

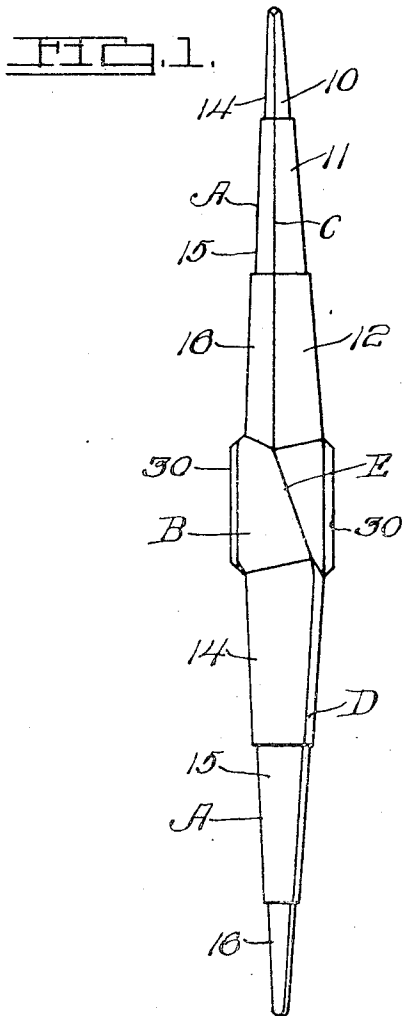
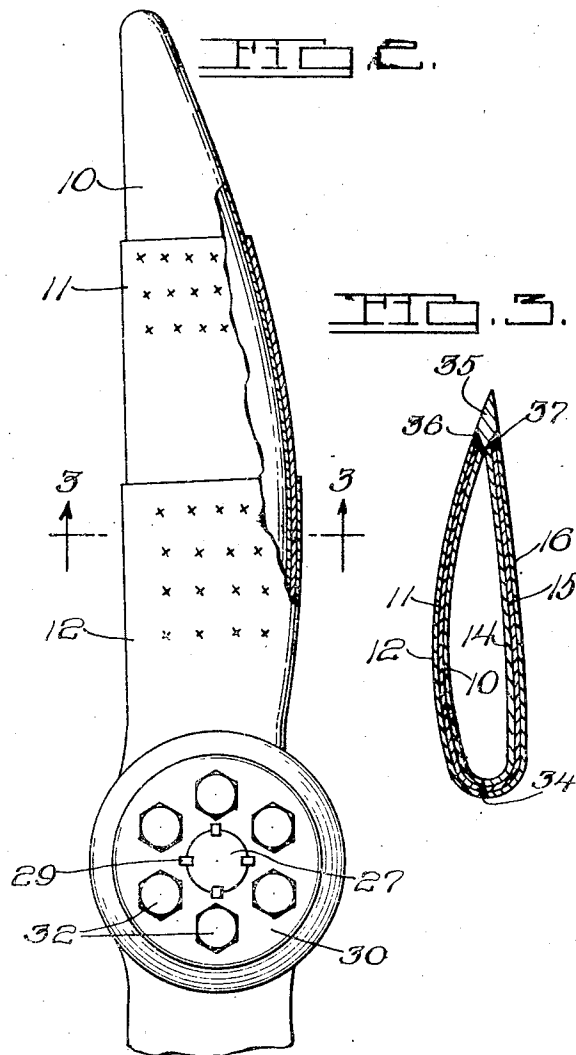
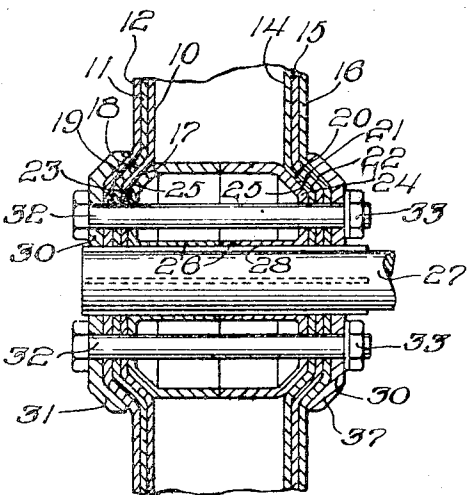
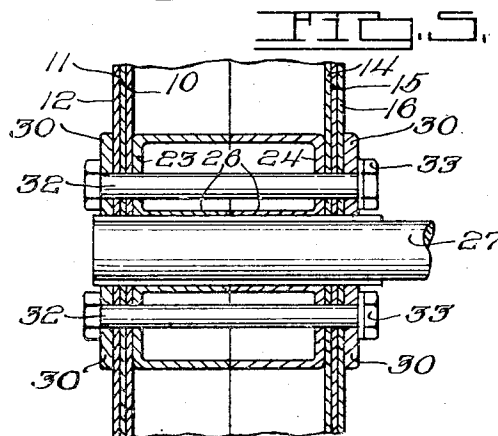
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PROPELLER

