P. C. HEWITT.

PROPELLER.

APPLICATION FILED JUNE 14, 1919.

1,378,113.

Patented May 17, 1921.

Fig. 1.

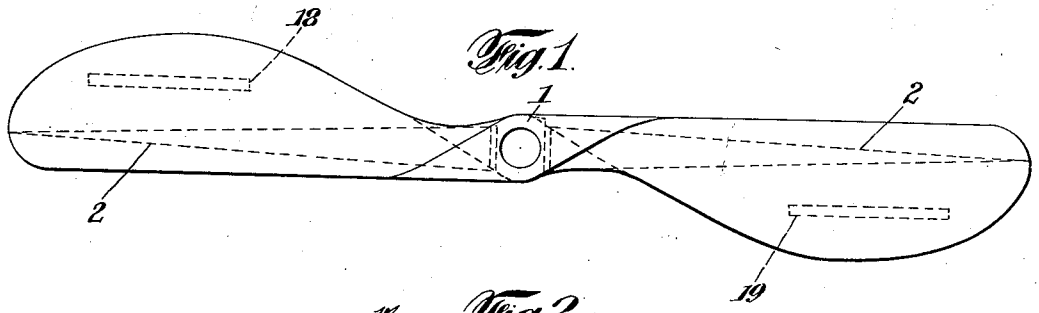


Fig. 2.

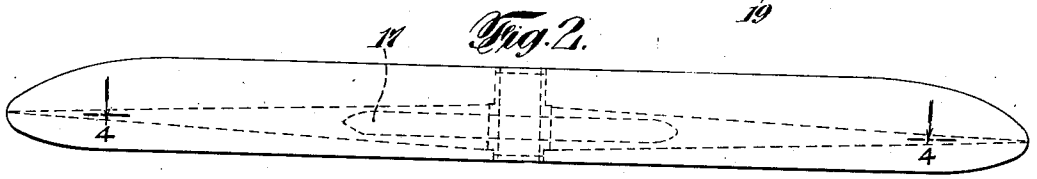


Fig. 3.

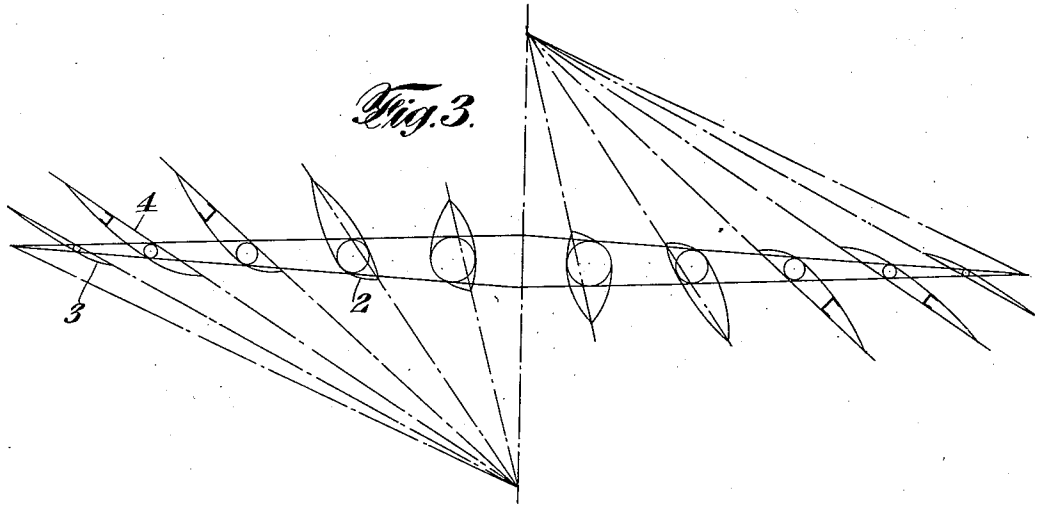


Fig. 4.

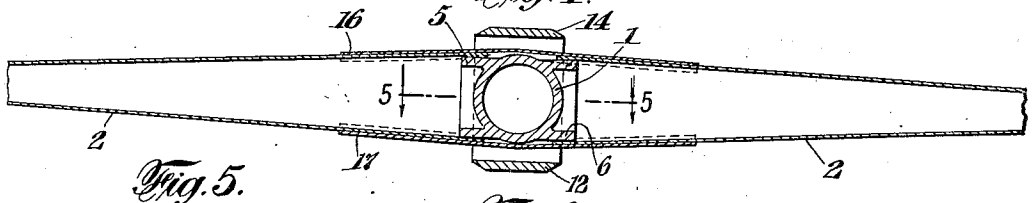


Fig. 5.

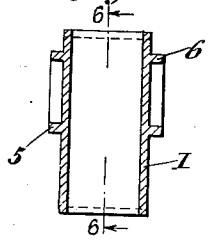
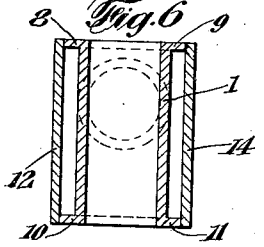


Fig. 6.



