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PROPELLER MOUNTING FOR OUTBOARD MOTORS

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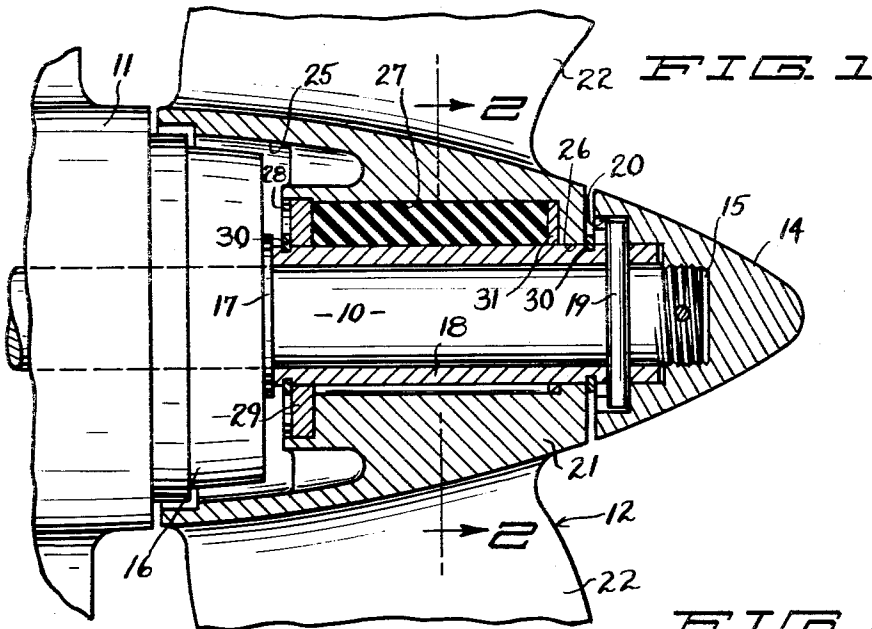


FIG. 2

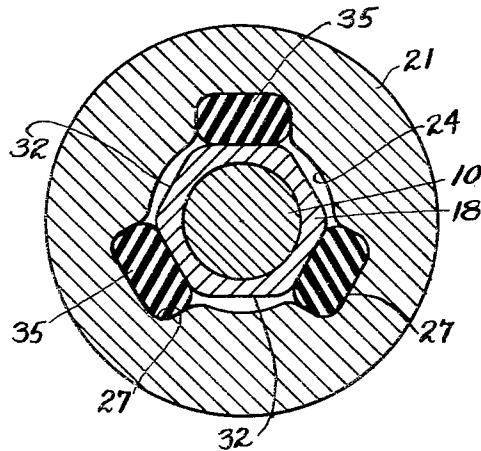
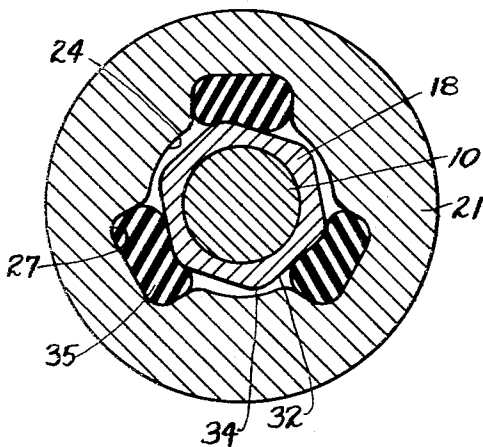


FIG. 3



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PROPELLER MOUNTING FOR OUTBOARD MOTORS

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This invention relates generally to outboard motors and more particularly concerns the motor propeller mounting.

In conventional outboard motor construction the propeller is mounted on a propeller shaft which is driven through suitable connection with the main drive shaft of the motor. The propeller is held against rotation on the propeller shaft by means of a frangible shear pin extending diametrically or tangentially through the shaft. Accordingly the propeller shaft and propeller are rotatively integral. This construction is not completely satisfactory from an operational standpoint. The rigid connection between the propeller and shaft causes the shear pin to break whenever an underwater obstruction is engaged even though only momentarily. Also any propeller vibration is transferred to the motor through the drive shafts. Finally, but not the least important is the fact that when the motor is shifted between forward and reverse or when the speed is rapidly accelerated, the change in propeller direction or speed is very abrupt so as to interfere with smooth performance.

