June 15, 1937. H. A. HALL 2,083,993

PROPELLER BLADE

Original Filed June 19, 1936

Fig. 1.

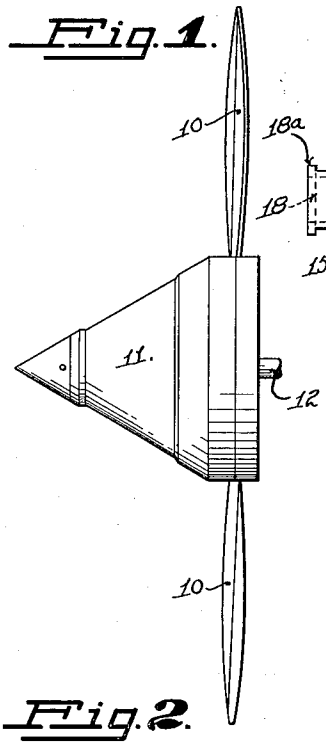


Fig. 3.

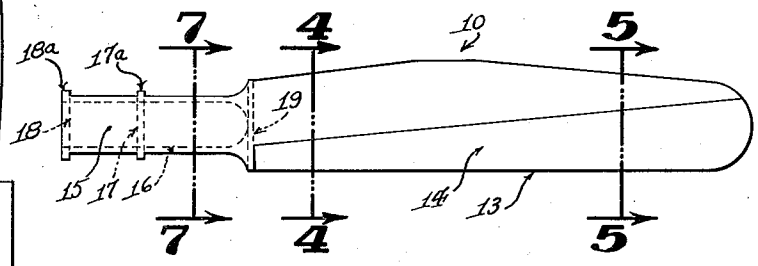


Fig. 4.

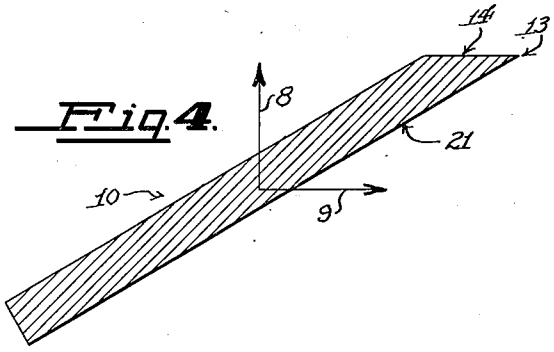


Fig. 2.

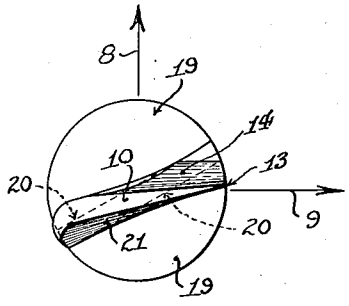


Fig. 5.

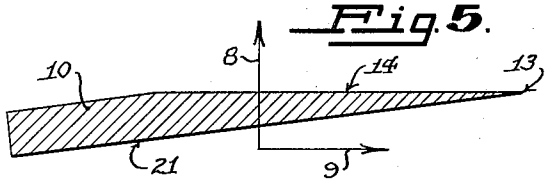


Fig. 6.

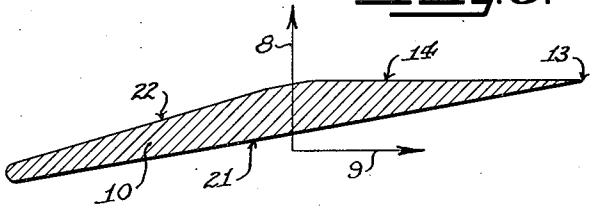
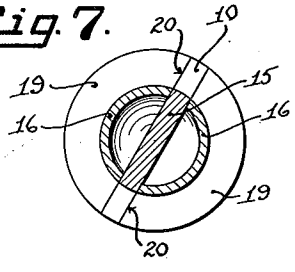


Fig. 7.



INVENTOR,
Harold A. Hall
BY Booth & Booth
ATTORNEYS.

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UNITED STATES PATENT OFFICE

2,083,993

PROPELLER BLADE

Harold A. Hall, Los Gatos, Calif.

Original application June 19, 1936, Serial No. 86,091. Divided and this application December 18, 1936, Serial No. 116,540

5 Claims. (Cl. 170—159)

This application is a division of applicant's co-pending application Serial No. 86,091, filed June 19, 1936. The invention claimed herein relates to aircraft propellers, and has for its principal object the provision of blades of improved form whereby efficiency is increased, and manufacturing and maintenance costs are reduced.

A second object is to provide improved shanks for the blades, whereby they may be securely held in suitable mountings, and which adapt them either for permanent positioning or for adjustability to vary their pitch angle. Still other objects and advantages of the invention will become apparent from the following specification, which should be read with the understanding that changes may be made, within the scope of the claims hereto appended, in the form, construction and arrangement of the several parts herein described and illustrated, without departing from the spirit of the invention.

Reference will be made to the accompanying drawing, in which

Fig. 1 is a side elevation of a propeller provided with my improved blades.

Fig. 2 is an end elevation of one blade.

