Feb. 7, 1939. R. B. MANNING 2,146,481

PROPELLER

Filed May 28, 1937 2 Sheets-Sheet 1

Fig. 1.

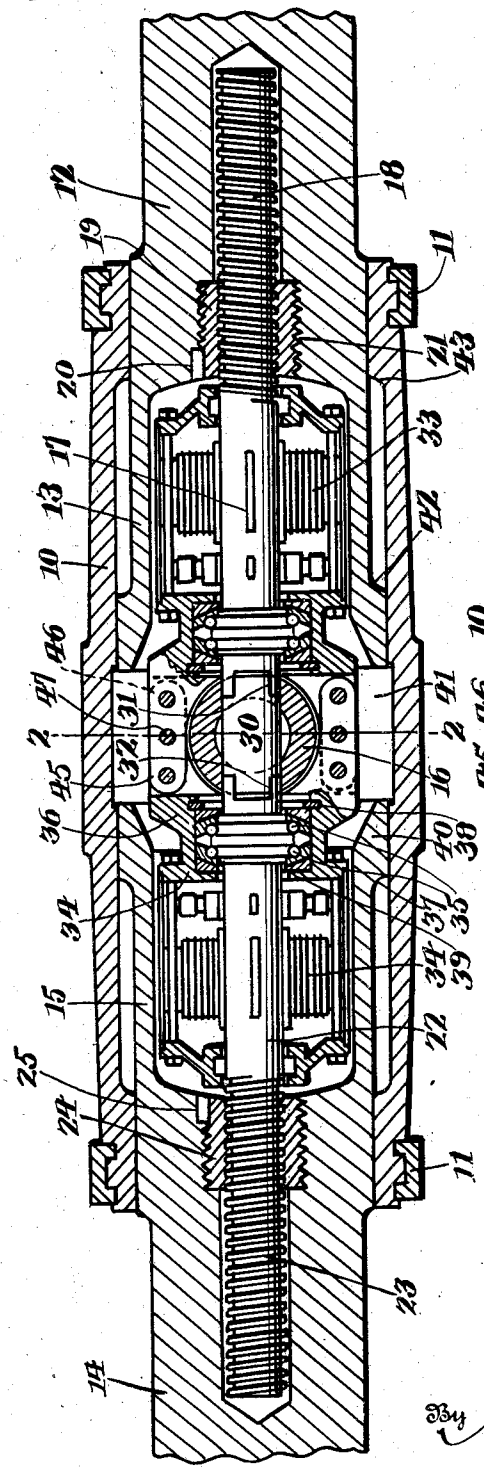
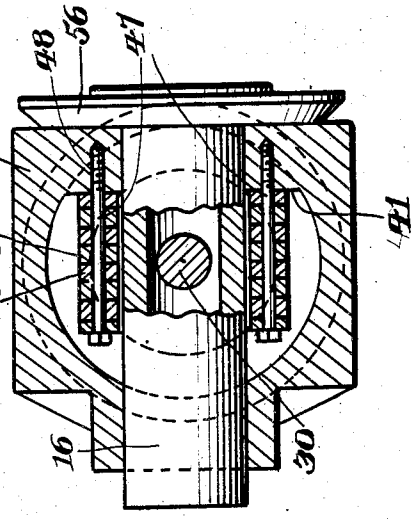


Fig. 2.



