Oct. 8, 1963 L. H. BLOUNT 3,106,248

FAIRING FOR A CONTROLLABLE PITCH PROPELLER

Filed Jan. 30, 1962 2 Sheets-Sheet 1

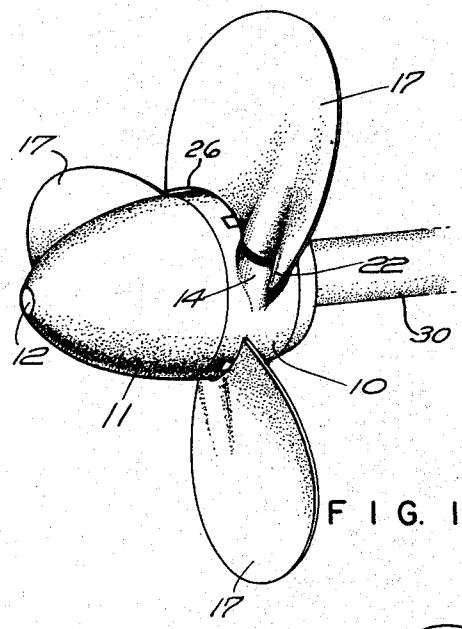

FIG. 1

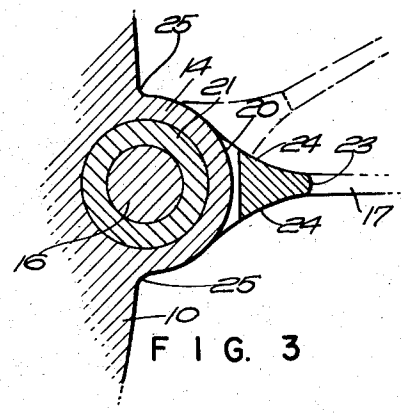

FIG. 3

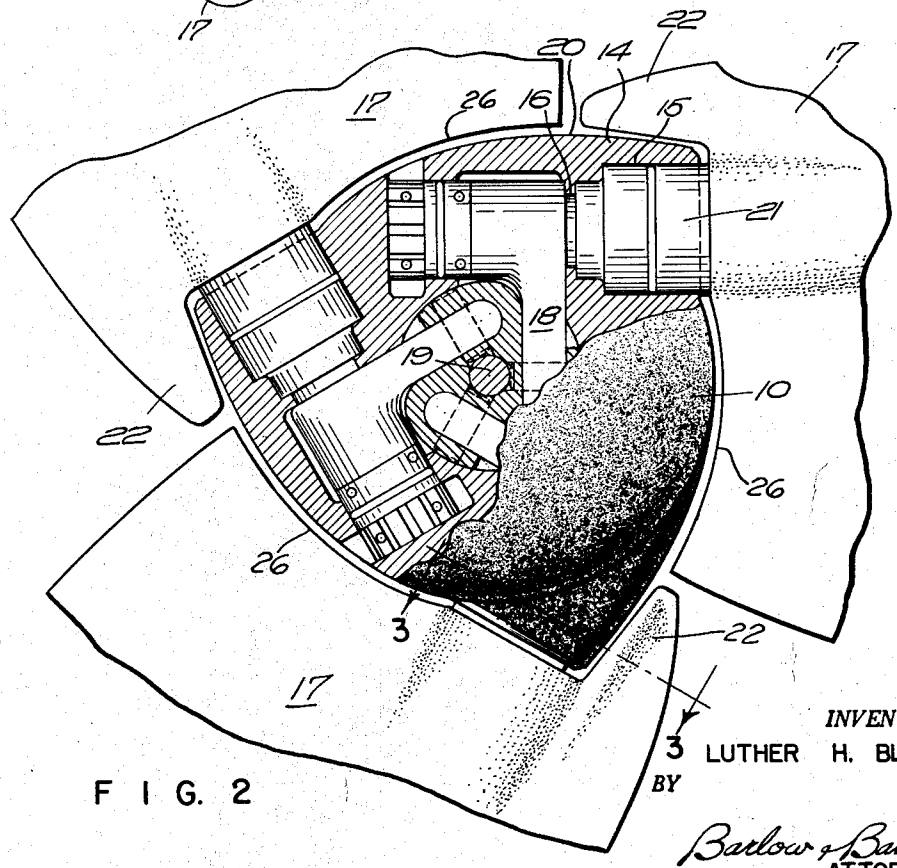

FIG. 2

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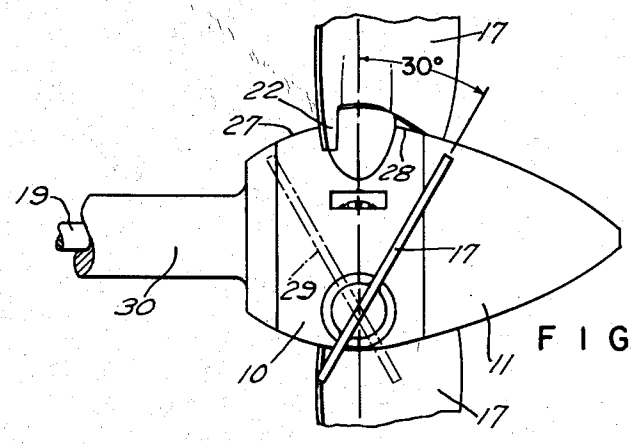

