April 27, 1926. 1,582,166

N. H. CEDERQUIST

VARIABLE PITCH PROPELLER

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Fig. 1.

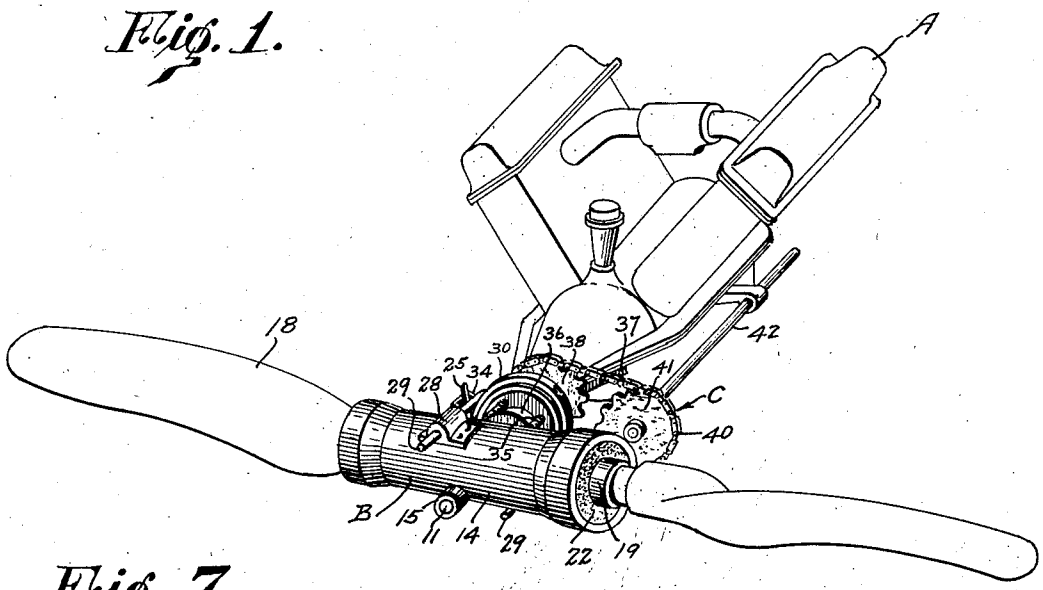


Fig. 7.

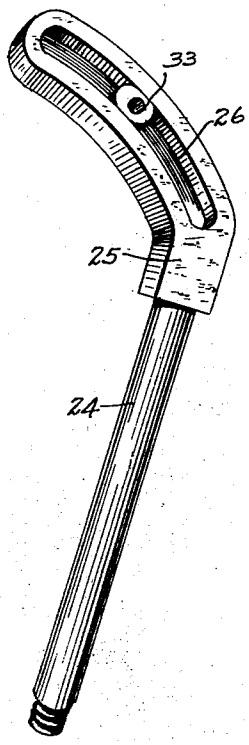


Fig. 6.

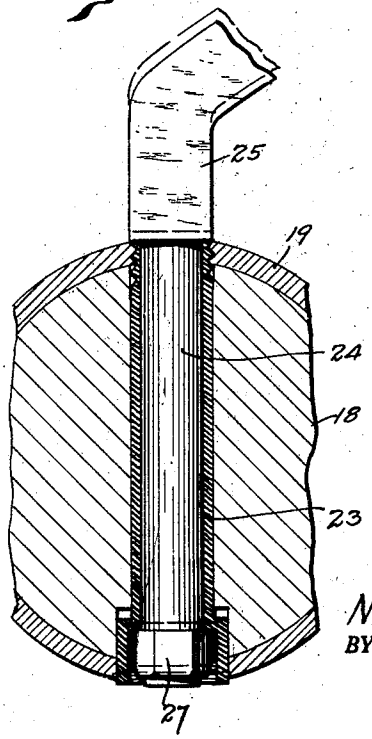
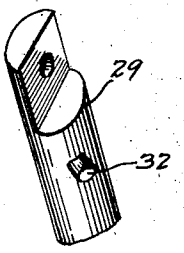


Fig. 8.



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Fig. 2.

