Sept. 12, 1933. C. A. BRAUCHLER 1,926,428

SEPARABLE BLADE PROPELLER

Filed Nov. 2, 1931 4 Sheets-Sheet 1

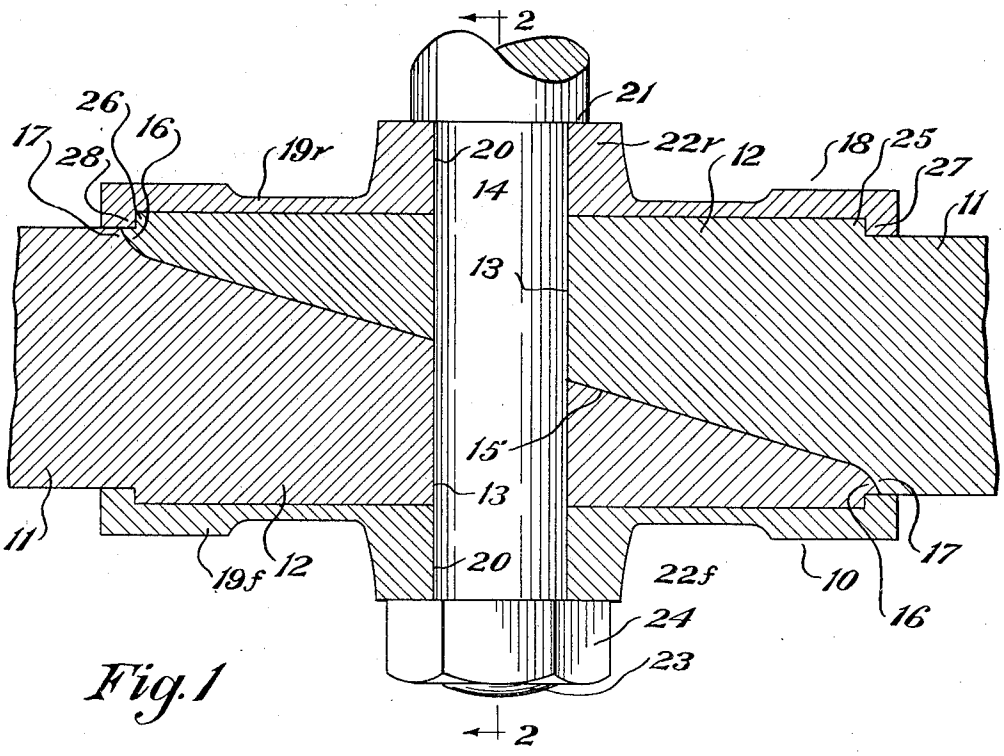


Fig. 1

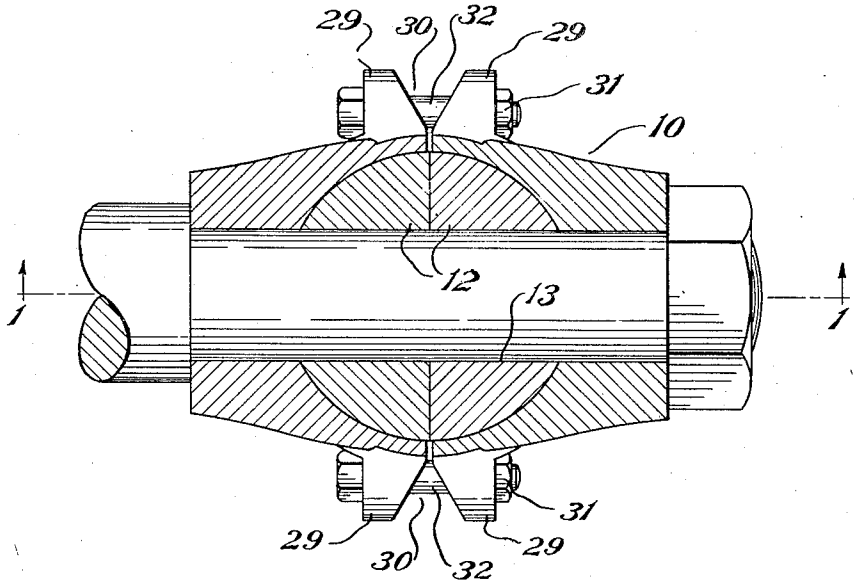


Fig. 2

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SEPARABLE BLADE PROPELLER

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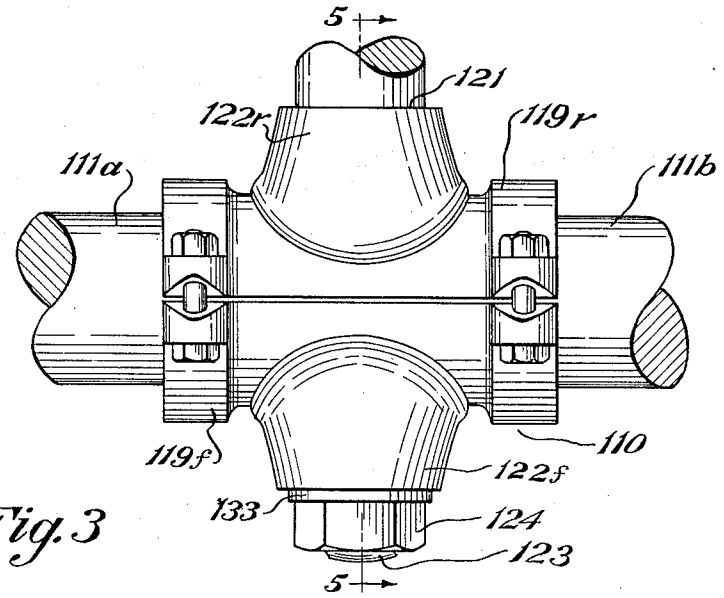