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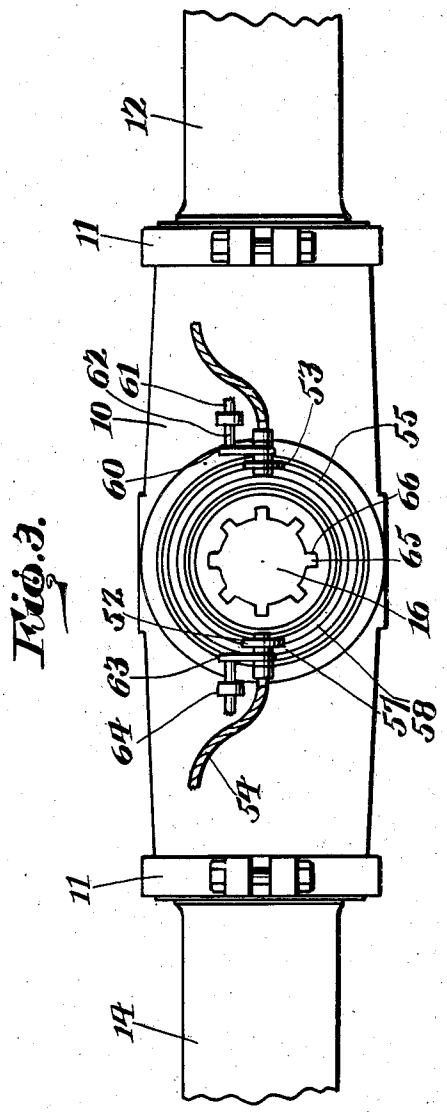


Fig. 3.

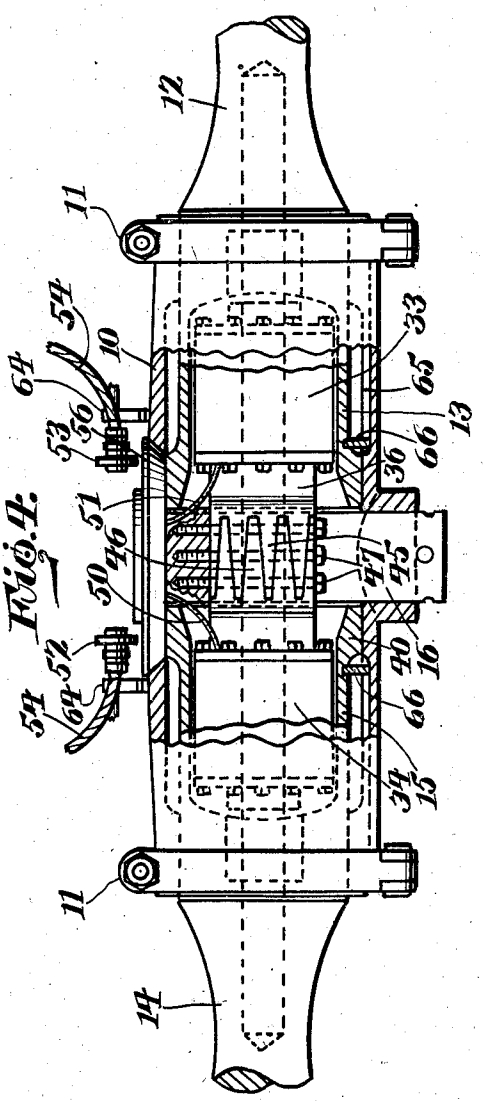


Fig. 4.

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PROPELLER

Ray B. Manning, South Jacksonville, Fla.

Application May 28, 1937, Serial No. 145,328

4 Claims. (Cl. 170—163)

This invention relates to propellers.

An object of the invention is the provision of a device for varying the diameter of a propeller in which the blades of the propeller are moved inwardly or outwardly of the hub to secure a greater efficiency between the motors and propellers of aircraft operating at high altitude since there is a difference of efficiency of an airplane propeller between high and low altitudes.

Another object of the invention is the provision of a mechanism for increasing or decreasing within prescribed limits the diameter of a propeller of the well known screw type, the mechanism being controlled at will by the operator for accommodating the propeller for varying conditions to obtain the greatest efficiency.

A further object of the invention is the provision of a propeller having blades slidably mounted in the hub thereof with means for moving the blades radially inwardly or outwardly of the hub for decreasing or increasing the diameter of the propeller with means for maintaining the blades in a predetermined position and with motors incorporated in the hub at either side of the propeller shaft for aiding in properly counterbalancing the propeller.

This invention will be best understood from a consideration of the following detailed description, in view of the accompanying drawings forming a part of the specification; nevertheless, it is to be understood that the invention is not confined to the disclosure, being susceptible of such changes and modifications as define no material departure from the salient features of the invention as expressed in the appended claims.

In the drawings:

Figure 1 is a horizontal section of the propeller,

Figure 2 is a transverse vertical section taken along the line 2—2 of Figure 1,

Figure 3 is a side view of the propeller, and

Figure 4 is a plan view of the propeller partly in section.