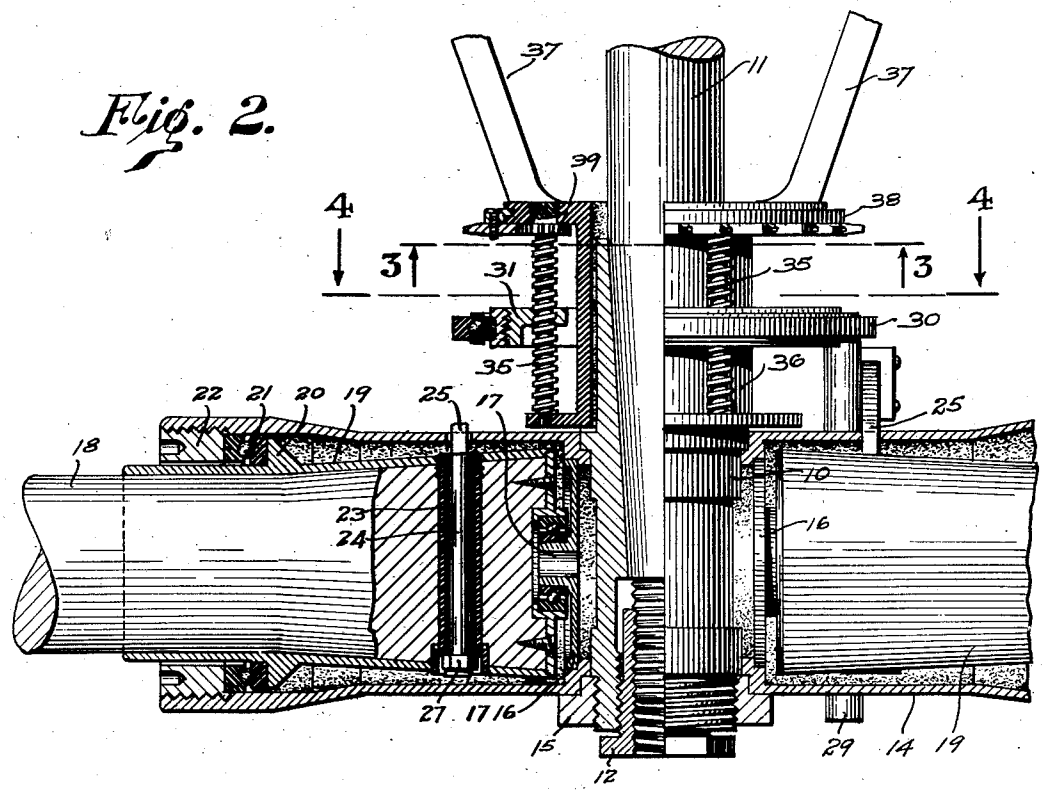
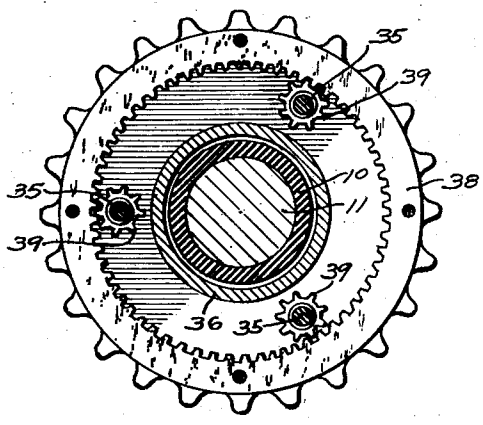


Fig. 3.



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VARIABLE PITCH PROPELLER

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Fig. 4.

