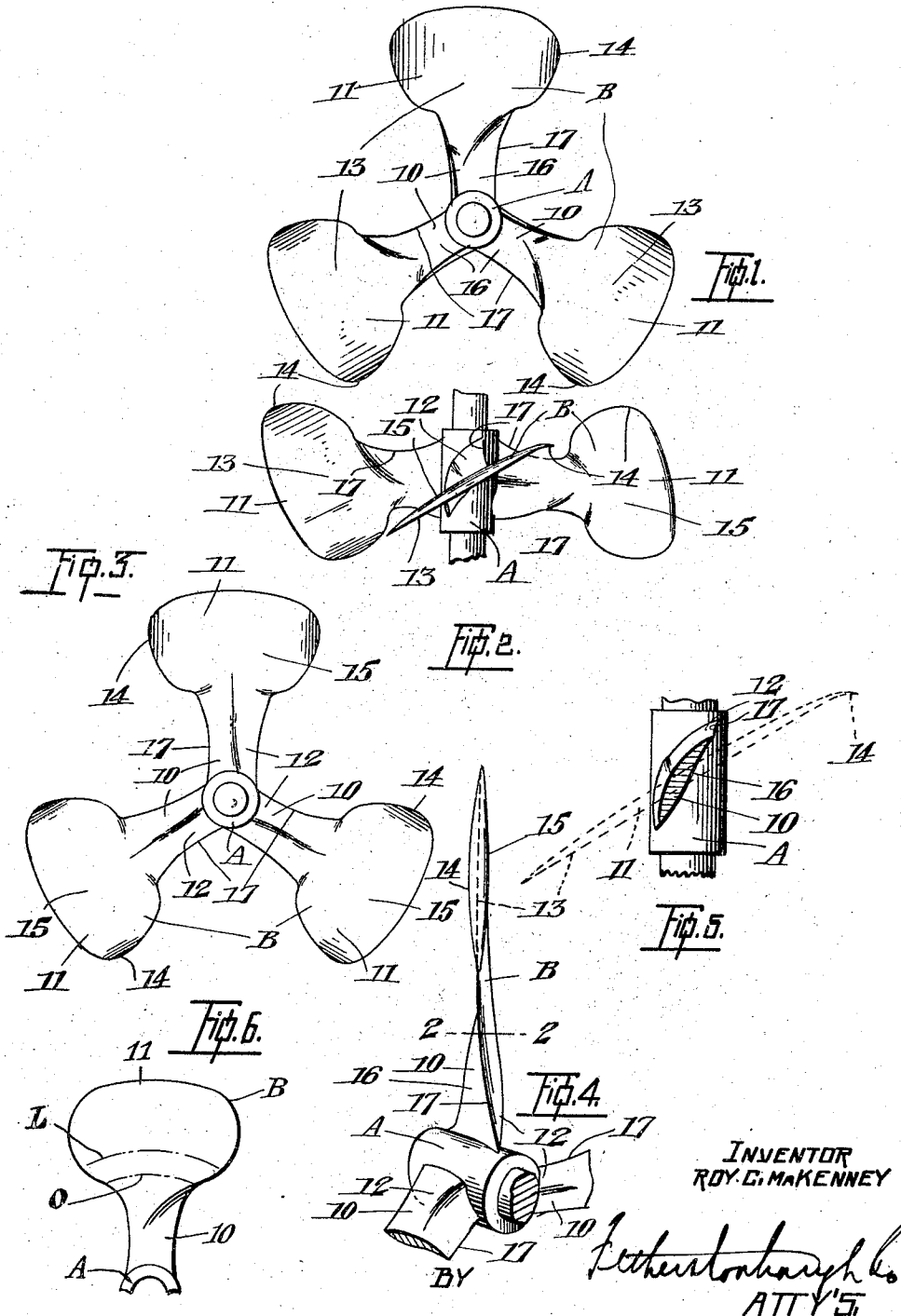


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PROPELLER.
APPLICATION FILED NOV. 25, 1918.

1,427,307.

Patented Aug. 29, 1922.



UNITED STATES PATENT OFFICE.

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Specification of Letters Patent. Patented Aug. 29, 1922.

Application filed November 25, 1918. Serial No. 264,050.

To all whom it may concern:

Be it known that I, ROY C. MAKENNEY, a subject of the King of Great Britain, and resident of the city of St. John, in the Province of New Brunswick, Dominion of Canada, have invented certain new and useful Improvements in Propellers, of which the following is a specification.

This invention relates to improvements in propellers and the objects of the invention are to secure greater efficiency from the propeller and avoid waste of power near the hub thereof.

Further objects are to provide an improved design of blade by which a greater propulsive force may be obtained from the same amount of power, and it consists essentially of the improved construction hereinafter described in detail in the accompanying specification and drawings;—

In the drawings:—

Fig. 1 is an end view of propeller.

Fig. 2 is a top view.

Fig. 3 is an end view showing the opposite side of Fig. 1.

Fig. 4 is a perspective in detail also showing a helical twist of the inner part.

Fig. 5 is a section on the line 2—2 of Figure 4.

Fig. 6 is a side elevation of one of the blades showing the pitch lines thereon.

In the drawings like characters of reference indicate corresponding parts in all the figures.

Referring to the drawings, A represents the hub of the propeller and B the blades, of which any number desired may be provided. The propeller illustrated has three blades and is designed to turn in clockwise direction, which is known as "right hand." A left hand propeller would have the inclinations reversed.

Each blade is formed with an inner part 10 and an outer part 11, the outer part being considerably wider than the inner part and set at a greater pitch thereto.

The object for designing the blade in two parts namely an inner part 10, and an outer part 11, is the following.

