

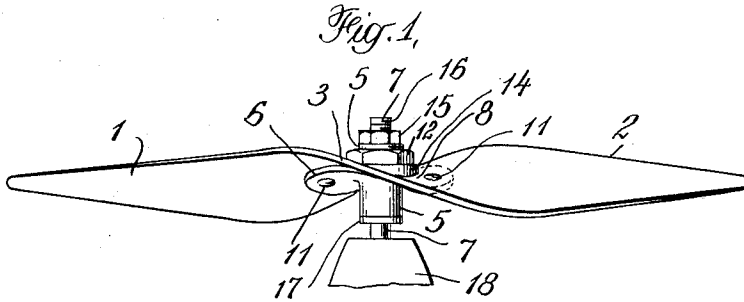
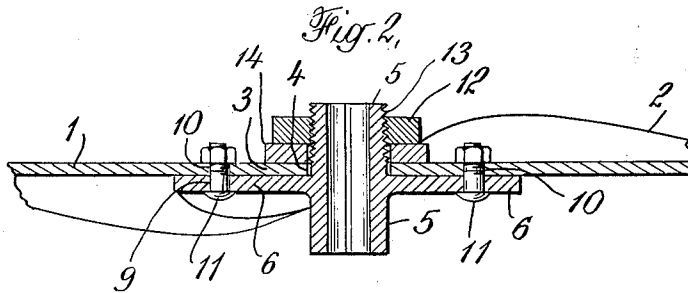
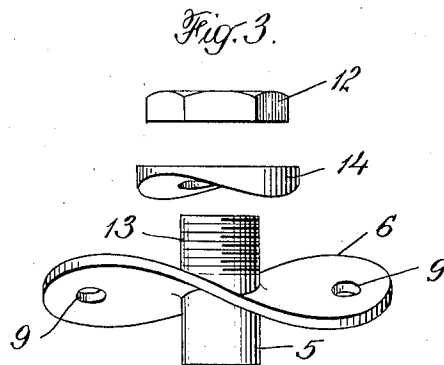
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1,542,412

S. A. REED

AERONAUTICAL PROPELLER

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AERONAUTICAL PROPELLER.

Application filed May 14, 1924. Serial No. 713,122.

To all whom it may concern:

Be it known that I, SYLVANUS A. REED, a citizen of the United States, residing in New York city, in the county of New York and State New York, have invented certain new and useful Improvements in Aeronautical Propellers, of which the following is a specification.

This invention relates generally to aeronautical propellers and more particularly to metal propellers of the type devised by me and disclosed in different forms in my U. S. Letters Patent No. 1,463,556, granted July 31, 1923, and No. 1,518,410, granted December 9, 1924, to which reference may be had for a detailed description of my types of metal propellers and the novel principles involved.

I have found that in certain classes of metal propellers, especially where large powers must be absorbed at low rotative speeds, therefore requiring larger blade areas, that the necessary bulk for blade stiffness and resultant pitch stability leads to an increase in weight which is detrimental, and after numerous uses of the above-referred to type of metal propellers in actual flights of aeroplanes, I have discovered that by the use of certain forged or rolled alloys of metallic magnesium, the necessary bulk for blade stiffness and resultant pitch stability may be obtained, without such detrimental increase in weight. In the adoption of this magnesium alloy, there is also a gain even in case of my said type of propellers where alloys of aluminum base do not lead to a detrimental increase in weight, it is a material advantage to decrease the total weight of the aeroplane and its accessories, and this gain can be obtained by the use of such magnesium alloys. Such alloys must have certain physical properties substantially equivalent to those of duralumin class, such as tensile strength, elasticity and toughness, in addition to the very advantageous property of low specific gravity which I have now availed myself of, which latter property is common to both constituents of the magnesium base and aluminum alloy.

I have successfully made practical aeronautical propellers of my above-referred to

type from a magnesium base aluminum alloy of about 96 per cent magnesium and 4 per cent aluminum, the metal having been flowed, rolled or forged. I have also discovered that while the flat plates of magnesium base and aluminum alloys are not usually capable of being fully shaped into propeller form when cold, they may be usually successfully shaped by working them while warmed to a temperature moderately above normal, which degree of heating does not detrimentally affect the desired physical properties of the metal. These discoveries have materially advanced the art of aviation, and the adaptation of such alloys to the manufacture of propellers of my type involves features of design which I have successfully worked out, and by my original and special correlation of blade-form and cross-sections with the physical properties of magnesium alloys, I have solved an important aviation problem.

My present improvements further include novel means for mounting an aeronautical propeller in its driving connection with the driving-shaft, whereby metal propellers, and particularly those of the aforesaid type, may be easily and conveniently mounted on the drive-shaft of an ordinary aeroplane and be inter-changeable with conventional propellers, without necessitating any change or cutting of the drive-shaft.

I have illustrated a type of my invention in the accompanying drawings, wherein:

Fig. 1, shows a side elevation of an embodiment of my inventions.

