Aug. 9, 1949. D. B. COOLEY 2,478,244

PITCH ADJUSTING MECHANISM FOR PROPELLERS

Filed Feb. 27, 1946 2 Sheets-Sheet 1

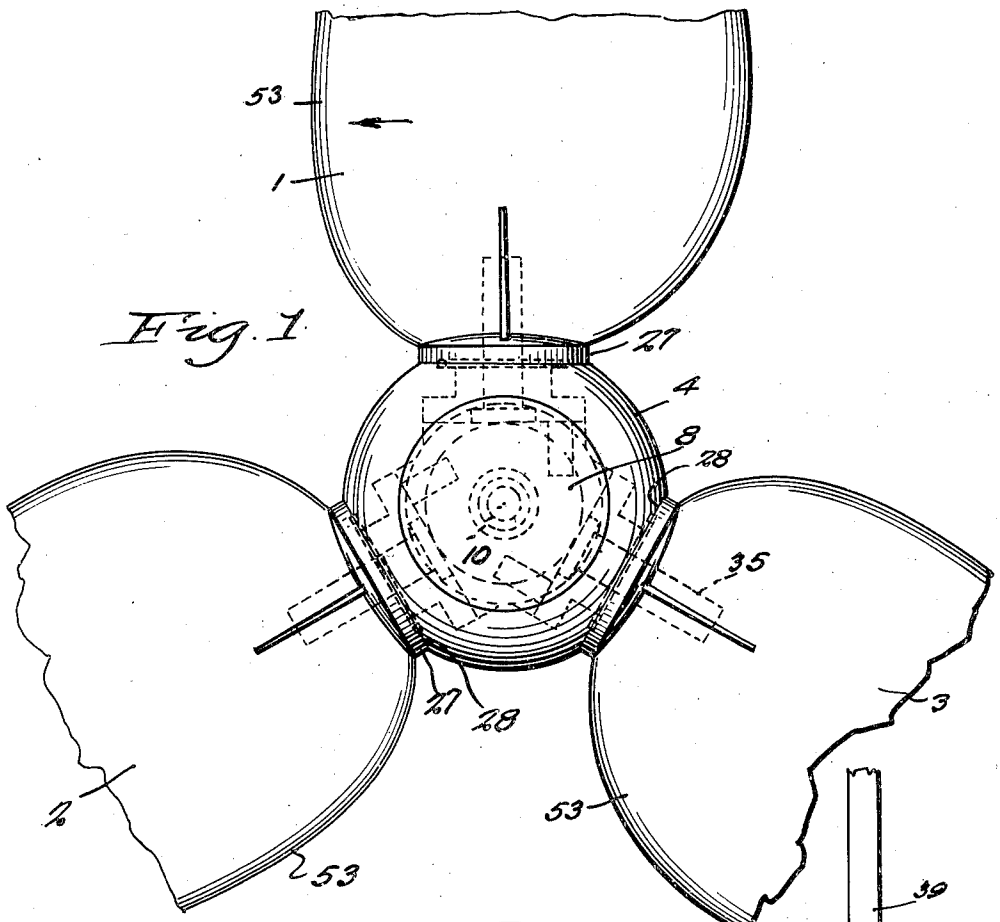


Fig. 1.

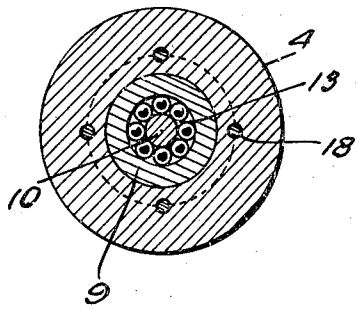


Fig. 4.

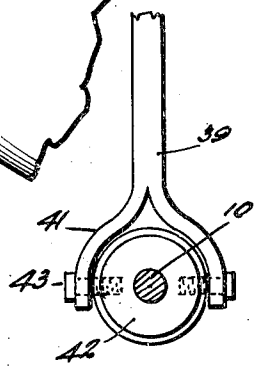


Fig. 5.