The primary object of the present invention is to provide a new and improved mounting for an outboard motor propeller which will allow the propeller limited rotational slippage on its drive shaft so as to eliminate any sudden jolts on the motor when the shaft is reversed or rapidly accelerated.

Another object of the invention is to provide a new and improved propeller mounting which provides a peripheral cushion between the shaft and propeller to reduce the transfer of propeller vibration to the motor.

Still another object of the invention is to provide a propeller mounting wherein there is a resilient rotational connection between the propeller and its drive shaft which will absorb the impact of momentary underwater obstructions on the propeller.

With these objects in view the invention broadly comprises providing a series of seats spaced around the internal periphery of the propeller hub to lie opposite relatively flat surfaces on the propeller shaft unit and a cushion element of deformable material disposed in each seat and held under radial compression therein between the seat and the opposing flat surface so as to provide a resilient peripheral mounting of the hub on the shaft unit.

The above mentioned and additional objects of the invention will be brought to light during the course of the following specification, reference being made to the accompanying drawing, in which—

FIG. 1 is a vertical axial section through the propeller hub structure with the propeller shaft and certain other portions of the structure shown in elevation.

FIG. 2 is a vertical section taken along 2—2 of FIG. 1 with the propeller in normal position on the shaft.

FIG. 3 is similar to FIG. 2 but showing the hub rotationally offset with respect to its normal operating position on the shaft.

Referring now more particularly to the drawing like reference numerals will be used to denote like parts and structural features in the different views. A propeller shaft 10 extends rearwardly through the lower unit 11 of an outboard motor, with the forward portion of the shaft

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suitably geared to the motor drive shaft to be driven thereby. A propeller designated generally at 12 is mounted on the shaft 10 and is held in place thereon by means of a propeller nut 14 which is threaded on the threaded rear end portion 15 of the shaft 10.

The lower unit 11 is provided with a bearing unit 16 in which the shaft 10 is journaled and with a fluid seal 17 encircling the shaft to prohibit water entrance to the lower unit. A tubular bushing or sleeve 18 encircles the shaft 10 extending from the seal 17 to the propeller nut 14. This bushing 18 is locked to the shaft 10 by means of a shear pin 19 which extends diametrically through aligned apertures in the bushing and shaft, the ends of the pin 19 being disposed in the forwardly opening recess 20 in the nut 14. The shaft 10 and bushing 18 integrally carried thereby provide a propeller shaft unit.

Propeller 12 has a central hub 21 from which the propeller blades 22 project outwardly in generally radial directions. Hub 21 has an axial passage 24 which is greatly enlarged as at 25 at one end to provide a forwardly opening chamber for reception of the bearing 16. Passage 24 is round in cross section near the rear end of the hub with the surface 26 closely encircling the bushing 18. Forward of the internal flange having the surface 26 the hub is provided with a plurality of circumferentially spaced elongated pockets 27 which open inwardly to passage 24. These pockets are substantially greater in width than in depth as may be observed in FIGS. 2 and 3. At the forward end of passage 24 and before it opens into chamber 25 the passage is enlarged to form a circular recess 28 for reception of an annular washer 29. The bushing 18 is provided with spaced peripheral grooves for the reception of retainer rings 30 positioned at the rear end of the hub and immediately forward of the washer 29. These rings serve to lock the propeller 12 against axial sliding movement on the bushing 18. A washer 31 having center opening for reception of the shaft 10, and having a configuration in plan to fit the passage 24 and pockets 27 is disposed around the shaft immediately forward of the hub surface 26.

Bushing 18 is round in external cross section except for the portion intermediate the washers 29 and 31. This section of the bushing is formed hexagonal in cross section as will be observed in FIGS. 2 and 3 with a plurality of flat surfaces 32 joining each other circumferentially by rounded corners, as denoted at 34. The flats 32 are of substantially the same width and length as the pockets 27 and are so spaced circumferentially on the bushing so that as one flat is immediately opposite one of the pockets, other flats will directly oppose the other pockets.