Fig. 3

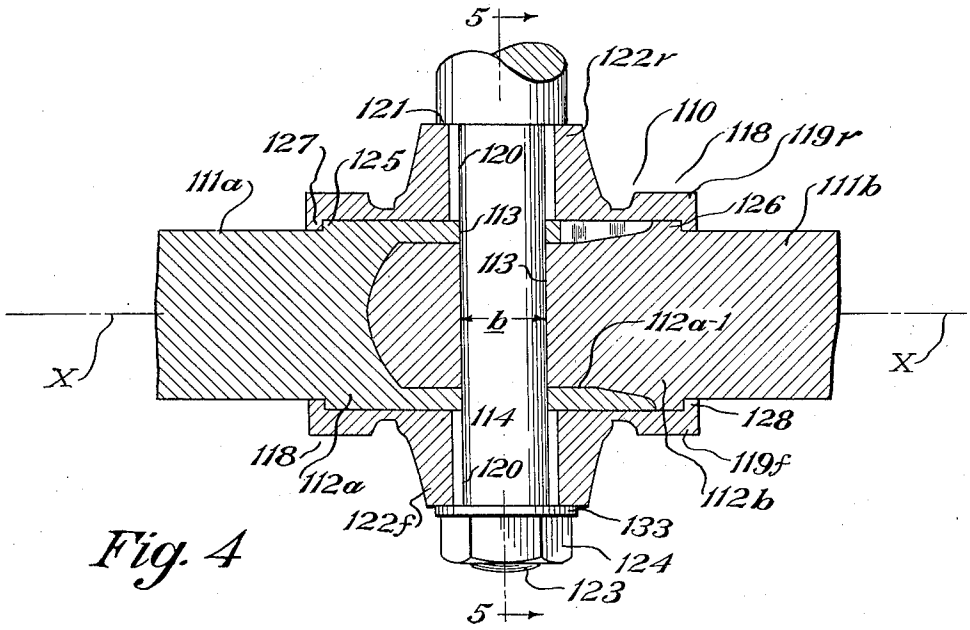


Fig. 4

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SEPARABLE BLADE PROPELLER

Filed Nov. 2, 1931 4 Sheets-Sheet 3

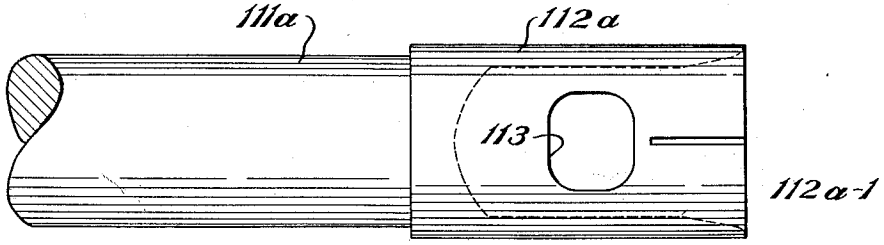


Fig. 6

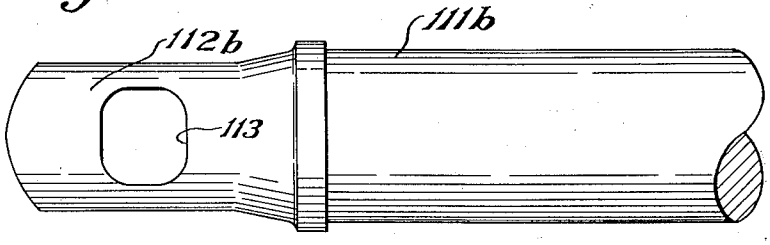


