Jan. 4, 1938. G. H. McLEOD 2,104,306

SCREW PROPELLER

Filed June 20, 1936

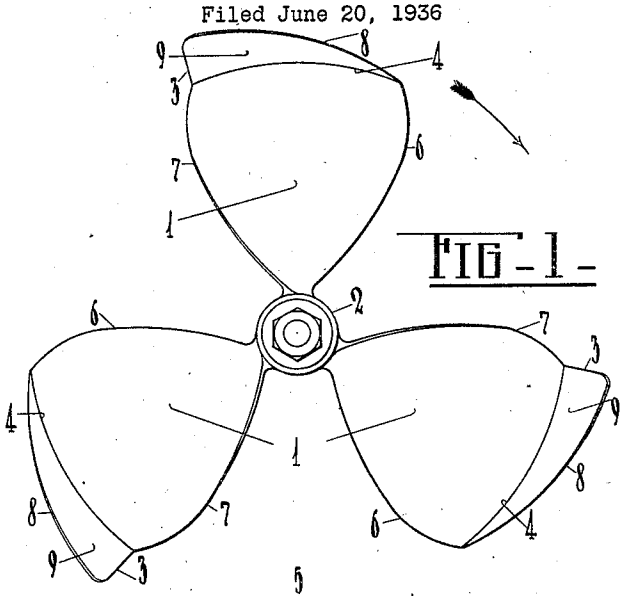


FIG-1-

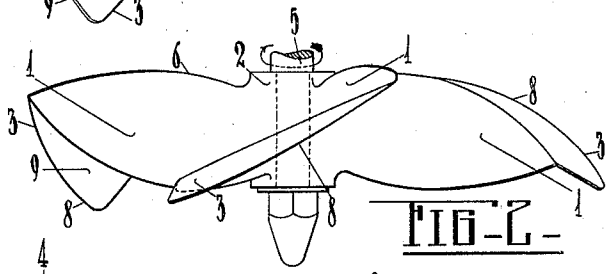


FIG-2-

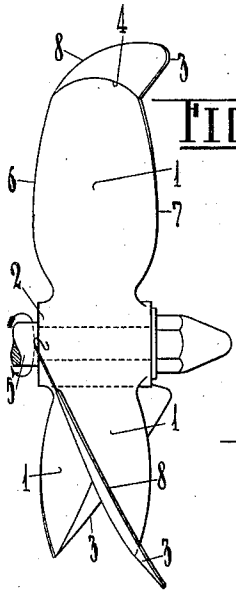


FIG-3-

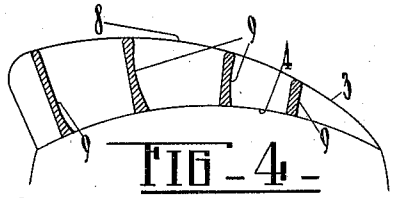


FIG-4-

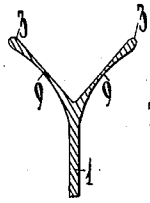


FIG-6-

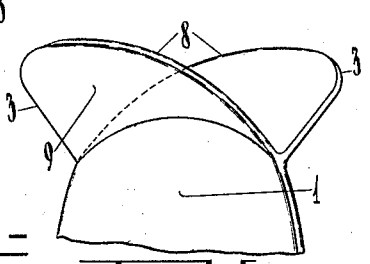


FIG-5-

G. H. McLeod
Inventor

By: Glascock Downing & Seebold
Attys.

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SCREW PROPELLER

George Harnett McLeod, Auckland, New Zealand

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6 Claims. (Cl. 170—170)

The invention relates to screw propellers used on power driven boats of all descriptions, aeroplanes and like machines, and also to power driven fans and the like.

The object of the invention is to provide an improved form of screw propeller or fan, designed to attain a greater degree of efficiency in operation, than known forms of propellers.

A propeller made according to the invention, is formed with a plurality of working surfaces, provided by main blades extending radially from the propeller boss, and by outer blades extending from the main blades, to provide duplex blade units.

The outer blades are in the form of extensions from the extremities of the main blades, said extensions being directed outwardly from, and forming angles with the main blades, so as to provide working surfaces beyond the radii of the latter.

The extensions thus formed, provide inclined smaller or tip blades at the radial extremities of the main blades of the propeller, the extension or width of said tip blades from the main blades, commencing at, and increasing from the outer extremities of the leading edges of the main blades according to the usual direction of rotation of the propeller, and increasing towards the following edges of the main blades, so that the greatest extension or width of the tip blades, is at the following edges of the main blades, while the line of junction between each extension or tip blade and the main blade which carries it, is disposed on the periphery of an imaginary cylinder having its axis coincident with the axis of the propeller and its shaft.