Fig. 2, shows a central vertical sectional view of the parts shown in Fig. 1, the plane of the section containing the axis of the drive-shaft.

Fig. 3, is a side view of the flanged sleeve, the clamping filler block and the nut which is mounted on the sleeve and engages the said block, the several parts being shown as separated.

Referring to the drawings, 1 and 2, indicate the blades of an aeronautical propeller of my above-referred to type, said blades extending in opposite directions and being united by a central part 3, and all of which parts are made of solid metal in a unitary structure from blade tip to tip, though, of

course, the blades may be made separate and suitably connected together, instead of being made all in one piece as herein shown.

The construction and arrangement of the different parts of this propeller may be made in accordance with the descriptions found in my said patents, herein-above referred to. This propeller is made of the magnesium base and aluminum alloy above specifically described and is worked into shape while the metal blank is warmed as above stated, so that I secure in this product the important advantages to which I have before referred.

The central blade-bearing part 3, is provided with a circular opening 4, through which extends the hub sleeve 5, the exterior of which is provided with an integral flange 6, which is shaped to conform to the central warped surface or deformation 8, which is formed in said central part in order to establish the required inner blade-angles. This sleeve is secured to the part 3, by means of bolts 11, passing through said part and the flange 6, the holes 10, in said part registering with the bolt-holes 9, in the attaching flange, for the reception of said bolts. One end of the sleeve 5, is threaded upon its exterior at 13, for the reception of a nut 12, which serves to force down and hold the clamping filler piece 14 against the face of the central part 3, to firmly grip the propeller in place, said filler piece, or block being perforated for the reception of the sleeve which it surrounds and being shaped to conform to the deformed surface of the central blade-connecting part 3, with which it contacts. A nut 15, turns on thread 16, on the drive-shaft 7, and abuts the end of the hub-sleeve 5, so as to hold it against endwise movement thereon, and the sleeve and shaft are keyed together in the usual way. A fixed collar 17, on the drive-shaft 7, holds the sleeve 5, at its inner end towards the fuselage which is indicated at 18.

If preferred, the said attaching parts may be relocated by having the attaching-flange 6, disposed near the outer end of the hub-sleeve 5, so as to engage the outer face of the blade-uniting part 3, while the inner end of the sleeve may have the thread and nut 12, for binding against the inner or rear face of said part 3, in either case the propeller is firmly secured between the integral flange 6, of the hub sleeve and the nut on said sleeve.

By means of this construction, the propeller may have its attaching hub secured to it in final position, ready to be applied to the end of the ordinary drive-shaft 7, provided with the thread 16, and securing nut 15. In each instance the warped surface at 8, of the central blade-uniting part 3, is conformed to upon one side by the

attaching-flange 6, of the sleeve, and upon the other by the filler piece 14, which surrounds said sleeve.

It will be understood that while I have herein given the proportion of the components of the magnesium base aluminum alloy in about 96 per cent magnesium and 4 per cent aluminum, the proportion between said constituents may be varied, without, however, departing from the spirit of my invention.

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

1. An aeronautical propeller having blades formed of an alloy of magnesium.

2. An aeronautical propeller having blades formed of an alloy of magnesium and aluminum.

3. An aeronautical propeller having solid blades formed of forged alloy of magnesium.

4. An aeronautical propeller formed of a solid single-piece of light weight metal or alloy having high tensile strength and elastic properties and having its central part shaped to establish the required inner blade angles and provided with a hub-receiving opening, a hub device consisting of a sleeve fitting the drive-shaft to which it is secured, said sleeve passing through the opening in said central part and provided with an external flange engaging and substantially conforming to the said central part and means for securing the flange thereto, and clamping means surrounding said sleeve and engaging the side of said central part opposite to that engaged by said flange.

5. An aeronautical propeller formed of forged alloy of magnesium in a solid single piece from tip to tip of the propeller.

6. A metal aeronautical propeller having a solid central plate-like blade-uniting part warped to establish the required inner blade angles and provided with an opening, a metal hub attached thereto for attachment to a driving-shaft, said hub consisting of a sleeve fitting said shaft to which it is secured and the sleeve passing through said opening in said central part, said sleeve being provided with an external flange substantially fitting the warped surface of the said part and means for securing said flange to said part, and clamping means surrounding said sleeve and engaging the opposite side of said part from that engaged by said flange.

7. A metal aeronautical propeller having a solid central plate-like blade-uniting part distorted to establish the required inner blade angles and provided with a hub-receiving opening, a metal hub comprising a sleeve adapted to fit the driving-shaft and to be secured thereto, said sleeve being

provided with a flange substantially fitting the warped surface of said central part and attached to said part, said sleeve extending through said opening in the central
5 part and provided with an external thread, a clamping-member surrounding said sleeve and engaging the face of said part opposite that engaged by said flange, and a nut on said sleeve-thread for engaging said clamping-member.
10 In testimony whereof, I have hereunto set my hand.

SYLVANUS A. REED.