Oct. 16, 1934. F. J. MARTENS ET AL 1,977,077

CONTROLLABLE PITCH PROPELLER HUB

Filed Aug. 22, 1932 3 Sheets-Sheet 1

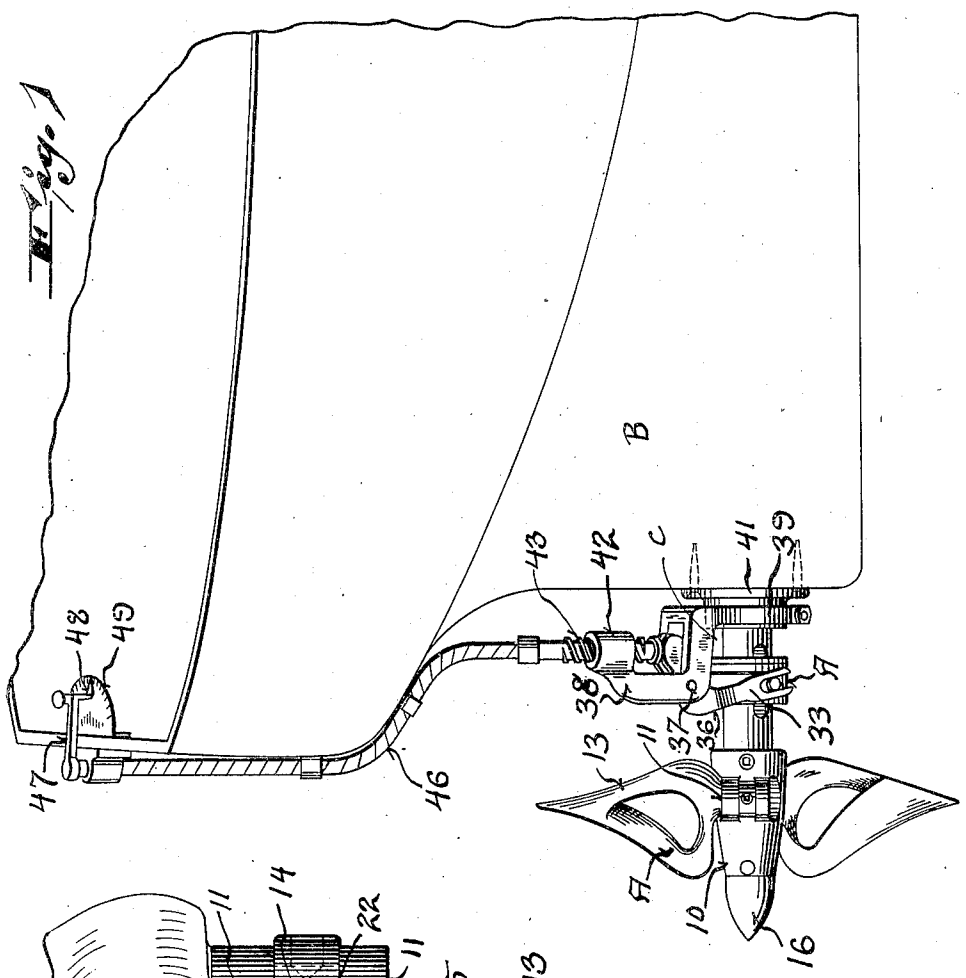


