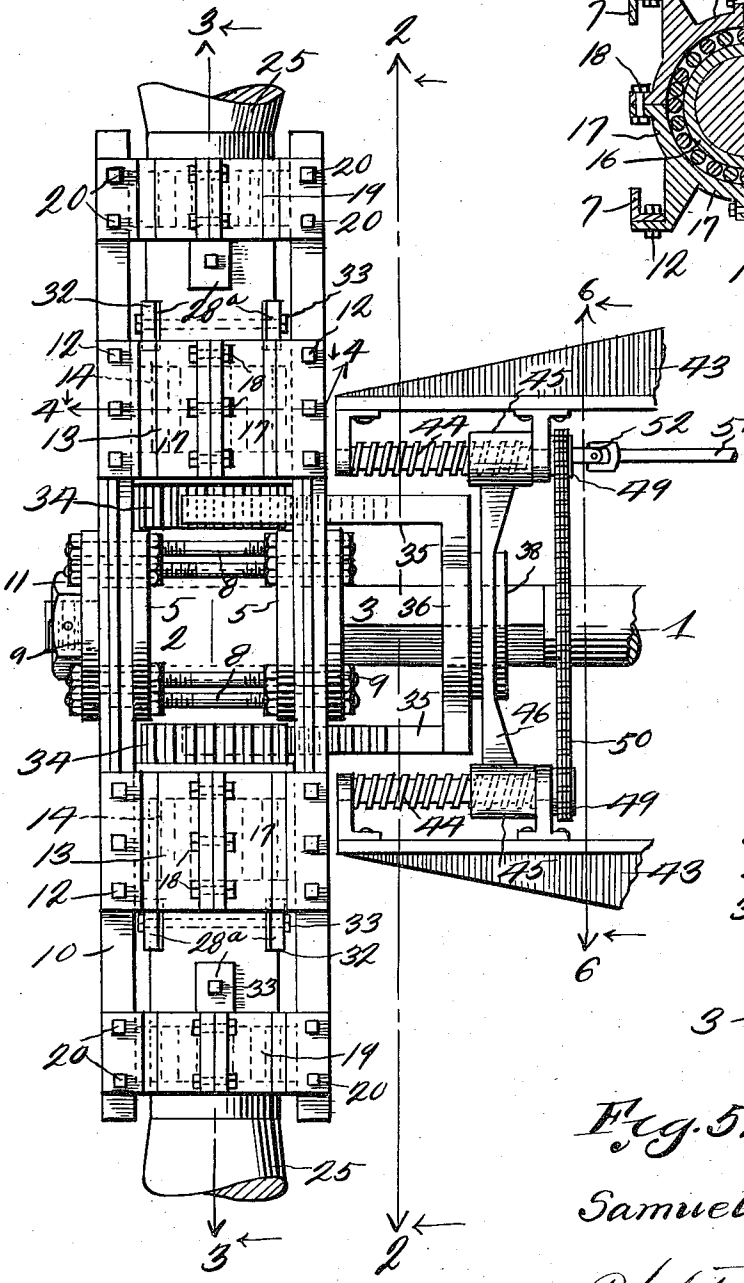
May 22, 1923. 1,455,990

S. W. CARTER

ADJUSTABLE PITCH PROPELLER FOR AIRPLANES

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Fig. 1.



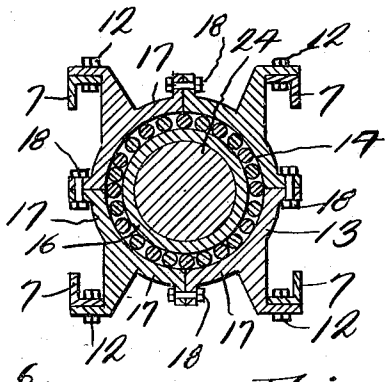


Fig. 4.

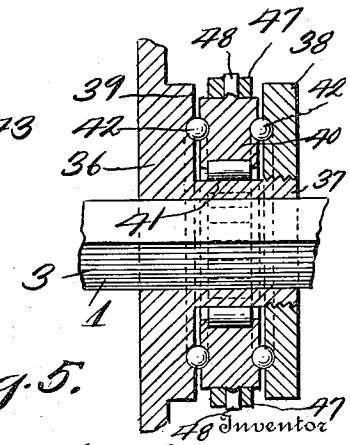


Fig. 5.

