Sept. 27, 1938. V. B. BRUMWELL 2,131,217

AUTOMATIC VARIABLE PITCH PROPELLER

Filed Dec. 12, 1936

Fig. 1.

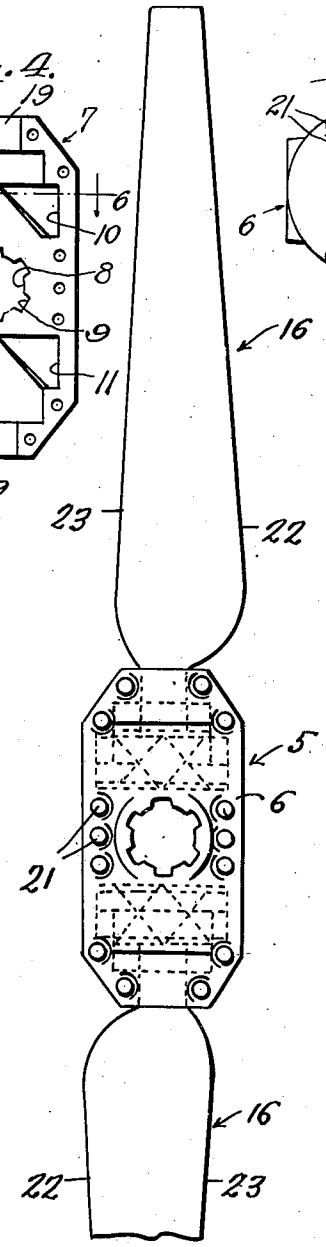


Fig. 4.

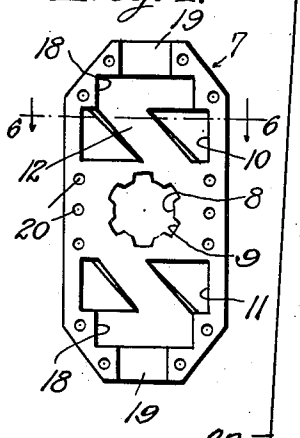


Fig. 7.

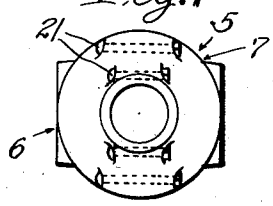


Fig. 2.

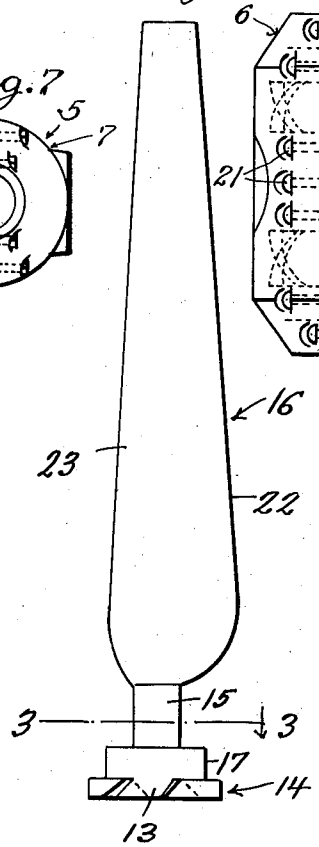
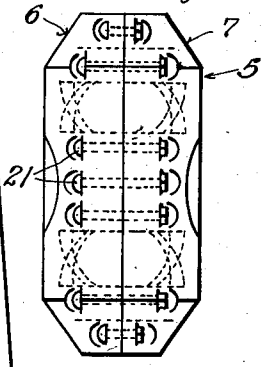


Fig. 5.



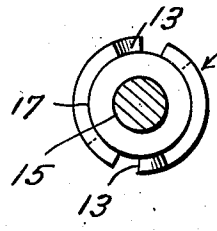
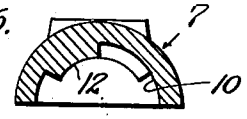


Fig. 3.

Fig. 6.



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AUTOMATIC VARIABLE PITCH PROPELLER

Vincent Boyd Brumwell, San Diego, Calif.

Application December 12, 1936, Serial No. 115,620

2 Claims. (Cl. 170—162)

My invention relates generally to propellers of the automatic variable pitch type, and particularly to a propeller of this type of marked simplicity and ease of manufacture, the propeller being composed of only two parts other than the propeller blades.

Another important object of my invention is to provide a propeller of the type indicated above which enables using a shorter or smaller propeller without sacrifice of performance, and results in an arrangement which reduces the strain on the crankshaft and engine, and which permits the engine to turn at the same speed at any altitude while the throttle is open.

Another important object of my invention is to provide a propeller of the character indicated in which there is practically no "pull" when landing.

Other important objects of my invention will be apparent from a reading of the following description taken in connection with the drawing, wherein for purposes of illustration I have shown a preferred embodiment of my invention.

In the drawing:—

Figure 1 is a general front elevational view of the embodiment.

Figure 2 is a front elevational view of one of the propeller blades.

Figure 3 is a horizontal sectional view taken through Figure 2 approximately on the line 3—3 and looking downwardly in the direction of the arrow.

Figure 4 is a front elevational view of the back section of the hub.

Figure 5 is a side elevational view of the assembled hub sections.

Figure 6 is a horizontal sectional view taken through Figure 4 approximately on the line 6—6 and looking downwardly in the direction of the arrow.

Figure 7 is a top plan view of Figure 5.

