

Nov. 11, 1941.

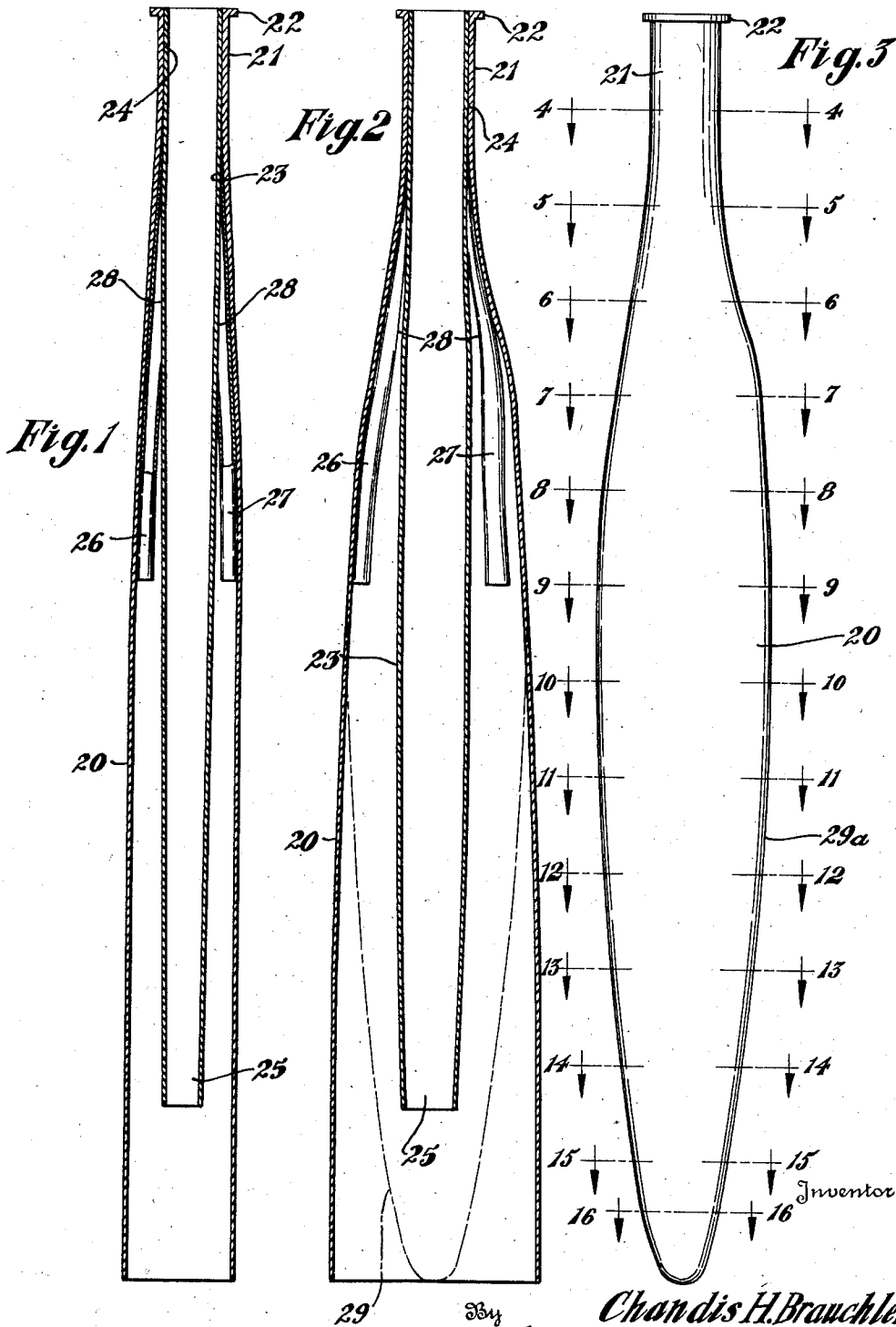
C. H. BRAUCHLER

2,262,163

PROPELLER BLADE

Filed May 25, 1939

2 Sheets-Sheet 1



By *Chandis H. Brauchler*
Freese & Bishop Attorneys

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2 Sheets-Sheet 2

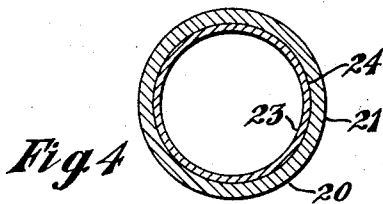


Fig. 4

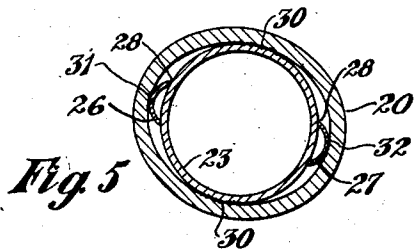


Fig. 5

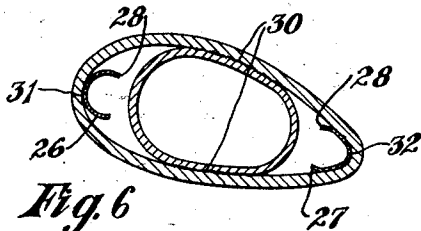


Fig. 6

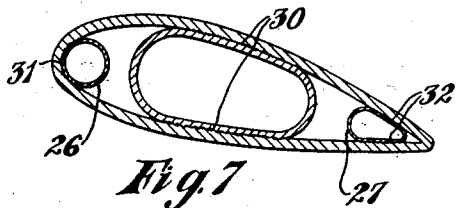


Fig. 7

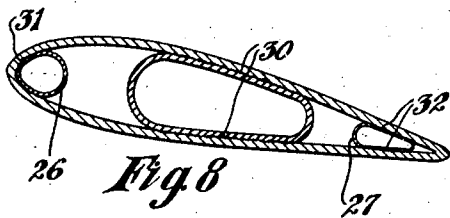


Fig. 8

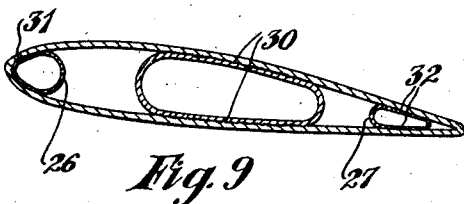


Fig. 9

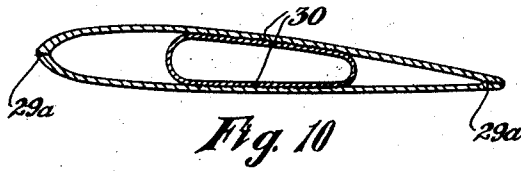


Fig. 10

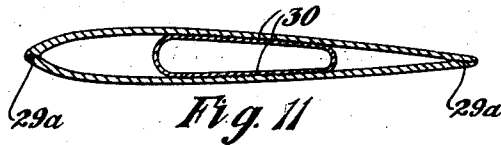


Fig. 11

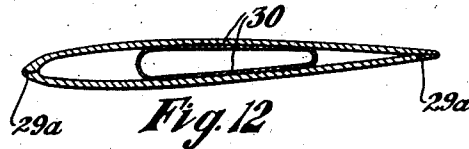


Fig. 12



Fig. 13

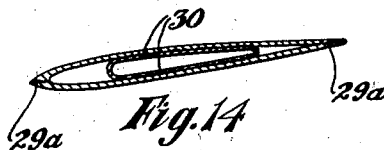


Fig. 14



Fig. 15



Fig. 16

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UNITED STATES PATENT OFFICE

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PROPELLER BLADE

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Application May 25, 1939, Serial No. 275,633

4 Claims. (Cl. 170-159)

The invention relates to propellers especially designed for use upon air craft, and more particularly to hollow metal propeller blades and the method of making the same.

Hollow metal propeller blades have been made and have been found to be stronger than the solid blades of duralumin and similar light weight metals and alloys, while at the same time being lighter in weight.

Owing to the considerable vibration set up in such propeller blades when in operation the present invention contemplates a reinforced hollow metal blade so constructed that it will strengthen the blade without materially adding to the weight thereof.

