

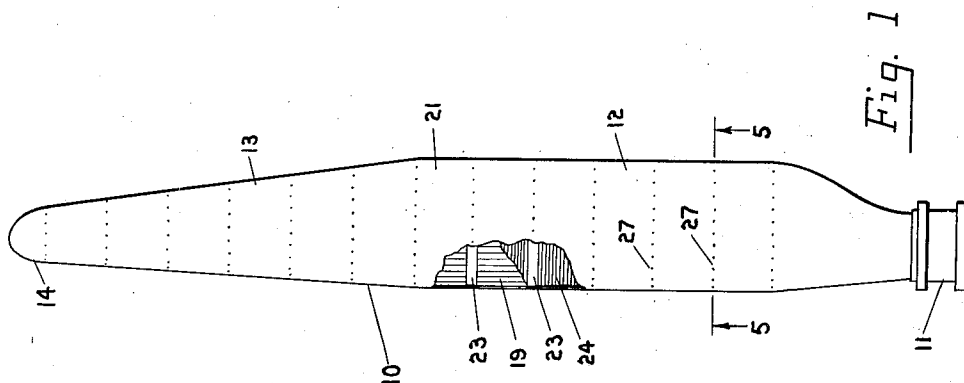
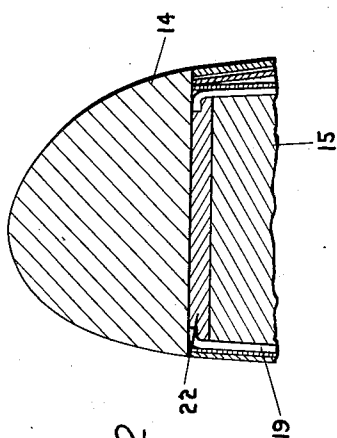
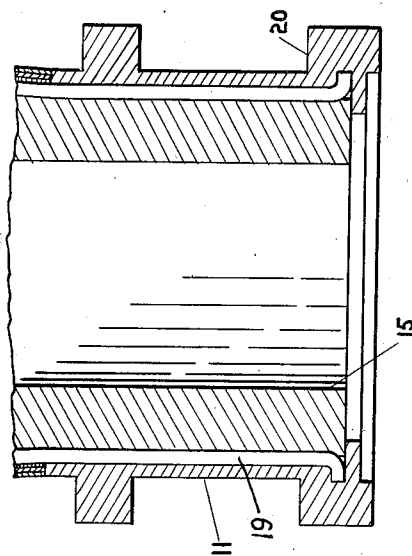
Feb. 13, 1940.

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WIRE PROPELLER BLADE

2,189,785

Filed Feb. 8, 1938

2 Sheets-Sheet 1



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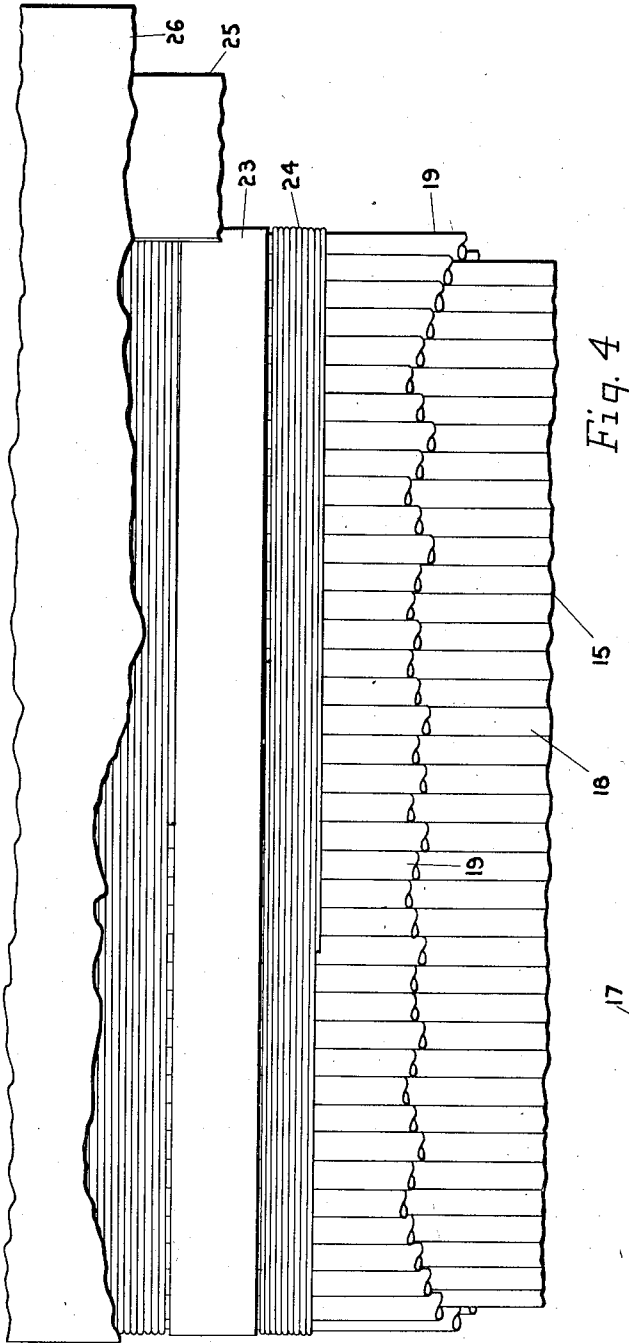