Fig. 1

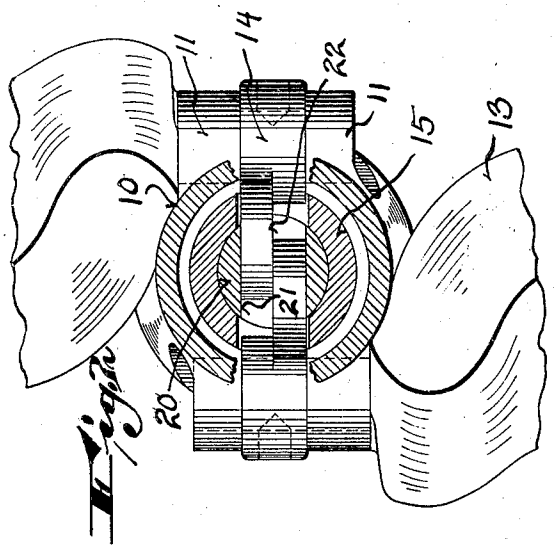


Fig. 2

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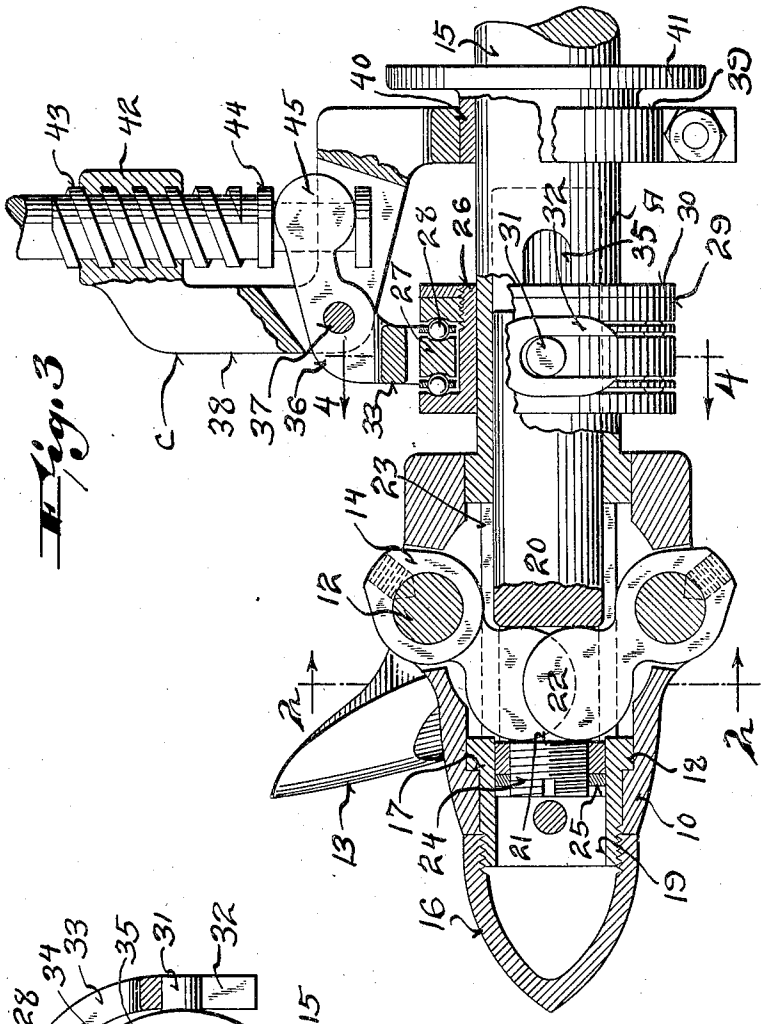