Fig. 7

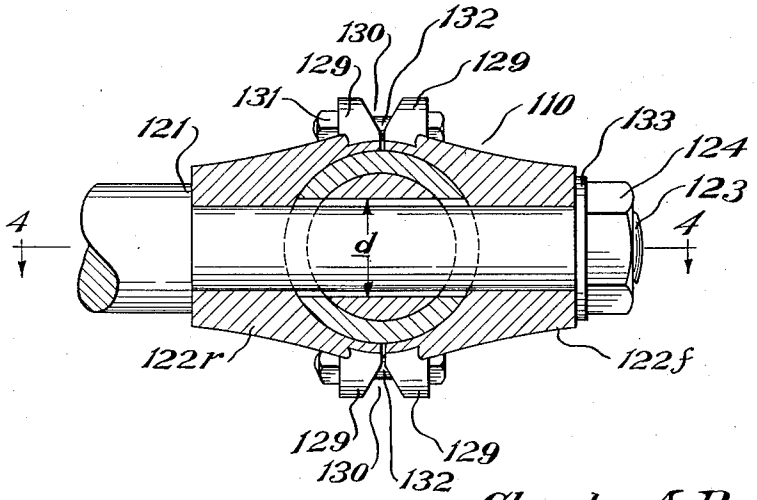


Fig. 5

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Sept. 12, 1933. C. A. BRAUCHLER 1,926,428

SEPARABLE BLADE PROPELLER

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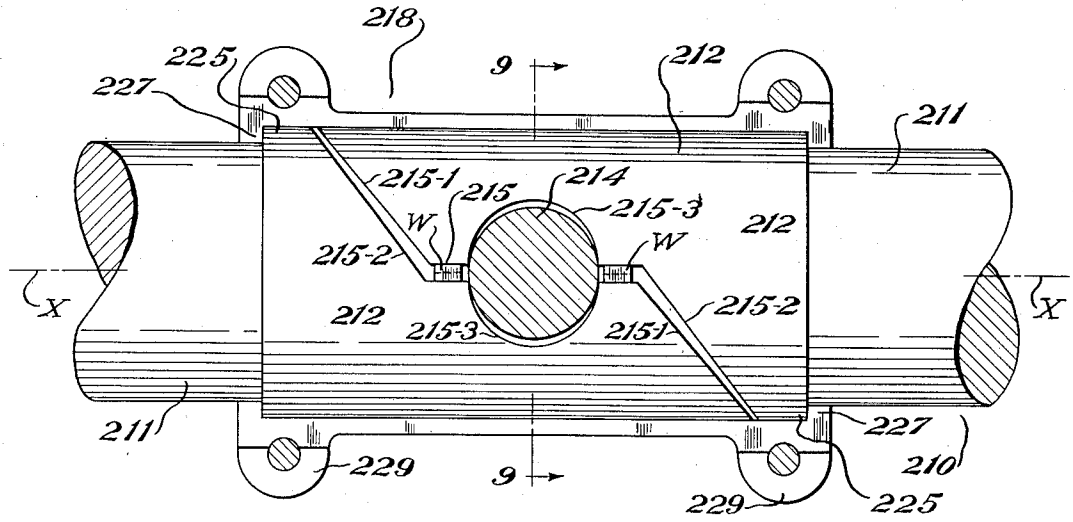