Fig. 4

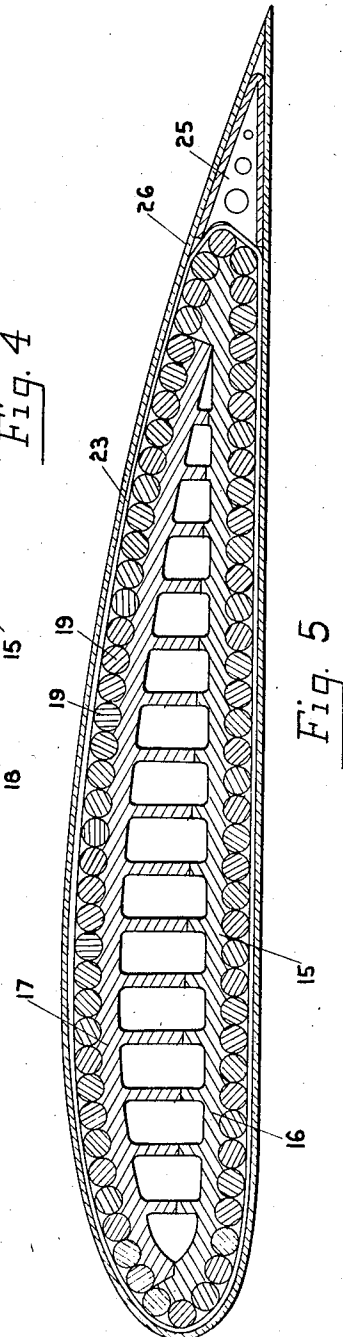


Fig. 5

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UNITED STATES PATENT OFFICE

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WIRE PROPELLER BLADE

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Application February 8, 1938, Serial No. 189,327

3 Claims. (Cl. 170—159)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

This invention relates to a wire propeller blade, and has for an object to provide an improved propeller blade especially intended for use in aircraft, but equally useful elsewhere wherever saving in weight is important, which propeller blade has a thin covering of wire to take up all the propeller stresses, with the exception of the rigidity of the blade at rest.

A further object of this invention is to provide an improved propeller blade especially intended for use in large sizes on large aircraft, which will be of lighter construction in large sizes than is possible with any other material.

Further advantages of the propeller of this invention are that: it permits a more uniform determination of stresses in wires in wire propeller structure than of fibre stresses in steel structure; it provides a propeller of the lightest construction in large propellers especially, because certain sections do not have to be made over-size and over-weight to allow for undetermined stresses; an interior supporting form can be cast as a very light structure so that the propeller blade becomes almost a thin outer shell of steel wire.

Further advantages are that, due to the high tensile properties of drawn steel wire, the size of the wire used will give an over all weight saving over hollow steel propellers. The wire propeller because of its inherent flexibility between stressed members is better able to assume the varieties of loading stresses than a complex form of vibrations usually to be contended with. It is less liable to fatigue or serious fracture, due to overstressing of one or more sections. It is less liable to complete failure, due to damage from machine gun fire or other causes. It is well protected from corrosion by the use of a stainless steel envelope, and therefore has a longer life than propellers in current use. There are no particular limitations as to the size of blades which may be manufactured for all sizes now in prospect or contemplated. Large production without expensive equipment is possible because of the built-up structure including the cast interior.