FIG. 4

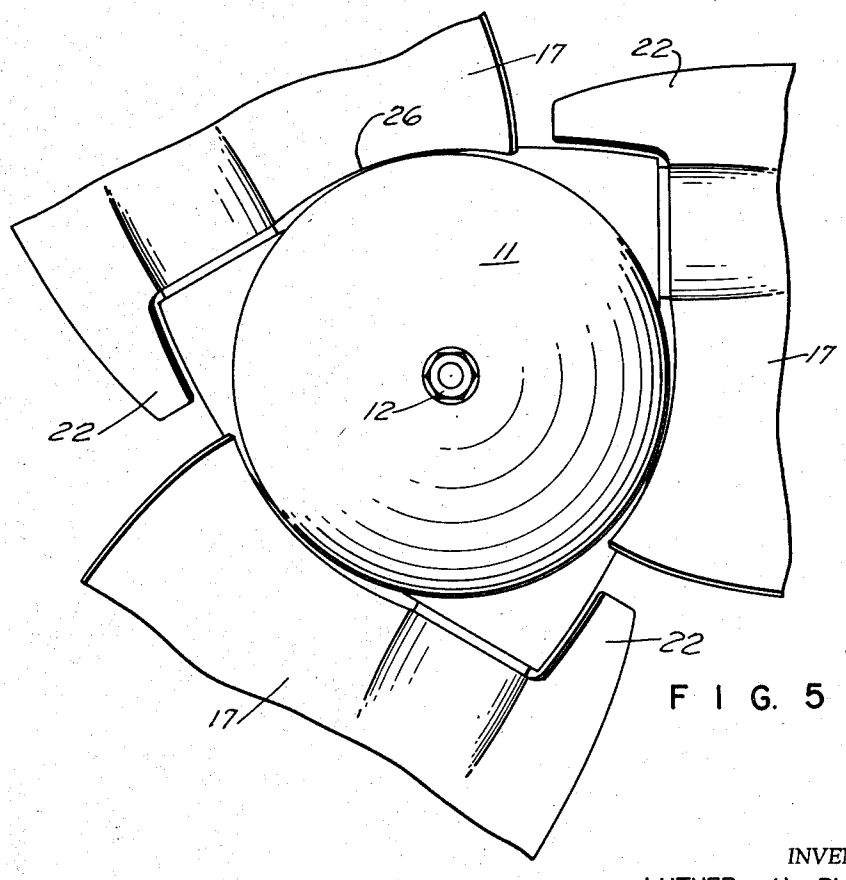

FIG. 5

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FAIRING FOR A CONTROLLABLE PITCH PROPELLER

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1 Claim. (Cl. 170—160.58)

This invention relates to a controllable pitch propeller and more particularly to the contour or shape of the hub and blades assembled therewith.

In the use of controllable pitch propellers it often occurs that the hub is relatively large in diameter due to internal mechanism for controlling the blades which extend therefrom. Thus as rotation occurs, anything protruding off center tends to provide considerable disturbance in the form of cavitation in the water.

One of the objects of this invention is to provide a propeller of the controllable pitch type in which the blades are supported from a relatively large hub by bosses protruding from the hub with the blade extending along the boss and to fair the blade along the portion which extends in front of or overlaps the boss so as to provide a better flow line of the water as it passes through the water.

Another object of this invention is to also fair the boss into the hub so as to provide a better flow of liquid about the boss and hub as rotation occurs.

Another object of this invention is to provide a substantially uniform cross section at various pitch settings of the blade so as to maintain a better flow of the liquid about the boss and hub.

Another object of the invention is to provide an increased efficiency of the blade by increasing the driving surface of the blade.

A more specific object of the invention is to increase the driving surface of the blade by causing the inner edge of the blade to more closely follow the hub.

With these and other objects in view the invention consists of certain novel features of construction as will be more fully described and particularly pointed out in the appended claims.

In the accompanying drawings:

FIGURE 1 is a perspective view of the propeller;

FIGURE 2 is an end view partly in section of the propeller showing the bearing for the blades;

FIGURE 3 is a section on substantially line 3—3 of FIGURE 2 and showing in dotted lines another position of the blade;

FIGURE 4 is a top plan view of the hub and with the blades rotated through an angle of substantially 30° from their neutral position; and

FIGURE 5 is an end view on a larger scale of the showing in FIGURE 4 looking from the trailing end of the hub.