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PROPELLER

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This invention relates to propellers, and particularly to propellers for aircraft and the like, the principal object being the provision of a new and novel construction formed from sheet metal into a hollow structure of light weight and great strength.

Another object is to provide a propeller initially formed in two halves and thereafter secured together by welding, so as to form an integral structure.

Another object is to provide a hollow metallic propeller initially formed in two halves and thereafter secured together by welding, each half extending the full length of the propeller and being built up by securing together successively shorter overlapping sheet metal stampings effecting a laminated structure.

Another object is to provide a propeller as above described in which each of the half portions is built up by securing the successively shorter portions to the exterior of the longest portion in succession, as by welding them thereto.

Another object is to provide a new and novel hub construction for a sheet metal propeller.

A further object is to provide a new and novel method for forming the trailing edge of a sheet metal propeller.

The above being among the objects of the present invention, the same consists in certain novel features of construction and combinations of parts to be hereinafter described with reference to the accompanying drawings, and then claimed, having the above and other objects in view.

In the accompanying drawings which show a suitable embodiment of the present invention, and in which like numerals refer to like parts throughout the several different views;

Fig. 1 is an edged view of a propeller.

Fig. 2 is an enlarged fragmentary partially broken face view of the propeller shown in Fig. 1.

Fig. 3 is an enlarged sectional view taken on the line 3—3 of Fig. 2.

Fig. 4 is an enlarged vertical sectional view

taken through the hub of the propeller shown in Figs. 1 and 2 as on the axis thereof.

Fig. 5 is a modification of the construction shown in Fig. 4.

The present invention deals with propellers formed of sheet metal and particularly to those types thereof which are of hollow construction and adapted for use in connection with aircraft work.

In accordance with the present invention, I form a propeller of the type described by initially forming the propeller in two halves, each half extending the full length of the propeller and each constituting one face of both blades thereof extending from the leading edge of each blade to the trailing edge of each blade, and being built up of successively shorter superimposed sheet metal sections, each of which is provided with a portion co-operating with the corresponding portion of the other half to form a hub structure.

Referring to the accompanying drawings, I show a propeller having two oppositely disposed blades indicated generally as A, and a hub indicated generally as B, each blade being provided with a leading edge C and a trailing edge D. As previously noted, the propeller as a whole is formed in two main halves, which when assembled, have a line of juncture along the leading and trailing edges respectively of such blades, the line of juncture at the hub extending from the leading edge of one blade to the trailing edge of the opposite blade along a line such as E.

Referring to Figs. 2, 3 and 4, it will be noted that each half is made up of a plurality of initially separately formed sheet metal members, shown in the drawing as three but which may obviously be of any desired number to obtain the strength desired. These members may be made up from sheet metal of uniform and relatively light gauge. Referring to the upper half in Fig. 2, the inner of these members 10 is formed to the shape of the corresponding half of the completed propeller from one end thereof to the other, that is, it is formed to the desired shape and contour as well as pitch for the blades A, and to the desired shape and contour for the corresponding portion of the hub B, its mar-

