

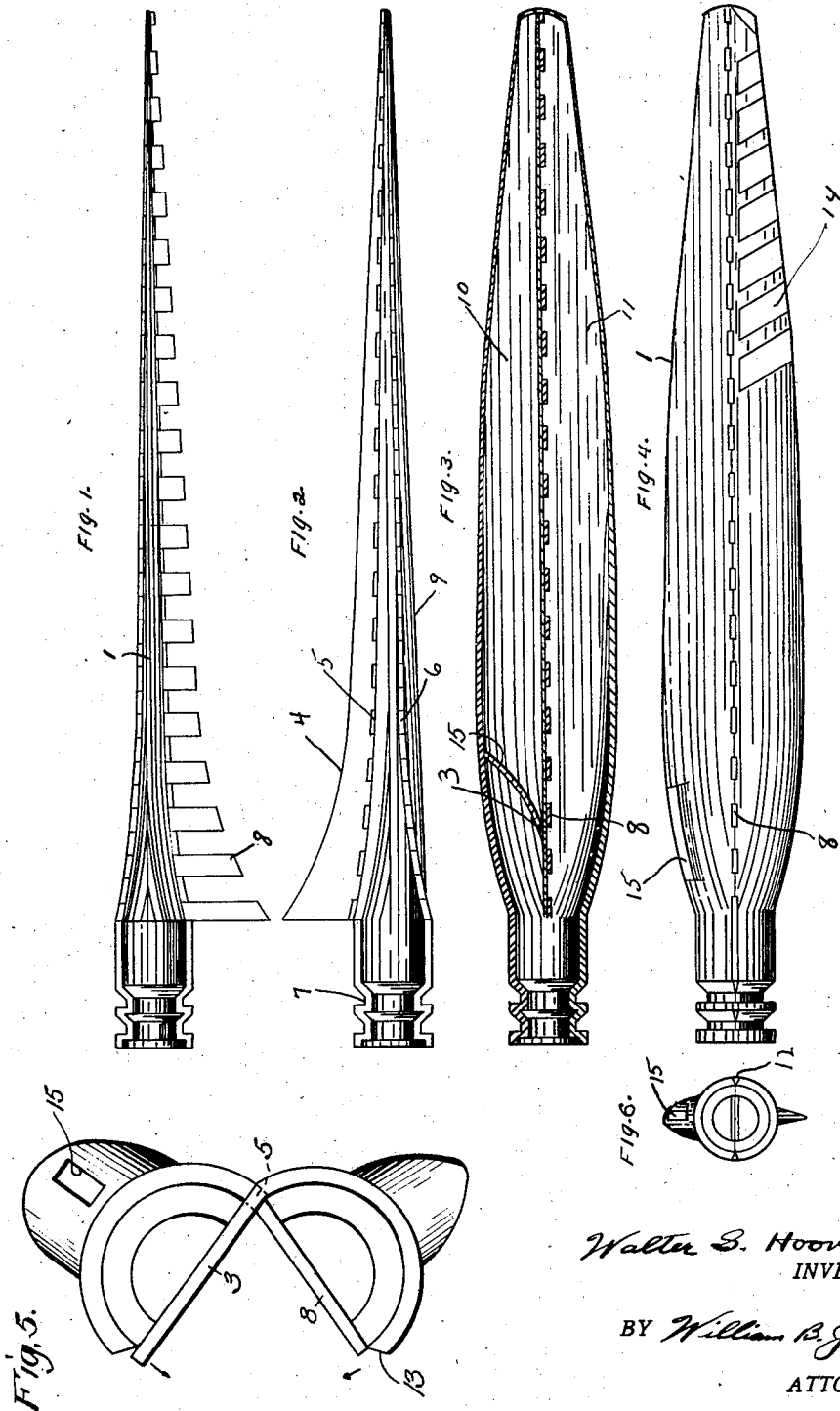
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HOLLOW PROPELLER

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## HOLLOW PROPELLER

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5 Claims. (Cl. 170—159)

This invention relates to improvements in propeller blade structures more particularly to propellers of hollow steel or duraluminum and it is among the objects thereof to provide a composite blade structure having a reinforcing strut extending transversely of the blade and in which the parts shall be firmly interlocked and secured in a manner to render the blade unbreakable at the joint.

A further object of the invention is the provision of a novel propeller design consisting of two sections one of which is provided with a reinforcing strut, and the other with fingers adapted to interlock with slots provided in the cooperating section, and which shall be adapted to have the reinforcing struts, the fingers, slots, and the camber formed by drop forge or die stamping methods either simultaneously or by a succession of operations.

A further object of the invention is the provision of hollow propeller structures in which the blade sections are divided into a plurality of compartments which may be utilized as exhaust passages communicating with scavaging slots at the trailing edge of the propeller blades, or as air intake passages communicating with air scoops provided on the leading edge of the blade, the object of the air scoops being to eliminate the use of a supercharger for aeroplane engines.

These and other objects of the invention will become more apparent from a consideration of the accompanying drawing constituting a part hereof in which like reference characters designate like parts and in which:

Figure 1 is a bottom plan view of the top section of the propeller;

Figure 2 a top plan view of the bottom or trailing section of the propeller;

Figure 3 a vertical section extending through the leading and trailing edges of the propeller blade;

Figure 4 a rear elevation of the assembled blade illustrating the air scoop and scavaging slot respectively located adjacent the hub and tip of the blade;

Figure 5 an end elevation viewed from the hub end illustrating the manner of interlocking the half section;

Figure 6 an end elevation of the assembled blade structure as viewed from the hub end thereof.