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PITCH ADJUSTING MECHANISM FOR PROPELLERS

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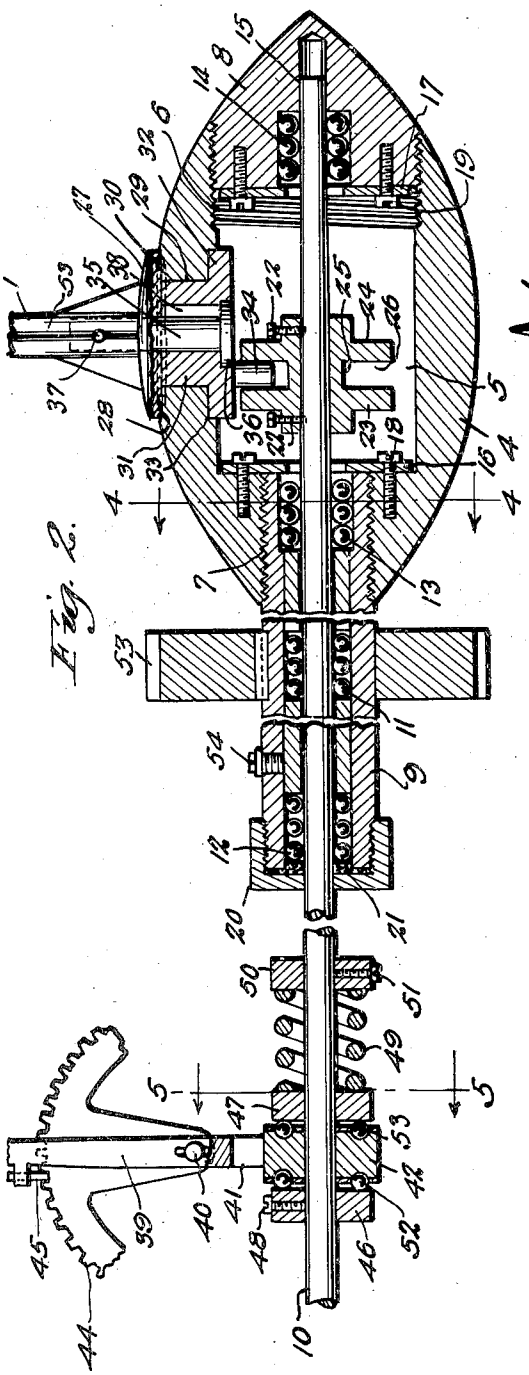


Fig. 2.

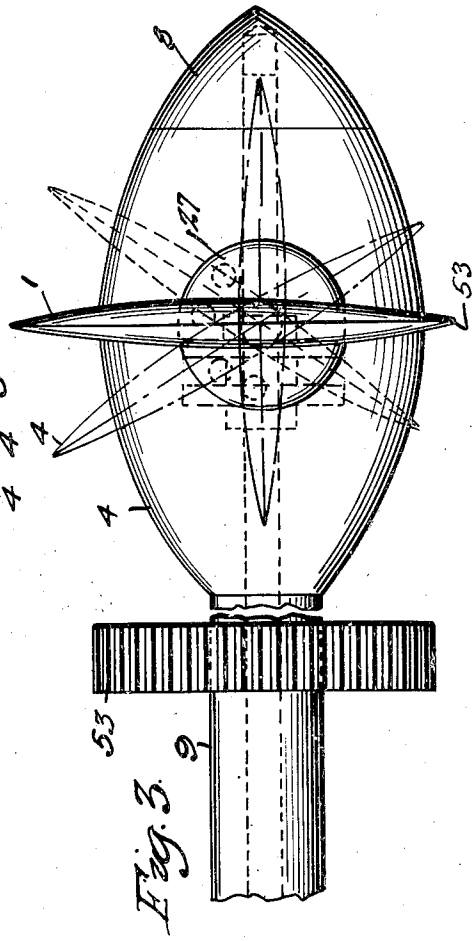


Fig. 3.

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PITCH ADJUSTING MECHANISM FOR PROPELLERS

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Application February 27, 1946, Serial No. 650,484

1 Claim. (Cl. 170—160.42)

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My invention relates to improvements in pitch adjusting mechanism for propellers.

The invention is designed with the primary object in view of providing mechanism of simple form and a minimum number of parts for variably adjusting the pitch of propeller blades, either marine or aircraft, within a maximum range of variation in opposite direction, respectively, and obviating the use in such mechanisms of cumbersome and expensive reverse gearing and clutch assemblies.

Other and subordinate objects, also comprehended by my invention, together with the precise nature of my improvements, and the manifold advantages thereof will become apparent when the following description and claim are read with reference to the drawings accompanying and forming part of this specification.

