Feb. 2, 1954 W. F. CLARK 2,667,936

BOAT PROPELLER

Filed Sept. 16, 1950 2 Sheets-Sheet 1

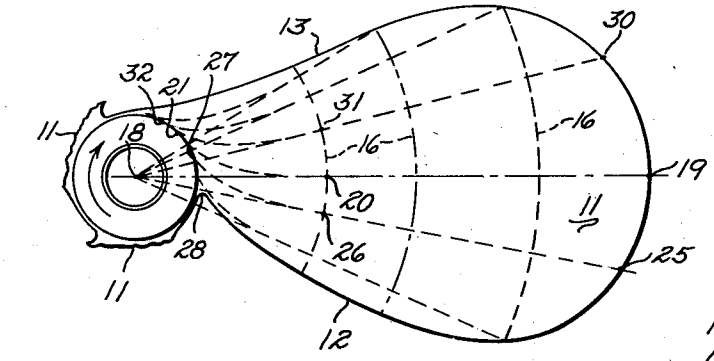


Fig. 1.

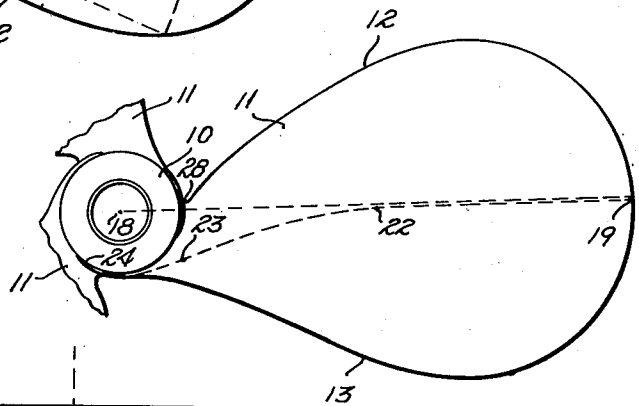


Fig. 2.

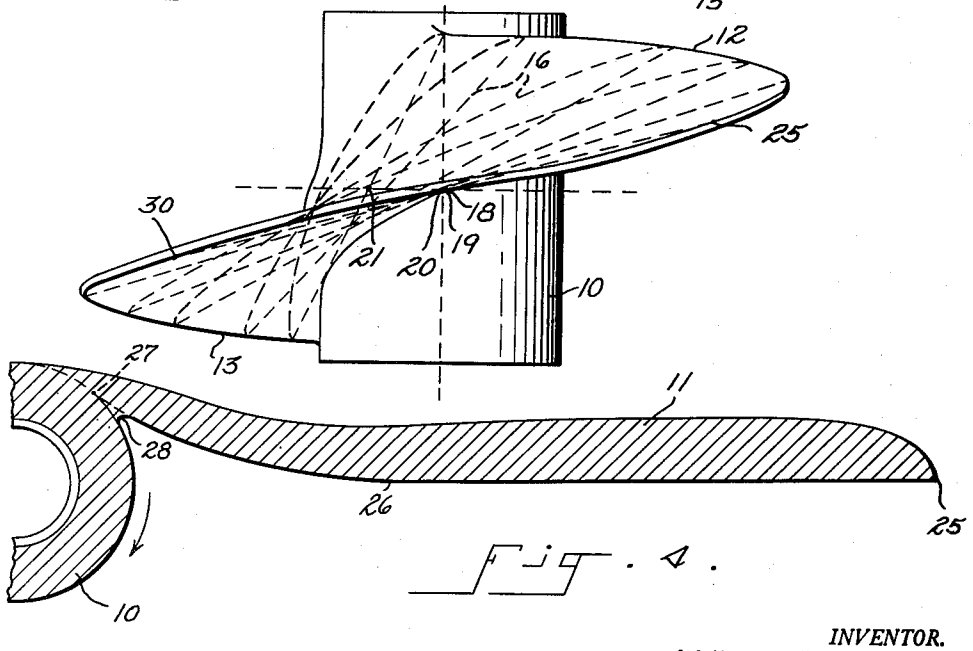


Fig. 7.

Fig. 4.

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Filed Sept. 16, 1950 2 Sheets-Sheet 2