With reference to the several figures of the drawing, the structure therein illustrated comprises the two half sections generally designated by the reference characters 1 and 2, the section 2

being provided with a strut 3, the extended edge 4 of which is of the same contour as the face of the propeller blade with which it cooperates when set to its proper position.

The strut member is provided with slots 5 and the other edge of the blade section is provided with notches 6 in alinement with the slots 5 of the strut. The hub portion of the blade section is provided with grooves 7 to interlock with the hub casting (not shown) in which the propeller blades are mounted.

The half section 1 shown in Figures 1 and 4 of the drawing, is provided with fingers 8 of varying lengths corresponding to the thickness of the blade section, namely, the dimension from the edge of the notches 6 to the slots 5.

The section 1 constitutes the top or leading edge of the propeller and the section 2 the trailing edge, the section 1 having a camber 9 on its face as shown in Figure 1.

The half sections of Figures 1, 2, 4 and 5 are formed by either drop forge or die stamping operations, the strut and the camber 9 all being formed simultaneously and the interlocking fingers 8 and the half section 2 may be provided with the slots 5 and notches 6 in the die stamping operation.

The half sections 1 and 2 are assembled in the manner shown in Figure 5 of the drawing wherein the fingers 8 of the section 1 are shown disposed through the slots 5 of the section 2 and the strut 3 is shown with its outer face in abutment with the edges of the section 1.

By bending the sections in the direction shown by the arrow, the fingers 8 of section 1 will lie in the notches 6 of the edge of section 2 and permit the closing of the half sections with the fingers 8 projecting through the slot 6 with the extreme ends of the fingers contiguous with the face of the propeller blade, and so assembled the strut 3 extends transversely of the hollow blade section and divides the blade into chambers 10 and 11.

After the strut and fingers of the propeller sections have been bent to their assembled position, the open seam along the notched edge 6 of the section is welded at 12 substantially 90° from the leading and trailing edges thus assuring a strong and rigid joint at the mid section of the blade which is the point of least stress so that very little strain is acting on the joint.

Both edges of the blade are welded along the root section, namely, the hub portion to produce a strong construction.

In the welding of the joint the usual chamfer 13 may be provided as shown in Figure 6 of the

drawing in which the fused metal is deposited in forming the weld.

This design of propeller blade eliminates stresses resulting from propulsive thrusts which are not active on the welded seam and this method of interlocking the sections with the internal strut running the full length of the blade and parallel to the propulsive stresses, produces greater rigidity throughout the length of the blade.

The construction producing the above enumerated characteristics, is particularly desirable for variable pitch propellers in which the bending moments on the blades are much greater than in rigid propeller construction, also by means of the reinforcing transverse strut and the interlocking fingers, a light weight metal such as duraluminum may be utilized with safety, and steel propellers may be made to resist or stand up under increased horse power at high peripheral speeds which is the trend in modern aeroplane propulsion design. A minimum weight propeller constructed of duraluminum, also relieves the centrifugal thrust load on the propeller and is therefore greatly desired if it can be constructed with sufficient rigidity and strength.

By providing scavaging slots 14 on the trailing edge of the propeller adjacent the tip, fluttering of the blade is prevented and ice formation is reduced or eliminated.

By providing an air scoop 15 Figures 3 and 4 on the leading edge of the blade adjacent the hub end or blade root, air can be drawn into the propeller and conducted through the hub structure to the engine to take the place of a supercharger now commonly employed in aeroplanes designed for high altitude flying. Similarly, the exhaust of the engine may be conducted through the hub into the chamber 11 from which it passes through the scavaging slots 14 near the tip of the propeller.

By means of the strut 3 partitioning the blade into two chambers, both the scoops and scavaging slots may be utilized in the same propeller blade so long as provision is made for conducting the air and exhaust through the hub to separate conduits.

Although one embodiment of the invention has been herein illustrated and described, it will be evident to those skilled in the art that various modifications may be made in the details of construction without departing from the principles herein set forth.

I claim:

1. A propeller blade structure comprising a plu-

rality of longitudinal sections joined by interlocking said sections on one side substantially 90° from the leading and trailing edges of the blade and welding the other edge of the sections along their abutting faces substantially 180° from the interlocked joint.

2. A propeller blade structure comprising two longitudinal half sections formed to a leading and trailing section of predetermined shape and contour, one of said sections having fingers projecting thereon and the other of said sections having slots and notches, said sections being interlocked by disposing the fingers of one section through the slots and notches in said other section, and welding the joined sections along the open seam.

3. A propeller blade structure comprising a pair of half sections, one of which constitutes the leading edge of the propeller and the other of which constitutes the trailing edge, one of said sections being provided with fingers and the other with a strut of a width corresponding to the thickness of the hollowness of the blade, said strut having slots and the other edge of said strut section having notches, said fingers slots and notches being equally spaced and adapted to cooperate to form an interlock of the two propeller sections, said interlock sections being welded along their joined faces substantially at right angles to the leading and trailing edges of the blade.

4. A propeller blade structure comprising a pair of half sections one of which is provided with fingers adapted to extend the full width of the section, and the other of which is provided with interlocking slots and notches spaced to receive said fingers, said notches functioning to project the ends of the fingers flush with the face of the blades whereby they are contiguous with the outer face.

5. A propeller blade structure comprising hollow metallic members formed of half sections which are joined by interlocking said sections and by welding the same along their seams, said sections being formed to have the seam disposed at right angles to the leading and trailing edges of said propellers and being further provided with an integrally formed strut extending longitudinally of the blade whereby the blade is divided into separate compartments one of said compartments being provided with slots at the trailing edge of the blade tip for routing fumes from the hub section and the other of said compartments having a scoop at the leading edge adjacent the hub end of the blade.

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