This may be accomplished by locating a metal tube within the hub portion of the blade and tapered toward the tip thereof forming a central longitudinally disposed reinforcing tube through the blade.

The edge portions of the hollow blade may be further reinforced by locating smaller metal tubes within the tubular blade adjacent to the edge portions thereof.

Another object of the invention is the method by which the improved reinforced hollow blade is made.

The invention may be accomplished in the manner hereinafter described and illustrated in the accompanying drawings in which

Figure 1 is a longitudinal sectional view through a tubular blank for forming a hollow metal blade with the reinforcing tubes pressed therein;

Fig. 2, a similar view of the partly completed product after the same has been pressed or forged to the desired cross-sectional shape;

Fig. 3, an elevation of the completed blade; and

Figs. 4 to 16, inclusive, are transverse sectional views taken on the lines 4-4 to 16-16, inclusive, Fig. 3, showing the cross-sectional shapes of the completed blade at spaced intervals from the hub and to the tip end of the blade.

Similar numerals refer to similar parts throughout the several views.

In making the improved propeller blade a metal tube 20, preferably a seamless steel tube, is reduced to the desired finished diameter at its hub end, as indicated at 21, by forging or the like, a collar 22 being up set therein for connecting the blade to the hub in usual and well-known manner.

The diameter of the tube 20 is such that when the tube is forged or otherwise formed to the finished cross-sectional shape of the propeller blade,

it will be of proper cross-sectional shape from the hub end to substantially the middle portion of the blade.

