise than as specifically disclosed.

What is claimed is:

1. A torpedo motor mounting structure comprising, in combination: a torpedo section; a propulsion motor positioned entirely within said torpedo section and having end-bells of substantially frusto-conical configuration; said torpedo section having a pair of ring-shaped ribs at the motor end-bell stations; a clamp-ring member making sliding fit into one of said ring-shaped ribs and having an annular flange which is conically tapered to parallel the lateral surface of the end-bell adjacent thereto; the other of said ribs having a conically-tapered annular seat facing the lateral surface of the end-bell adjacent thereto; a pair of conically-tapered ring-shaped noise-isolation members, one sandwiched between the conically-tapered annular flange of said clamp-ring member and the end-bell adjacent thereto, the other sandwiched between said seat of said other rib and the end-bell adjacent thereto; said clamp-ring member further having a peripheral flange confronting the rib adjacent thereto; and bolt means passing through said peripheral flange and threading into the rib adjacent thereto for drawing said clamp-ring member toward said other rib and thereby clamping said motor in place.

2. A torpedo motor mounting structure in accordance with claim 1, wherein each said ring-shaped noise-isolation member is of laminated structure comprising a noise-isolation material sandwiched between and bonded to a pair of inner and outer metal collars, said laminated structures each comprising a lateral flange to improve noise-isolation and shock-absorption characteristics.

3. A torpedo motor mounting structure in accordance with claim 2, wherein the noise-isolation materials of said ring-shaped members have cavities formed therein to become closed during shock-loading.

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