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ADJUSTABLE PITCH PROPELLER FOR AIRPLANES

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Fig. 2.

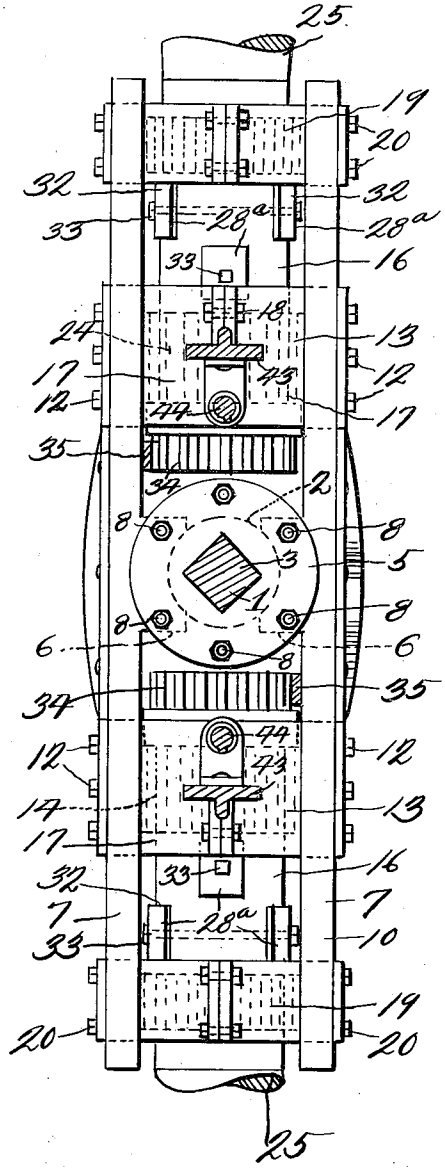
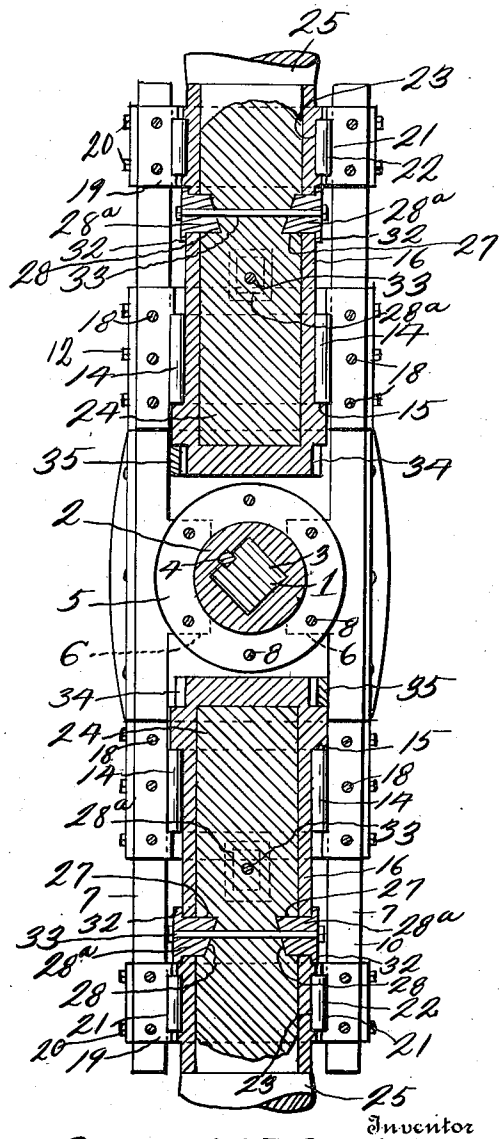


Fig. 3.



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Fig. 7.

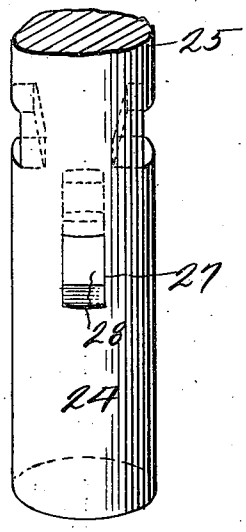


Fig. 6.

