July 31, 1945. H. W. MOLLENHAUER 2,380,540

AUTOMATIC AREA CONTROL PROPELLER

Filed Nov. 9, 1942

Fig. 1

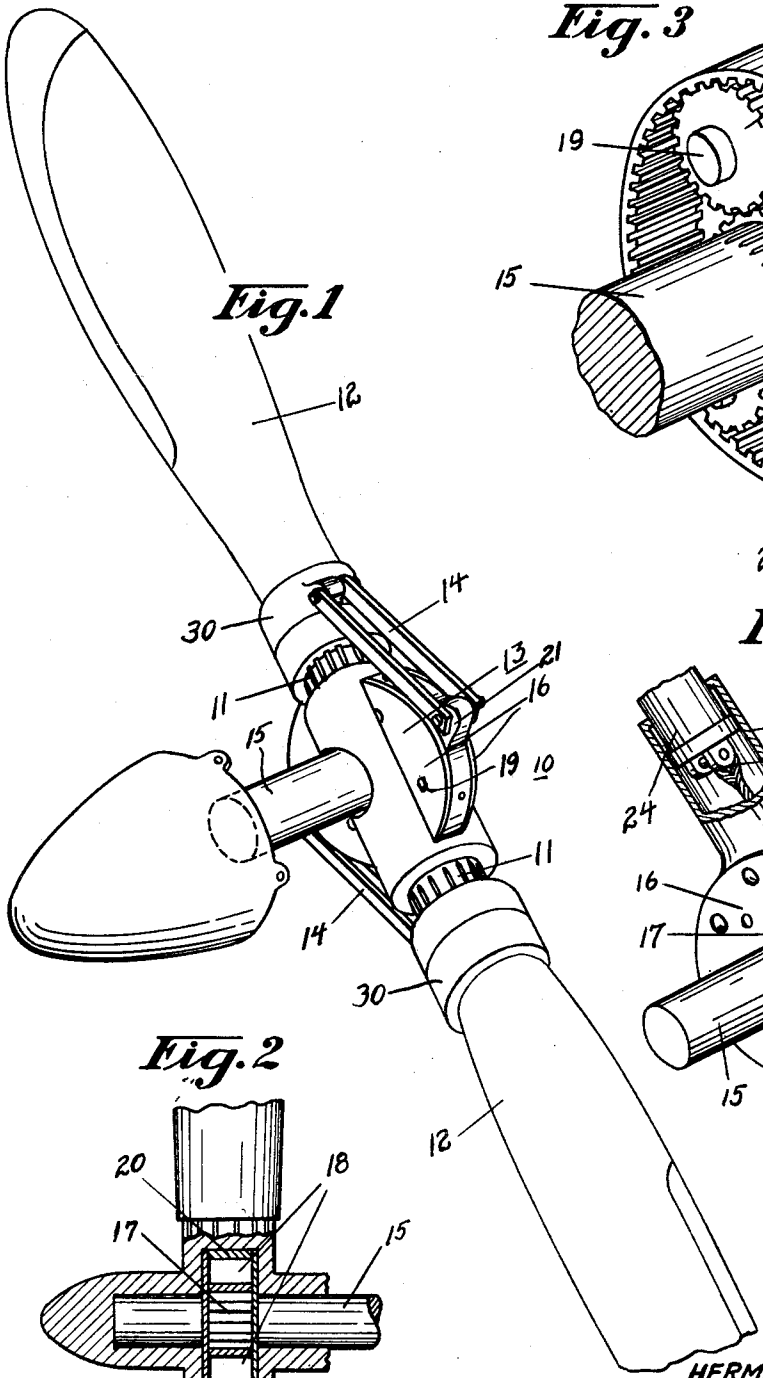


Fig. 3

Fig. 4

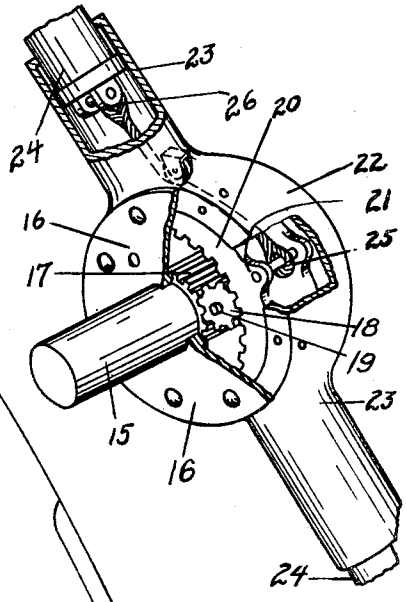


Fig. 2

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AUTOMATIC AREA CONTROL PROPELLER

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4 Claims. (Cl. 170—160)

This invention relates to propellers and has particular relation to a new and novel method of increasing the length of such a propeller at times, particularly adaptable for aircraft.

In aircraft it is extremely desirable to have a propeller which takes a larger "bite" in the air when great pulling power is required. It has hitherto been the practice to achieve this by the use of variable pitch blades or by using more than two such blades.

I propose to provide a propeller which will automatically extend its own radius when its speed is increased.

A primary object of my invention, therefore, is to provide a propeller in which the blade will assume an extended position when the speed of the propeller is increased.

Another object of my invention is to provide a propeller which is automatic in adjustment.

A further object of my invention is to provide a variable radius propeller which is simple in construction and positive in action.

A still further object of my invention is to provide a variable radius propeller which will vary in length in relation to the speed and power with which it is turned.

Other and further features and objects of the invention will be more apparent to those skilled in the art upon a consideration of the accompanying drawing and following specification, wherein is disclosed a single exemplary embodiment of the invention, with the understanding, however, that such changes may be made therein as fall within the scope of the appended claims without departing from the spirit of the invention.

In said drawing:

Figure 1 is a view in perspective of a propeller constructed according to one embodiment of my invention.

Figure 2 is a side elevational view in cross section of another embodiment of the invention to show the gearing arrangement thereof.

Figure 3 is an enlarged view in perspective of the gearing means constructed according to one embodiment and illustrating it in detail.