With the foregoing and other objects in view, the invention consists in the construction, combination and arrangement of parts hereinafter described and illustrated in the drawings, in which,

Fig. 1 is an elevational view of a propeller blade of this invention partly in section;

Fig. 2 is a fragmentary sectional view of the blade tip of this invention;

Fig. 3 is a fragmentary sectional view of the blade hub of this invention;

Fig. 4 is a top elevational view of a fragment of the blade with each of the layers successively broken away; and

Fig. 5 is a sectional view on line 5—5 of Fig. 1.

There is shown at 10 the propeller blade of this invention, which includes the blade hub portion 11, a blade portion of uniform width 12, and a blade portion of progressively narrowing taper 13 terminating in a blade tip portion 14. This blade 10 includes a cast form or skeleton 15, which may be solid in small sizes, but will preferably be hollow, as shown, for use in large sizes, and may include two cooperating complementary sections 16 and 17. This skeleton 15 will be cast of a light metal such as aluminum or magnesium, or their alloys. Such materials meet the main requirement that the skeleton should have sufficient elasticity under a compressive load to absorb vibrations, permit some bending, and allow for flexures in torsion. The outer surface of the skeleton 15 is cast in corrugations 18 which are arcs of a circle of a radius corresponding to the radius of tensile steel wires 19 which are laid therein. The steel wires 19 are of uniform diameter throughout the blade portion 12, and at the hub end 11 they are bent outwardly and locked in position under a steel hub barrel 20. In the blade portion 13 the radius of the corrugations 18 progressively diminishes as it approaches blade tip 14, the wires 19 throughout this section tapering uniformly from their full radius at the meeting line 21 between the blade portions 12 and 13 to one-half the radius at the blade tip 14. The ends of the wires 19 are then turned in and locked in the steel tip 14 by being spot welded to the end plate 22, to which the blade tip 14 is fixed.

All the wires are given an initial tensile stress before being secured in position, and a plurality of steel securing bands 23 uniformly spaced along the length of the blade 10 are tightly drawn around the wires and spot welded in place. Between each of these steel bands 23 piano wire 24, of such a diameter that it makes a flush surface with the steel bands, is tightly wound around the wires 19, the wrapping being done by machine to give a uniform tension stress to each turn of the wire. Each turn of the wire is spot welded to its neighbor at two or more points to prevent unraveling in case of injury to one turn. The wire structure is then treated to prevent corrosion and a tail section 25 added to complete the outline of the blade.

Next a thin, hollow stainless steel cover 26 is

pulled tightly over the wire form and the tail section, and is spot welded as at 27 to the steel bands 23. This cover gives the blade a smooth, clean appearance and protects the interior from corrosion or superficial damage, and can be replaced when it becomes worn or damaged.

Other modifications and changes in the proportions and arrangements of the parts may be made by those skilled in the art without departing from the nature of the invention, within the scope of what is hereinafter claimed.

The invention described herein may be manufactured and used by or for the Government of the United States for governmental purposes without the payment of any royalties thereon or therefor.

Having thus set forth and disclosed the nature of this invention, what is claimed is:

1. A wire propeller blade comprising a light cast metal skeleton of propeller blade contour having a plurality of corrugations longitudinally thereof, a plurality of tensile wires laid in said corrugations and secured at each end of the blade, a plurality of transverse bands spaced along the blade over said longitudinal wires, and a plurality of wire wrappings about said longitudinal wires between said spaced steel bands,

each turn of the transversely wrapped wire being spot welded to each adjacent turn.

2. A wire propeller blade comprising a light cast metal skeleton of propeller blade contour having a plurality of corrugations longitudinally thereof, a plurality of tensile steel wires laid in said corrugations and secured at each end of the blade, a plurality of transverse steel bands spaced along the blade over said longitudinal wires, a plurality of wire wrappings about said longitudinal wires between said spaced steel bands, a metal cover drawn over the foregoing assembly and spot welded to said steel bands to secure it in position.

3. A wire propeller blade comprising a light cast metal skeleton of propeller blade contour having a plurality of corrugations longitudinally thereof, a plurality of tensile steel wires laid in said corrugations and secured at each end of the blade, a plurality of transverse steel bands spaced along the blade over said longitudinal wires, a plurality of wire wrappings about said longitudinal wires between said spaced steel bands, a tail section along one edge of the blade, and a metal cover drawn over the foregoing assembly and spot welded to said steel bands to secure it in position.

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