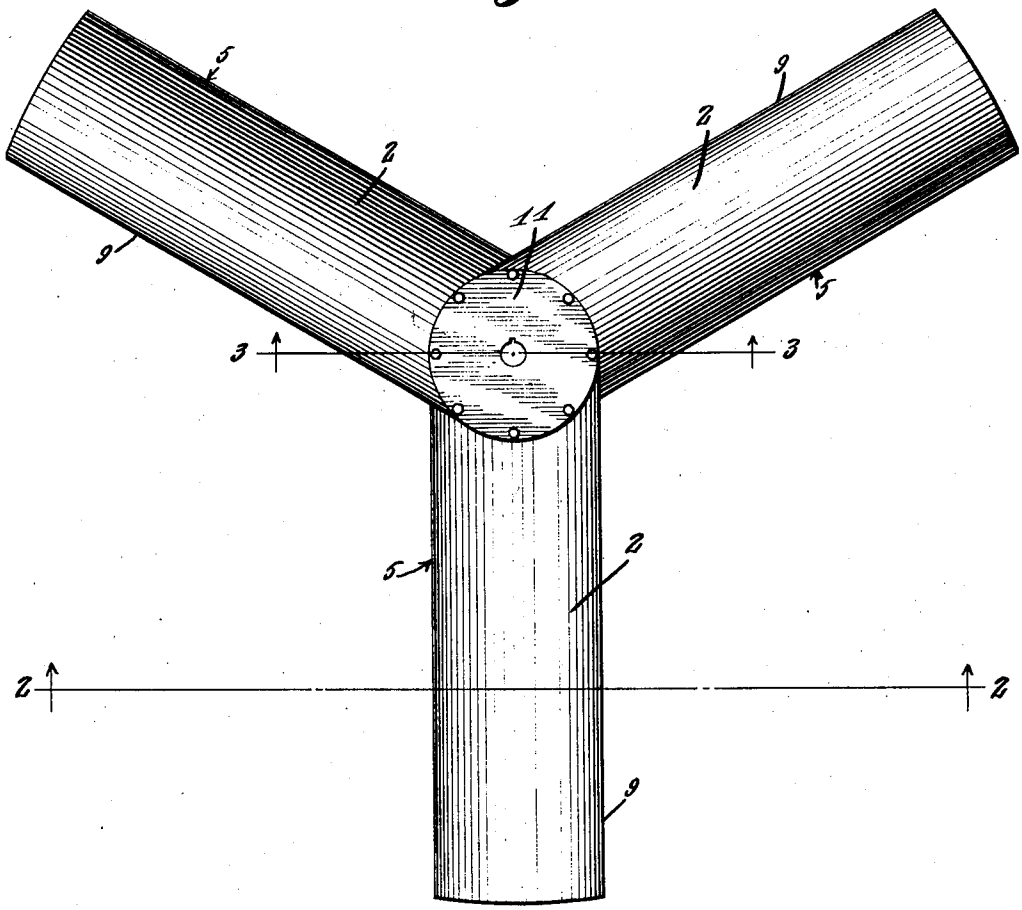
April 7, 1925. 1,532,158

G. H. SANFORD

AIRSHIP PROPELLER

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Fig. 1.



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Fig. 2.

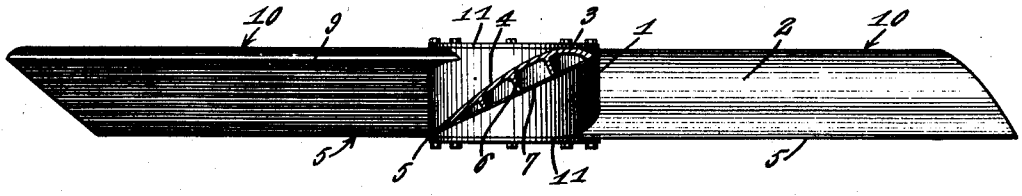


Fig. 3.

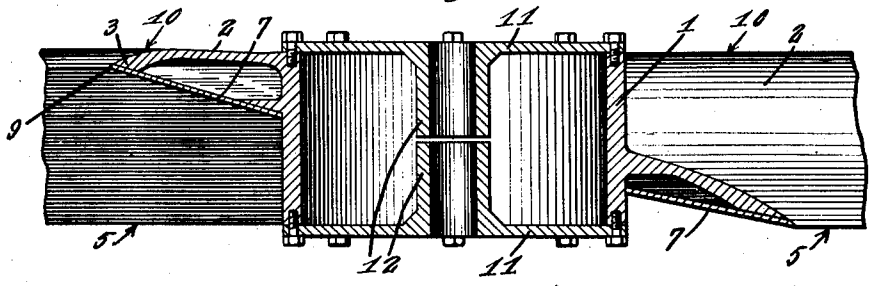
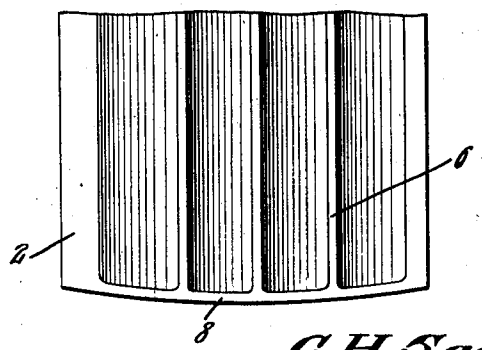


Fig. 4.



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Patented Apr. 7, 1925. 1,532,158

UNITED STATES PATENT OFFICE.

GEORGE H. SANFORD, OF MEADVILLE, PENNSYLVANIA.

AIRSHIP PROPELLER.

Application filed October 8, 1923. Serial No. 667,349.