Fig. 3 is a rear elevation of one blade removed from the propeller hub, one of the shank filler members being removed.

Figs. 4 and 5 are transverse sections of the blade, taken on the respective lines 4—4 and 5—5 of Fig. 3.

Fig. 6 is a transverse section of a blade of slightly modified shape, taken approximately midway between the shank and the outer end or tip.

Fig. 7 is a transverse section through the shank of the blade, on the line 7—7 of Fig. 3, both shank filler members being shown in position.

In Figs. 2, 4, 5 and 6 the vertical arrows 8 indicate the direction of flight, and the horizontal arrows 9 indicate the direction of rotation of the blade.

My improved blade may be mounted in any suitable propeller hub, such as that which forms the subject matter of my copending application referred to above. The construction of the hub and mounting form no part of the invention claimed herein, and therefore have been omitted from this specification. By way of illustration, there is shown in Fig. 1 a propeller having blades 10 projecting from a central hub 11, the latter being mounted upon a shaft 12.

Each blade 10 is formed from a flat piece, preferably of steel, beveled to a sharp leading edge 13, as shown in Figs. 2, 4, 5 and 6 in which the direction of flight is indicated by the arrow 8, and the direction of rotation of the blade by the arrow 9. The bevel 14 which produces the sharp leading edge does not extend all the way to the base of the blade, leaving a shank portion 15 of reduced width and rectangular section, as shown in Figs. 3 and 7. This flat rectangular shank portion is interposed between two semi-cylindrical hollow filler members 16, the edges of said members being preferably welded to the blade, and forming with it a unitary cylindrical shank. The filler members 16 are provided with spaced annular flanges 17 and 18, the latter being at their inner end, and the shank portion of the blade is provided with corresponding projections 17a and 18a whereby the flanges of the built-up cylindrical shank are made continuous. After being welded to the blade, the members 16 may be turned down in a lathe to make a cylindrical flanged shank adapted to fit accurately in whatever form of holding socket (not shown) may be provided in the hub 11. The flanges 17 and 18 lock the blade in said socket to prevent it from flying out endwise, and the cylindrical form of the shank enables it to be turned, if desired, to vary its pitch angle.

The outer ends of the filler members 16 are provided with enlarged semi-cylindrical flanges 19, Figs. 2, 3 and 7, which fit snugly against the flat faces of the blade throughout its entire width, as shown at 20, and are preferably welded thereto. These flanges 19 provide a cylindrical shoulder (shown best in Fig. 2) at the base of the effective portion of the blade. The mounting of the blade is preferably such that said shoulder is flush with and forms a continuation of the outer surface of the hub 11, as set forth more fully in my co-pending application referred to above.

The bevel 14, which produces the sharp leading edge of the blade, is formed upon its back, and increases in width from the outer end of the shank to the tip or outer end of the blade, where said blade is wedge shaped, as shown in Figs. 2, 3, 4 and 5. At the same time the blade is twisted slightly, as shown best in Fig. 2, to reduce the pitch angle of the pressure face 21 at said outer end. The plane of said bevel 14 therefore remains approximately perpendicular to the line of flight, which is its best position. The portion of the back of the blade near the trailing edge can also be beveled if desired, as shown at 22 in Fig. 6, to decrease weight, although I have found by actual experiment that efficiency is increased

much more by beveling the leading edge than the trailing edge.

It will be seen from the foregoing description that my construction provides a simple, efficient, and inexpensive form of blade provided with a shank that can be securely held in the hub to prevent the blade from working loose while permitting its pitch angle to be set at any desired value.

I claim:

1. In an air propeller, a blade formed from an initially flat strip of substantially rectangular cross section, the back of said blade being beveled to produce a sharp leading edge, said bevel increasing in width and the angle between it and the face of the blade decreasing from the inner end to the outer end, and said blade being twisted about its longitudinal axis to decrease the pitch angle of said face from said inner end to said outer end.

2. In an air propeller, a blade formed from an initially flat strip of rectangular cross section, one wider side of said strip having a bevel increasing in width from the inner to the outer end, said bevel reducing the thickness of the leading edge of the blade to a knife edge throughout its entire effective length.

3. In an air propeller, a blade formed from an initially flat strip of rectangular cross section, one wider side of said strip having a bevel increasing in width from the inner to the outer end to produce a sharp leading edge for the blade throughout its entire effective length, and said blade being twisted about its longitudinal axis to decrease its pitch angle from said inner end to said outer end.

4. In an air propeller, a blade formed from an initially flat strip of substantially rectangular cross section, the back of said blade having a bevel increasing in width and decreasing in angularity with respect to the face of the blade from the inner end to the outer end, said blade being twisted about its longitudinal axis through approximately the same angular distance as the decrease in angularity of said bevel, and said blade being mounted with the plane of said bevel approximately perpendicular to the axis of the propeller.

5. In an air propeller, a blade having a shank portion at its inner end and an effective portion extending from said shank portion outwardly, said effective portion having a sharp leading edge throughout its length, the angle between the face and the back of said effective portion decreasing from the inner end to the outer end thereof, and said effective portion being twisted about its longitudinal axis to decrease the pitch angle of said face from said inner end to said outer end.

HAROLD A. HALL.