In proceeding with this invention, I have provided a propeller in which the central hub receives the spindles of the blades in a position offset from the arc formed by a uniform length of radial line from the center of the hub, and in order to provide a good support for these blades, I have provided a boss for each which extends outwardly from the general circular cross section of the hub and have extended a portion of the blade along this boss. In order to provide a good approach to laminar flow along the blade and boss, I have faired the leading edge of the blade at this boss portion to the boss and have faired the boss to the hub, this occurring on all of the plurality of blades which are mounted in the hub. I have also increased the efficiency of this propeller by causing the blades to each follow the outer surface of the hub along the edge which is closely adjacent to the hub,

and in order that the blade may be adjusted, the hub is also curved in a plane passing through the axis of rotation of the shaft, thus permitting greater movement of the blade which follows the contour of the hub than would otherwise be permissible.

With reference to the drawings, the hub comprises a body portion **10** and a cap portion **11** secured thereto by a bolt **12**. Bosses **14** extend outwardly from the generally circular arcuate surface of the hub portion **10** and provide bearings **15** for the spindles **16** of the propeller blades **17**. These spindles are rotated through arms **18** from a control rod **19** running axially of the shaft **30** which rotates the propeller hub.

The outer surface **20** of each boss **14** is concentric to the axis of the spindle **16** and its bushing **21**. Each blade has a horn portion **22** which extends axially of the spindle **16** along and in close proximity to the cylindrical surface **20** of the boss **14**, it being desirous to follow the contour **20** as closely as is convenient, and the leading edge **23** of this horn portion is narrow but is faired by flaring along the lines **24**, **24** on either side toward the boss so as to provide a good smooth flow of liquid along the surfaces **24** and along the concentric surface **20** of the boss. Likewise the boss is faired to the hub as at **25**, **25** on either side so as to assist in the smooth flow of water along these portions as the hub rotates and the boss and blade advance clockwise as shown in FIGURE 1 or counterclockwise as shown in FIGURE 2.

The fairing as just described in connection with the boss will materially cut down the power required and increase the efficiency of this propeller. One of the reasons for the increase in efficiency is that in a controllable pitch propeller there is an unusually large hub diameter to propeller diameter ratio as has been briefly alluded to above. This ratio can be on the order of 0.4 as compared to 0.15 for fixed pitch propellers. It follows, therefore, that the large hub produces an abrupt unfairness which condition will produce poor flow conditions through the propeller with a considerable increase in the form of resistance of the hub as well as accelerated velocities through the propeller race and increased eddying resistance and core cavitation losses. The practical result of these resistances is an increase in shaft horsepower and in some tests that have been made, it has been found that this increase can be as high as 10%. In the present construction as set forth in this invention, the horn portion **22** of the propeller is brought around the outside of the boss to provide an effective blade area on either side thereof and present a leading portion in the forward blade position thereto as specifically diagrammed in FIGURE 3. This configuration gives a substantial laminar flow characteristic across the blade as it "slices" the water and reduces to a negligible amount core vortex cavitation losses.

It will be further noted that the blade used in the propeller of this invention has a mean width ratio which is much greater than that of a fixed propeller of the same diameter. This results from the fact that at the inner radii the controllable pitch propeller of the instant invention has a large width approaching that of the maximum width of the entire blade. In this fashion the thrust and torque coefficients of a propeller construction in accordance with this invention will result in a higher propeller efficiency. In order to increase the efficiency of the propeller, the blades **17** are provided along their edge **26** which is closest to the hub with an arc as shown in FIG. 1 which will closely follow the curvature of the hub when the blade is in neutral position in a plane at substantially right angles to the axis of the hub and drive shaft and yet will permit movement of the blade about its axis to a position of at least 30° such as shown in FIG.

4. In this angular position as seen in FIG. 4, the edge 26 will come closer to the hub as shown in FIG. 5. The outer surface of the hub, however, is curved in a plane passing through the axis of the drive shaft on either side of the plane passing through the axis of the spindles 16 as shown at 27 and 28 so that the edge 26 may provide movement of the blade to the desired angular position, it being of course understood that if the portion 10 of the hub were truly cylindrical, this angular movement could not be accomplished to such an extent, whereas with the curvature shown in FIG. 4 at 27 and 28, the swinging of the blade is not interfered with in a 30° movement, and this is all that is necessary in the manipulation of the blades. It, however, is apparent that by arranging the curvature of the hub as at 27 and 28 and the curvature of the blade at 26, the desired amount of swinging of the blade may be provided for.

By this arrangement the working surface of the blade, whether it be adjusted for forward propulsion as shown in full lines with a left-hand rotation as shown in FIG. 4 or for rearward propulsion as shown in dotted lines at 29, the inner edge 26 of the blade will still clear the hub portion 28 or 27 as the case may be.

I claim:

In a controllable pitch propeller, a hub rotatable about an axis central of a drive shaft, a blade having a spindle rotatable about an axis in a plane at substantially right angles to the axis of said hub, said spindle axis being offset to one side of but parallel to a radius from said shaft axis, a boss projecting outwardly from said hub and providing a bearing for said spindle, said boss presenting a surface along its leading portion which is distant from the hub axis which portion is concentric with said spindle axis, said blade having a horn at its leading edge projecting inwardly axially of said spindle in overlapping relation to and closely adjacent said concentric surface, said horn being narrow at its leading edge and faired to said boss and said boss being faired to said hub.

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