Fig. 8

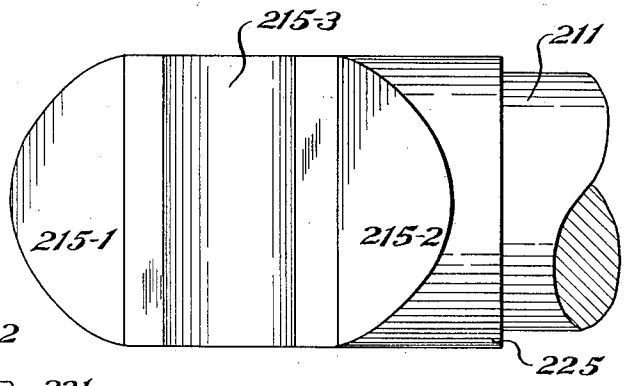


Fig. 10

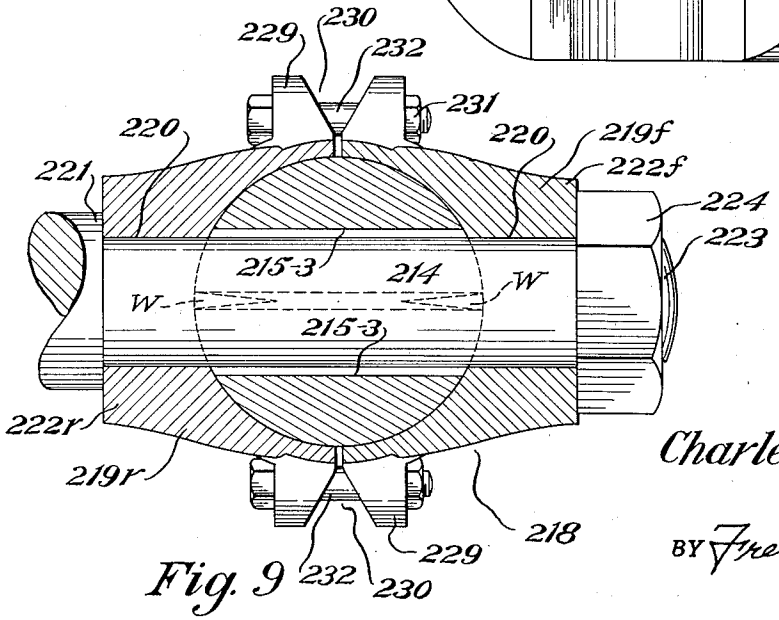


Fig. 9

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Patented Sept. 12, 1933 1,926,428

UNITED STATES PATENT OFFICE

1,926,428

SEPARABLE BLADE PROPELLER

Charles A. Brauchler, Canton, Ohio

Application November 2, 1931. Serial No. 572,477

12 Claims. (Cl. 170—173)

The invention relates to propellers particularly adapted for aeronautical use, and more particularly to that type of propeller in which the blades are separate units mounted upon the shaft.

Subject matter disclosed but not claimed herein has been made the subject of my copending application for Propellers, filed November 2, 1931, Serial No. 572,476.