Other features are also comprised in the invention which will however, be more particularly described with the aid of the accompanying drawing wherein:—

Figure 1 is a rear elevation,

Figure 2 a plan view, and

Figure 3 a side elevation of a propeller formed according to the invention, while

Figure 4 illustrates by means of a diagram incorporating a series of sections, the formation of the outer blades, and

Figures 5 and 6 are a part side elevation, and part sectional view respectively, illustrating a modification, and also the formation of the outer blades, both views being exaggerated to show the hollowing of said blades.

In carrying out the invention, the improved propeller or fan is formed to rotate through two distinct and separate zones, main blades 1 of more or less usual form, and extending radially from the boss 2, rotating through an inner zone, while outer blades or extensions 3 from the extremities of the main blades 1, rotate through an outer zone, whereby a plurality of working surfaces is provided beyond the radii of the main blades and resulting in the propeller being formed with duplex blade units.

The extension from the extremity of a main blade 1 to form an outer blade 3, is in a direction outwards from the main blade along said extremity, at the required angle and pitch, so that the line of junction 4 between the outer or tip blade 3 thus formed, and the main blade 1, is in true relationship to the bore of the propeller, or in other words, the lines 4 formed by the intersections of the outer blades 3 and the main blades 1, are all disposed truly upon the periphery of an imaginary cylinder having its axis coincident with the axis of the propeller and its shaft 5. The angle or set of the outer blades 3 in relation to the blades 1, varies in accordance with the power used for propulsion.

The degree of extension of each outer or tip blade 3, from a main blade 1, is from nothing, starting at the outer extremity of the leading edge 6 of the latter, to a dimension at the outer extremity of the following edge 7 of the main blade 1, approximating from one quarter to one third of the width of said main blade 1, the outer edge or extremity 8 of said outer or tip blade 3, being in the form of a shallow convex curve 12.

The surface area of each outer or tip blade 3, can be equal to from one sixth to one eighth of the surface area of the main blade 1 from which the tip blade 3 extends, said proportions being however, merely approximate.

The actual width or degree of extension of the outer or tip blades 3, the area of the latter, and the angle at which said outer or tip blades 3 are set in relation to the main blades 1, are each and all determined by the power used, the revolutions required, the work required to be done, and other conditions encountered in actual practice.

The surface 9 of each outer or tip blade 3 presented to the axis about which the propeller rotates, is made hollow or concave through its width or extension from the main blade 1, the degree of hollowness or concavity increasing in a direction, from the least width or extension of the blade 3 from the blade 1, so that the greatest degree of hollowness or concavity of the blade 3 is at or close to the greatest width or extension of the latter from the blade 1, (Figures 4, 5, 6), the effect of which is to allow water to clear

itself without undue turbulence, and at the same time increase the thrust of the propeller.

In addition, for vessels used principally for towing and like purposes, each main blade 1 may be provided with two outer or tip blades 3, (Figures 5 and 6) each as before described, but set to opposite hands, so that increased efficiency of the propeller will also be obtained when same is reversed, as when a vessel is reducing way, or going astern.

A second or additional outer or tip blade 3 may, or may not, have the same set or angle in relation to the inner or main blade 1, as the first outer or tip blade.

Where two outer blades 3 are provided on main blade 1, the space between said outer blades 3, can be left open, or be partly or completely filled in, also the main blades 1 will be adequately strengthened at the boss 2.

What I do claim and desire to obtain by Letters Patent of the United States of America is:—

1. A screw propeller comprising main blades extending radially from the propeller boss, and outer blades extending from the main blades to provide duplex blade units, the main and outer blades forming a plurality of working surfaces, the outer blades being in the form of extensions from the extremities of the main blades, said extensions being directed outwardly from and forming angles with the main blades so as to provide working surfaces from the radii of the latter, the extension commencing at the outer extremity of the leading edge of the main blade and increasing in width in a direction towards the following edge of the main blade, the greatest width of the outer blade being at the outer extremity of said following edge.

2. A screw propeller as in claim 1, wherein the outer blades are formed with surfaces presented to the axis about which the propeller rotates, said faces being made concave through their width or extension from the main blades.

3. A screw propeller, as in claim 1, wherein the outer blades are formed with surfaces presented to the axis about which the propeller rotates, said faces being made hollow through their width or extension from the main blades the degree of concavity of the outer blades, increasing in a direction from the least width or extension of the outer blades, so that the greatest degree of concavity, is at or close to the greatest width of the outer blades.

4. A screw propeller, as in claim 1, wherein two outer blades are provided on each main blade, said outer blades being set to opposite hands.

5. A screw propeller as in claim 1, wherein the line of junction between each outer blade, and the main blade on which it is formed, is disposed upon the periphery of an imaginary cylinder having its axis coincident with the axis of the propeller and its shaft.

6. A screw propeller as in claim 1 wherein the outer edges of the outer blades are in the form of shallow convex curves.

GEORGE HARNETT McLEOD.