

Feb. 3, 1942.

A. OSBOURNE

2,272,128

MARINE PROPELLER

Filed Nov. 28, 1940

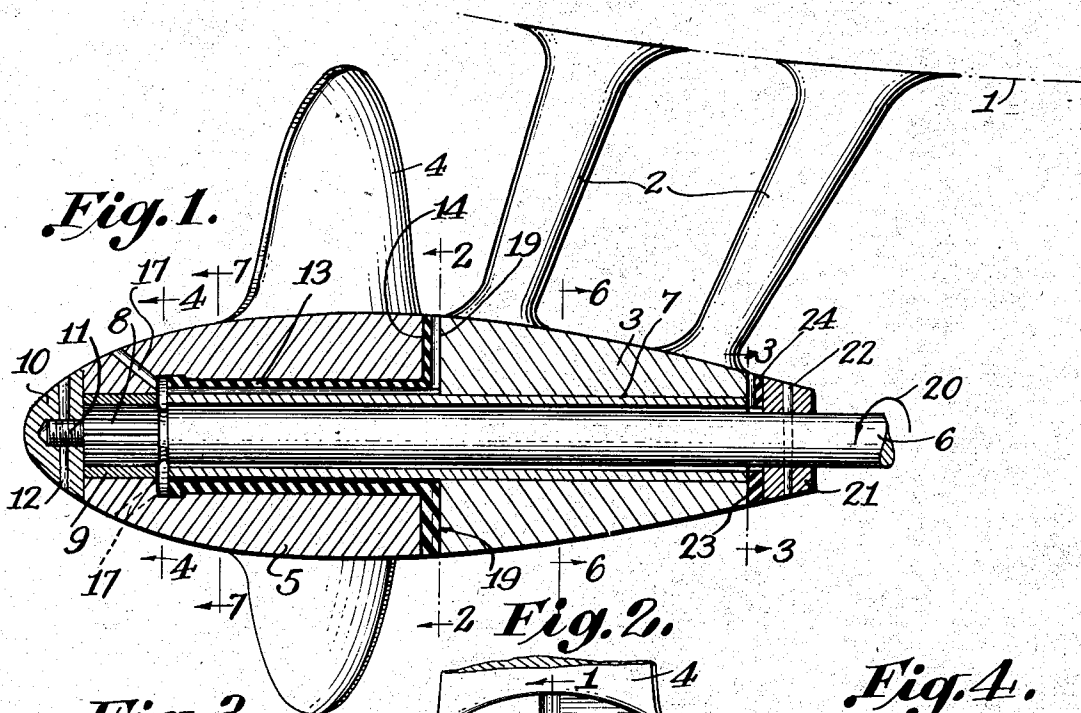


Fig. 3.

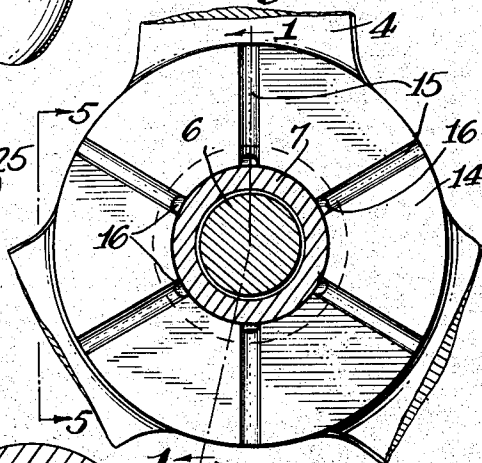
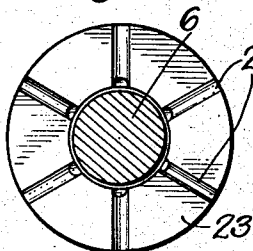


Fig. 4.

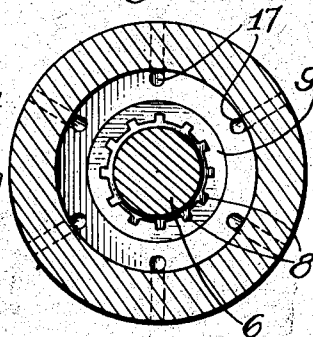


Fig. 6.