Referring more particularly to the drawings 10 designates a housing of the hub section of the propeller. This housing if desired may be in sections and joined together at their ends by means of bands 11.

A blade 12 has a hollow portion 13 slidably mounted in one end of the housing 10. A second blade 14 has a hollow portion 15 slidably mounted in the other end of the housing 10. A propeller shaft 16 extends through the hub of the propeller as shown in Figs. 2, 3 and 4 and is connected to the hub in a manner which will be presently explained.

A screw 17 is provided with left hand threads at 18 and has a threaded connection with a nut 19 which is secured at 20 in a socket 21 in the shank portion of the blade 12.

A screw 22 has right hand threads, as shown at 23, engaging the threads of a nut 24 mounted in the shank of the blade 14 and secured thereto as shown at 25. It will be seen from this construction that since the nuts 19 and 24 are secured within the shanks of the respective blades 12 and 14, rotation of the screws 17 and 22 will cause the shanks and likewise the blades to be moved outwardly or inwardly of the housing 10, depending upon the direction of rotation of the screws.

A member 30 is located transversely of the longitudinal axis of the shaft 16 and has connections 31 and 32 with the screws 17 and 22, so that said screws will be simultaneously rotated in the same direction. The inner ends of the said screws project into a diametrical passage in the shaft 16 and the member 30 is located within said passage and between the inner ends of said screws.

An electric motor 33 is connected with the screw 17 so that when the motor is operating the screw will be revolved. A motor 34 is connected to the screw 22 and is adapted to revolve the screw or shaft 22 in the same direction that the screw or shaft 17 is revolved by the motor 33. The motors 33 and 34 are of the reversible type so that the shafts or screws 17 and 22 may be rotated in either direction.

A combined radial and two-way thrust bearing is shown at 35 on either side of the shaft 16 and these bearings are mounted in sections of a housing 36. These sections of the housing are extended to form end plates 37 for the motors 33 and 34. A ring 38 set in an annular groove in the inner wall of the sections of the housing 36 maintains the bearings 35 in position at one side while an annular flange 39 at the inner end of each motor cooperates with the ring 38 for maintaining the bearings in position.

The inner end of each shank portion of the blades is provided with a flange as shown at 40 with the inner end of the flange being adapted to engage an extension 41 on the center of the housing 10 to limit the inward movement of each blade. This flange is also provided with a shoulder 42 which is adapted to engage a shoulder 43 from the housing 10 for limiting the outward movement of the blades.

It will be noted that the hollow shank portions 13 and 15 of the blades form housings for the motors 33 and 34.

As previously stated, the housing 36 is formed of two sections and these sections are joined together at the central portion of the hub by means of fingers 45 and 46. A plurality of fingers 45 project from one section of the housing 36 while alternately disposed fingers project from

the other section of the housing and when these fingers are interfitted they are connected together by means of bolts 47 which have their inner ends threaded into the wall of the housing 10 as shown at 48.

The motors are supplied with current from a source within the airplane by means of wires 50 and 51, brushes 52 and wires 54. A brush 53 is adapted to engage a ring contact member 55 which is mounted upon the outer flat face 56 of the hub section or housing 10. This ring is insulated from the hub section but is connected with the wire 51. The rolling contact or brush 57 is adapted to engage a ring contact member 58 which is located concentrically with respect to the ring 55. The last-mentioned contact is also insulated from the housing but is connected with the wire 50 which leads through either motor 33 or 34. The wire 51 also leads to the motors 33 and 34.

The contact member or brush 53 is carried by a lever 60 which is rocked by a rod 61 mounted in bearings 62 carried by a fixed part (not shown) external of the housing 10. The brush or contact 57 is operated by a lever 63 which is mounted in a bearing 64 carried by a fixed part, preferably a bearing for the shaft 16.

Since the motors 33 and 34 may be revolved in either direction, one of the contact members 53 when moved into engagement with the ring contact 55 by the operation of the rod 61 will cause direct rotation of both motors. When the brush 57 is moved into engagement with the ring 58 it will cause an opposite direction of rotation of both motors since the current from the source in the last instance is supplied through the field coils of the motor causing reversing of rotation of said motor.

