L. G. NILSON.

PROPELLER.

APPLICATION FILED SEPT. 28, 1917.

1,308,527.

Patented July 1, 1919.

2 SHEETS—SHEET 1.

Fig. 1.

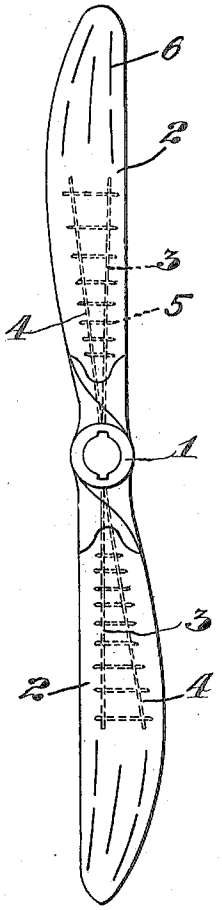


Fig. 3.

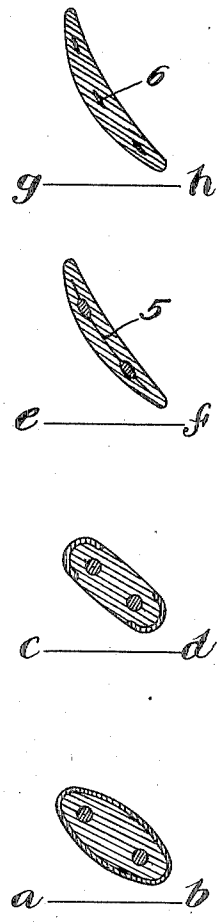
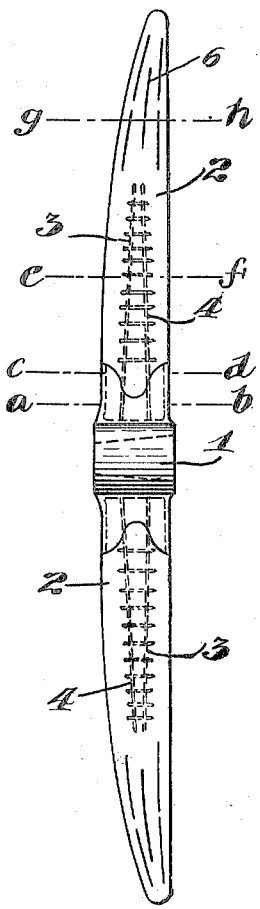


Fig. 2.



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2 SHEETS—SHEET 2.

Fig. 4.

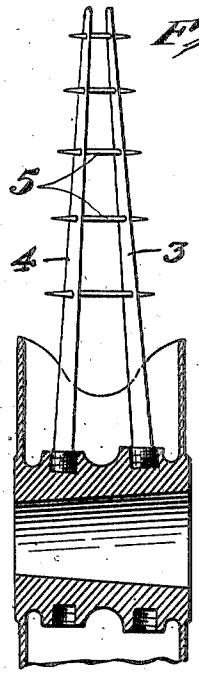


Fig. 5.

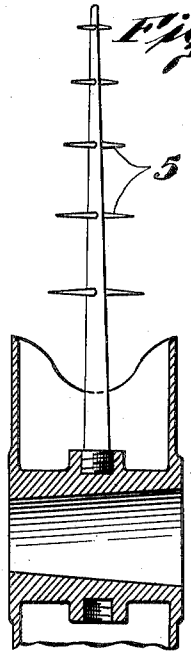


Fig. 6.

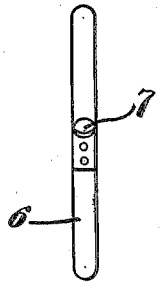


Fig. 7.

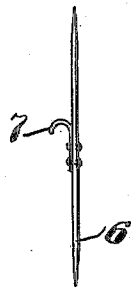


Fig. 8.

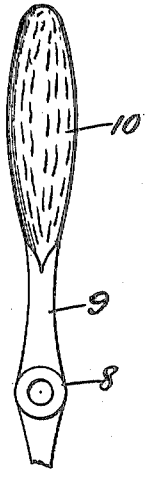


Fig. 9.

