April 25, 1944. H. H. ROBY 2,347,282

PROPELLER HUB ASSEMBLY

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Fig. 1.

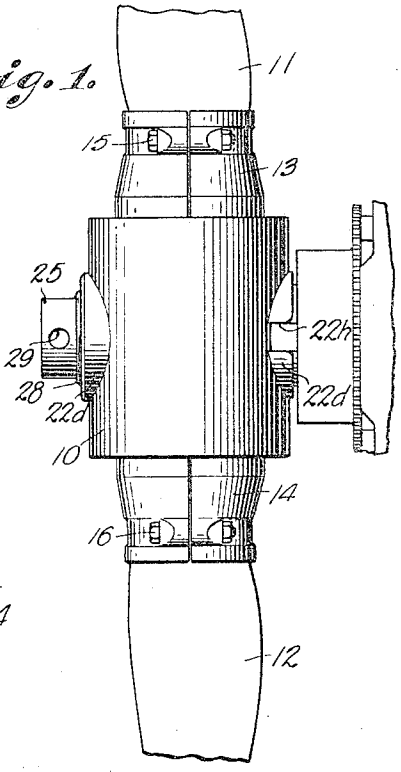


Fig. 2.

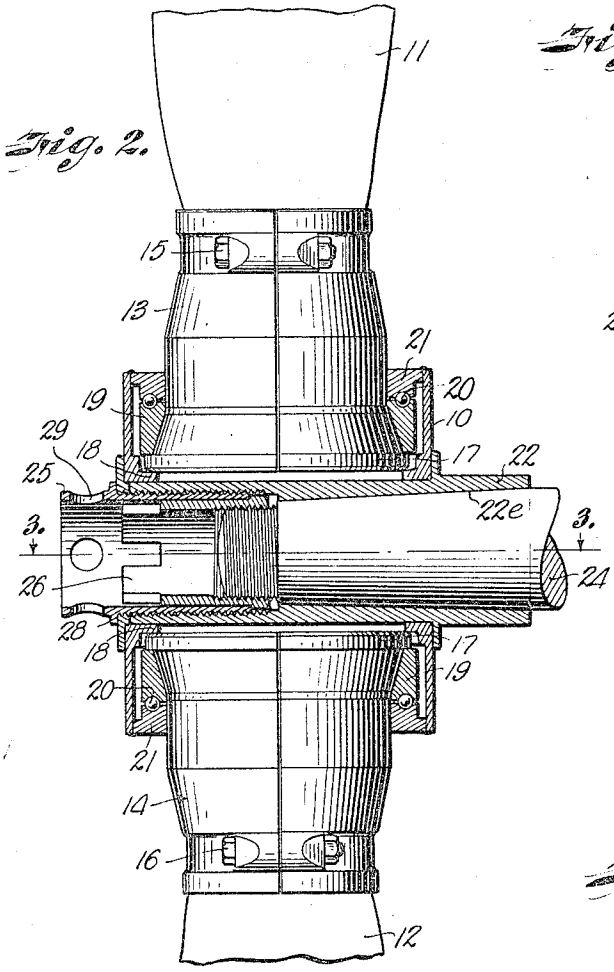


Fig. 7.

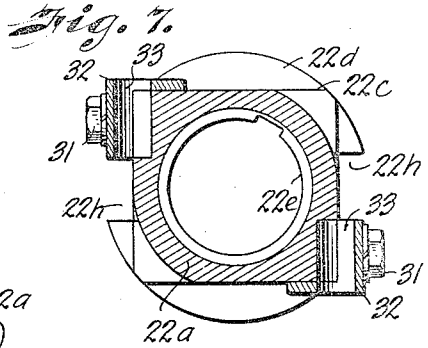
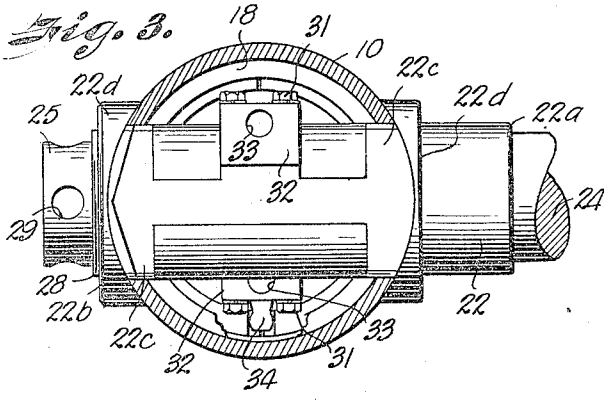