To all whom it may concern:

Be it known that I, GEORGE H. SANFORD, a citizen of the United States, residing at Meadville, in the county of Crawford and State of Pennsylvania, have invented a new and useful Airship Propeller, of which the following is a specification.

This invention relates to propellers for airships and while it is capable of being used with different types of airships it is more especially designed as a lifting propeller for helicopters.

One of the objects of the invention is to provide a propeller of the blade type that can be manufactured of metal and the design of which is such as to produce an increased thrust or lift with an attending decrease in the amount of power used.

A further object is to provide a propeller, the blades of which are so designed that their lower surfaces will glide upon the air with increased carrying or lifting capacity and reduced resistance.

A still further object is to provide a propeller the construction of which is simple, strong and durable and greatly lessens the tendency found in ordinary propellers to become "limber" after use and to avoid crystallization of the material of which the blades are formed.

With the foregoing and other objects in view which will appear as the description proceeds, the invention resides in the combination and arrangement of parts and in the details of construction hereinafter described and claimed, it being understood that changes in the precise embodiment of the invention herein disclosed may be made within the scope of what is claimed without departing from the spirit of the invention.

In the accompanying drawings the preferred form of the invention has been shown.

In said drawings—

Figure 1 is a plan view of the propeller.

Fig. 2 is a section on line 2—2, Fig. 1.

Fig. 3 is a section on line 3—3, Fig. 1, on an enlarged scale.

Fig. 4 is a bottom view of the outer end portion of one of the blades with the bottom plate removed.

Referring to the figures by characters of reference 1 designates a cylindrical tubular hub from which radiate integral blades 2 each of which is pitched at a predetermined angle of incidence to the plane of rotation, the upper advancing edge portion of each blade being bowed transversely as indicated at 3 and merging into a downwardly and rearwardly extended portion 4 that is slightly curved as shown and terminates at the rear or trailing edge 5 of the blade.

Formed on or otherwise suitably arranged upon the lower face of each blade are parallel longitudinal reinforcing ribs 6 and a smooth thin bottom plate 7 is welded or otherwise attached to the lower edges of these ribs and to the advancing and trailing edges of the blade. Each plate is extended throughout the length of each blade and is welded or otherwise suitably connected at its inner end to the hub 1 while its outer end is similarly connected to a depending flange 8 on the blade and at the ends of the ribs 6. Each of these flanges 8 constitutes a closing member of the end of its blade, the said member being curved in the direction of its length.

It will be noted that the plates 7 present smooth flat surfaces which slope downwardly from the advancing or leading edge of the blade to the rear trailing edge thereof. It has been found in practice that by providing a blade with a bottom plate of this type the working efficiency is superior to that of a blade having a camber. It will be noted that the outer end of each blade is concentric with the center of the propeller thus insuring little if any resistance by the ends of the blades as the propeller rotates.

As heretofore pointed out the upper surface of each blade is curved transversely and, as will be seen by referring to the drawings, the uppermost portion of each blade is flush with the upper end of the hollow hub 1. As will be understood by those skilled in the art that the portion of each blade between the leading edge 9 and the uppermost portion 10 acts to deflect air upwardly during the rotation of the propeller, thereby tending to create a partial vacuum condition above the blade and increasing the lifting action of the propeller.

By providing each blade with a bottom plate the operation of casting the propeller is greatly simplified. The ribs 6 give considerable strength and rigidity to each blade and make possible a metal propeller of ample strength, durability and lightness. Any tendency of the blade to flatten out during rotation of the propeller at a high speed is prevented by the integral flange 8.

For the purpose of mounting the hub on a shaft there are provided heads or plates 11 bolted or otherwise connected to the ends of the hub and each having an inwardly extending integral sleeve 12 at the center thereof. These sleeves aline and are adapted to receive and be secured to a shaft. The construction of hub described insures strength and lightness and enables the hub to be cast in sections with the respective blades, these sections being subsequently welded together to provide a continuous cylindrical hub. Consequently the production of the propeller is greatly simplified and there is no danger of the propeller warping as would be the case should it be produced in a single casting.

Although three blades have been shown extended from the hub it is to be understood that this number may be varied if found advantageous. In practice, however, it has been found that a three blade propeller gives maximum efficiency.

It is to be understood that the pitch of the blades can be varied but in every instance the uppermost portion of the blade which lies flush with the upper end of the hub should be located at a point not more than one-third the distance across the blade from the front edge thereof. This location of the highest point of the blade has been found essential where maximum efficiency is desired.

What is claimed is:—

1. An all metal propeller comprising a hollow cylindrical hub, blades radiating therefrom and integral therewith, each blade being transversely concaved and pitched at an angle to its plane of rotation, reinforcing ribs extending longitudinally upon the working surface of each blade, an attachable flat plate connecting the bottom edges of the ribs and extending from the leading to the trailing edge of each blade and from the hub to the outer end of each blade, reinforcing plates closing the ends of the hub, and inwardly extending shaft engaging sleeves upon the plates on the hub.

2. In a propeller as described, a plurality of radially extending blades, the inactive surface member of the said blades being formed in one piece with reinforcing ribs, and reinforcing leading and trailing edges, flat plates secured to the edges of the reinforcing ribs and to the leading and trailing edges, and a curved closing member for the outside end of the blades, being formed in one piece with the cast portion of the blade, and hermetically closing the hollow blade.

3. A propeller of the class described formed entirely of metal and comprising a tubular hub, transversely curved blades integral therewith and pitched at an angle to their plane of rotation, each of said blades having its ends closed and concentric with the center of the hub, reinforcing ribs extending longitudinally along and integral with the blades, and an attachable flat plate mounted on the ribs and the edges of the blade.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

GEORGE H. SANFORD.

Witnesses:

CHARLES L. SANFORD,

MARY E. SANFORD.