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PROPELLER FOR AIRPLANES AND DIRIGIBLE BALLOONS

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Fig. 1.



Fig. 2.

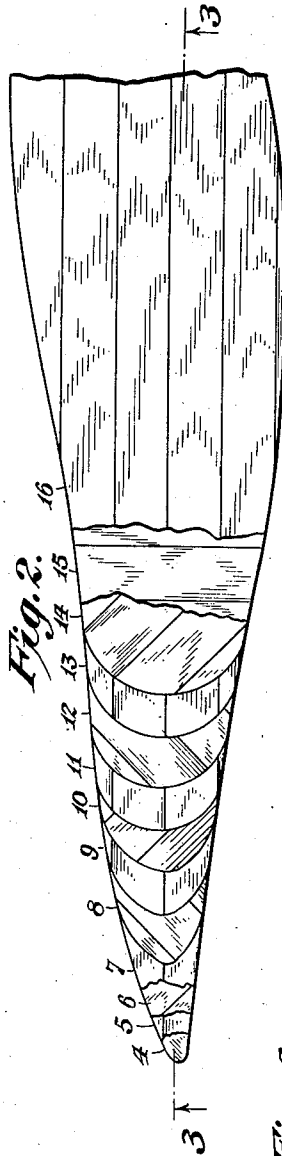


Fig. 3.

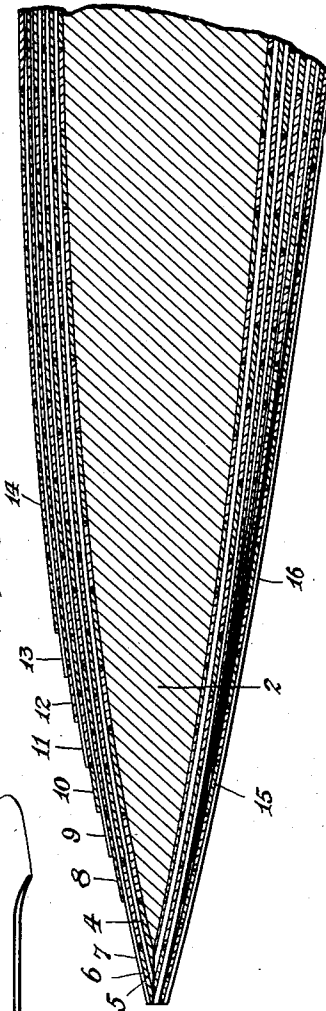
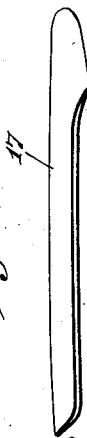


Fig. 4.



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PROPELLER FOR AIRPLANES AND DIRIGIBLE BALLOONS

Application filed December 22, 1923. Serial No. 682,189.

My invention relates to improvements in propellers designed for use with airplanes employing very large engines, or for dirigible balloons, and my object is to provide a propeller for the purpose, which, while being substantially as strong as those now made, will be materially lighter. Propellers for use with dirigible balloons or air planes employing very large engines are relatively large and heavy and at the present time are sometimes twenty to twenty-five feet in length. They are now made of laminated wood, solid throughout, and are unduly heavy, proportioned to their strength.

I find that it is possible to construct a propeller for the purpose, having a core of a relatively light wood or other material, and with a skin or coating of laminated strips applied to the core, which will be substantially as strong as propellers now made, and at the same time will be very much lighter than present propellers.

In order that my invention may be better understood, attention is directed to the accompanying drawing forming a part of this specification, and in which:

Fig. 1 is a side view of my improved propeller showing in full lines the relatively light core, and in dotted lines the skin or coating of laminated strips and the metal sheathing covering the tip and leading edge of the propeller;

Fig. 2, a detail view illustrating the employment of thin veneer strips to form the coating or skin, certain strips being broken away to illustrate the strips beneath the same;

Fig. 3, a sectional view on the line 3—3 of Fig. 2, the strips or veneers at the top being shown after they have been applied but before sand papering and at the bottom showing the finished outer surface of the propeller; and

Fig. 4, a perspective view of the metal sheathing which may be applied to the tip and leading edge of the improved propeller.