Fig. 3.



INVENTOR.
Horace H. Roby

BY Thos. E. Scofield

ATTORNEY.

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PROPELLER HUB ASSEMBLY

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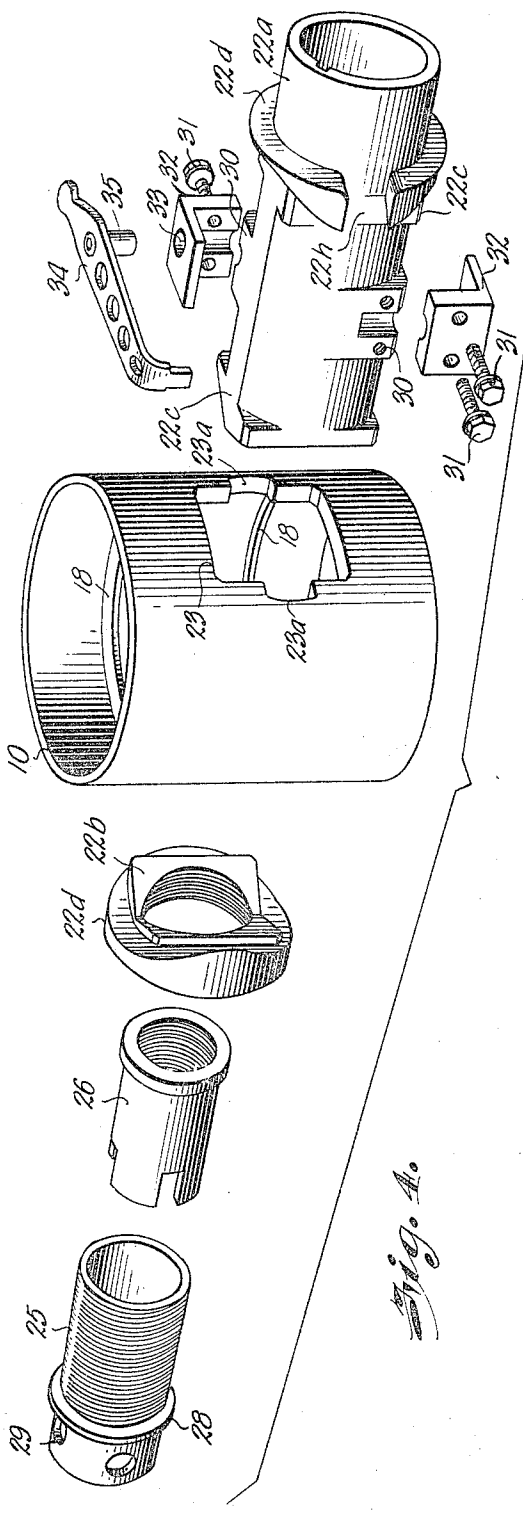


Fig. 4.

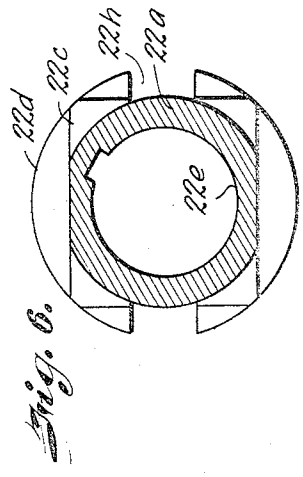


Fig. 6.