It is common practice in such propellers to provide a hub arranged to be mounted upon the shaft and having radially disposed sockets into which the shank ends of the blades are inserted and clamped.

Such propellers are rotated at high speed, and consequently there are centrifugal forces set up of substantial magnitude which tend to pull the blades out of the sockets in the hub.

One object of the present improvements is to provide a novel construction and arrangement for a propeller having separable blades, each of which includes an integral hub portion arranged to be mounted upon and engaged by the shaft, thus eliminating the possibility of disengaging the blade from the hub by centrifugal action.

A further object of the present improvements is to provide a novel construction and arrangement for a variable pitch propeller having separable blades, each of which includes an integral hub portion and arranged to be mounted upon and engaged by the shaft.

The above and other objects may be attained by constructing a hub portion upon the shank end of each blade, and providing an opening in each hub portion for receiving and engaging the shaft, adjustable means being provided for engaging the blades and the shaft, and the blades being preferably adjustable for varying the pitch of the propeller.

Embodiments of the invention are illustrated in the accompanying drawings, in which

Figure 1 is a fragmentary top plan sectional view of the hub portion of one embodiment of the invention in the form of a two-blade propeller, as on line 1—1, Fig. 2;

Fig. 2, a transverse sectional view thereof as on line 2—2, Fig. 1;

Fig. 3, a fragmentary top plan view of the hub portion of a second embodiment of the invention in the form of a variable pitch two-blade propeller;

Fig. 4, a fragmentary plan sectional view thereof, as on line 4—4, Fig. 5;

Fig. 5, a transverse sectional view thereof as on lines 5—5, Figs. 3 and 4;

Fig. 6, a fragmentary front elevation view of the hub portion of the blade at the left side of Figs. 3 and 5, detached from the shaft and from the other blades;

Fig. 7, a similar view of the other blade;

Fig. 8, a fragmentary front elevation and sectional view of a third embodiment of the invention in the form of a two-blade variable pitch propeller;

Fig. 9, a transverse sectional view thereof as on line 9—9, Fig. 8; and

Fig. 10, a fragmentary front elevation view of the hub portion of the blade at the right side of Fig. 8, detached from the shaft and from the other blade.

Similar numerals refer to similar parts throughout the drawings.

One embodiment of the invention as applied to a two-blade fixed pitch propeller is indicated generally by 10 in Figs. 1 and 2.

As shown in this form of the invention, each of the propeller blades may be of the same construction. The shank 11 of each blade includes at its inner extremity a hub portion 12 adapted to form one-half of the hub of the propeller and being provided with a transverse bore 13 which is alined with a similar bore in the sleeve of the other blade and receives the shaft 14 upon which the propeller is mounted.

The hub portions 12 of the blades are overlapped and are preferably provided with diagonal faces 15 abutting each other, and each face 15 may terminate in a curved end 16 adapted to fit tightly against a curved shoulder 17 formed on the other blade.

Improved separable sleeve means indicated generally by 18 are provided for simultaneously engaging the hub portions 12 and the shaft 14, and the engaging means 18 as illustrated include a rear engaging member 19*r* forming a half sleeve and a front engaging member 19*f* forming the other half sleeve, located respectively at the rear and front of the overlapped hub portions 12, the half sleeves constituting a longitudinally split sleeve.

As illustrated the front and rear engaging members 19*f* and 19*r* are identical, so that they may be made by the same set of forging dies, and each of the engaging members 19*r* and 19*f* is provided with a central transverse bore 20 extending therethrough, and the bores 20 of the engaging members register with each other and with the bores 13 of the hub portions 12, and the shaft 14 extends through the registered bores.

The shaft 14 has preferably formed thereon a shoulder 21 against which is abutted a central

annular flange 22*r* extending from the rear engaging member 19*r*.

The front engaging member 19*f* is provided with a similar annular flange 22*f*.