In said drawings:

Figure 1 is a view in rear elevation of my improved pitch adjusting mechanism in a preferred embodiment thereof,

Figure 2 is a view in longitudinal section,

Figure 3 is a fragmentary view in plan,

Figure 4 is a view in transverse section taken on a line 4—4 of Figure 2, and

Figure 5 is a detail view in transverse section taken on a line 5—5 of Figure 2.

Describing my invention in detail, with reference to the drawings by numerals, according to the preferred illustrative embodiment of the invention, the propeller blades, three being shown for the purpose of illustration and designated 1, 2, 3 are grouped equi-distantly around a substantially oval hub 4 to extend radially from said hub. For a purpose presently appearing, said blades 1, 2, 3 are mounted in said hub 4 to oscillate about longitudinal axes off set toward the leading edges of the blades.

The hub 4 is hollow to provide a central chamber 5 therein, for parts presently described, and provided with rear and front end bores 6, 7. A tail plug 8 is threaded into the rear end bore 6, and a tubular drive shaft 9 is threaded, at its rear end, into the bore 7. The drive shaft 9 is designed to be journalled in any suitable manner for rotation and against endwise movement.

A propeller blade adjusting shaft 10 extends axially through the drive shaft 9 and the chamber 5 and projects out of the front end of said drive shaft. The propeller blade adjusting shaft 10 is endwise shiftable in opposite directions in an intermediate and end anti-friction bearings 11, 12, 13, of the radial thrust type, suitably secured in the drive shaft 9. The rear end of said

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shaft 10 extends through a similar anti-friction bearing 14 provided in the tail plug 8, the terminal end of said shaft extending into a counter bore 15 in said plug. Suitable keeper rings 16, 17 for the anti-friction bearings 13, 14 are bolted, as at 18, 19 to the front and rear ends of the chamber 5. A threaded bearing cap 20 and a sealing gasket 21 close the front end of the drive shaft 9 with the propeller blade adjusting shaft 10 extending therethrough. As will be seen, said adjusting shaft 10 is free to rotate in the drive shaft 9 and the hub 4 to reduce friction.

Suitably fixed, as by set bolts 22, on said adjusting shaft 10 within the chamber 5, is a pair of side by side discs 23, 24 spaced apart by a hub 25 on one disc to form an annular groove 26 between said discs.

Returning to the propeller blades 1, 2, 3, each blade is provided with a disc-like base flange 27 rotatable on an annular, flat seat 28 on the hub 4 surrounding a radial bore 29 in said hub. A sealing ring 30 is interposed between each flange 27 and seat 28. A collar 31 is rotatably fitted in each bore 29 flush with the seat 28 and provided with an inner end circumferential flange 32 rotatable in an internal seat 33 in the hub 4. A crank pin 34 extends from the flange 32 of each collar 31 and is rotatably fitted in the groove 26 formed by the discs 23, 24. Studs, as at 35, extend through said collars 31 into the blades 1, 2, 3 in the axes of said blades and with heads, as at 36, countersunk flush in said collars. Pins, as at 37, extend through said blades 1, 2, 3 into the studs 35 and fasten the blades to the studs. Keys, as at 38, fix the studs in said collars 31.

Means are provided for shifting the propeller blade adjusting shaft 10 endwise, as follows. At a suitable point, forwardly of the drive shaft 9, a hand lever 39 is pivotally and slidably mounted, as at 40, on a fixed mounting, not shown, said lever having a forked inner end 41 straddling a collar 42 through which said shaft 9 is rotatably and slidably extended. Studs 43 on the forked end 40 of said lever 39 and which are threaded into said collar 42 provides for moving said collar in opposite directions through swinging of said lever 39 in opposite directions. A suitable detent segment 44 and detent pin 45 provide for releasably locking said lever 39 in different positions. The collar 42 is confined between a pair of collars 46, 47, the collar 46 being fixed by a set bolt 48 to said shaft 10, and the collar 47 being loose on said shaft. A coiled compression spring 49 on said shaft 10 is interposed between the collar 47 and a third collar 50 fixed to said

shaft 10 by a set bolt 51. Anti-friction bearing units 52, 53 on the collar 42, and interposed between said collar 42 and the collars 46, 47 are suitably mounted on the collar 42.

Any suitable mechanism may be provided for operating the drive shaft 9, for instance, a reduction gear drive, not shown, to a gear 53 fast on said shaft.