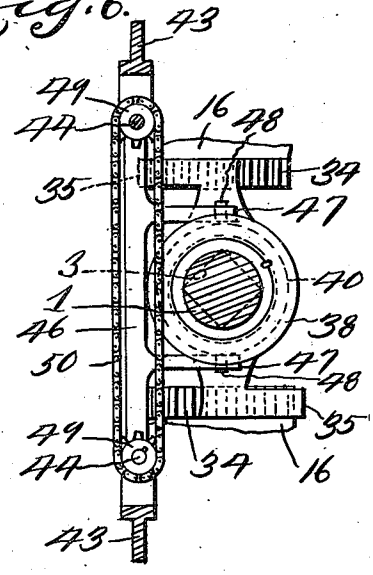
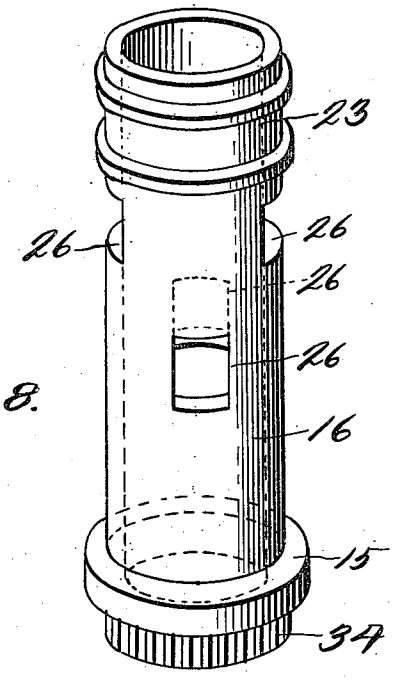


Fig. 8.



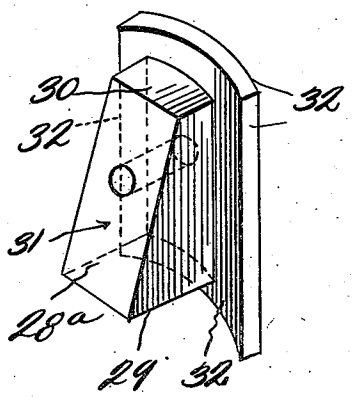


Fig. 9.

Inventor
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By Philip A. Ferrell
His Attorney

Patented May 22, 1923. 1,455,990

UNITED STATES PATENT OFFICE.

SAMUEL W. CARTER, OF WASHINGTON, DISTRICT OF COLUMBIA.

ADJUSTABLE-PITCH PROPELLER FOR AIRPLANES.

Application filed August 13, 1921. Serial No. 492,040.

To all whom it may concern:

Be it known that SAMUEL W. CARTER, a citizen of the United States, residing at Washington, in the District of Columbia, has invented certain new and useful Improvements in Adjustable-Pitch Propellers for Airplanes, of which the following is a specification, reference being had therein to the accompanying drawing.

The invention relates to air propellers for airplanes and other lighter-than-airships, and has for its object to provide a propeller of this character wherein the propeller blades may be simultaneously moved for varying the pitch, so as to give equal propulsion and efficiency in the atmospheric changes of altitudes. Also to provide means whereby the pivoted propeller blades may be simultaneously set at a neutral angle while the plane is gliding for purposes of landing, or for testing the motor before starting a flight.

A further object is to provide an adjustable pitch propeller comprising a frame carried by a propeller shaft, sleeves rotatably mounted in bearings at the ends of said frame, the inner ends of said sleeves being provided with gears, with which gears rack bars mesh, said rack bars are carried by a longitudinally movable yoke slidably mounted on the drive shaft and rotatable therewith. Also to provide worms located adjacent each side of the drive shaft and mounted in brackets, said worms having threaded thereon a movable yoke controlling member, and means whereby when one of said worms is rotated, the other worm will simultaneously rotate.

A further object is to provide means whereby the butts of the propeller blades will be positively held in the rotatable sleeves carried by the frame, said means comprising oppositely disposed wedge shaped blocks extending through rectangular shaped apertures in the opposite sides of the sleeves, said blocks being provided with integral flanges conforming to the outer periphery of the sleeves, and to provide bolt means connecting the oppositely disposed blocks together for positively holding the propeller blades against displacement incident to centrifugal force.