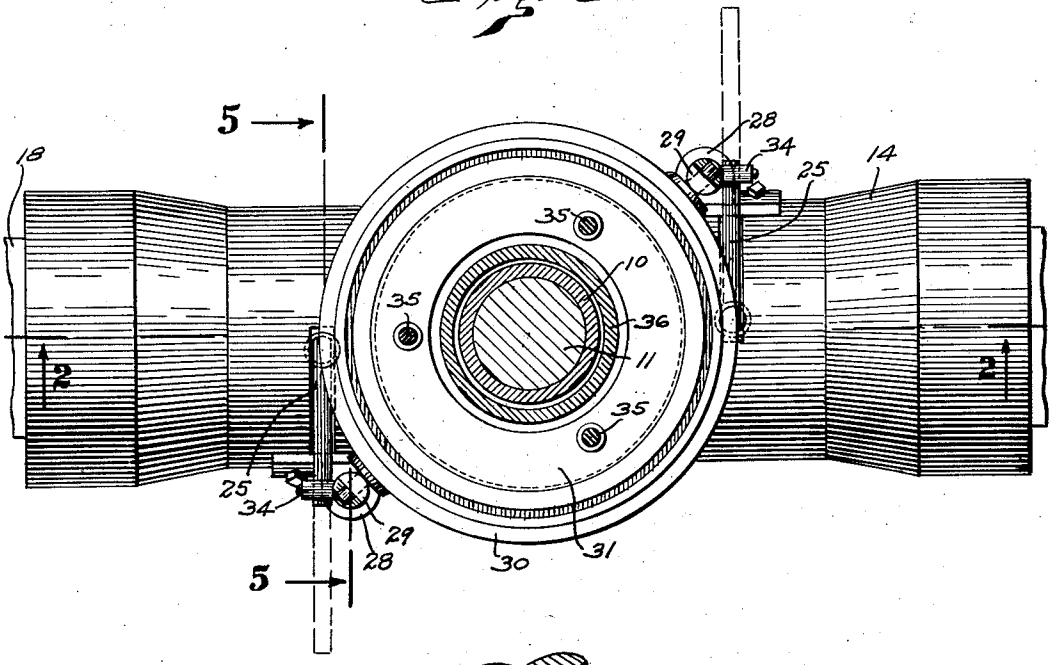
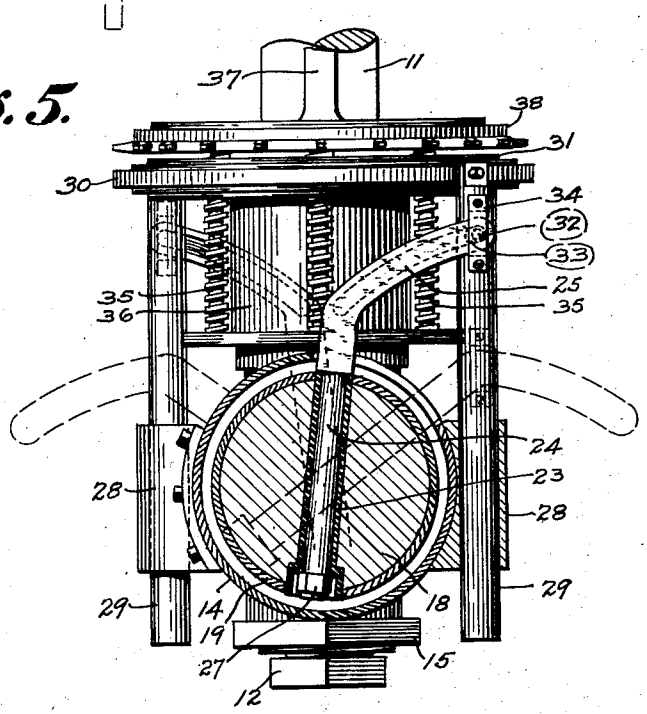


Fig. 5.



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Patented Apr. 27, 1926. 1,582,166

UNITED STATES PATENT OFFICE.

NILS HERMAN CEDERQUIST, OF ALHAMBRA, CALIFORNIA.

VARIABLE-PITCH PROPELLER.

Application filed August 21, 1922, Serial No. 583,221. Renewed September 22, 1925.

To all whom it may concern:

Be it known that I, NILS HERMAN CEDERQUIST, a citizen of the United States, residing at Alhambra, in the county of Los Angeles and State of California, have invented new and useful Improvements in a Variable-Pitch Propeller, of which the following is a specification.

This invention relates to a propeller wherein the blades may be adjusted about their axes while the propeller is in operation. It is a desideratum of propellers for flying machines, especially aeroplanes, that the pitch be adjustable to the degree of reversal. Thus, in taking off the ground, the pitch may be adjusted to produce the most effective traction, and after the machine is in flight, the pitch may be changed to produce efficient traction in flight. Then, by reversing the pitch, a brake effect may be produced in landing. With a propeller meeting these conditions, the extent of the field necessary for starting and landing is materially decreased. During flight, there may be various events which make variation in the pitch of the propeller desirable.

The principal objects of this invention are to provide a propeller of the character described having blades rotatable to vary the pitch, together with mechanism to effect such variations, which mechanism is sensitive, may be operated by a comparatively small movement of the control, is susceptible to initial independent adjustment of the blades, is durable, simple and strong in structure.

These objects, together with other objects, and corresponding accomplishments, are obtained by means of the embodiment of my invention illustrated in the accompanying drawings, in which:

Fig. 1, is a perspective view showing the propeller connected to an engine: Fig. 2. is a fragmentary plan view partly in section of the hub and associated mechanism; Fig. 3, is a section as seen on line 3—3 of Fig. 2; Fig. 4, is a section as seen on line 4—4 of Fig. 2; Fig. 5, is a section as seen on line 5—5 of Fig. 4; Fig. 6, is an enlarged fragmentary view of a detail of the structure shown in Fig. 5; Fig. 7, is a perspective view of the adjustment arm; and Fig. 8, is a fragmentary perspective view of an adjustment rod.