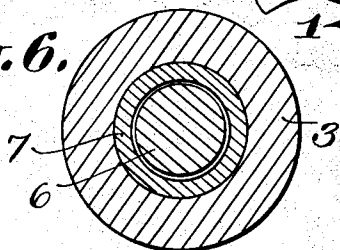


Fig. 5.

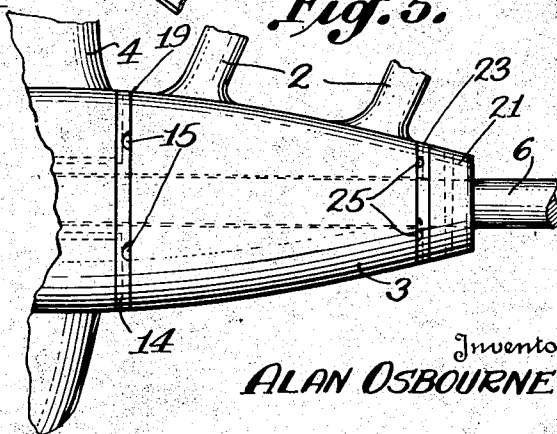
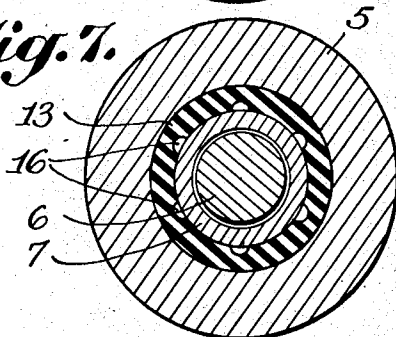


Fig. 7.



Inventor
ALAN OSBOURNE.

By *J. F. Morkushead*

Attorney

UNITED STATES PATENT OFFICE

2,272,128

MARINE PROPELLER

Alan Osbourne, Brooklyn, N. Y.

Application November 28, 1940, Serial No. 367,590

8 Claims. (Cl. 308-121)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

The invention described herein may be manufactured and used by or for the Government of the United States for governmental purposes without the payment to me of any royalty thereon in accordance with the provisions of the act of April 30, 1928 (ch. 460, 45 Stat. L. 467).

This invention relates in general to marine propellers and more particularly those employing floating propeller shafts.

Heretofore it has been the conventional practice in the marine art to employ propeller shafts of larger diameter than has been necessary to carry the torque of the engine to the propeller. This excess in diameter of the propeller shaft has been considered necessary because the thrust of the propeller has been carried back through the propeller shaft to the engine and because the propeller's weight was overhung so that the propeller shaft functioned as a cantilever beam, thus exposing the propeller shaft to extreme sidewise distortion or whip. Moreover, this excess of diameter of propeller shaft in the conventional arrangement necessitates an excess of shaft stiffness over that required to carry the required torque. This excess in stiffness results in greater torsional criticals of the propeller shaft and engine assembly occurring at higher revolutions per minute than would occur if the shaft were of smaller diameter. This results in an excessive amount of energy of vibration being fed into the system and a consequent excessive torsional stress transferred to the engine gearing.

It has also been conventional practice in the marine art to employ propeller shafts with directly engaging bearings in the form of soft metal bushings. Being submerged in the water it is a common occurrence for grit, sand or other abrasive substances to accumulate between the rotating propeller shaft and its bearing and become embedded in the soft metal bushing. The inevitable result is wear and damage to the propeller shaft. This results in undue play between the shaft and bearing and consequent vibration and misalignment in seaway, necessitating the trouble and expense of replacement of the shaft or bearing or both.

Another bad feature of the conventional marine propeller assembly is the lack of provision for ready assembly and disassembly and the replacement of parts.

It is therefore a primary object of this invention to provide an improved marine propeller assembly whereby these disadvantages will be overcome and more particularly so by reason of the provision in the propeller assembly of a full

floating propeller shaft and a propeller hub which are carried by a strut barrel located at the stern, the strut barrel being provided with such thrust members suitable for forward and astern operation that the conventional overhang of the propeller shaft is eliminated and the absorption of the stresses and thrusts near their source is accomplished and not transferred to the engine assembly and gearing.