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PROPELLER.

1,378,113. Specification of Letters Patent. Patented May 17, 1921.

Application filed June 14, 1919. Serial No. 304,191.

To all whom it may concern:

Be it known that I, PETER COOPER HEWITT, a citizen of the United States, residing at Ringwood Manor, Passaic county, New Jersey, and whose post-office address is 18 East 33rd street, in the city, county, and State of New York, have invented certain new and useful Improvements in Propellers, of which the following is a specification.

My invention relates to propellers, and more particularly to propellers for use in flying machines or the like. The principal object of the invention is to eliminate the movement that produces chattering of the propeller blades when not sufficiently rigid to resist as the propeller rotates in the air.

While the location of the center of pressure or thrust on a propeller blade by the air or other fluid medium in which the propeller rotates depends upon various factors, such for example as the pitch angle or the angle of incidence, and the form of the blade, it is for the more approved forms of blades having the usual pitch angles a considerable distance forwardly of the longitudinal center line of the blade. The ordinary solid blade, such as the well known aeroplane propeller blade made of wood, has its center of strength and accordingly its center of support to the rear of the center of pressure or thrust of the blade. There is accordingly in operation a torsion on the blade tending to increase the pitch angle or angle of incidence, and the result with light blades in usual conditions of use is a chattering of the blade and a tendency to increase the pitch when it should be decreased, especially when it is moving at a high velocity.

I obviate these objections by providing a propeller with blades, the center of support of which is forwardly of the center of pressure of the blades, the blades being, as it were, pulled rather than pushed through the air.

The accompanying drawing forming a part of this specification shows one embodiment of my invention applied to an ordinary form of propeller in which the blades are self-sustaining, or in other words, supported from the hub of the propeller, or at their inner ends, entirely because of the strength thereof and without additional external supporting means.

In the drawings, Figure 1 is a face view of said embodiment of the invention.

Fig. 2 is a side view of the same.

Fig. 3 is a diagrammatic view of the same, showing various sections of the propeller blades.

Fig. 4 is a fragmentary sectional view on a larger scale, taken on line 4—4 of Fig. 2 with the outer walls of the propeller omitted.

Fig. 5 is a sectional view of the hub of the propeller taken on line 5—5 of Fig. 4; and

Fig. 6 is a sectional view of the same taken on line 6—6 of Fig. 5.

The propeller shown comprises a hub 1, and two blades, each having an internal supporting and reinforcing member 2, and a forward wall 3 and rear wall 4 incasing said member. All parts of the blades, as shown, are made of sheet metal, the members 2 being circular in section and conical in shape and surrounding at their larger or inner ends circular flanges 5 and 6 projecting from opposite sides of the hub 1 and desirably integral therewith. The members 2, although shown of circular cross-section, may be made of any suitable cross-section. These conical reinforcing members 2 may be secured to the flanges 5 and 6 respectively in any suitable way as by soldering or brazing, or may be welded directly to the hub. The sheets 3 and 4 forming the outer walls of the blades are secured together at their outer edges and likewise secured to the reinforcing members 2 throughout the length of the latter in any suitable manner, as by welding. Each of the sheets comprising the outer walls of the propeller blades may extend integrally from one tip of the propeller to the opposite tip, being secured intermediate its ends to the hub 1. To this end the hub, as shown, is provided at its upper and lower edges with outwardly directed flanges, 8, 9, 10 and 11, to which are secured plates 12 and 14, the plate 12 being secured, as by welding to the flanges 8 and 10 on one side of the hub, and the plate 14 to the flanges 9 and 11 on the opposite side of the hub. The intermediate portions of the sheets comprising the outer walls 3 and 4 bear flat against the outer faces of the plates 12 and 14 respectively and are secured thereto in any suitable manner as by spot welding. By making the walls 3 and 4 continuous and integral from the tip of one blade to the tip of the opposite blade, the centrifugal force acting on each wall to one side of the hub is balanced by the centrifugal force acting on the same to the opposite side of the hub.

For adding additional strength to the propeller and to securely hold the reinforcing members 2 in position upon the hub, strips or straps 16 and 17 of suitable material, such as steel, may be secured, as by welding to opposite sides of said members adjacent their inner ends, so as to connect said members. In order to hold the walls 3 and 4 in their proper relationship to each other rearwardly of the members 2, suitable reinforcing means, such as the channel-shaped member 18 and 19, of suitable material, such as steel, may be secured as by welding between said walls.