Referring more particularly to Fig. 1, an aeroplane engine, which may be of any suitable type, is indicated by "A". Connected to the engine shaft is my improved propeller "B", the connection being made through operating mechanism indicated generally by "C".

The hub comprises a sleeve 10 fixed to the drive shaft 11 by any suitable means. In this case the shaft is tapered and threaded at the end. The sleeve is forced on the shaft by means of a nut 12 having an internal thread engaging the shaft and an external thread engaging internal threads on the sleeve. Mounted over the sleeve and engaging shoulders formed thereon, is a cylindrical socket member for the blades indicated by 14. A nut 15 mounted upon the sleeve 10, holds the socket member in position. The socket member comprises two diametrically opposed blade sockets of like construction. At the bottom of each blade socket is a plate 16 with a pintle 17 at the center thereof. Near the outer end of each blade socket the internal diameter is increased and the outer end is internally threaded. Extending circumferentially of each blade socket is a slot to permit movement of the adjustment arm later described.

Disposed within each blade socket is the shank of a propeller blade indicated by 18. The propeller blade shown may be of the usual type, that is, the material thereof is of wood. The shanks are mounted in metallic ferrules 19. Formed on each ferrule is an external shoulder 20 serving as a seat for a ball bearing indicated by 21. The bearing is held in position by means of an internal nut 22 mounted within the socket. Extending transversely through each ferrule and shank is an opening to receive a bushing 23 for the adjustment arm. The opening in the ferrule in one side is of larger diameter than the other and both openings are threaded. The opening through the shank of the propeller blade is counterbored, the counterbore being of the same diameter as the large opening in the ferrule and registering therewith. The bushing 23 corresponds in shape to the opening through the ferrule and shank but has an enlargement at one end corresponding to the counterbore. Both ends of the bushing are threaded so that the bushing may be adjusted longitudinal of itself in the shank of the propeller blade as best shown in Fig. 6. In the bushing 23 is an adjustment arm comprising a shank 24 threaded at one end and having an enlarged arcuate end 25 which is shouldered and pro-

vided with a way 26. Holding the adjustment arm in position in the bushing is a nut 27.

Mounted to slide axially of shaft 11 and control the position of the adjustment arms is an adjustment carriage. Referring more in detail to the drawing, slide bearings 28 are mounted on the socket 14. Adjustment rods 29 are mounted to slide in the bearings. The rods are fixed to a strap 30, which is rotatably mounted upon a ring 31, by a suitable ball bearing. The ring 31 is so mounted that it may be moved axially of the shaft 11. Adjacent the ring 31 and on the rods 29 are pins 32. Pivotally mounted upon the pins are shoes 33 shown in Fig. 7. The shoes are arranged to slide in the ways 26. Holding the adjustment arms and rods in position are straps 34. Thus, movement of the ring 31 along the shaft will cause a movement of rods 29 and a swinging movement of the adjustment arm as indicated by the dotted lines in Fig. 5. Such a movement by my construction can rotate the blades through substantially 45 degrees. This is sufficient to reverse the pitch. Heretofore, variable pitch propeller blades, such as have been sufficiently strong to be used practically, have not had a structure whereby a complete reversal could be effected.

The ring 31 has a three point suspension upon screws 35. These screws pass through threaded openings in the ring and are rotatably mounted between the flanges of the sleeve 36, which is fixed to the engine frame or fuselage by means of legs 37. Rotatably mounted on the sleeve 36 is a gear 38. Gear 38 has external sprocket teeth and internal gear teeth. The internal gear teeth mesh with pinions 39 fixed to the screws 35. Thus, by rotating the gear 38 the screws 35 are rotated and the ring 31 moved along the shaft. This causes movement of the adjustment rods and the consequent movement of the adjustment arms. The ultimate result is that the propeller blades are turned to change the pitch.

Referring more particularly to Fig. 1, a chain 40 is shown passing over the sprocket gear 38 to the sprocket wheel 41. The sprocket wheel 41 is fixed to a shaft 42 which leads to the control movement disposed in the fuselage convenient for operation by the pilot. It is obvious that rotation of the shaft 41 will transmit motion to the propeller blades and the latter will be turned an amount corresponding to the amount of rotation of the shaft. This adjustment may be instantaneously accomplished during the operation of the propeller. When the propeller is installed, it may be found that by reason of the relation of the parts of the mechanism, a slight adjustment of the pitch of one blade with respect to the other is necessary in order to properly balance the traction of the blades. This may be accomplished by adjusting the bushings in the propeller blades. A wrench to take hold of the bushings at the counterbore, or any other suitable means for convenient adjustment, may be provided.