Another object of the invention is the provision of a propeller assembly to include a full floating propeller shaft and propeller hub, with a non-metallic "Cutless" water lubricated bearing which latter is independent of and not in bearing contact with the propeller shaft, whereby wear and damage to the propeller shaft is avoided.

A further object of the invention is to provide improved means for the intake, circulation of water and discharge of water and foreign substances from the bearing surfaces.

A further object is the provision of a marine propeller assembly which is most readily assembled and disassembled and capable of ready replacement of parts.

With the foregoing and other objects in view, the invention resides in the combination of parts and in the details of construction hereinafter set forth in the following specification and appended claims, certain embodiments thereof being illustrated in the accompanying drawing, in which:

Fig. 1 is a view in side elevation of a portion of the hull of a marine vessel and struts for supporting a propeller bearing, and showing the bearing assembly and propeller hub in longitudinal section and the relationship of the propeller shaft with respect thereto.

Fig. 2 is a view in cross-section taken along line 2-2 of Fig. 1, showing the radial water intake channels for the bearing.

Fig. 3 is a view in cross-section taken along line 3-3 of Fig. 1, showing the radial water channels for the bearing.

Fig. 4 is a view in cross-section taken along line 4-4 of Fig. 1, showing the radial water outlet channels.

Fig. 5 is a fragmentary elevational view taken as at line 5-5 of Fig. 2 to illustrate the abutting relation of the propeller hub and bearing support and the radial water intake channels of the non-metallic bearing member.

Fig. 6 is a view in cross-section taken along the line 6-6 of Fig. 1, showing space between shaft and strut barrel.

Fig. 7 is a view in cross-section taken along the line 7-7 of Fig. 1, showing the longitudinal water channels of the non-metallic bearing member for the propeller hub.

Referring more particularly to the drawing, a portion of the stern under water portion of the marine vessel is shown at 1 which is provided with suitable struts or brackets 2 for carrying a strut barrel 3, for supporting the propeller and shaft assembly, the propeller being indicated at 4, the propeller hub at 5 and the propeller shaft at 6.

As shown in Fig. 1, the propeller shaft 6 is a floating shaft, it being disposed in spaced relation to a replaceable non-corrosive hard metal quill, or sleeve 7, which is fixedly mounted on the bracket 3 so as to be non-rotatable.

Near its stern end the propeller shaft is provided with splines 8 to engage a replaceable non-corrosive hard metal sleeve 9 fixedly carried by a propeller hub 5 so as to constitute a driving connection between the shaft and the propeller 4. The assembly is held in position by a screw nut fairwater, or hub cap 10 screwed on the screw thread propeller shaft extension 11 and held in place by a transverse pin 12 extending through the fairwater and propeller shaft extension.

Interposed longitudinally between the rotatable propeller hub and the stationary sleeve 7 and radially between the propeller hub and the bracket 3 is a non-metallic water-lubricated "Cutless" bearing fixed to the propeller hub, the longitudinal cylindrical portion being designated at 13 and its radial circular flange at 14.

As shown in Figs. 2 and 5, the flange 14 of this water-lubricated bearing is provided with a plurality of radial grooves 15 extending inwardly from the exterior to the outer surface of the sleeve 7. As more clearly shown in Fig. 7, the cylindrical portion 13 of the bearing is provided with a plurality of longitudinally extending channels 16 in its inner surface. These channels 16 may be straight, as shown, or spiral. In the rear portion of the propeller hub are arranged outlet passages 17. Thus when under way the water is drawn in through channels 15 of the bearing flange 14 which face the rear surface 19 of the stationary bracket 3. The bearing, being rotatably carried by the propeller hub, the water in the channels 15 and the film of water between these faces supports the load imposed upon the bearing in its contact with the bracket surface 19. The same is true of the water in the channels 16 in the cylindrical bearing portion 13 and its rotative engagement with the sleeve 7. The outlet ports 17, registering with channels 16, insure water circulation and discharge of foreign abrasive substances that may enter the bearing channels. Centrifugal force may cause a reversal of the direction of water flow but the resultant effect will be the same as far as lubrication of rubbing surfaces is concerned.

For forward propulsion the propeller shaft rotates in the direction of the arrow 20 and the bearing flange 14 acts as a thrust bearing between the propeller hub and the bracket surface 19.