As shown more particularly in Fig. 3, the shaft 16 is provided with keys 65 adapted to be received within keyways or grooves 66 in the hub section of the propeller for securing the shaft 16 to said hub.

The operation of my device is as follows: It will be seen by this construction that the blades of the propeller may be moved inwardly or outwardly toward or away from the shaft 16 by the proper direction of rotation of the motors 33 and 34 since the left hand thread of the screw or shaft 17 and the right hand thread 23 of the screw or shaft 22 will cause outward or inward movement of the blades, depending upon the direction of rotation of the electric motors. The blades are restricted in their outward movement by means of their cooperating shoulders 42 and 43 and their inward motion is restricted by the flange 40 engaging the extension 41 in the hub section 10 of the propeller.

Since the inner ends of the shafts or screws 17 and 22 having a flexible connection with each other by the medium of the member 30 located transversely of the shaft 16 said screws or shafts must be always revolved simultaneously and in the same direction.

When it is desired to move the blades inwardly or outwardly of the hub section it is only necessary for the operator to move the proper brush 52 or 53 into engagement with its respective ring for energizing the motors and cause said motors to rotate in a certain direction. The brushes 52 and 53 will be normally out of contact with the rings during rotation of the propeller.

The housing 10 is provided with grooves 65 which are formed on the inner wall of the housing 10 and pins or lugs 66 carried by the shank portions of the blades 12 and 14 ride in these grooves in order to maintain the proper pitch of the blades. Otherwise when the members 17 and 22 are revolved the blades themselves would be revolved. However, the grooves 65 may be of spiral type so that when the blades are moved outwardly or inwardly, said blades may be revolved in the hubs to maintain the same pitch or to vary the pitch with the variations of the propeller diameter when desired.

I claim:

1. A propeller comprising a hub, blades slidably mounted in the hub, a screw having at one end a left-hand threaded engagement with one blade and a right-hand threaded engagement with the other blade so that rotation of the screw will cause inner or outer radial movement of the blades, means for revolving the screw in either direction, a radial and two-way thrust bearing supporting the intermediate portion of the screw, a casing for the bearing formed of sections, the adjacent edges of the section having complementarily formed interfitting fingers and bolts passing through the finger and threaded into the hub for securing the sections together and for securing the casing to the hub.

2. A propeller comprising a hub, blades slidable in the hub, means for moving the blades radially outwardly or inwardly of the hub and including a right-hand screw threaded into one blade, a left-hand screw threaded into the other blade, said screws being in longitudinal alignment, means connecting the inner ends of the screws together, a thrust bearing for each of the inner ends of the screws, a sectional casing fixed against rotation in the hub and housing the bearings, a motor directly mounted on the inner end of each screw for revolving the screws simultaneously.

3. A propeller comprising a hub, blades slidable in the hub, means for moving the blades radially outwardly or inwardly of the hub and including a right-hand screw threaded into one blade, a left-hand screw threaded into the other blade, means connecting the inner ends of the screws together, a thrust bearing for each of the inner ends of the screws, a casing fixed against rotation in the hub and housing the bearings, a motor associated with each screw for revolving the screws simultaneously, a pair of rings connected with each motor, a contact member associated with each ring and adapted to be moved away from the ring during normal rotation of the propeller, one of said contact members when moved into engagement with one of the rings causing rotation of the motors in one direction, the engagement of the other contact with its associated ring causing rotation of the motors in the opposite direction.

4. A propeller comprising a hub, blades slidable in the hub, means for moving the blades radially outwardly or inwardly of the hub and including a right-hand screw threaded into one blade, a left-hand screw threaded into the other blade, means connecting the inner ends of the screws together, a thrust bearing for each of the inner ends of the screws, a sectional casing fixed against rotation in the hub and housing the bearings, a motor mounted on the inner end of each screw for revolving the screws simultaneously, contacts secured to the hub, and contacts adapted to be moved into and out of engagement with the contacts on the hub for closing circuits to the motors.

RAY B. MANNING.