Fig. 3

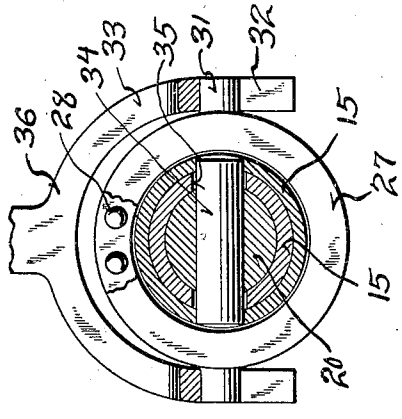


Fig. 4

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Fig. 5

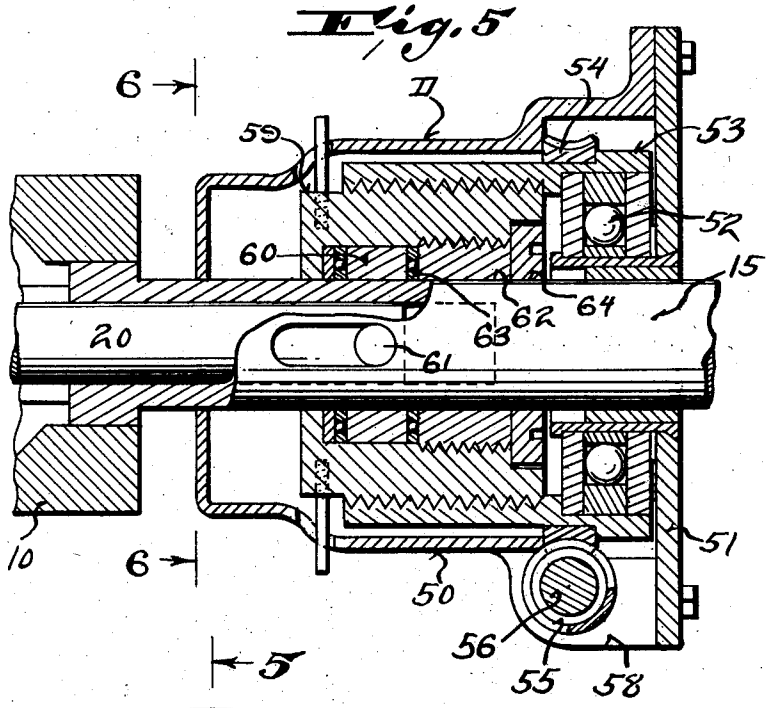
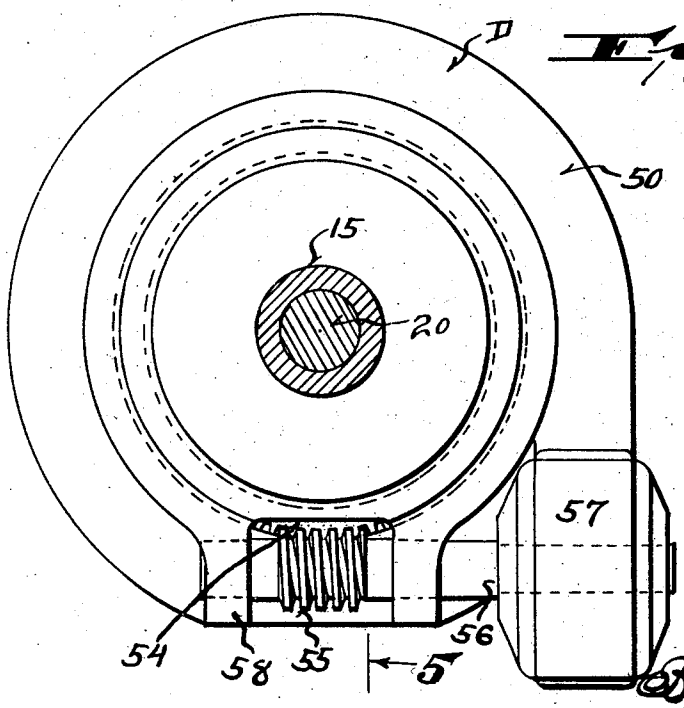


Fig. 6



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Patented Oct. 16, 1934 1,977,077

UNITED STATES PATENT OFFICE

1,977,077

CONTROLLABLE PITCH PROPELLER HUB

Fred J. Martens and Clinton O. Thompson, Milwaukee, Wis., assignors of one-third to Edward A. Wilke and Mae V. Wilke, both of Milwaukee, Wis.

Application August 22, 1932, Serial No. 629,854

2 Claims. (Cl. 170—163)

This invention appertains to vehicle propulsion and more specifically to a novel variable pitch propeller, which is particularly adapted for aeronautical use, but which is susceptible for marine purposes.

One of the primary objects of our invention is to provide a propeller having movable blades, whereby the pitch angle can be readily changed to suit varying conditions with novel means for moving the blades to the desired adjusted position.

Another salient object of our invention is to provide a novel mechanism for changing the pitch angle of the blades of a propeller in which all stress is eliminated from the propeller shaft and transmitted to the fuselage or hull of a boat, as the case might be and in which all lost motion or play between the blades and the adjusting means is eliminated.

A further important object of our invention is the provision of a propeller embodying a hub having movable blades rockably mounted thereon with novel means for mounting the hub on the propeller shaft and novel means for rocking the blades through the use of a screw mechanism, whereby the blades will be automatically locked in their adjusted position.

A further object of our invention is the provision of rock arms connected with the roots of the propeller blades extending into the hub of the propeller and engaged by a push rod with novel means for adjusting the push rod longitudinally of the propeller shaft including a push collar and an adjusting screw for the push collar.

A further object of our invention is to provide an adjustable means for taking up play between the push rod and the rock arms so that the device can be adjusted incident to any wear between the rock arms and push rod.

A still further object of our invention is to provide a novel mechanism for changing the pitch angle of propeller blades, which will be durable and efficient in use, one that will be simple and easy to manufacture and one which can be placed upon the market and incorporated with a propeller at a low cost.

With these and other objects in view, the invention consists in the novel construction, arrangement and formation of parts, as will be hereinafter more specifically described, claimed and illustrated in the accompanying drawings, in which:—

Figure 1 is a fragmentary side elevation of a hull of a boat showing our propeller and the adjusting means for the blades thereof incorporated therewith.

Figure 2 is an enlarged detail sectional view through the propeller taken on the line 2—2 of Figure 3 looking in the direction of the arrows.