With the above and other objects in view the invention resides in the combination and arrangement of parts as hereinafter set forth, shown in the drawings, described and claimed, it being understood that changes in the precise embodiment of the invention may be made within the scope of what is claimed without departing from the spirit of the invention.

In the drawings:—

Figure 1 is a side elevation of the adjustable propeller, showing the operating mechanism and the drive shaft.

Figure 2 is a vertical sectional view taken on line 2—2 of Figure 1.

Figure 3 is a vertical sectional view taken on line 3—3 of Figure 1.

Figure 4 is a horizontal sectional view taken on line 4—4 of Figure 1.

Figure 5 is a vertical sectional view through the slidable collar for controlling the yoke.

Figure 6 is a vertical sectional view taken on line 6—6 of Figure 1.

Figure 7 is a perspective view of the butt end of one of the propeller blades.

Figure 8 is a perspective view of one of the propeller butt sleeves.

Figure 9 is a perspective view of one of the blocks for holding the propeller butt in the sleeve.

The present invention is an improvement on Patent No. 1,383,388, issued July 5, 1921 to Samuel W. Carter, and has for its object to render said invention more practical and positive in its operation. Referring to the drawings, the numeral 1 designates a drive shaft of an air plane, which may be driven in any suitable manner, and 2 a flanged sleeve secured on the rectangular shaped portion 3 of the shaft by means of a key 4. Engaging the outer faces of the flanges 5 of the flanged sleeve 2 are the lugs 6 of bars 7, which bars are equidistant from each other and are held in place by means of bolts 8, which pass through the flanges 5, lugs 6, and plates 9, which engage the outer faces of the lugs 6, therefore it will be seen that a propeller supporting frame 10 is provided, which frame is securely held on the rectangular shaped portion 3 of the drive shaft 1 and is held against rearward movement thereon by means of the nut 11 threaded on the outer end of the shaft 1. The bars 7 are preferably formed from angle iron as shown in Figure 1, and have secured thereto by means of bolts 12 roller bearing collars 13, in which collars roller bearings 14 are dis-

posed, which roller bearings engage the shoulders 15 of cylindrical propeller holding sleeves 16 and support the same in an anti-frictional bearing in such a manner that the sleeve will be held against longitudinal move- against centrifugal force during the rapid rotation of the propeller as a whole, and at the same time so supporting the cylindrical sleeve that it may be easily rotated by operating mechanism hereinafter set forth for varying the pitch of the propeller blades. The roller bearing collars 13 are formed from segmentally shaped sections 17, which sections are bolted at 18 at diametrically opposite points thereby allowing the bearing to be disassembled for cleaning and repairing without disassembling the whole bearing collar or the entire propeller blade holding structure. Adjacent the outer end of the frame 10 roller bearing collars 19 are secured by means of bolts 20, said collars being similarly constructed as the collars 13 and have disposed in annular raceways 21, roller bearings 22, which roller bearings also engage in the raceways 23 in the outer periphery of the butt receiving sleeves 16. It will be seen that the butt receiving sleeves 16 are anti-frictionally supported and supported in such a manner, and at spaced points that they will freely move during a pitch changing operation, and also in such a manner that the sleeves in which the propeller butts 24 are secured will be held against displacement incident to centrifugal force during the rotation of the propeller as a whole. The butts 24 of the propellers 25 are inserted in the sleeves 16 under heavy pressure preferably by hydraulic press, and after the butts 24 are in place in sleeves 16, a tool is inserted through the rectangular shaped openings 26 which are diametrically disposed in the sleeves 16, and the butts 24 are provided with rectangular shaped recesses 27 corresponding in size to the rectangular shaped openings 26 in the sleeves 16. The recesses 27 are deeper at their sides adjacent the end of the butt 24 than at their outer sides and are provided with inclined outwardly extending inner walls 28^a, and into which recesses 27 rectangular shaped blocks 28 are placed, said blocks having their inner ends 29 wider than their outer ends 30, thereby forming tapering surfaces 31 which taper at the same angle as the inner faces 28 of the recesses 27 and form means disposed at a right angle to the propeller butts for holding said butts against outward movement incident to centrifugal force during the rotation of the propeller. The rectangular shaped blocks 28^a are so shaped that a maximum amount of service engages in the recesses 27 of the butts 24 for holding the butts against outward movement, and that by reducing the width of the upper ends of the blocks 28^a the amount of material removed from the butts will be reduced, thereby preventing weakening of the butts. Each block 28^a is provided with integral flanges 32 which engage the outer periphery of the sleeves 16 and prevent inward movement of the blocks 28^a after the blocks have been forced into the recesses 27 by means of bolts 33 which pass through the butts, preferably at right angle positions to each other as shown and through the blocks 28^a. It will be seen that the blocks are securely held in place by the bolts 33 and that the butts are positively held in such a manner that they will be held against outward movement during the rapid rotation of the propeller as a whole, at which time the propeller blades are subjected to great centrifugal force.