In these views corresponding parts are represented by the same numerals.

The propeller 1 is of any suitable design or shape, and comprises a core 2 made pref-

erably of balsa wood. As is known this wood is extremely light, and, although it inherently has little strength, it constitutes an effective core for the propeller and prevents buckling under load, giving in effect, the strength of a short column of material in compression, as compared to the long column effect which would be obtained from a thin wall in compression, without the bracing effect of balsa wood core. Balsa wood is preferred, but the core may be made of other light material suitable for the purpose. To the outside of the core 2, I apply thin strips or veneer or laminae of a very tough strong wood, preferably mahogany. These are secured in place by glue. Of course, it is understood that sheets or strips of tough strong composition or metal or other suitable material may be used. The illustration is of a propeller constructed, according to the invention, of thin strips or laminae of mahogany on the order of 1/64 inch in thickness and applied in layers to the core as follows: Layers 4, 5, 6 and 7 extend the full length of the propeller from tip to tip and are shown broken away to disclose the layers underneath. Layer 8 extends not quite to the tip of the propeller, while layer 9 extends not quite as near the tip as layer 8, and layer 10 not quite as near the tip as layer 9, etc. In this way a propeller is built up, upon the core, having a relatively thin covering or coating of mahogany veneer at the tips which becomes thicker and thicker toward the hub hole where the desired maximum strength is secured. Fig. 2 merely shows thirteen layers of mahogany veneer by way of illustration, it being understood that in practice very many more layers would be required to give the desired strength. After the several layers have been thus applied, the outer surface is smoothed down or dressed, as with sandpaper, until a uniformly smooth surface is presented. Layer 15, with the grain transversely of the axis of the propeller, is then glued on from tip to tip, and layer 16, with the grain longitudinally of the axis of the propeller, is lastly glued on from tip to tip. Thus a uniformly smooth surface is presented as at 16. Fig. 3, which may then be fin-

ished off in the usual manner, or one or more protective coverings of cloth or other protective material applied as desired.

Layers 5, 7, 9, 11, 13 and 16 are shown with the grain extending longitudinally of the propeller, so as to resist longitudinal strains due to the centrifugal effect, while the layers 4, 8, 12, and 6, 10, 14, are shown with the grain extending at an angle of substantially 45° to the length of the blade, the angle of each alternately crossing that of the other. These layers 4, 6, 8, 10, 12 and 14, add strength to the propeller to resist transverse and torque strains due principally to the thrust.

In order to protect the front or leading edge and tip of the propeller from water spray or abrasion of sand, stones, etc., it may be desirable to apply a metal tip or protective sheathing as shown at 17, Fig. 4. This metal tip or protective sheathing may be applied last after the propeller has been completely finished, as shown by dotted lines in Fig. 1.

I find in practice that a propeller made with a balsa wood core and with thin veneer coatings of mahogany arranged as explained, or coatings of a tough strong composition, or suitable metal sheetings, will have substantially the strength of a solid wood, or composition, or metal propeller as now made, while at the same time the weight will be only about one-third that of the solid propeller.

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

1. A propeller for airplanes or dirigible balloons, comprising a core of balsa wood and a completely enclosing coating therefor, comprising a large number of thin successive veneers, each progressively shorter lengthwise, of strong tough material, said coating being the principal source of structural strength.

2. A propeller for airplanes or dirigible balloons, comprising a core of balsa wood and a completely enclosing coating therefor, comprising a large number of thin successive veneers, each progressively shorter lengthwise, of strong tough wood, said coating being the principal source of structural strength.

3. A propeller for airplanes or dirigible balloons, comprising a core of balsa wood and a completely enclosing coating therefor, comprising a large number of thin successive veneers of mahogany, each progressively shorter lengthwise, said coating being the principal source of structural strength.

4. An improved propeller for airplanes or dirigible balloons, comprising a core of balsa wood and a completely enclosing coating therefor, comprising a large number of thin successive veneers of mahogany, each progressively shorter lengthwise and some of said layers extending longitudinally of the

propeller and others substantially transversely thereof.

This specification signed this 18th day of December, 1923.

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