Figure 3 is an enlarged fragmentary longitudinal sectional view through the propeller and adjusting means illustrating the novel connection between the blades and push rod.

Figure 4 is a transverse section through the propeller shaft taken on the line 4—4 of Figure 3 looking in the direction of the arrows illustrating the means connecting the push collar with the push rod.

Figure 5 is an enlarged fragmentary longitudinal section illustrating a modified form of means for actuating the push rod, the figure being taken on the line 5—5 of Figure 6 looking in the direction of the arrows.

Figure 6 is a section taken on the line 6—6 of Figure 5 looking in the direction of the arrows illustrating the use of an electric motor for operating the push rod.

Referring to the drawings in detail, wherein similar reference characters indicate corresponding parts throughout the several views, the letter A generally indicates our improved device and B the hull of a boat with which the same can be incorporated. As heretofore stated, our improved device is particularly adapted for use in connection with aeroplanes and the like and we have merely shown the device connected with a boat for the purpose of illustrating one use thereof.

Our propeller comprises a hollow hub 10 having formed thereon at diametric opposite points hollow bosses or hub sleeves 11, which form bearings for the roots or shanks 12 of the propeller blades 13. These propeller blades 13 may be of the same type as shown and claimed in the allowed application of Frederick J. Martens, filed June 21, 1930, Serial No. 469,531, or of any other preferred type. The bearing bosses 11 are slotted and receive crank or rock arms 14, which are keyed or otherwise secured to the roots or shanks 12 of the blades 13. The hub 10 of the propeller is rigidly secured to the drive or propeller shaft 15 and is held in place thereon by the use of a hub cap 16 which is threaded on the end of the shaft 15. As shown, the hub cap 16 forces a shoulder 17 formed on the hub into engagement with an annular rib 18 formed on the shaft.

As clearly shown in Figures 2 and 3, the shaft 15 is provided with a longitudinal bore 19 for a portion of its length and a push rod 20 is slidably mounted in the bore. Adjacent to the outer end of the push rod, a slot 21 is formed therein, which receives the circular knobs 22 formed on

the rock or crank arms 14. These crank arms slidably extend through longitudinally extending slots 23 formed in the shaft 15 and these slots open into the bore of said shaft.

In order to take up any wear between the push rod 20 and the rock arms 14, a bearing screw 24 is adjustably carried by the outer end of the push rod and this screw bears against the circular knobs 22 and holds the same in engagement with the inner wall of the slot formed in said push rod. A lock nut 25 can be provided for holding the bearing screw 24 in any preferred adjusted position.

Obviously, from the description so far, any longitudinal adjustment of the push rod 20 will rock the crank arms 14 and thereby bring about the swinging of the propeller blades which will change the effective pitch angle thereof.

In Figures 1–4, inclusive, we have illustrated one means for actuating the push rod and in Figures 5 and 6 we have illustrated another form of means for adjusting this rod. The means for adjusting the push rod, as shown in Figures 1–4, inclusive, is generally indicated by the reference character C and embodies a push collar 26 slidably mounted on the propeller shaft in rear of the hub of the propeller. This push collar 26 rotatably receives a push ring 27 and anti-friction bearings 28 are interposed between the push ring and the push collar. As shown, a locking collar and nut 29 and 30 are employed for holding the push ring 27 in place. The push ring 27 at diametrically opposed points is provided with radially extending pins 31 which are engaged by the forked terminals 32 of an adjusting yoke 33. The push collar 26 is operatively connected to the push rod 20 by means of a cross pin 34 and it is to be noted that this cross pin is slidably mounted in suitable longitudinally extending slots 35 formed in the propeller shaft 15.

The adjusting yoke 33 is formed in the lower end of a bell crank 36, which is rockably mounted at its angle on a pivot pin 37 carried by a supporting bracket 38. This supporting bracket is mounted in a novel manner and one arm thereof is provided with a supporting collar 39 which is rigidly mounted on a bearing 40, which rotatably receives the propeller shaft 15. This bearing 40 is formed on or has secured thereto a face plate 41. This face plate is rigidly connected to the crank housing outboard or hull of the boat inboard, as is clearly shown in Figure 1 of the drawings. Obviously, where the propeller is used in connection with an aeroplane, the face plate 41 is securely bolted to the crank housing.

Formed on the bracket 38 above the bearing 40 is a feed nut 42 and this feed nut receives a feed screw 43. The lower end of the feed screw 43 is provided with a slotted head 44, which receives the rounded knob 45 formed on the upper arm of the bell crank 36.

