A. P. FILIPPI.

PROPELLER.

APPLICATION FILED AUG. 24, 1917.

1,378,776.

Patented May 17, 1921.

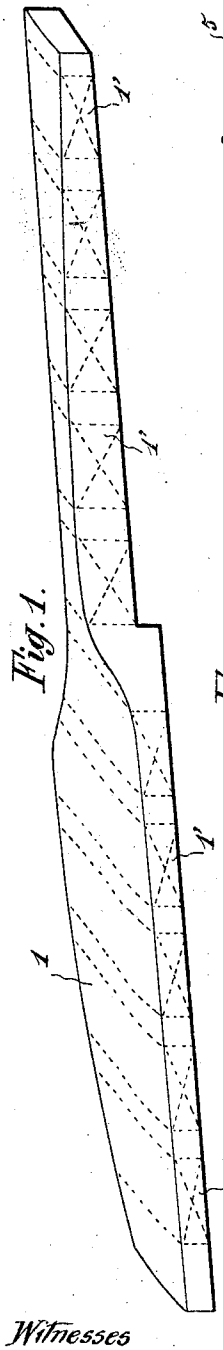


Fig. 1.

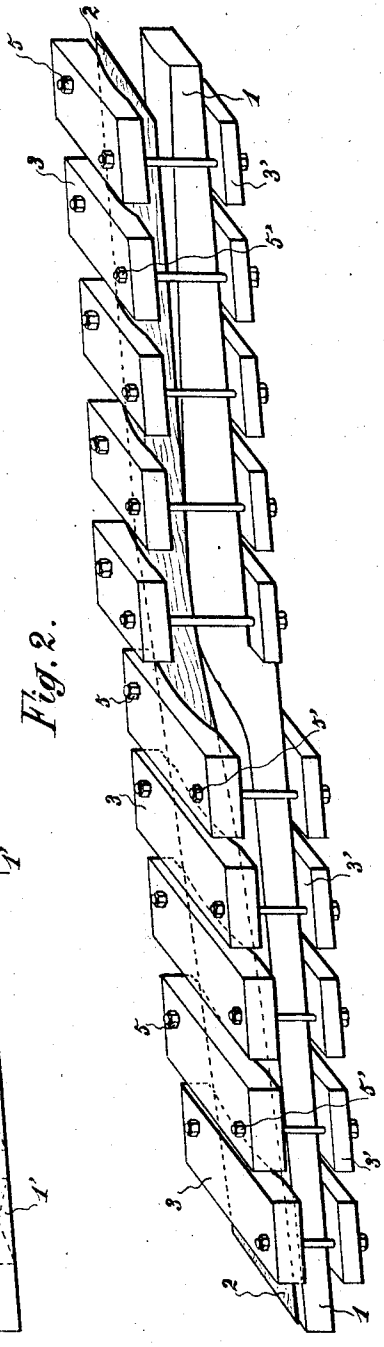


Fig. 2.

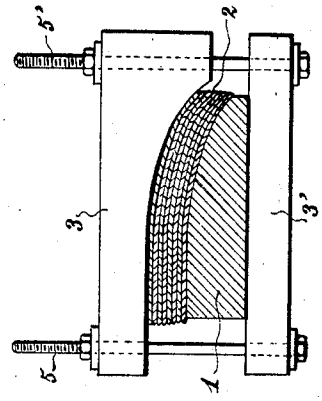


Fig. 4.

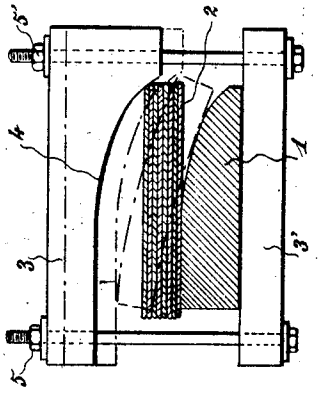


Fig. 3.

Witnesses

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UNITED STATES PATENT OFFICE.