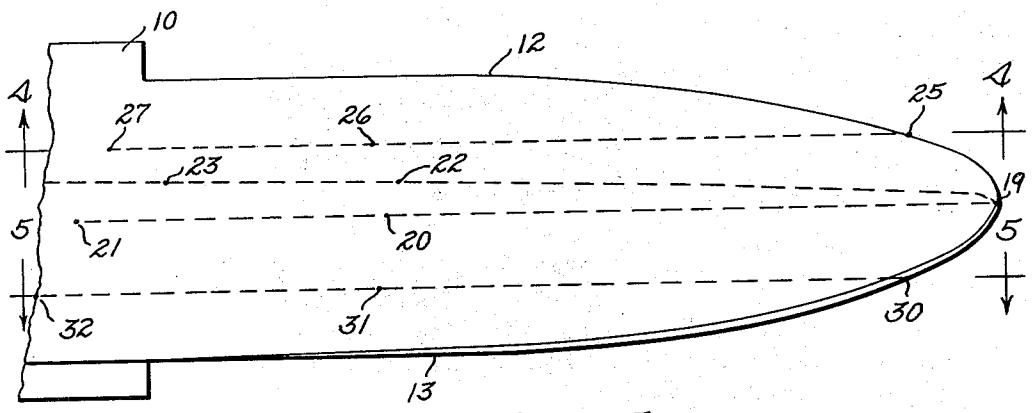


Fig. 3

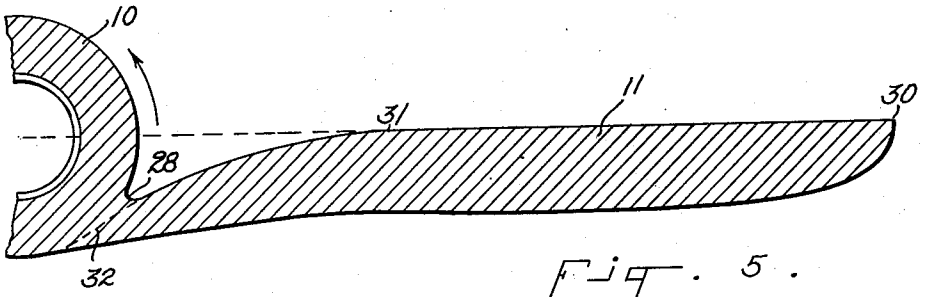


Fig. 5.

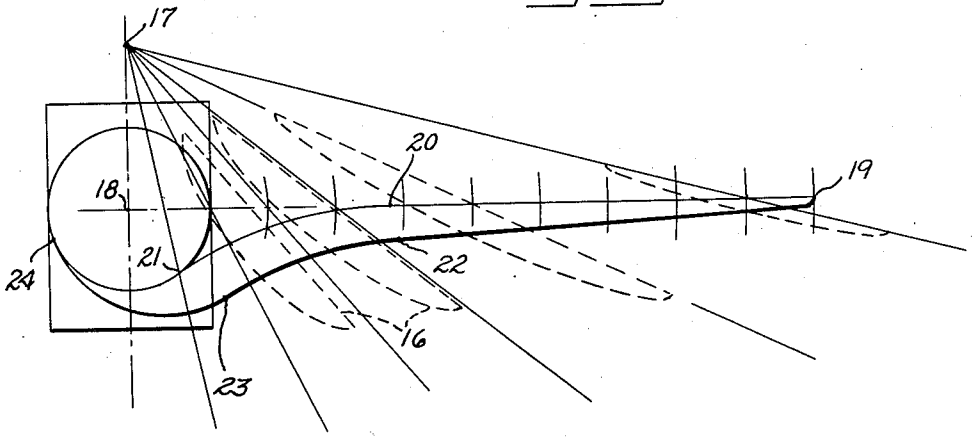


Fig. 6

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BOAT PROPELLER

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Application September 16, 1950, Serial No. 185,281

1 Claim. (Cl. 170—159)

1

The present invention comprises an improvement in propellers for boats, the invention being such that increased efficiency and increased speeds are achieved. An object of the invention is to provide a propeller with means for reducing turbulence and thus increasing the effective thrust of the blades, and eliminating drag and corrosion due to cavitation. The principles of the invention may be applied to a propeller having normally positioned or raked blades in accordance with the choice of the designer.

The objects and advantages of the present invention may be more readily ascertained by inspection of the following specification taken in connection with the accompanying drawing wherein like numerals refer to like parts throughout, while the features of novelty will be more distinctly pointed out in the appended claim.

In the drawing, Fig. 1 is a plan view of a portion of a normal propeller looking toward the working surface of one of the blades;

Fig. 2 is a rear view looking toward the back surface of one of the blades;

Fig. 3 is a side elevation showing the back surface of one of the blades;

Fig. 4 is a vertical section taken substantially along line 4—4 of Fig. 3;

Fig. 5 is a vertical section taken substantially along line 5—5 of Fig. 3;

Fig. 6 is a development layout for the blade; and

Fig. 7 is an end view of a blade having the sections developed in Fig. 6 applied thereto.

A propeller constructed in accordance with my invention comprises a cylindrical hub 10 from which a plurality of blades 11 extend. Each of the blades comprises a leading edge 12 commencing at a point near one longitudinal end of the hub and a trailing edge 13 commencing at a point near the other longitudinal end of the hub, the two edges merging at the outer end of the blade along a curved line in accordance with usual practice. The exact outline of the blade is immaterial, the present illustration being of a blade having a substantially elliptical shape, the outer portion being substantially circular about a point taken along a central radius, the radius of the circle being such as to define the desired working surface area.