The outer end 23 of the shaft 14 is threaded, and a nut 24 is screwed thereon and abuts against the flange 22*f*, clamping the front engaging member 19*f*, the blade hub portions 12 and the rear engaging member 19*r* against each other and against the shaft shoulder 21.

Each of the interfitting hub portions 12 is preferably provided with shoulders 25 and 26 located respectively at opposite sides of the shaft 14, and each of the engaging members 19*r* and 19*f* is provided at its opposite ends with internal flanges 27 and 28, overlapping and engaging respectively the adjacent hub portion shoulders 25 and 26.

An ear 29 is provided at each end corner of each engaging member and located in line with the ear for the adjacent end corner of the other engaging member, and each set of alined ears is clamped together, as by means of a bolt 30 and a nut 31, the shank 32 of the bolt preferably extending through registering bores formed in the alined ears.

By the foregoing construction and arrangement of the propeller 10, the propeller blades and the engaging members may be easily forged, and when assembled together as above set forth, a propeller structure is provided including separable blades positively engaged with each other and with the shaft.

A second embodiment of the invention as applied to a two-blade variable pitch propeller is indicated generally by 110 in Figs. 3 to 7, inclusive.

As shown in this form of the invention, the propeller blades are of complementary or mating construction. The shank 111*a* of one blade includes at its inner extremity a hub portion 112*a* having a longitudinally extending socket 112*a*—1 formed therein, and the shank 111*b* of the other blade includes at its inner extremity a hub portion 112*b* which fits in the socket 112*a*—1, and the interfitting hub portions 112*a* and 112*b* are each provided with a transverse bore 113, and the bores 113 communicate with each other, and the shaft 114 upon which the propeller is mounted extends through the communicating bores 113 which are enlarged with respect to the shaft.

Improved separable sleeve means indicated generally by 118 are provided for simultaneously engaging the hub portions 112*a*, 112*b*, and the shaft 114, and the engaging means 118 as illustrated include a rear engaging member 119*r* forming a half sleeve and a front engaging member 119*f* forming the other half sleeve, located respectively at the rear and front of the interfitting hub portions 112*a* and 112*b*.

As illustrated the front and rear engaging members 119*f* and 119*r* are identical, so that they may be made by the same set of forging dies, and each of the engaging members 119*r* and 119*f* is provided with a central transverse bore 120 extending therethrough, and the bores 120 of the engaging members register with each other and communicate with the enlarged bores 113 of the hub portions 112*a* and 112*b*, and the shaft 114 fits and extends through the registered bores 120, and extends through the enlarged communicating bores 113.

The shaft 114 has preferably formed thereon a shoulder 121 against which is abutted a central annular flange 122*r* extending from the rear engaging member 119*r*.

The front engaging member 119*f* is provided with a similar annular flange 122*f*.

The outer end 123 of the shaft 114 is threaded, and a nut 124 is screwed thereon and abuts against the flange 122*f*, clamping the front engaging member 119*f*, the blade hub portions 112*a* and 112*b*, and the rear engaging member 119*r* against each other and against the shaft shoulder 121.

The hub portion 112*a* is provided with a shoulder 125 and the hub portion 112*b* is provided with a shoulder 126, and each of the engaging members 119*r* and 119*f* is provided at its opposite ends with internal flanges 127 and 128, overlapping and engaging respectively the adjacent hub portion shoulders 125 and 126.

An ear 129 is provided at each end corner of each engaging member and located in line with the ear for the adjacent end corner of the other engaging member, and each set of alined ears are clamped together, as by means of a bolt 130 and a nut 131, the shank 132 of the bolt preferably extending through registering bores formed in the alined ears.

The breadth *b* of each bore 113 in the direction of the longitudinal axis X—X of the blades is preferably equal to the diameter of the shaft 114.

The length *d* of each bore 113 transversely of the axis X—X is greater than the diameter of the shaft 114, whereby the blades may be rotated about the axis X—X with respect to each other to vary the pitch of the propeller when the nut 124 is loosened.

As illustrated a washer 133 is preferably interposed between the nut 124 and the front engaging member 119*f*.