The inner part 10 is given less pitch than the outer part's pitch base line L (which will be described hereafter), so that when revolving through the water the inner part will not push or interfere in any way, and will thus save considerable power. This power, in the true-screw propeller, is wasted

on account of the low angle with reference to direction of the boat on the inner part of the true-screw propeller blade, which push the water more sideways than astern. The more the water is pushed astern the easier the boat moves ahead.

In the embodiment illustrated the inner part has a helical twist on the driving side and the edges are curved in opposite directions both fore and aft and sideways, also the inner part is set at approximately 20 to 35 per cent less pitch than the outer part 11 pitch base line L. In this way when the propeller is rotating the inner part does not push or work in any way, and hence there is a considerable saving in power on this part of the blade.

The outer part 11 is made with a flat driving surface set perpendicular to the hub axis, and this is the driving portion of my propeller. The smooth flat face exerts an even smooth pressure astern of water throughout its entire width and depth, and consequently there is less friction and back pressure than with a concaved true-screw or other designed blade, which will exert a different pressure on water at different points of its blade surface both radial and axial.

The driving blade face of my propeller being set at right angles to shaft forces the water in a straight line parallel to shaft with the result that there is no waste of power by exerting force in an indirect manner. The outer part 11 is rounded off nicely on the edges to form a pleasing shape, and is not limited to this particular style in the attached drawings as to shape of blade.

I do not choose any particular portion of the diameter of a propeller to set the pitch line base L on, as in practice, raising or lowering the pitch base line L, may be proved more efficient.

As at present designed the pitch base line L is placed at two-thirds the diameter of propeller and find it very satisfactory. The proper angle at which to set the outer part 11 is calculated at this pitch base line and is governed by the diameter of the propeller, type of boat and purpose it is to be used for, horsepower, revolution and type of engine. Any width of blade may be used as further experiment will prove the most suitable.

As already stated the outer part 11 has a flat driving face, therefore it has the same angle throughout its length and width, and this will cause the pitch to increase radially

outward to the end of blade, till at its highest point above the pitch base line L it would be 50% more than at the pitch base line.

This is owing to the longer circumference line at the edge of the blades over that at the pitch line and this increase averages 25% more pitch than a true screw propeller at $\frac{1}{2}$ the outer one-third diameter.

In other words, on account of the outer part 11 having a flat face the angle is the same through any cross sections therefore causing the pitch to be greater the further the cross section turns off from the hub because the line of circumference gets larger.

Therefore it will be noted that by the saving of power on the inner part 10 it is possible to use a flat driving blade on the outer part 11, and this driving blade being flat expands the pitch radially outward, which, in the case of the above figured examples, averages 25% more pitch (which practically means "push") than a true screw propeller on this outer portion of the blades where the water offers more resistance.

This gives my propeller the same advantage as a long oar over a short one, and in consequence of this gain in pitch a gain in speed is secured over a true screw propeller of equal pitch and diameter.

It is obvious that if pitch base line was lowered to one-half the diameter instead of two thirds the pitch would be 100% more at the top, or if base line was raised above the $\frac{2}{3}$ diameter the pitch would decrease accordingly.

The space between the pitch line basis L and the line O drawn at the top of the inner part 10 is the slip portion of the driving blade or outer part 11. That is:—the driving blade being flat the angle is the same throughout and this portion being below the pitch base line L will decrease in pitch, till if propeller is slipping, say, 20 per cent. The lowest part of the driving blade 11 will cease to push when it is 20 per cent of the distance below pitch base line L to the axis of the propeller.

The curved line O shown on the blade illustrated in Figure 6 shows the portion between the inner portion 10 and the blade or outer part 11. The helical twist of the inner part starts from this line.

The inner part 10 from its top (that is from line O) to the hub has a helical twist on its back face, and its edges curving in opposite directions sideways (to strengthen same) and fore and aft, so that the front

portion 12 of the inner part 10 is constructed at as much slant aft as possible. This is the reason for giving the inner part 10 a helical twist; so that when the boat is moving ahead the water will strike against the front portion 12 opposing very little resistance, and whatever resistance there is is utilized to turn the propeller over, similar to a windmill, and thereby aid at pushing the boat ahead by transmitting power.

The front portion 15 on the outer part 11 as well as the front portion 12 on the inner part 10 are rounded off tapering to a sharp cutting edge 17, which cuts through the water with less resistance than a blunt or wedge-shaped cutting edge.

On my improved blade,—the circumference on the outer part being obviously longer than it is on the inner part, it is not necessary to set the blades at such a sharp angle as near the hub to secure the same number or more inches pitch ahead at each revolution. In this way a greater push is secured by my propeller, as the angle of pressure is less while the pitch averages more. The whole propeller blade is designed to eliminate all possible angle of pressure, and this is accomplished by the above described combination, which will force the boat or aircraft ahead at a greater speed.

As many changes could be made in the above construction and many apparently widely different embodiments of my invention within the scope of the claims constructed without departing from the spirit or scope thereof, it is intended that all matter contained in the accompanying specification and drawings shall be interpreted as illustrative and not in a limiting sense.

What I claim as my invention is:

A propeller blade comprising an inner and outer part, the inner part being set with a helical twist at 25 to 30 per cent less pitch than the outer part pitch basis, the driving side of the outer part being flat and at right angles to the axis of the hub of the propeller, thereby causing the pitch to expand as it nears the top of the blade, and the front face of the blade being convex and tapering off to a sharp cutting edge.

In witness whereof I have hereunto set my hand in the presence of two witnesses.

ROY C. MAKENNEY.

Witnesses:

TRUEMAN E. BISHOP,
STEPHEN W. PALMER.