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PROPELLER.

1,378,776. Specification of Letters Patent. Patented May 17, 1921.

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To all whom it may concern:

Be it known that I, ANTOINE PADOUE FILIPPI, citizen of the French Republic, residing at Paris, France, have invented certain new and useful Improvements in Propellers, of which the following is a specification.

The present invention relates to a process and an apparatus for the manufacture of propellers having twisted blades with great accuracy, a maximum of strength and a minimum tendency to warping.

To this end the material from which a twisted blade or blades is or are to be formed is clamped or pressed on a mold so as to conform it to the desired curvatures on one face only, preferably the attacking or forward face of the blades, the other corresponding face being afterward worked to the desired curvature by shaving off or otherwise removing the surplus material by the known methods.

Heating means could be used during the molding operation, but generally better results are obtained if such heating means are not used.

According to the invention the material to be treated is a compound laminated material consisting of a number of leaves of wood glued or cemented together. The said leaves of wood are of relatively small depth and have a length and a width slightly greater than the length and the width of the propeller to be manufactured. The total depth of the compound laminated material is preferably slightly greater than the depth of the central part of the propeller to be manufactured. The compound laminated material is, after gluing or cementing of its leaves applied upon a mold or matrix the active surface of which forms the counter-part of the surface of the propeller which is to be obtained. The compound laminated material is then strongly and gradually pressed against the active surface of the mold or matrix, till it beds exactly against the said active surface. The pressure is maintained for a sufficient length of time to allow the glue or cement to be entirely dry. The pressure is then released, and a solid block is obtained having one of its faces molded to the form of the corresponding face of the propeller to be manufactured. The said block is afterward worked by shaving off or otherwise removing the surplus material by the known methods for giving to its other face the form corresponding to the other face of the propeller to be manufactured.

The annexed drawing shows by way of example, one mode of constructing apparatus for the working of the process:—

Figure 1 is a perspective view of the mold.

Fig. 2 shows the whole of the arrangement entirely mounted with a series of press-cramps in position for the molding of one face of the propeller.

Fig. 3 is a vertical transverse section made between two press-cramps showing the position of the various parts and the leaves or laminations before pressing; this figure also shows in dot and dash lines, the position which the laminations tend to take when the pressing action commences.

Fig. 4 is a similar view showing the final position of the parts, when the molding is finished and the laminations have, as a result, exactly assumed the shape of the matrix.

Upon these drawings I designates the matrix upon which are traced marks I′ indicating the positions or sites to be occupied by the presses; it is important that the site should be exactly determined because as will be described later, upper cramps of the presses are hollowed to the transverse profile of the matrix at the section under consideration.

Upon the matrix I, I apply (see Fig. 3) the series of leaves coated with glue or cement and arranged like the leaves of a laminated metal spring. The matrix I and the lamination 2 are held between presses of any suitable number; each one of these presses (see Figs. 3 and 4) is formed of an upper cramp 3 and a lower cramp 3′ connected together by bolts 5, 5′ serving to effect the necessary pressing action. The lower cramp 3′ is a simple piece of wood (or any other appropriate material) intended to receive and support the matrix I; this piece is perforated at its ends with two holes for the passage of the bolts 5 and 5′.

The upper cramp 3 is notched or shaped upon its lower face to a profile 4 corresponding exactly for each press to the transverse profile of the matrix at the part which is to receive the press considered. This cramp is also perforated at its end with holes corre-

sponding to those of the lower cramp and intended for the passage of the bolts 5 and 5′.

In the method of execution illustrated, I utilize ten presses for the whole length of the matrix; it goes without saying that this number varies with the dimensions of the propeller which is to be obtained.