Accordingly the propeller 110 constitutes a propeller structure including separable blades and releasable means positively engaging the blades with each other and with the shaft, the blades being movable about their longitudinal axes with respect to each other when the engaging means are released.

A third embodiment of the invention as applied to a two-blade variable pitch propeller is indicated generally by 210, and is illustrated in Figs. 8 to 10 inclusive.

As shown in this form of the invention, the propeller blades are of the same construction at their inner ends. The shank 211 of each blade includes at its inner extremity a hub portion 212.

The hub portions 212 of the blades are overlapped and are preferably provided with opposite faces 215 extending parallel with the longitudinal axis X—X of the blades.

A diagonal face 215—1 extends transversely across one-half of each hub portion 212 from the outer end of its face 215 to the outer extremity of the hub portion, and a diagonal face 215—2 extends transversely across the other half of the hub portion from the inner end of its face 215.

The faces 215—1 and 215—2 of one of the blades are respectively located opposite the faces 215—2 and 215—1 of the other blade.

Each of the faces 215 has a semi-circular trough 215—3 formed therein and opening towards the trough of the opposite face, whereby the oppositely opening troughs 215—3 form together an opening through which extends the shaft 214 upon which the propeller is mounted.

Improved separable sleeve means indicated generally by 218 are provided for simultaneously engaging the interfitting hub portions 212 and the shaft 214, and the engaging means 218 as

illustrated include a front engaging member 219*f* forming a half sleeve and a rear engaging member 219*r* forming the other half sleeve, located respectively at the front and rear of the front and rear overlapping hub portions 212.

As illustrated the front and rear engaging members 219*f* and 219*r* are identical so that they may be made by the same set of forging dies, and each of the engaging members 219*f* and 219*r* is provided with a central transverse bore 220 extending therethrough, and the bores 220 of the engaging members register with each other and communicate with the opening formed by the troughs 215—3 of the hub portions 212, and the shaft 214 fits and extends through the registered bores 220, and extends through the opening formed by the troughs 215—3, which opening is larger than the cross section of the shaft 214, whereby the blades may be rotatably moved with respect to each other about their longitudinal axis X—X for varying the pitch of the propeller.

Wedges W may be interposed between the opposite faces 215 for maintaining any desired propeller pitch after adjustment of the same.

The shaft 214 has preferably formed thereon a shoulder 221 against which is abutted a central annular flange 222*r* extending from the rear engaging member 219*r*.

The front engaging member 219*f* is provided with a similar annular flange 222*f*.

The outer end 223 of the shaft 214 is threaded, and a nut 224 is screwed thereon and abuts against the flange 222*f*, clamping the front engaging member 219*f*, the overlapping blade hub portions 212 and the rear engaging member 219*r* against each other and against the shaft shoulder 221.

Each of the hub portions 212 is preferably provided with a shoulder 225, the shoulders 225 being located at opposite sides of the shaft 214, and each of the engaging members 219*r* and 219*f* is provided at its opposite ends with internal flanges 227, overlapping and engaging the adjacent hub portion shoulders 225.

An ear 229 is provided at each end corner of each engaging member and located in line with the ear for the adjacent end corner of the other engaging member, and each set of alined ears is clamped together, as by means of a bolt 230 and a nut 231, the shank 232 of the bolt preferably extending through registering bores formed in the alined ears.

Accordingly the propeller 210 constitutes a propeller structure including separable blades and releasable means positively engaging the blades with each other and with the shaft, the blades being movable about their longitudinal axis with respect to each other when the engaging means are released.

It is apparent that each of the improved propellers 10, 110, and 210, moreover constitutes a propeller structure including separable blades and releasable means engaging the blades with each other, the assembled blades and engaging means constiuting a unit releasable from engagement with the shaft, whereby the assembled propeller unit may be easily and quickly placed on the shaft or removed therefrom in changing a broken propeller or the like.