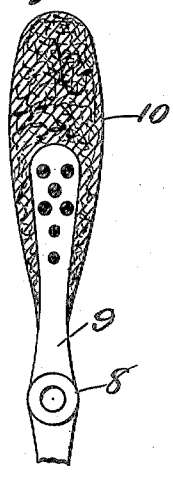
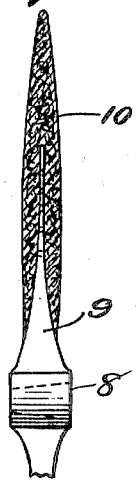


Fig. 10.



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UNITED STATES PATENT OFFICE.

LARS G. NILSON, OF HOBOKEN, NEW JERSEY.

PROPELLER.

1,308,527. Specification of Letters Patent. Patented July 1, 1919.

Application filed September 28, 1917. Serial No. 193,627.

To all whom it may concern:

Be it known that I, LARS G. NILSON, a citizen of the United States, and resident of Hoboken, in the county of Hudson and State of New Jersey, have invented certain new and useful Improvements in Propellers, of which the following is a specification.

This invention relates to propellers employed with aircraft, and my improvements are directed particularly to the construction of a propeller combining the features of strength and flexibility, together with such homogeneity of structure as will maintain the integrity thereof against the influences of vibration.

The standard aeronautic propeller of today is of wood, built up of different sections, glued together and afterward formed into shape. The objection to this type of propeller lies not only in the difficulty of getting suitable material, but also the slow process of manufacturing; while the finished product is not entirely satisfactory. Experience has shown that owing to the vibration caused by the engine as well as the vibration due to the motion through the air, the life of the ordinary wood propeller is comparatively short. As the power of the engine is produced by a series of explosions the propeller necessarily acts as a fly-wheel. These impulses have a tendency to loosen the hub fastenings, and the continued vibration also finally loosens the glue or cement which holds the different sections of wood together. Moisture and unfavorable atmospheric conditions will also loosen the glue; and for military work the propeller is easily injured or destroyed if hit by bullets or pieces of flying shrapnel. Many propellers are also destroyed by unavoidably hitting objects when landing.

To overcome these difficulties I have invented a propeller having its hub or middle portion of metal and the wings or blades partially flexible or resilient. The wings or blades are strong and rigid enough to perform the function of using up the power of the engine and at the same time are sufficiently flexible to remain serviceable when pierced by a rifle bullet, and to prevent breakage if the propeller tips should hit the ground when making a bad landing.

Other features and advantages of my said invention will hereinafter appear.

In the drawings:—

Figure 1 is a front elevation of my improved propeller.

Fig. 2 is a side elevation thereof.

Fig. 3 shows a group of cross sectional views respectively on the lines A—B, C—D, E—F, G—H, of Fig. 2.

Fig. 4 is an enlarged partial sectional view of the hub with details of the propeller framework or a supporting structure.

Fig. 5 is a detail view of a portion of the propeller frame, showing a modification.

Figs. 6 and 7 are respectively plan and side views of a stiffening element.

Fig. 8 is a partial view of a modified form of propeller, and Figs. 9 and 10 are respectively front and side views of a further modification.

In the production of my improved propeller the central or hub portion 1 thereof is made of metal of suitable form with an orifice to receive the propeller shaft, and is extended, in shell-like form, in the manner of sockets, for a short distance along the wings. The wings or blades 2 are made of a slightly yielding elastic or flexible substance like vulcanized India rubber, braced or supported internally by the outwardly converging arms 3 and 4, to which are fastened anchoring members 5. The arms 3 and 4 are securely fastened to the hub portion 1, fitting within the sockets thereon, and should be made of spring-steel or similar material and so proportioned that they will bend slightly when subjected to great strain. They are tapered, the thickest portion being at the hub and gradually becoming smaller toward the ends, so that the bending will also be gradual. The arms 3 and 4 in a wing or blade need not extend out to the extreme end thereof but can terminate at any desired point of its length. There should, however, be embedded in the rubber a number of spring strips like that shown at 6 in Figs. 6 and 7. These strips are provided with a small hook 7 to prevent them

from creeping and working out of the surrounding material. Instead of the arms 3 and 4, a single arm, centrally disposed, like that shown in Fig. 5 can be used.