The inner ends of the sleeves 16 are provided with gears 34 and with which gears the racks 35 located on opposite sides of the shaft 1 mesh. The racks 35 are carried by a yoke 36, which yoke is longitudinally slidable on a rectangular shaped portion 3 of the shaft 1, and is provided with a boss 37 which is secured a flange 38. Interposed between the flange 38, and the face 39 of the yoke 36 is a thrust collar 40, which thrust collar is mounted on roller bearings 41 interposed between its inner periphery and the outer periphery of the boss 37, said thrust collar also having interposed between its sides and the flange 38 and face 39 and yoke 36 ball bearings 42, which ball bearings prevent, in connection with the roller bearings 41, destruction of the thrust collar 40 incident to the rapid rotation of the yoke 36, which revolves with the propeller as a whole. It will be seen that the rack bars 35 engage the gears 34 at opposite sides, therefore the blades will during a movement of the rack bars be rocked in their bearings in opposite directions thereby changing the pitch of the propeller blades as desired. Disposed at opposite sides of the drive shaft 1 are brackets 43, which may be supported in any suitable manner on the fuselage, and rotatably mounted in bearings of said brackets are worms 44, which worms extend through threaded bosses 45 of a thrust collar moving yoke 46, which yoke is provided with arms 47 which receives lugs 48 at diametrically opposite sides of the collar 40. The worms 44 are provided with sprockets 49, and around said sprockets, a sprocket chain 50 extends. It will be seen that when the operating shaft 51, which is universally connected at 52 to one of the worms 44, is rotated that both worms 44 will simultaneously rotate thereby moving the yoke 46 and bosses 45 in such a manner that the rack bars 35 will be reciprocated for changing the pitch of the propeller blades 25. The operating shaft may lead to the cockpit of the airplane and be rotated in any suitable manner.

The invention having been set forth what is claimed as new and useful is:—

1. The combination with a bearing sleeve disposed on the butt of a propeller blade, of means for securing said sleeve on said butt, said means comprising oppositely disposed blocks extending through openings in the sleeve and into registering recesses in the butt, marginal flanges carried by the blocks and engaging the sleeve for limiting the inward movement of the blocks, and bolts extending through the butt and connecting together the oppositely disposed blocks.

2. The combination with a bearing sleeve disposed on the butt of a propeller blade, of means for securing said sleeve on said butt, said means comprising oppositely disposed rectangular shaped blocks extending through openings in the sleeve and into registering recesses in the butt, marginal flanges carried by the blocks and engaging the sleeve for limiting the inward movement of the blocks and bolts extending through the butt and connecting together the oppositely disposed blocks.

3. The combination with a bearing sleeve disposed on the butt of a propeller blade, of means for securing said sleeve on said butt against displacement, said means comprising oppositely disposed rectangular shaped blocks extending through openings in the sleeve and into recesses in the butt, said rectangular shaped blocks being wider at their ends adjacent the inner end of the butt than at their outer ends, thereby presenting a maximum holding surface against displacement under centrifugal force, bolts extending through oppositely disposed blocks for holding the same in close engagement with the sleeve and in the butt recesses and integral flanges carried by the blocks engaging the outer periphery of the sleeve for limiting the inward movement of the block.

4. The combination with a bearing sleeve disposed on the butt of a propeller blade, of means for securing said sleeve on said butt, said means comprising oppositely disposed rectangular shaped blocks extending through oppositely disposed rectangular shaped openings in the sleeve and into registering recesses in the butt, flanges carried by the outer ends of said blocks and engaging the outer periphery of the sleeve and a bolt passing through said oppositely disposed blocks for holding the same in the openings and recesses.

In testimony whereof I hereunto affix my signature.

SAMUEL W. CARTER.