I claim:

1. A propeller including a pair of separable blades, each blade having a hub portion overlapping the hub portion of the other and provided with a shoulder, a shaft, and separable sleeve means engaging the hub portions with each other and with the shaft and having internal flanges engaging said shoulders.

2. A propeller including a pair of separable blades, each blade having a hub portion interfitting with the hub portion of the other and provided with a shoulder, a shaft, and separable sleeve means engaging the hub portions with each other and with the shaft and having internal flanges engaging said shoulders.

3. A propeller including a pair of separable blades, each blade having a hub portion overlapping the hub portion of the other and provided with a shoulder, sleeve means separably engaging the propeller hub portions with each other and having internal flanges engaging said shoulders, and a shaft interfitting and engaging with the sleeve means and with the propeller hub portions.

4. A propeller including a pair of separable blades, each blade having a hub portion overlapping the hub portion of the other and provided with a shoulder, releasable sleeve means engaging the hub portions with each other and having internal flanges engaging said shoulders, a shaft, and means securing the hub portions and the sleeve means on the shaft.

5. A propeller including separable blades, the blades having hub portions overlapping each other and provided with shoulders, a shaft, and separable sleeve means engaging the hub portions with each other and with the shaft and having internal flanges engaging said shoulders.

6. A propeller including separable blades, the blades having hub portions overlapping each other and provided with shoulders, a sleeve member engaging the overlapping hub portions and having internal flanges engaging said shoulders, the overlapping hub portions and the sleeve member being provided with registering bores, a shaft extending through the registering bores, and means securing the overlapping hub portions and the sleeve member on the shaft.

7. A propeller including separable blades, the blades having hub portions overlapping each other and provided with shoulders, sleeve members engaging the overlapping hub portions and having internal flanges engaging said shoulders, the overlapping hub portions and the sleeve members being provided with registering bores, a shaft extending through the registering bores, and means securing the overlapping hub portions and the sleeve members on the shaft.

8. A propeller including separable blades, the blades having hub portions overlapping each other and provided with shoulders, sleeve means clamping the overlapping hub portions together and having internal flanges engaging said shoulders, the overlapping hub portions and the sleeve clamping means being provided with registering bores, a shaft extending through the registering bores, and means securing the overlapping hub portions and the sleeve clamping means on the shaft.

9. A propeller including separable blades, the blades having hub portions overlapping each other, a member engaging the overlapping hub portions, the overlapping hub portions and the member being provided with communicating bores, a shaft extending through and fitting the bore of the engaging member and extending through the bores of the overlapping hub portions, the bores of the overlapping hub portions having cross sections larger than the cross section of the shaft for permitting axial movement

of the blades on the shaft, and means securing the overlapping hub portions and the engaging member on the shaft.

10. A propeller including separable blades, the blades having hub portions interfitting with each other, a member engaging the interfitting hub portions, the interfitting hub portions and the member being provided with communicating bores, a shaft extending through and fitting the bore of the engaging member and extending through the bores of the interfitting hub portions, the bores of the interfitting hub portions having cross sections larger than the cross section of the shaft for permitting axial movement of the blades on the shaft, and means securing the interfitting hub portions and the engaging member on the shaft.

11. A propeller including a pair of separable blades, one of the blades having a hub portion provided with a socket therein, the other blade having a hub portion fitting in the socket, a member engaging the interfitting hub portions, the interfitting hub portions and the member being provided with communicating bores, a shaft extending through and fitting the bore of the engaging member and extending through the bores of the interfitting hub portions, the bores of the interfitting hub portions having cross sections larger than the cross section of the shaft for permitting axial movement of the blades on the shaft, and means securing the interfitting hub portions and the engaging member on the shaft.

12. A propeller including a pair of separable blades, each blade having a hub portion provided with a shoulder, a shaft, a longitudinally split sleeve engaging the hub portions and having internal flanges engaging said shoulders, means for clamping said sleeve upon the hub portions of the blades, and means for fixing said sleeve upon the shaft.

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