By rotating the feed screw 43, the same will be moved toward or away from the propeller shaft and this movement will be imparted to the bell crank 36 for causing longitudinal adjustment of the push collar 26. Movement of the push collar will be in turn imparted to the push rod 20 through the medium of the pin 34. This will bring about the adjustment of the propeller blades to the desired angle.

Any preferred means can be employed for operating the feed screw 43 and in Figure 1 we have shown the feed screw connected to a flexible shaft 46. This flexible shaft 46 can be led to the desired point on the boat B and the upper end of the shaft can have secured thereto a crank handle 47. By moving the crank handle, motion can be transmitted to the feed screw.

If preferred, the crank handle 47 can be provided with an indicator 48 for traveling over a scale plate 49 so as to indicate the exact pitch angle of the propeller blades.

By providing the supporting bracket 38 and securing this bracket to the hull of the boat, all thrust is eliminated on the propeller shaft and consequently, no undue wear will take place on the engine, transmission gears or the like.

From the foregoing, it can be seen that an exceptionally simple and durable means for adjusting the propeller blades is provided and that the entire device is of a compact nature.

In Figures 5 and 6 our means for adjusting the push rod 20 is generally indicated by the reference character D and in this instance, we employ a casing 50 connected with a back plate 51, which can be rigidly connected with the fuselage crank case or hull, as the case may be. The propeller shaft 15 extends axially through the casing and is rotatably supported therein by a bearing 52, which also rotatably supports a feed screw 53, which is in the nature of an elongated internally threaded sleeve. Secured to the periphery of the feed screw 53, in any preferred manner, is a worm wheel 54 and this worm wheel has meshing therewith a worm 55. The worm 55 is secured to or is formed on the armature shaft 56 of an electric motor 57. The electric motor 57 can be bolted or otherwise secured to the back plate 51 and the armature shaft 56 is rotatably supported in suitable bearings 58 connected with the casing 50.

The feed screw 53 is retained against longitudinal movement and all longitudinal thrust thereof can be taken care of by the engagement of the worm wheel with a shoulder on the casing and an annular shoulder formed on the feed screw. Threaded into the feed screw 53 is a hollow feed nut 59 and this nut 59 is mounted for longitudinal movement on the propeller shaft 15. Arranged within the feed nut 59 is a push collar 60 and this collar is freely rotatable in said feed nut. A pin 61 is employed for connecting the push collar with the push rod 20 and this pin extends through slots formed in the propeller shaft. The collar 60 is held in place within the feed nut 59 by means of a hollow plug 62 threaded into said feed nut. Suitable thrust bearings 63 can be interposed between the feed nut and the push collar and between the push collar and the plug 62. A lock nut 64 can be employed for holding the plug 62 against movement after adjustment.

From the above description and from a survey of Figures 5 and 6, it can be noted that upon turning of the armature shaft 56, the worm wheel 54 and the feed screw 53 will be rotated. This will bring about longitudinal movement of the feed nut 59 in the feed screw and this longitudinal movement will be transmitted to the push rod through the medium of the collar 60 and the pin 61.

While we have shown an extraneous motor 57 for actuating the push rod, suitable means can be provided for operating the push rod from the engine of the boat or aeroplane.

Changes in details may be made without departing from the spirit or the scope of this invention, but what we claim as new is:

1. In a device of the class described, a propeller shaft having a longitudinal bore for a portion of

its length and provided with a pair of diametrically opposed slots communicating with said bore, a propeller including a hollow hub secured to said shaft over said slots, a push rod slidably mounted in the bore of the propeller shaft having a slot therethrough communicating with the slots in the propeller shaft, propeller blades rotatably carried by the hollow hub, crank arms secured to the propeller blades and extending through the slots of the propeller shaft and into the slot of the push rod, and means for sliding the push rod longitudinally in the shaft to adjust the pitch of the blades.

2. In a device for adjusting the pitch angle of the blades of a propeller, a rigid support, a propeller shaft rotatably mounted in said support and confined against longitudinal movement, a push rod movable longitudinally of the propeller shaft, a bracket rigidly secured to the support and projecting radially of the propeller shaft, a bell crank rockably mounted at its angle on the bracket, a push collar operatively connected to the push rod and bell crank, a nut rigidly connected with the bracket beyond the bell crank, a feed screw movable in the feed nut and radially disposed relative to the shaft engaging said bell crank, and means for rotating the feed screw in said feed nut.

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