gins of course being located at the corresponding leading and trailing edge of each blade and extending along the line E at the hub. A second member such as 11 similarly
 5 formed from sheet metal but stopping short of each end of the propeller is then placed over the exterior of the first member 10 and secured thereto, preferably by spot welding, although other means such as riveting, acet-
 10 ylene or electric welding may be employed. The member 11 of course fits snugly over the member 10 so as to nest the member 10 therein, and its margins extend to the corresponding margins of the member 10. A
 15 third member 12 is then applied to the exterior surface of the member 11, it being still shorter than the member 11 and being applied and secured thereto in the same manner that the member 11 is applied to the mem-
 20 ber 10. Other such sections may be similarly applied if desired. The margins of these members are preferably located as indicated in Fig. 3.

The opposite half of the propeller is built
 25 up of members 14, 15 and 16 in exactly the same manner as the members 10, 11 and 12, the member 14 corresponding in length to the member 10, the member 15 being the same length as the member 11, and the member 16
 30 being the same length as the member 12, the only difference being that the shape of the members 14, 15 and 16 will be somewhat different than the shape of the members 10, 11 and 12 due to the fact that the former constitute the pressure faces of the blades, while
 35 the latter constitute the reversed faces of the blades.

All of these members are preferably formed at the hub portion thereof as indicated in Fig. 4, that is, the member 10 is
 40 formed to provide an outwardly projecting cup-shaped portion 17, the member 11 with a similar cup-shaped portion 18 in which the portion 17 nests, and the member 12 with a
 45 similarly cup-shaped portion 19 in which the portion 18 nests. The members 14, 15 and 16 are provided with similarly nested cup-shaped portions 20, 21 and 22 respectively. The hub portion thus described is preferably
 50 reinforced as follows:

Two oppositely disposed cup-shaped members 23 and 24 having bevelled faces
 55 adapted to be received against the inner faces of the cup-shaped portion 17 of the members 10 and 14, and each having an inwardly turned sleeve portion 26, are positioned between the two halves of the propeller during assembly. These members 23 and 24
 60 unite to provide a hollow hub structure in which a drive shaft such as 27 may be received. Key ways such as 28 may be formed in the sleeve portions 26, which abut to form a continuously walled opening, to receive
 65 keys such as 29 for securing the propeller against rotation to the shaft 27.

In practice, the two halves made up of sheet metal parts secured together as previously described are placed together with their corresponding edges in matching relation-
 70 ship and with the hub members 24 and 25 in position between them. Clamping plates such as 30 having inwardly turned ends 31 adapted to engage the outer side surfaces of the cup-shaped portions 19 and 22 are then
 75 placed over the ends of the hubs, and bolts such as 32 are passed through the hub portion from side to side and are drawn up by means of nuts such as 33. The corresponding
 80 edges of the blade halves are welded along the leading edge as at 34 in Fig. 3, and a diamond shaped strip such as 35, formed to effect a relatively sharp trailing edge, is positioned as indicated in Fig. 3 and welded
 85 to the two halves as at 36 and 37 respectively. The line of junction E between the two halves at the hub portion is then welded, thus completing the welding of the entire construction, after which the welded portions thereof may be finished as desired.

I am aware that heretofore it has been pro-
 90 posed to form a propeller in a similar manner, except that the successively shorter portions of the blade structure are positioned on the inside of the blade. That construction
 95 gives an unbroken exterior surface to the blade, but I have found that the very slight breaks in the surface of the present propeller produced where the end of one of the portions 11 or 12 joins its adjacent portion, has substantially no effect on the efficiency of the
 100 propeller, and furthermore, by placing the successively shorter portions upon the exterior of the blade, it is possible to complete the final welding with much more accuracy than is possible in the above mentioned construction, and at the same time a stronger structure results. The provision of the trailing
 105 edge member 35 aids in providing a weld of great strength at the trailing edge, as well as one that is easy and economical to produce, and further results in a construction that does not tend to promote turbulence of the air at the trailing edge in operation.

The construction described at the hub is very desirable in that the members 23 and 24
 115 abut against each other, and the various blade portions are thus clamped between the portions 23 or 24 and the corresponding clamping members 30, the cup-shaped formation of the various members serving to locate
 120 the various blade and hub portions with respect to each other, and further serving upon tightening of the nuts 33 to draw all of the parts into more intimate relationship with
 125 each other.