By reason of the gradually increasing cross-section of the reinforcing and supporting members 2 from their outer toward their inner ends, the strength of said members and of the blades increases toward the axis of the propeller and with the increase of strain on the blade. The members 2 are desirably made of stronger material than the outer walls of the blades. For a propeller eight feet in diameter to be capable of withstanding a thousand pounds thrust, the members 2 may be made of sheet steel about one-tenth of an inch thick or less, while the outer walls of the blades may be made of the same material from one-thousandth of an inch to one-hundredth of an inch thick, the thickness of the outer walls being preferably considerably less than the last-mentioned amount. With this construction, it is evident that the center of strength and support of the blade will be determined by the location of the members 2 and will be substantially along the longitudinal center lines of said members. The hub of the propeller may be of wrought steel although one of the high tensile strength aluminum alloys recently produced may be more advantageous.

Referring to Fig. 3, the sections of the blades are shown in a well known manner so as to indicate not only the shape of the blades, but also the pitch angle or angle of incidence, the propeller shown being one of the uniform pitch type wherein the blade angle is smallest at the tip and increases toward the hub. The distances of the sections from the axis of the propeller are represented in this figure by the distances from the vertical center line to the centers of the respective circles representing the members 2. The longitudinal center line of the members 2 is desirably arranged a distance to the rear of the front or leading edge of the blade equal to not more than thirty per cent. (30%) of the width of the blade. This is a substantial distance forwardly of the center of pressure of the blade with the form of blade shown. In general, the center of support should be forwardly of the center of pressure. With the usual blade forms the center of pressure does not approach any closer to the forward or leading edge of the blade than to a line arranged to the rear of said edge a distance equal to about twenty (20) or thirty (30) per cent. of the width of the blade. When mention is made herein to the position of the reinforcing and supporting members 2, the position of the axis or center of strength of the said members is generally to be understood. The position of the center of support will, of course, have to be determined to best suit the requirements of any given case.

While I have shown one form of my invention, it is to be understood that I am not to be restricted to this form and that modifications within the scope of the appended claims may be made in the specific device herein shown without departing from the spirit of my invention.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A propeller having a hollow self-sustaining blade, the center of support of which is forwardly of the center of pressure of the blade.

2. A propeller blade, the center of strength of which is forwardly of the center of pressure of the blade, the blade being of increasing strength from the outer toward the inner end thereof.

3. A propeller blade having an internal reinforcing member arranged forwardly of the longitudinal center of the blade and of increasing strength from its outer end toward its inner end.

4. A propeller blade having an internal reinforcing member arranged forwardly of the center of pressure of the blade and of increasing strength from its outer end toward its inner end.

5. A propeller blade having a tapered reinforcing member of sheet material extending longitudinally thereof and arranged throughout the length of the blade forwardly of the center of pressure of the blade.

6. A propeller blade having a tapered internal reinforcing member of curved cross section extending longitudinally thereof and arranged throughout the length of the blade forwardly of the center of pressure of the blade.

7. A propeller blade having an internal reinforcing member extending longitudinally thereof and arranged throughout the length of the blade forwardly of the center of pressure of the blade, said reinforcing member being of increasing strength from its outer end toward its inner end.

8. A propeller blade comprising an outer casing of sheet material and an internal reinforcing member extending longitudinally of said casing and arranged forwardly of the center of pressure of the blade, said reinforc-

ing member being of increasing strength from its outer end toward its inner end.

9. A propeller having a self-sustaining blade comprising an outer casing of sheet material and an internal reinforcing member of sheet material extending longitudinally of said casing and arranged forwardly of the center of pressure of the blade.

10. A propeller having a self-sustaining blade comprising an outer casing of sheet material and an internal reinforcing member of stronger sheet material extending longitudinally of said casing and arranged forwardly of the center of pressure of the blade.

11. A propeller having a self-sustaining blade comprising an outer casing of sheet material and an internal reinforcing member of stronger sheet material extending longitudinally of said casing and arranged forwardly of the center of thrust of the blade, said reinforcing member being of increased cross-section from its outer toward its inner end.

12. A propeller comprising a hub and a hollow blade extending outwardly directly therefrom, said blade being provided with a reinforcing member connected to said hub and arranged forwardly of the center of pressure of the blade.

13. A propeller having a hub and blades carried by said hub, said blades comprising outer walls which extend integrally from tip to tip of the propeller and are formed of sheet material and connected with said hub, and a reinforcing member for each blade also connected with said hub and arranged forwardly of the center of pressure of the blade.

14. A propeller having a hub and a blade carried by said hub, said blade comprising outer walls of sheet material connected with said hub, and a reinforcing member for the blade also connected with said hub and arranged forwardly of the center of pressure of the blade.

15. A propeller having a hub and a blade carried by said hub, said blade comprising outer walls of sheet material connected with said hub, and a reinforcing member for the blade also connected with said hub and arranged forwardly of the center of pressure of the blade, said member being of increasing strength from its outer toward its inner end.

16. A propeller having a hub and a blade carried by said hub, said blade comprising outer walls of sheet material connected with said hub, a reinforcing member for the blade also connected with said hub and arranged forwardly of the center of pressure of the blade, and means reinforcing said walls rearwardly of said member.

In testimony whereof, I have signed my name to this specification.

PETER COOPER HEWITT.