The detailed construction can, of course, be varied in a great many ways but it must be remembered that in all cases it is necessary to have a strong metallic hub for the purpose of effecting an absolutely rigid connection with the propeller shaft; and then to provide a frame-work, rigid at the hub, but gradually increasing in flexibility toward the points or tips of the propeller blades. Whatever backbone is used for transmitting the torque must have stays, such as the cross bars, projections or ribs 5 to provide a suitable anchorage for the surrounding medium. The detached spring strips 6, are to be embedded in the rubber at the proper places, such as indicated, to add to the general stiffness. The rubber or composition comprising the mass material of which the propeller blades or wings are composed, may be reinforced in the manner well known, for example, in the art of tire construction, such as by the embedment therein of canvas, woven fabric, cord, fiber, etc.

I have mentioned rubber as the material which seems most practical at the present time but other materials or compositions can be used,—for instance, bakelite, especially backed up properly, reinforced and anchored to a hub of sufficient strength.

The form of my improved propeller shown in Figs. 1 and 2 is that of the conventional wooden propeller, but inasmuch as the central portion of any propeller does not add much to its effectiveness a smaller hub and extended arms can just as well be used, as shown in Fig. 8.

In a modification of my invention shown in Figs. 9 and 10 the metal hub 8 may have radial extensions 9 of suitable form, preferably tapering toward the ends to be increasingly resilient in the outward direction, which extensions may form respectively the cores for the propeller blades which may be composed of a suitable composition.

For instance, the blades as 10 may consist of canvas or the like impregnated with a suitable binding material, and squeezed into shape under pressure.

If rubber be used for the binder any desirable flexibility can be obtained, while if other material, like bakelite, be used a hard product results having a fine smooth surface and that is stronger than wood.

Obviously the blades may be made either detachable from the hub or integral therewith.

Where my improved propeller is provided with wings or blades made of non-resonant material it will be evident that the added advantage will be acquired of reducing the noise created by the propeller whirling through the air.

Variations may be resorted to within the spirit and scope of my said invention and parts thereof used without others.

I claim:—

1. A composite propeller comprising a hub portion of rigid material, blades of flexible material extending from said hub, and embedded resilient stiffening means for said blades.

2. A composite propeller comprising a hub portion of rigid material, having radial sockets, blades of flexible material fitted in said sockets, and resilient stiffening means extending from said hub portions into said blades.

3. A composite propeller comprising a hub portion of rigid material, having radial sockets, blades of flexible material fitted in said sockets, resilient stiffening means extending from said hub portions into said blades, and anchorage means upon said stiffening means for said blades.

4. A composite propeller comprising a hub portion of rigid material, having radial sockets, blades of flexible material fitted in said sockets, stiffening means extending from said hub portions into said blades, and detachable spring strips embedded in said blades.

5. The combination, in a propeller, of a metal hub, a radial spring arm engaged therewith; and a blade of flexible molded materal about said arm.

6. The combination, in a propeller, of a metal hub having a radial socket, a spring arm secured to said hub, and a blade of flexible molded material about said arm and entered within said socket.

7. The combination, in a propeller, of a metal hub, a blade therefor of flexible material and a spring arm embedded within said blade and secured to said hub, said arm characterized by diminishing in tension toward its outer end.

8. The combination, in a propeller, of a metal hub, a radial spring arm engaged therewith, said arm having projection, and a blade of flexible molded material about said arm and projections.

9. A propeller comprising a hub of rigid material, blades composed of molded material, and means incorporated in said blades to vary their lengthwise flexibility, whereby they may yield more readily toward their tips.

10. A composite propeller comprising a metallic hub portion, radial extensions of said hub portion which are diminished outwardly to increase their resiliency, and blades of molded material formed about said extensions.

11. A composite propeller comprising a

metallic hub portion, radial extensions of said hub portion which are diminished outwardly to increase their resiliency, and blades of molded material formed about said extensions, said extensions having means of engagement with said molded blades.

Signed at borough of Manhattan in the city county and State of New York, this 24th day of September A. D. 1917.

LARS G. NILSON.

Witnesses:
F. W. BARKER,
A. B. BARKER.