As seen in Fig. 6, any arcuate section of the blade taken along the intersection of a cylinder having its axis coincident with the axis of the hub comprises a curved line along the back surface of the blade, the curvature of the line being such as to comply with design requirements for the thickness of the blade along its central radius. These sections are indicated in dotted lines at 16, the working surface portions thereof extending along lines from the point 17 which is a point along the longitudinal axis of the hub at a distance from the center of the hub equal to the pitch divided by 2 pi, the lines extending from the point 17 to points along the central radius of the working surface extending from the longitudinal center of the hub at 18 to the tip of the blade indicated at 19. The line 18—19 may be considered to be a portion of a plane including the outer portion of a radial line defining the center of the blade and the longitudinal axis of the hub. The radial element of the working surface of the blade indicated in Fig. 6 extends radially from the point 20 which is arbitrarily selected as being somewhere between .3 and .5 of the radius of the blade. Inwardly from the point 20 the working surface of the blade taken along a plane normal to the axis of the hub is defined by a curve tangent to the outer surface of the hub, the point of tangency 21 being rearward with respect to the direction of rotation from the plane including the axis of the hub. The rear surface of the blade may be laid out by determining the central thicknesses of the respective transverse sections 16 and thus drawing a corresponding line 19—22—23—24. This line 19—22—23—24 represents the rear edge of a section normal to the working surface of the blade including the line 19—20—21. From 19 to 22 it is a straight line, from 22 to 23 it is a curved line somewhat parallel to the portion 20—21, and from 23 to 24 it is an arbitrarily selected curved line forming a reverse curve with the portion 22—23 and terminating tangent to the hub of the propeller. The portion of the line from 23 to 24 is of arbitrarily selected curvature designed to fair the rear surface of the blade into the hub. Similar sections perpendicular to the working surface may be laid out for any other portion of the blade by drawing lines parallel to the line 18—19 and measuring the thicknesses of the section 16 at the point where the lines intersect.

In Fig. 1 the line 18—19 is laid out as shown and comprises the central radius of the blade. The point 20 is indicated at the section of the arcuate line 16 at substantially .4 of the radius of the blade and the sweep back at the intersection of the horizontal plane with the working surface of the blade is indicated by the line 20—21 to the point of tangency with the outer surface of the hub. It is to be appreciated that the acute angle between the hub and the blade is partially filled in by a strengthening fillet 28 which is

made as small as practicable. A plurality of other radii are drawn from the axis of the hub 18 and a plurality of other elements taken along planes normal to the axis of the hub are also indicated in dotted outline, each of the elements being straight radial lines beyond the arcuate line 16 at .4 of the radius of the blade and being swept back with respect to the direction of rotation to a point of tangency with the outer surface of the hub.

Figs. 4 and 5 are sections taken through the blade along planes normal to the axis of the hub. In Fig. 4 it will be seen that the intersection of the plane with the working face of the blade is a straight line from a point 25 at the edge of the blade to a point 26 along the arc passing through point 20 and is a curved line tangent to the outer surface of the hub from the point 26 to the point 27. The line of intersection of the plane with the rear surface of the blade is of irregular contour determined by the development previously explained. The fillet 28 is indicated in this figure. Fig. 5 is a similar section with the element defined by the horizontal plane being a straight line from point 30 to the point 31 taken along the arcuate line passing through point 20 and is then a curve swept back to the point of tangency at 32, the fillet 28 being indicated in this view as well. In Figs. 4 and 5 it is apparent that the working surface is swept back from a vertical plane including the line 25—26 and the axis of the hub.

It should be apparent from the foregoing that turbulence would be decreased to an absolute minimum since the working surface from a point between a third and a half of the radius of the blades is raked rearwardly with respect to the direction of rotation. Inwardly from the center of the blade the rearward rake thereof forces the water toward the hub to a certain extent, thus counteracting the outward thrust of the blade and causing the water to be directed toward the axis of the blade without turbulence, and eliminating eddying and pocketing behind the blade.

Having illustrated and described a preferred embodiment of my invention, it should be apparent to those skilled in the art that the invention permits of modification in arrangement and detail. I claim as my invention all such modifications as come within the true spirit and scope of the appended claim.

I claim:

A propeller comprising a cylindrical hub and a plurality of blades extending from the hub, each of said blades having its leading edge starting from a point near one longitudinal end of the hub and its trailing edge starting from a point near the other longitudinal edge of the hub, the working surface of each of said blades being such that any element thereof defined by the intersection of a plane normal to the axis of the hub is a straight radial line beyond the center of the blade and a curved line tangent to the outer surface of the hub inwardly from the center of the blade, the point of tangency being rearward with respect to the direction of rotation from a plane including the axis of the hub and the straight radial portion of the element.

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