Figure 4 is a cut-away view of another embodiment of my invention.

Referring now to the drawing, and more particularly to Figure 1; the propeller here shown consists of a hub portion indicated generally at 10, having two radially extending arms 11. Slidably mounted on these arms are propeller blades 12. Mounted within the hub is a blade extension control mechanism indicated generally at 13 and operatively connected to the blades by means of link members 14.

I will now describe in detail the extension control mechanism 13. A power driven shaft 15 extends into the hub portion 10. Mounted on this shaft and within the hub are two face plates 16 which are fully rotatable on the shaft. A gear 17 is fixedly mounted on the drive shaft between the two face plates. Disposed on the outer circumference of this gear and adapted to cooperate therewith are three intermediate gears 18 having stub shafts 19 which extend through the face plates and are freely mounted therein. Mounted to cooperate with the outer portion of these intermediate gears is an internal planetary gear 20 which has ear portions 21 thereon to which the aforementioned link members 14 are operatively connected. The planetary gear 20 is free to rotate between the two face plates. If desired, the splined shafts 11 may be rotated and controlled by any suitable mechanism (not shown) to vary the pitch of the blades. The sleeves 30 are rotatable on the blades 12 so that the connectors 14 need not rotate when the blades are rotated.

This control mechanism is more fully shown in Figures 2 and 3.

Another embodiment of my invention is shown in Figure 4. In this structure a similar gear arrangement is provided. However, the hub portion of the propeller consists of a housing 22 having extending tubular portions 23 in which the propeller blades 24 are slidably mounted. In this manner the movable portions of the control mechanism may be completely enclosed.

A cable member 25 is operatively connected at one end to the internal planetary gear in a conventional means as shown at 25. The other end of this cable is attached to the base of a propeller blade as shown in 26. In this embodiment the housing member 22 is supported by the face plate 16 which is freely mounted on the drive shaft 15.