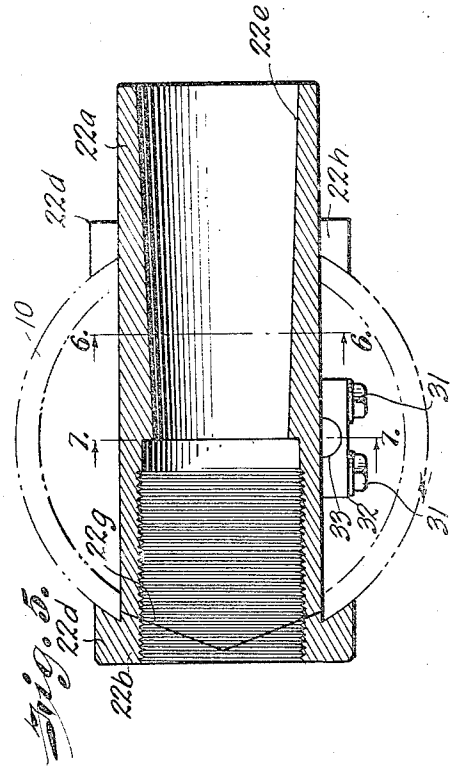


Fig. 5.

INVENTOR.
Horace H. Roby
BY Thos. E. Scofield
ATTORNEY.

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PROPELLER HUB ASSEMBLY

Horace H. Roby, Wichita, Kans.

Application January 8, 1942, Serial No. 426,058

3 Claims. (Cl. 170—173)

My invention relates broadly to new and useful improvements in propeller hub assemblies and more particularly to an assembly made from tubular parts uniquely correlated to materially reduce the cost and labor of machining such as is necessary in the conventional cast hub and without in any way sacrificing strength and compactness.

Propeller hubs are almost entirely constructed from cast metal. In a cast metal construction, many of the relatively inaccessible internal surfaces must be machined to an exceedingly small tolerance. This is a difficult and tedious task. Also, when finished, the material and labor costs are substantial.

An important object of my invention, therefore, is to provide a propeller hub that is formed from pieces of tubing uniquely fitted, interconnected and correlated. The result is a strong, unitary hub construction that is inexpensive to manufacture. Less actual metal is required than in the cast metal hub, thus reducing the weight of the hub and effecting a saving of metal. Also, when the pieces of tubing are disassembled, any necessary machining operations may be easily and expeditiously accomplished. By using my construction, much less time is required to manufacture the hub than is required for a cast metal hub.

Another object of my invention is to provide a propeller hub of the above mentioned character that may be used in a variable pitch propeller construction. More particularly, the hub is adapted for use in connection with propeller constructions of the type shown in my copending application, Serial No. 361,884, filed October 19, 1940, which matured into Patent No. 2,281,456 on the 28th day of April, 1942.

Other objects and advantages of my invention will be apparent during the course of the following description.

In the drawings, forming a part of this specification and wherein like numerals are employed to designate like parts throughout the same,

Fig. 1 is a side elevation of a propeller hub embodying my invention, showing propeller blades associated therewith and the entire assembly mounted on the crank shaft of an internal combustion engine,

Fig. 2 is an enlarged view, similar to Fig. 1, parts being broken away to more clearly show the internal structure of the hub assembly,

Fig. 3 is a transverse sectional view taken on the line 3—3 of Fig. 2,

Fig. 4 is an exploded perspective view of my propeller hub assembly,

Fig. 5 is a longitudinal sectional view of the crank shaft sleeve embodying a part of my invention and showing the manner in which the same is fitted to the barrel portion of the assembly,

Fig. 6 is a transverse sectional view taken on the line 6—6 of Fig. 5, and

Fig. 7 is a transverse sectional view taken on the line 7—7 of Fig. 5.