Referring in detail to the drawing, the numeral 5 generally designates the hub of the propeller which is composed of the front section 6 and the rear section 7. These sections are substantially similar, each being provided with a transverse bore 8 with the requisite keyways 9 therein to receive the propeller shaft. Each section 6, 7 is provided in its upper part with a semi-cylindrical chamber 10 and in its lower part below the bore 8 with a similar semi-cylindrical chamber 11 which is reversed with respect to the chamber 10, but longitudinally aligned therewith.

Around the outer wall of each of these chambers is a land 12 which is disposed at an approximate 45 degree angle and which operatively cooperates with the correspondingly shaped and angulated grooves 13 in the corresponding annulus 14 which is fastened to the arm or shaft 15 of the corresponding propeller blade 16. The upper part of the annulus 14 has a reduced cylindrical portion 17 which is received in and turns in the reduced semi-cylindrical portion 18 of the corresponding one of the chambers 10 and 11, the shaft or arm 15 working through the receiving opening 19 in the top or bottom or end of the chamber.

Each of the sections 6 and 7 is provided with a corresponding plurality of registrable bolt receiving holes 20 in which are disposed the bolts 21 to lock the sections together in registry as indicated in Figure 5 and in Figure 7.

With the annuli 14 of the respective propeller blades 16 mounted in the chambers formed by the registration of the chambers 10 and 11, upon assembly of the sections 6 and 7 in the manner indicated, the propeller is assembled for use and installation on the propeller shaft (not shown). The numeral 22 designates the trailing edge of the propeller blade 16, while the numeral 23 designates the leading edge of the propeller blade. In this connection it is to be noted that the trailing edge is off-center with respect to the leading edge, so that most of the wind pressure will be on the trailing edge.

For a successful application of the invention the propeller blade must be constructed so that the wind pressure on the trailing edge 22 will be substantially equal to the centrifugal force of the hub housing when the engine is idling at zero altitude, thus keeping the pitch of the blades at zero or no pitch. As the engine increases speed the centrifugal force exceeds the wind pressure on 22 to such an extent that it forces the blades outward and increases the pitch until full speed where the wind pressure and the centrifugal force are again equal. The blade also must be constructed so that at every different engine speed the pitch of the propeller must be at the most advantageous pitch. Thus in high altitude or stratosphere flying where the air is thin, as the higher altitude is reached the wind pressure decreases gradually on the blades 16. The centrifugal force increases slightly as the engine turns faster. The blades are forced out further. Thus the pitch increases until the wind pressure and centrifugal force are equal. This gives a maximum propeller efficiency for stratosphere flying. As the plane gains altitude the pitch increases on the blades and decreases when descending. When

landing the engine is idling and the pitch is back to zero or no pitch. Opposed blades are forced in opposite directions of rotation in imparting the pitch.

The grooves 13 and the lands 12 are so arranged that when the propeller blades are in the pitch of zero or no pitch, and the hub is turned faster, the centrifugal force will force the blades to rotate outwardly so as to increase the pitch of the blades as far as full speed and until full speed is reached. As the hub is slowed down, the pitch of the blades becomes automatically lessened until the zero pitch position is reached at idling speed of the engine. The greatest angle obtainable is about 45 degrees or slightly more. As a higher altitude is reached in an aeroplane equipped with a propeller in accordance with the present invention, the centrifugal force will exceed the wind pressure on the trailing edge of the blades, so that the blades will be forced to an increased pitch whereat the wind pressure on the trailing edges of the blades will equalize the force of the centrifugal force.

Although I have shown and described herein a preferred embodiment of my invention, it is to be definitely understood that I do not desire to limit the application of the invention thereto, and any change or changes may be made in the materials, and in the structure and arrangement of the parts, within the spirit of the invention and the scope of the subjoined claims.

What is claimed is:—

1. An automatic change pitch propeller of the class described comprising a hub adapted for mounting on a propeller shaft, said hub having radially extending portions each formed with a circular chamber and an opening in its outer end communicating with the chamber, propeller blades carried by said radial portions and each having a shaft part passing through the opening and a circular part slidably located in the chamber, each blade having its trailing edge off-center with respect to the leading edge to provide a greater wind pressure on the trailing surface than on the leading surface, means in the chamber and means on the circular portion for partly rotating the blade when the same moves axially, said circular portion having unimpeded sliding movement in the chamber aside from the frictional engagement of such means on the circular portion with the means in the chamber, the parts being constructed and arranged to increase the pitch of the blade as the same moves axially outwardly under the action of centrifugal force and to decrease the pitch as the blade moves inwardly by the action of the air pressure on the blade overcoming the centrifugal force.

2. An automatic change pitch propeller of the class described comprising a hub adapted for mounting on a propeller shaft, said hub having radially extending portions each provided with a chamber and each chamber having a circular outer part and a circular inner part, the inner part being of larger diameter than the outer part, an angularly disposed land on the cylindrical wall of the enlarged inner part of said chamber, propellers extending into the radially extending portions of the hub and each having on its inner end a circular portion of two diameters, the smaller portion having sliding movement in the smaller part of the chamber and the larger part having sliding movement in the larger part of the chamber, said larger part having an inclined groove therein for slidingly engaging the land, said circular portion having unimpeded sliding movement in the chamber aside from the frictional engagement of the land with the walls of the groove, each blade and its circular portion moving axially outwardly under the action of centrifugal force of the rotating hub, each blade having its trailing edge off-center with respect to the leading edge to place the major portion of the blade surface to the rear of the center of the blade, whereby the greater wind pressure will be exerted on the trailing surface, the parts being constructed and arranged to cause increased pitch of the blade when the same is moved outwardly by centrifugal force and the pitch is decreased by axially inward movement of the blade when the wind pressure on the blade exceeds the centrifugal force.

VINCENT BOYD BRUMWELL.