For astern propulsion the propeller shaft obviously rotates in the opposite direction. The thrust bearing for such operation is shown as comprising a faired sleeve 21 keyed to the propeller shaft 6 by a key 22, with a water-lubricated non-metallic "Cutless" bearing 23 carried by the sleeve 21 and bearing against the forward surface 24 of the supporting bracket 3. This bearing 23, as more clearly shown in Fig. 3, is

provided with a plurality of radial channels 25 extending from the exterior to the propeller shaft in order that the water drawn in through the radial channels provides a supporting water film for supporting the load imposed upon this thrust bearing during astern operation.

From the foregoing it will be apparent that there has been accomplished the provision of a full floating propeller shaft which is relieved of all rotative metallic bearing contact and resultant abrasive wear. This is true by reason of the fact that the bearing contacts have been restricted to a stationary sleeve 7, in spaced relation to the propeller shaft 6, and the "Cutless" non-metallic water-lubricated bearing members 13, 14 and 23, one of which, namely 13, 14, is carried by the propeller hub 5 and the other, 23, by the propeller shaft 6.

As previously described, and as shown in Fig. 1, the outboard arrangement of the strut and strut barrel, together with the quill 7 at the stern of the boat for housing the propeller and propeller shaft eliminates overhang of the propeller shaft which is present in the conventional assembly. Thus by the location of the bearing assembly the cantilever beam disposition of the conventional propeller shaft is avoided. In other words the thrust of the propeller is absorbed adjacent the source and not transferred to the engine gearing. This permits the use of propeller shafts of relatively small diameter. As a result the propeller shaft may be made more flexible to avoid torsional criticals occurring at relatively high engine revolutions per unit of time, as well as preventing shaft seizure due to the deflection of the vessel's hull in a seaway.

While there have been shown two specific embodiments and locations of thrust bearings for forward and astern propulsion, it is to be understood that the full floating water-lubricated propeller shaft feature of my invention may be utilized in conjunction with an assembly in which the thrust bearings are located in the conventional manner in or on the hull of the vessel, or with the supporting "Cutless" non-metallic bearings arranged in any other relationship as long as the floating feature is retained.

Another important feature of the invention is the ease of assembly and replacement of the parts. The sleeve 7 being imbedded in the bracket 3, the rear half of the sleeve extends rearwardly of the bracket. The propeller and its hub carrying the bearing 13, 14 is slid into position from left to right as shown in Fig. 1, and the splines 8 of the propeller shaft brought into engagement with the hub sleeve 9 in driving relationship. The screwing on of the fairwater 10 on the stud 11 and the keying of the same with the pin 12 completes this part of the assembly. A removal of the assembly is brought about by a reversal of this assembling operation and a mere removal of the shaft and the thrust bearing assembly including the sleeve 21 and "Cutless" bearing 23 permits removal and replacement of the latter.

I claim:

1. In combination in a submersible marine propulsion assembly, a stationary supporting bracket carrying a stationary cylindrical metallic sleeve interiorly thereof, a full floating propeller shaft extending through said sleeve in spaced relation thereto, a propeller and hub in driven engagement with said shaft and carried by said sleeve, and a water-lubricated non-metallic bearing carried by said hub and disposed between said hub and said sleeve, and between said hub

and said bracket, and a second water-lubricated non-metallic bearing carried by a member carried by said shaft and disposed between said member and said bracket.

2. In combination in a submersible marine propulsion assembly, a stationary supporting bracket carrying a stationary cylindrical metallic sleeve interiorly thereof, a full floating propeller shaft extending through said sleeve in spaced relation thereto, a propeller and hub in driven engagement with said shaft and carried by said sleeve, and a water-lubricated non-metallic bearing carried by said hub and disposed between said hub and said sleeve, and between said hub and said bracket, said bearing having registering radial and longitudinal channels to receive water from the exterior to the outer surface of said sleeve and registering channels in said hub to discharge the water at the stern end of the assembly.