A cushion element 35 is disposed in each pocket 27. These elements are preferably round in cross section prior to insertion into the assembly. When in place in the pockets 27, however, they are compressed between the flat 32 and the bottom of pocket 27 into an oblong cross sectional shape, as shown in FIG. 2, with the cushion completely filling the pocket. The cushions may be readily placed in position after having been frozen in their compressed condition in a manner now well known. These cushions are formed of rubber, neoprene or some other flexible, elastic material of similar composition.

In normal propeller operation the propeller hub is held on the bushing in the position shown in FIG. 2. The resilient mounting afforded by the cushions 35 prohibits propeller vibrations from being transferred through the shaft 10 to the motor proper. If the speed of shaft 10 is rapidly reversed or accelerated through operation of the motor throttle or shift controls, the change of rotational direction or speed will be transmitted to the pro-

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propeller 12 through the yieldable cushions 35 prohibiting any abrupt jolt as where the propeller is integral with the shaft. Normally during such a transmittal the bushing 18 will move to the relative position within the hub 21 shown in FIG. 3 with corners 34 of the bushing pressing into the cushions 35. When the initial propeller load on the bushing has decreased, the hub will return to the normal position shown in FIG. 2 with the flats 32 opposite the pockets 27.

Conversely, when one of the propeller blades strikes a momentary obstruction in the water the yieldable connection with the propeller shaft will allow the shaft to rotate slightly relative to the hub 21 to prohibit any damage to the internal mechanism of the motor. Where the obstruction is of such a nature as to impose substantial drag or resistance on the propeller, the shear pin 19 will break in the usual manner completely severing any operative connection between the shaft 10 and bushing 18.

It will be observed in FIG. 3 that the outside corners 34 of the bushing 18 cause a wave in the cushioning element 35 ahead of the corner relative to its direction of rotation within the hub. This bulge or wave serves to provide increasing resistance as the corner moves across the pocket 27 until the next flat surface on the bushing comes into position opposite the pocket. During this action the friction between the bushing and the cushioning element 35 will tend to cause the latter to rotate about its axis within the pocket. Inasmuch as the element 35 is round in cross section, however, it will again return to its oblong cross sectional shape when the bushing 18 and hub 21 have returned to their normal operative relative positions, as in FIG. 2. The resistance to compression inherent in the cushioning elements 35 will cause the units to return to said normal position.

While the propeller mounting has herein been shown and described as used on an outboard motor, it will be understood that the same construction can be used on the propeller shaft of any marine engine with the same beneficial results.

There is thus provided a new and improved propeller mounting which economically and effectively carries out the aforementioned objectives. It is understood that suitable modifications may be made in the structure as disclosed, provided such modifications come within the spirit and scope of the appended claims. Having now therefore fully illustrated and described my invention,

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what I claim to be new and desire to protect by Letters Patent is:

1. In a marine motor including a propeller drive shaft unit, a propeller including a center hub circumposed in spaced relation about said shaft unit, said shaft unit having a polygonal cross-section comprising a series of chordally disposed flat surfaces connected by rounded corners, said rounded corners being disposed a greater radial distance from the longitudinal axis of said shaft unit than the radial distance of a bisecting radius normal to said flat surfaces, said hub including a plurality of circumferentially spaced inwardly opening pockets each disposed in radially opposed relation to one of said flat surfaces, each of said pockets having a width circumferentially of said hub substantially equal to the width of an opposed flat surface, each pocket including a bottom wall disposed perpendicular to said bisecting radius and including side walls substantially perpendicular to said bottom wall, a plurality of cylindrical cushioning elements of deformable elastic material compressed into engagement with said bottom and side walls one each in said pockets and partially protruding therefrom with its longitudinal axis parallel to that of said shaft unit, each of said cushioning elements having a normal diameter greater than said pocket depth and being compressingly engaged substantially on the entire opposed flat surface of said shaft unit, said cushioning elements resiliently urging said bottom walls and flat surfaces into parallelism and permitting limited relative rotation when said rounded corners rotate toward an opposed pocket and the cushioning elements are partially deformed out of said pockets.

2. The structure of claim 1; said propeller drive shaft unit comprising a shaft having a sleeve circumposed thereabout, said sleeve including an outer periphery providing said polygonal cross-section, and shear pin means extending diametrically through said sleeve and shaft.

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