In the drawings wherein, for the purpose of illustration, is shown a preferred embodiment of my invention, the numeral 10 designates the barrel portion of the propeller hub assembly. The barrel 10 comprises a length of metal tubing in which propeller blades 11 and 12 are securely mounted. While I have shown a two-bladed propeller, it is understood, of course, that my invention is applicable to multiple blade units such as three or four blade propellers as well.

As best shown in Fig. 2, the butt ends of the propeller blades 11 and 12 are securely gripped by the propeller clamping members 13 and 14. The clamps 13 and 14 are formed in two parts which embrace the ends of the propellers and are held together by bolts and nuts 15 and 16. Each of the clamps has formed at its inner end an annular flange 17 that seats upon an annular shoulder 18 projecting from the internal wall of the barrel 10. The hub arrangement is such that the diameter of the propeller from blade tip to blade tip is the same as in the conventional fixed pitch propeller construction. A bearing race 19 rests upon the flange 17 and ball bearings 20 between the race 17 and thrust bearing ring 21 furnish a relatively frictionless bearing for the blades. Thrust rings 21 are fixedly mounted in the ends of the hub 10.

It will be seen that propeller clamps 13 and 14 are free to turn upon the ball thrust bearings 19, 20, and 21, and that the thrust created by the centrifugal force of the rotating shaft will be taken by the thrust rings.

When assembled, crank shaft sleeve 22 extends diametrically through the hub intermediate the propeller clamps 13 and 14. The sleeve is formed in two parts, 22*a* and 22*b*, best shown in Figs. 4 and 5. The outer end of the sleeve designated as 22*c* which extends through the outer opening 23 in the barrel 10 is essentially square in cross section and has a wedge-shaped end. As indicated in Fig. 4, the openings 23 in barrel 10 are similarly shaped to fit the portions 22*c* of the sleeve and prevent turning movement between the sleeve and barrel. The radial flange 22*d* formed on the crank shaft sleeve and the separate section 22*b* have curved inner faces which conform with and snugly fit the cylindrical outer surface of the barrel. These flanges overlying the surface of barrel 10 considerably strengthen the assembly and aid in immovably associating the crank shaft barrel and sleeve.

When assembled, the end of the crank shaft 24 extends through the tapered portion 22*e* of

the crank shaft sleeve. The sleeve and portion 22b are internally threaded as shown in Fig. 5 to receive the threads of the locking sleeve 25. When assembled as in Fig. 2, the tubular crank shaft nut 26 is screwed to the threaded end of the crank shaft while the external threads of locking sleeve 25 engage the internally threaded portions of sleeve 22a and sleeve section 22b. The locking sleeve 25 also seats upon the flange of the nut 26 to hold the assembly rigid as a unit.

The crank shaft sleeve, made up of parts 22a and 22b is thus fixedly applied to the crank shaft 24 and the barrel 10 rigidly affixed to sleeve 22a. The nut 26 is screwed onto the crank shaft by means of a suitable tool shaped to interfit with the crenelated outer end of the nut. The radial bead or ridge 28 on locking sleeve 25 seats against the flange of the portion 22b. The locking sleeve 25 is provided with diametrically opposed openings 29 through which a rod or bar may be inserted for tightening or loosening the sleeve. The end of crank shaft sleeve part 22a is wedge-shaped and part 22b is complemental to fit therewith. It will be noted that the junction between parts 22a and 22b is on a bias to the screw threads of the sleeve 22a—22b and forms substantially a continuation of the walls of the barrel 10. Thus locating the joint and arranging it across the threads of the parts 22a and 22b greatly strengthens the assembly and reduces likelihood of the sleeve parts failing along the line of the threads. For example, I have observed that vibrations and other contributing forces would cause a unitary crank shaft sleeve to fail behind the outer flange 22d along one of the holding threads. By forming the crank shaft sleeve in two parts a stronger structure is provided in that the flanges 22d are an integral part of the sleeve and the tendency for failure of the sleeve along the threads is to a great extent eliminated. By providing a V or wedge-shaped junction between crank shaft sleeve parts 22a and 22b, the entire joint is located between the inner and outer walls of the barrel and conforms substantially with its curvature. The barrel will therefore materially strengthen and support the joint and relieve strain to which the locking sleeve 25 is subjected.