It is of course not essential that the particular hub construction shown in Fig. 4 be employed, as it is apparent that other hub constructions may be found satisfactory with
 130

the particular construction of blades described.

It will also be apparent that the hub construction may be modified as indicated in Fig. 5, and in which the hub portions of the blade parts are not cupped as in Fig. 4, and the members 23 and 24 and clamping members 30 are modified accordingly.

These and other formal changes may be made in the specific embodiment of the invention described without departing from the spirit or substance of the broad invention, the scope of which is commensurate with the appended claims.

What I claim is:

1. A screw propeller comprising, in combination, a pair of continuous halves integrally connected together to form a hollow structure, each of said halves being formed of sheet metal and providing corresponding faces of opposite blades, said sheet metal being outwardly cupped at the hub portions thereof to form conical seats, and said cupped portions being clamped between a spacer member and a pair of clamping plates having conical surfaces complementary to said seats.

2. A screw propeller blade formed of two sheet metal halves integrally joined together along the leading edge of said blade, the sheet metal of said halves substantially contacting at the trailing edge of said blades with the rear edges of said sheets forming a re-entrant angle, and a knife edged member having adjacent faces disposed at a lesser angle with respect to each other than said re-entrant angle welded to said edges of said sheets and forming the trailing edge of said blade.

3. A screw propeller blade formed of two sheet metal halves integrally joined together along the leading edge of said blade, the adjacent rear edge corners of said halves substantially contacting with each other, and a diamond shaped strip disposed in parallel relation to said rear edges of said halves and having its forward faces welded to said rear edges and providing a sharp trailing edge for said blade.

4. A screw propeller including a hollow sheet metal structure formed of a relatively thin continuous sheet metal base structure of the same length as the completed propeller and formed to the shape of the final product, and a plurality of sheet metal members applied to the exterior of said base structure, each of said members including co-operating halves equally disposed on opposite sides of the hub portion of said base member and completely enclosing that portion of said base member disposed between the opposite ends of said members.

5. A screw propeller including a hollow sheet metal structure formed of a relatively thin continuous sheet metal base structure

of the same length as the completed propeller and formed to the shape of the final product, and a plurality of superposed sheet metal members externally applied to said base member, each of said members comprising a pair of cooperating halves conforming in shape to the corresponding portion of said base member and completely enclosing that portion of said base member extending between the ends of said members.

6. A screw propeller including a hollow sheet metal structure formed of a relatively thin continuous sheet metal base structure of the same length as the completed propeller and formed to the shape of the final product, and a plurality of superposed sheet metal members externally applied to said base member, each of said members comprising a pair of cooperating halves conforming in shape to the corresponding portion of said base member and completely enclosing that portion of said base member extending between the ends of said members, and said members being successively shorter in length from the surface of said base member outwardly.

7. A screw propeller including a base portion formed of a pair of separately formed continuous halves welded directly together at their leading edges and forming a hollow structure, each of said halves being formed of sheet metal and providing corresponding faces of opposite blades, and a plurality of successively shorter sheet metal laminations secured to the outer surfaces of said base portion and completely enclosing the corresponding portions of said base portion between them, each of said laminations including a pair of members welded together along the line of weld between said halves of said base portion at the leading edges of said propeller.

8. A screw propeller including a base portion formed of a pair of separately formed continuous halves welded directly together at their leading edges and forming a hollow structure, each of said halves being formed of sheet metal and providing corresponding faces of opposite blades, and a plurality of successively shorter sheet metal laminations secured to the outer surfaces of said base portion and completely enclosing the corresponding portions of said base portion between them, each of said laminations including a pair of members welded together along the line of weld between said halves of said base portion at the leading edges of said propeller, and a knife-edged member disposed at the trailing edges of each blade of said propeller to effect a sharp trailing edge to said blades and being welded to the corresponding halves of said base member and laminations whereby to secure the trailing edges thereof together.

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