3. In combination in a submersible marine propulsion assembly, a stationary supporting bracket carrying a stationary cylindrical metallic sleeve interiorly thereof, a full floating propeller shaft extending through said sleeve in spaced relation thereto, a propeller and hub in driven engagement with said shaft and carried by said sleeve, and a water-lubricated non-metallic bearing carried by said hub and disposed between said hub and said sleeve, and between said hub and said bracket, and a second water-lubricated non-metallic bearing carried by a member carried by said shaft and disposed between said member and said bracket, said driven engagement comprising splines on the stern end of said shaft meshing with a sleeve carried by said hub, said propeller shaft being free from rotative bearing engagement with any portion of said assembly.

4. In combination in a submersible marine propulsion assembly, a stationary supporting bracket carrying a stationary cylindrical metallic sleeve interiorly thereof, a full floating propeller shaft extending through said sleeve in spaced relation thereto, a propeller and hub in driven engagement with said shaft and carried by said sleeve, and a water-lubricated non-metallic bearing carried by said hub and disposed between said hub and said sleeve, and between said hub and said bracket, said bearing having registering radial and longitudinal channels to receive water from the exterior to the outer surface of said sleeve and registering channels in said hub to discharge the water at the stern end of the assembly, said driven engagement comprising splines on the stern end of said shaft meshing with a sleeve carried by said hub, said propeller shaft being free from rotative bearing engagement with any portion of said assembly.

5. In combination in a submersible marine propulsion assembly, a stationary supporting bracket carrying a stationary cylindrical metallic sleeve interiorly thereof, a full floating propeller shaft extending through said sleeve in spaced relation thereto, a propeller and hub in driven engagement with said shaft and carried by said sleeve, and a water-lubricated non-metallic bearing carried by said hub and disposed between said hub and said sleeve, and between said hub and said bracket, and a second water-lubricated non-metallic bearing carried by a member carried by said shaft and disposed between said member

and said bracket, said bearing between said hub and said bracket constituting a thrust bearing to operate as such during forward propulsion, said second named bearing constituting a thrust bearing to operate as such during astern propulsion.

6. In combination in a submersible marine propulsion assembly, a stationary supporting bracket carrying a stationary cylindrical metallic sleeve interiorly thereof, a full floating propeller shaft extending through said sleeve in spaced relation thereto, a propeller and hub in driven engagement with said shaft and carried by said sleeve, and a water-lubricated non-metallic bearing carried by said hub and disposed between said hub and said sleeve, and between said hub and said bracket, said bearing having registering radial and longitudinal channels to receive water from the exterior to the outer surface of said sleeve and registering channels in said hub to discharge the water at the stern end of the assembly, said bearing between said hub and said bracket constituting a thrust bearing to operate as such during forward propulsion.

7. In combination in a submersible marine propulsion assembly, a stationary supporting bracket carrying a stationary cylindrical metallic sleeve interiorly thereof, a full floating propeller shaft extending through said sleeve in spaced relation thereto, a propeller and hub in driven engagement with said shaft and carried by said sleeve, and a water-lubricated non-metallic bearing carried by said hub and disposed between said hub and said sleeve, and between said hub and said bracket, and a second water-lubricated non-metallic bearing carried by a member carried by said shaft and disposed between said member and said bracket, said driven engagement comprising splines on the stern end of said shaft meshing with a sleeve carried by said hub, said propeller shaft being free from rotative bearing engagement with any portion of said assembly, said bearing between said hub and said bracket constituting a thrust bearing to operate as such during forward propulsion, said second named bearing constituting a thrust bearing to operate as such during astern propulsion.

8. In combination in a submersible marine propulsion assembly, a stationary supporting bracket carrying a stationary cylindrical metallic sleeve interiorly thereof, a full floating propeller shaft extending through said sleeve in spaced relation thereto, a propeller and hub in driven engagement with said shaft and carried by said sleeve, and a water-lubricated non-metallic bearing carried by said hub and disposed between said hub and said sleeve, and between said hub and said bracket, said bearing having registering radial and longitudinal channels to receive water from the exterior to the outer surface of said sleeve and registering channels in said hub to discharge the water at the stern end of the assembly, said driven engagement comprising splines on the stern end of said shaft meshing with a sleeve carried by said hub, said propeller shaft being free from rotative bearing engagement with any portion of said assembly, said bearing between said hub and said bracket constituting a thrust bearing to operate as such during forward propulsion.

ALAN OSBOURNE.