When the propeller hub is to be used in a variable pitch propeller of the type shown in my copending application, Serial No. 361,884, I provide bosses 30 on the crank shaft sleeve intermediate the flanges 22d. Screws 31 hold L-shaped brackets 32 on the bosses 30. The bosses and brackets have registering recesses which form sockets 33. Two levers such as that shown at 34 are provided with pins 35 which pivotally seat in the sockets 33 on opposite sides of the sleeve. Mechanism, shown in my copending application, is mounted behind the propeller hub assembly to control the pitch of the propeller blades. The levers 34 connect through arms, not shown, running axially of the sleeve to the control mechanism behind the hub. Channels 22h in flanges 22d registering with recesses 23a in hub 10 provide apertures for the arms. It is to be understood, however, that the mechanism for adjusting the pitch of the propeller blades is herein recited by way of illustration and not by limitation. Other means may be used, if desired.

The unique shape and location of the joint between parts 22a and 22b of the crank shaft sleeve obviates any possibility of the sleeve breaking along the internal threads. The present arrangement has been tested under actual working conditions and the tendency of the unitary crank shaft sleeves to break has been eliminated by making the sleeve in two parts and by placing the junction on a bias to the threads and by positioning the junction so that it will be supported by the wall of the barrel 10. The unit may be inexpensively manufactured in large quantities and the time required to produce a unit is much less than the time required to produce a propeller hub of cast metal.

It will be seen that I have accomplished the objects of my invention. I have provided a propeller hub assembly that is made entirely from tubular parts uniquely connected and correlated. The arrangement is such that all finished surfaces of the assembly are exposed or easily accessible for machining when the parts are disassembled. The entire unit is compact, exceedingly strong, and light in weight. A substantial saving of material is effected.

It is to be understood that the form of my invention herewith shown and described is to be taken as a preferred example of the same and that various changes in the size, shape and arrangement of parts may be resorted to without departing from the spirit of my invention or the scope of the appended claims.

Having thus described my invention, I claim:

1. A propeller hub assembly comprising a crank shaft, a barrel member mounted on the crank shaft, propeller blades having shank portions secured to said barrel member, a crank shaft sleeve surrounding one end of the crank shaft and extending transversely through the barrel member, said sleeve formed in two parts which have complementary internal threads, an externally threaded locking member within the sleeve, the external threads of the locking member engaging the internal threads of the sleeve parts to hold the same together as a unitary structure, and means holding the crank shaft sleeve on the crank shaft.

2. A propeller hub assembly comprising a crank shaft, a barrel member mounted on the crank shaft, propeller blades having shank portions secured to said barrel member, a crank shaft sleeve formed in two parts surrounding one end of the crank shaft and extending transversely through the barrel, means holding the sleeve on the crank shaft, complementary internal threads in the sleeve parts, the joint between the parts crossing threads in said parts, and an externally threaded locking member whose threads engage those of the sleeve parts to hold the same together as a unitary structure.

3. A propeller hub assembly comprising a crank shaft, a barrel member mounted on the crank shaft, propeller blades having shank portions secured to said barrel member, a crank shaft sleeve formed in two parts surrounding one end of the crank shaft and extending transversely through the barrel, means holding the sleeve on the crank shaft, complementary internal threads in the sleeve parts, the joint between the parts of the sleeve located substantially at the wall of the barrel, and an externally threaded locking member whose threads engage those of the sleeve parts to hold the same together as a unitary structure.

HORACE H. ROBY.