It is apparent, from this description, that when the drive shaft 15 is rotated in a counter-clockwise direction, the intermediate gear 18 will revolve in a clockwise direction moving the internal planetary gear 20 in the same direction. This movement of the planetary gear will serve to draw the propeller blades inwardly. When the blades have reached the limit of their inward movement, the rotation of the planetary gear will cease. This will cause the intermediate gears to become locked and prevent their further rotation since they are within the face plates which are fixedly mounted in relation to the propeller

blades. Thus when the blades have stopped the rotary movement of the planetary gear, the propeller will revolve in a counter-clockwise direction in cooperation with the drive shaft.

As the speed of the propeller increases, centrifugal force will tend to drive the propeller blades outwardly. When the force supplied by the drive shaft to the intermediate and planetary gears is overbalanced by centrifugal force, the blades will commence to move outwardly, drawing the planetary and intermediate gears in a counter-clockwise direction. As the propeller is again slowed down, the force applied by the drive shaft will overcome the centrifugal force acting upon the blades and the blades will be drawn inwardly.

Thus it will be seen from the foregoing description and explanation that I have provided a propeller which is automatically adjustable to the power needs of the aircraft on which it is mounted. When the speed of the motor is increased the propeller blades will automatically extend themselves to move a greater volume of air or take a greater "bite." This will provide additional power for such operations of aircraft as take-off or high altitude flight. However, when only a nominal amount of power is used for "cruising" speeds the advantages of a small propeller in the nature of fuel economy will be present. In effect, I have provided two propellers. Furthermore, a propeller constructed according to my invention may be utilized in connection with the variable pitch mechanisms known to the art to regulate the effective area of the propeller as well as to vary the pitch of the blades to thus meet the many varied demands placed on the modern aircraft propeller.

Further, it is apparent that a device constructed according to the embodiments of my invention disclosed would be economical in construction and efficient in operation since there are few moving parts. Thus all the objects and advantages of my invention have been obtained.

Although I have described several specific embodiments of my invention, it is apparent that modifications thereof may be made by those skilled in the art. Such modifications may be made without departing from the spirit and scope of my invention as set forth in the appended claims.

I claim as my invention:

1. In a device of the class described, a hub rotatably and freely mounted on a shaft, propeller blades slidably mounted within the hub, a gear on the drive shaft, an internal planetary gear and an idler gear rotatably mounted on said hub and operatively connecting said drive gear and said planetary gear, and link means connecting said planetary gear to the blades to control the movement of said blades.

2. In a propeller, a drive shaft, a hub mounted for rotation on the drive shaft, hub carrying means, a gear on the drive shaft, an internal gear on the hub, and an idler gear between the two first mentioned gears, said idler gear being rotatably mounted on said hub and meshing with said first mentioned gears, propeller blades, the internal gear being rotatable in the hub and the hub carrying means for slidably mounting said propeller blades thereon and links between the internal gear and the propeller blade whereby torque in the drive shaft is balanced against centrifugal force in the propeller blades.

3. In a propeller, a drive shaft, a hub rotatably mounted thereon, propeller blades shiftably radially on said hub, planetary gearing disposed in said hub and including a sun gear on said shaft, a ring gear, a planet gear journaled for rotation in said hub and meshing with said sun gear and said ring gear, and means connecting said ring gear with said propeller blades so that the reaction of driving said hub and blades serves to oppose radially outward shifting of said blades due to centrifugal force.

4. In a propeller, a drive shaft, a gear fixed thereto, a hub rotatably mounted on said shaft, propeller blade means shiftable radially on said hub, gear means movably mounted on said hub in a position meshing with said drive gear and rotatable relative to said hub when said drive shaft rotates relative to said hub, and means connecting said gear means with said propeller blade means whereby the centrifugal force due to the rotation of said blade means acts through said gear means to oppose rotation of said hub relative to said drive shaft.

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