For the purpose of reinforcing the blade, a smaller tube 23, tapered from one end toward the other, and of proper diameter at its larger end to snugly fit within the hub end portion 21 of the blank shown in Fig. 1, as indicated at 24, is inserted into the tube blank 20 and the larger end thereof may be welded within the hub portion 21 of said tube blank with the smaller end 25 terminating at a point spaced from the opposite end of the tube blank 20, as shown in Fig. 1.

In some cases it may be desirable to reinforce the edge portions of the blade in which case smaller tubes 26 and 27 may be located within the tube blank 20 at opposite sides of the reinforcing tube 23 and the ends of these smaller tubes extending into the tapered end portion of the tube blank 20 may be cut off angularly, as indicated at 28, in order that they may be extended into the reduced tapered hub end portion of the blade.

The partly completed product, as shown in Figure 1, is then forged or pressed to substantially the desired cross-sectional shape of the finished blade, assuming the shape shown in Fig. 2, flattening the tube blank 20, and the reinforcing tubes 23, 26 and 27 to the various elliptical cross-sectional shapes shown in Figs. 4 to 16, inclusive.

In order to produce the desired contour of the blade the surplus metal of the deformed tube blank 20, as shown in Fig. 2, is then sheared or trimmed off, along the broken line 29 indicated on said figure, and the sheared edges are then welded together, as at 29a, forming the finished blade shown in Fig. 3.

The reinforcing tubes 23, 26 and 27 may be connected to the tube blank 20, as by resistance welding, as shown at 30, 31 and 32, respectively.

As shown in the cross-sectional views, Figs. 4 to 16, inclusive, the hub end portion 21 of the tube 20 remains circular while the tube 20 from this point to the tip of the blade is increasingly flattened passing through the various elliptical cross-sectional shapes shown from Fig. 5 to Fig. 9, inclusive, into which the tube 20 is deformed, and then through the additional increasingly flatter elliptical shapes from Fig. 10 to Fig. 16, inclusive, where the tube 20 has been sheared along the line 29 and the edges welded together as at 29a.

The smaller tubes 26 and 27 are also increasingly flattened into elliptical shape from the point at which the section Fig. 5 is taken to

the point at which the section Fig. 9 is taken, these smaller tubes having the cross-sectional shapes shown at the several stations between these points.

With this construction, the propeller blade is reinforced through its longitudinal center from the hub end almost to the tip by means of the central tube 25, which is deformed throughout its length to conform to the cross-sectional shape of the blade from hub to tip, thus, strengthening the blade throughout its length against the vibration caused by rapid rotation of the propeller when in use.

Furthermore, the edge portions of the blade are reinforced throughout a portion of its length by the small tubes 26 and 27 located within the edge portions of the hollow blade and deformed to conform to the cross-sectional shape thereof.

I claim:

1. A hollow metal propeller having a substantially cylindric hub end portion and being of increasingly flatter elliptic cross-sectional shape from the hub end toward the tip, a reinforcing metal tube located through the longitudinal center of the hollow blade and having a cylindric hub end portion snugly fitting within the cylindric hub end portion of the blade and being of increasingly flatter elliptic cross-sectional shape toward its other end to conform to the cross-sectional thickness of the blade, and smaller reinforcing tubes located within the edge portions of the hollow blade and deformed to correspond to the cross-sectional shape of the blade.

2. A hollow metal propeller having a substantially cylindric hub end portion and being of increasingly flatter elliptic cross-sectional shape from the hub end toward the tip, a reinforcing metal tube located through the longitudinal center of the hollow blade and having a cylindric end portion snugly fitting within the cylindric

hub end portion of the blade and being tapered and of increasingly flatter elliptic cross-sectional shape toward its other end to conform to the cross-sectional thickness of the blade, and smaller reinforcing tubes located within the edge portions of the hollow blade and deformed to correspond to the cross-sectional shape of the blade.

3. A hollow metal propeller comprising an outer sheath of substantially elliptic cross-sectional shape throughout the greater portion of its length and being of increasingly flatter elliptic cross-sectional shape toward the tip end, and a reinforcing metal tube located through the longitudinal center of the outer sheath and having a cylindric hub end portion, said tube being of increasingly flatter elliptic cross-sectional shape toward the tip end of the blade, the sides of the tube being connected to the adjacent side portions of the outer sheath and the edges of the tube being spaced inward from the edges of the outer sheath and having a considerably greater radii than the corresponding edge portions of the outer sheath.

4. A hollow metal propeller comprising an outer sheath of substantially elliptic cross-sectional shape throughout the greater portion of its length and being of increasingly flatter elliptic cross-sectional shape toward the tip end, and a reinforcing metal tube located through the longitudinal center of the outer sheath and having a cylindric hub end portion, said tube being tapered and of increasingly flatter elliptic cross-sectional shape toward the tip end of the blade, the sides of the tube being connected to the adjacent side portions of the outer sheath and the edges of the tube being spaced inward from the edges of the outer sheath and having a considerably greater radii than the corresponding edge portions of the outer sheath.

CHANDIS H. BRAUCHLER.