Referring now to the use and operation of the described invention. Normally, and with the hand lever 39 in the intermediate position shown in Figure 2, the adjusting shaft 10 is in an intermediate position as shown. In this position of said shaft 10 and as shown in dotted lines in Figure 3, the disks 23, 24, crank pins 34, and propeller blades 1, 2, 3 are in intermediate positions with said blades substantially coplanar and broad sides transverse to the hub 4 with the leading edges 53 of said blades arranged to be revolved counterclockwise as viewed in Figures 1 and 3. Obviously, said blades 1, 2 and 3 are thus arranged in ineffective position with no pitch thereto. By swinging the hand lever 39 to the left, as viewed in Figure 2, the propeller blade adjusting shaft 10 may be moved rearwardly, endwise, to correspondingly move the discs 23, 24 and, through the crank pins 34 and the collars 31, rotate said blades 1, 2, 3 clockwise as viewed in Figure 3, into, for instance, the angular position shown by dotted lines in Figure 3, whereby said blades are pitched for forward propulsion upon rotation of the drive shaft 9 and hub 4 in the direction indicated by the arrow in Figures 1 and 3. Conversely, by swinging said hand lever 39 to the right, as viewed in Figure 2, said blades 1, 2, 3 may be rotated counterclockwise from intermediate position as viewed in Figure 3, into the angular position shown by the dot and dash lines in Figure 3, whereby said blades are reversely pitched for reverse propulsion by rotation of said drive shaft 9 and hub 4 in the same direction as for forward propulsion by said blades. As will be apparent, said blades 1, 2, 3, may be variably pitched either for forward or reverse propulsion as desired, by variable swinging of the hand lever 39 in the proper directions. By swinging said hand lever 39 to the left into an extreme position, the propeller blade adjusting shaft 10 may be moved endwise rearwardly into an extreme position to cause the propeller blades 1, 2, 3 to be rotated clockwise, in a manner which will be now understood, into positions in which each is coplanar with said shaft 10 for instance as shown in dash lines in Figure 3. In this last position of said blades 1, 2, 3 the same are feathered so as to be ineffective under forward travel of a boat with the drive shaft 9 idle for instance in sailing.

The axes of the propeller blades 1, 2, 3 being offset toward the leading edges 53, said blades are provided with a portion in the rear of the axis of greater area than the portion in front of the axis. Hence, resistance to revolving action of said blades 1, 2, 3 will be greater in the rear

of the axes than forwardly of the axes. The result is that said blades 1, 2, 3 when operating for forward propulsion, will tend to feather and reduce the pitch of said blades until the inertia of the load to be propelled is overcome. During such feathering, the spring 49 will permit the propeller adjusting shaft 10 to move forwardly from any selected pitch adjusting setting thereof, likewise the discs 23, 24 to compensate for the resultant throw of the crank pins 34 due to feathering of said blades. Thus, the mechanism, and incidentally the drive for the drive shaft 9, will be relieved of excessive strain incident to starting a load to be propelled.

The hub 4 and drive shaft 9 may be filled with lubricating oil through, for instance, a filler plug 54 in said drive shaft.

The foregoing will, it is believed, suffice to impart a clear understanding of my invention without further explanation.

Manifestly, the invention, as described, is susceptible of modification as regards structure and combination of parts, without departing from the inventive concept, and right is herein reserved to such modifications as fall within the scope of the appended claim.

What is claimed is:

In mechanism of the class described, a hollow drive shaft, a hollow hub on one end of said shaft, propeller blades grouped around said hub and having base ends journaled in the hub whereby said blades are adjustable about the axes thereof to vary the pitch of the same, a propeller blade adjusting shaft endwise movable in opposite directions in said hub, operating connections in said hub between said adjusting shaft and the base ends of said blades for rotating said blades upon endwise movement of said adjusting shaft, and means to move said adjusting shaft comprising a pivoted lever, a collar fast on said adjusting shaft, a second collar on said adjusting shaft movable by said lever against the fixed collar to move said adjusting shaft in one direction and in which said adjusting shaft is endwise slidable in said direction independently of operation of said lever to permit feathering action of said blades, and means yieldingly opposing such independent sliding of said adjusting shaft comprising a pair of fixed and slidable collars, respectively, on said shaft with a coil spring between the same urging the slidable collar of the pair against the second-mentioned collar.

DAVID B. COOLEY.

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