To effect a molding of the propeller, I commence by placing the matrix I upon the series of lower cramps 3′, these cramps being distributed throughout the length of the matrix, at the points indicated by the markings 1′. I afterward arrange upon the matrix the block of laminations 2, which have been previously coated with cement or glue, and, the bolts 5, 5′ having been inserted through the holes of the lower cramps, I put in place the series of upper cramps 3, passing the upper extremities of the bolts through the holes in the said cramps. The upper cramps are, it is to be understood, arranged at the place of the markings 1′ and in an order such that the profiles 4 of these cramps correspond with the transverse profiles of the matrix at the points considered. The nuts are then screwed up on the bolts 5, 5′ and tightened up at first lightly, whereas afterward the pressure is gradually increased. The block of glued laminations 2, which at the commencement of the operation was placed horizontally as shown in Fig. 3 (the central part of the said block bearing upon the central part of the matrix) bends or sets during the screwing up action, toward the position indicated in dot and dash lines on Fig. 3. (It goes without saying that, relatively to Fig. 3, the inclination of the block 2 is made in the opposite direction for the other half of the propeller). The pressing action is progressively continued until the block is forced to bed exactly against the matrix (Fig. 4) the laminations moving slightly each upon the lower one according to the incidence curvature of the lamination of the block. The block is allowed to dry and when the drying is perfect, I dismount the series of the presses. One of the faces of the propeller is thus molded; it can be (after touching up, if necessary) rubbed down and varnished in the usual manner.

The other face is afterward made in the known manner by removing the surplus material, *e. g.*, by planing, employing templets or gages to obtain the desired shape.

As compared with an ordinary propeller blade made from laminated material, the present invention enables me to form a propeller from laminations of the maximum width of the blade, like the leaves of a laminated metal spring and with the maximum surface for the glue between adjacent laminations, this result being obtained by reason of the mold affording the desired twist and consequently with maximum adherence between the laminations. In other words my invention insures the maximum surface of adhesion between adjacent laminations, whereas in ordinary propellers the small extent of the surface of adhesion is a weak point. In my construction the fiber of each lamination is also continuous from one tip to the other tip across the central boss.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:

1. The herein described method of making propellers, which comprises assembling a plurality of flat unshaped laminations or leaves which are of the full length of the propeller to be made, with an adhesive applied to their meeting faces, submitting such laminations, while the adhesive is unset, to compression between surfaces shaped to mold one side of the assembled laminations throughout the length thereof to the desired form, thus giving the proper pitch and shape to the blades at the one and same side of the propeller, and maintaining such compression until the adhesive has become set and capable of maintaining the laminations in molded form.

2. The process for the manufacture of propellers, which consists in compounding flat unshaped laminated material all of the laminations being of the full length of the propeller to be produced, the laminations extending across the transverse width of each blade of the propeller, and also continuously from one blade to another blade at the same side of the propeller, molding said material by pressure to conform one face only of each blade at the same side of the propeller to a profiled mold or matrix which forms the counterpart of the said face of the twisted propeller blades, and trimming off the surplus material from the other faces of the twisted blades to give the same the finished form.

3. The herein described method of making propellers, which comprises superposing unshaped laminations of wood with an adhesive applied to their meeting faces, said laminations extending continuously between the blades and at the same side of the propeller, submitting the superposed unshaped laminations, while the adhesive between their meeting faces is unset, to compression between surfaces shaped to mold the same into the desired form to thus shape one face of each blade at the same side of the propeller, and to impart the proper twist to the blade, and maintaining such compression until the adhesive between the laminations has become set.

4. A propeller comprising superposed glued or cemented resilient laminations bent in shape to form the blades, the laminations

extending continuously from one blade to the other blade at the same side of the propeller, the blades being maintained in proper form and with the proper twist by the glue or cement which unites the laminations.

5. Apparatus for use in the making of propellers, comprising a profiled matrix forming the counterpart of the blades and hub to be obtained, and a suitable number of presses to coöperate with said matrix, each press having its lower face of a width to extend entirely across the blade of the propeller, said face having a profile corresponding to the transverse profile of the portion of the matrix with which it coöperates.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

ANTOINE PADOUE FILIPPI. [L. S.]

Witnesses:
THOMAS HALE,
EUGÈNE FULLIER.