What I claim is:

1. In a propeller, the combination of a hub having blade sockets, propeller blades rotatably mounted in said sockets, adjustment arms mounted on said blades at the hub extending laterally of said blades, means to independently adjust the lateral extension of each of said arms, an adjustment carriage movable axially of the hub, said carriage being connected to said arms so as to swing the latter in unison and vary the pitch.

2. In a propeller, the combination of a hub having blade sockets, propeller blades rotatably mounted in said sockets, bushings each having an internal shoulder at one of its ends and being adjustably secured in said blades so that their positions longitudinal of themselves may be varied, adjustment arms mounted in said bushings and having heads abutting said shoulders whereby adjustment of a bushing will vary the extension of the corresponding arm, and an adjustment carriage movable axially of the hub connected to said arms to swing the latter and vary the pitch.

3. In a propeller, the combination of a hub having blade sockets, propeller blades rotatably mounted in said sockets, adjustment arms extending laterally from said blades at the hub, said arms having ways, and an adjustment carriage movable axially of the hub having slide members mounted in said ways whereby movement of said carriage will swing said arms and vary the pitch.

4. In a propeller, the combination of a hub having blade sockets, propeller blades rotatably mounted in said sockets, bushings extending laterally through the shanks of said blades, each of said bushings having an internal shoulder at one of its ends and being secured in said blade so that its position longitudinal of itself may be varied, adjustment arms mounted in said bushings and having heads abutting said shoulders whereby adjustment of a bushing will vary the extension of the corresponding arm, said arms having ways, and an adjustment carriage movable axially of the hub and having slide members mounted in said ways whereby movement of said carriage will swing said arms and vary the pitch.

5. In a propeller, the combination of a hub having blade sockets, propeller blades rotatably mounted in said sockets, bushings extending laterally through the shanks of said blades, each of said bushings having an internal shoulder at one of its ends and be-

ing secured in said blades so that its position longitudinal of itself may be varied, adjustment arms mounted in said bushings and having heads abutting said shoulders whereby adjustment of a bushing will vary the extension of the corresponding arm, said arms having ways, rods movable axially of the hub and having slide members mounted in said ways whereby movement of said rods will swing said arms and vary the pitch, and operating means mounted on the shaft of the propeller to move said rods in unison.

6. A device as specified in claim 5, characterized by the operating means comprising a frame movable axially of the propeller shaft, the rods being fixed to said frame, said frame having a plurality of threaded openings, rotatable screws mounted in said openings, and means to rotate said screws in unison whereby said frame is moved axially of said shaft and the pitch of the propeller varied.

7. A device as specified in claim 1, characterized by the adjustment carriage comprising rods connected to the adjustment arms, a frame movable axially of the propeller shaft, said rods being fixed to said frame, said frame having a plurality of threaded openings, rotatable screws in said openings, pinions fixed to the ends of said screws, an internal gear meshing with all of said pinions, and means to rotate said internal gear.

8. A device as specified in claim 2, characterized by the adjustment carriage comprising rods connected to the adjustment arms, a frame movable axially of the propeller shaft, said rods being fixed to said frame, said frame having a plurality of threaded openings, rotatable screws in said openings, pinions fixed to the ends of said screws, an internal gear meshing with all of said pinions, and means to rotate said internal gear.

9. A device as specified in claim 3, characterized by the adjustment carriage comprising rods connected to the adjustment arms, a frame movable axially of the propeller shaft, the rods being fixed to said frame, said frame having a plurality of threaded openings, rotatable screws in said openings, pinions fixed to the ends of said screws, an internal gear meshing with all of said pinions, and means to rotate said internal gear.

10. A device as specified in claim 4, characterized by the adjustment carriage comprising rods connected to the adjustment arms, a frame movable axially of the propeller shaft, said rods being fixed to said frame, said frame having a plurality of threaded openings, rotatable screws in said openings, pinions fixed to the ends of said screws, an internal gear meshing with all of said pinions, and means to rotate said internal gear.

11. A device as specified in claim 7, characterized by the operating means comprising a frame movable axially of the propeller shaft, the rods being fixed to said frame, said frame having a plurality of threaded openings, rotatable screws in said openings, pinions fixed to the ends of said screws, an internal gear meshing with all of said pinions, and means to rotate said internal gear.

In witness that I claim the foregoing I have hereunto subscribed my name this 8th day of August, 1922.

NILS HERMAN CEDERQUIST.