

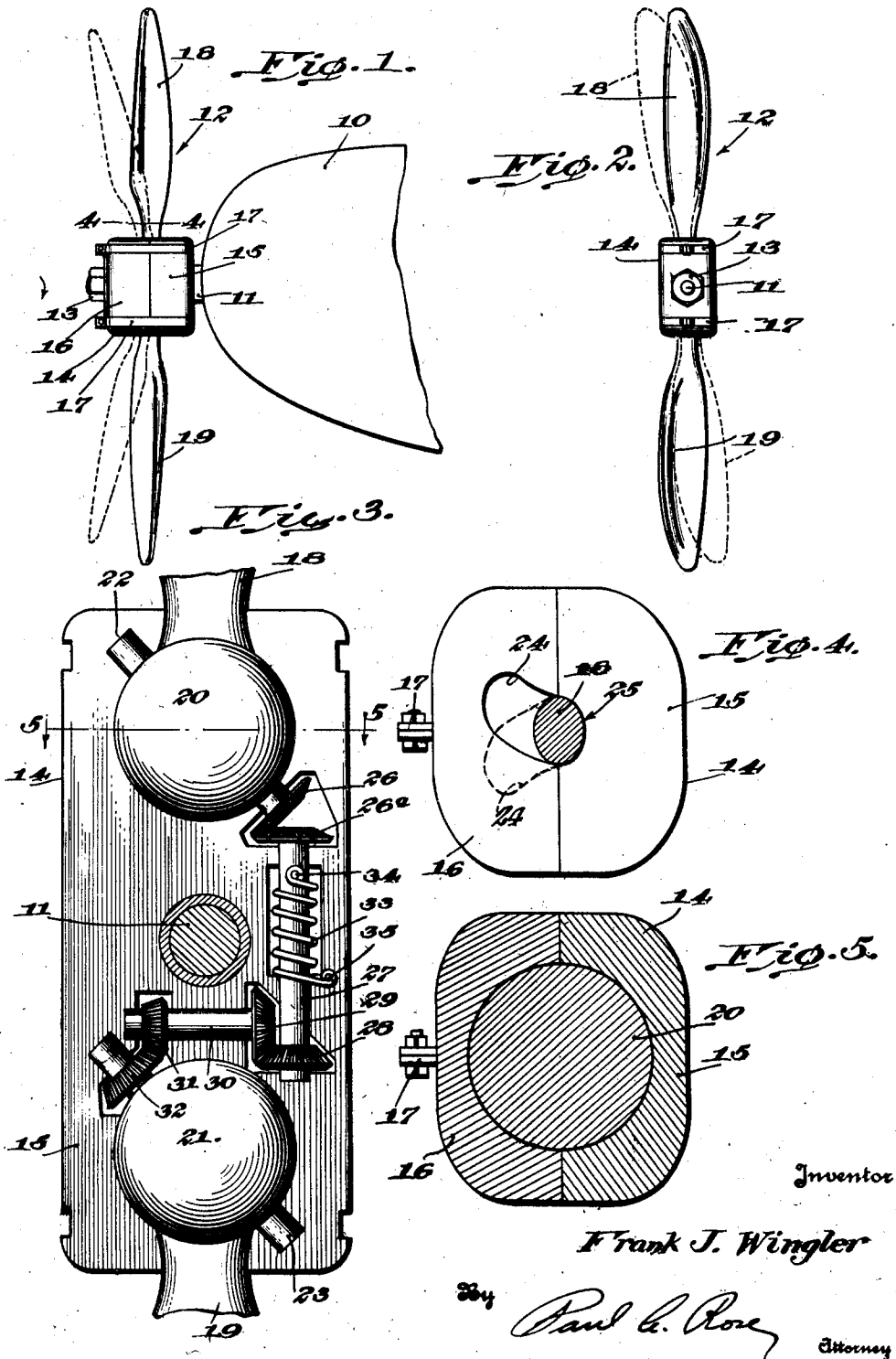
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VARIABLE PITCH PROPELLER

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VARIABLE PITCH PROPELLER

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5 Claims (Cl. 170—162)

My invention relates to propellers and particularly to variable pitch propellers for use upon air or water craft.

It is an object of the present invention to produce a propeller adapted for use with air or water craft in which the pitch and diameter of the blades is varied in accordance with the power applied thereto and the forward speed of the craft itself.

It is also an object of the invention to provide such a device which will function automatically, which will be extremely simple in construction and operation and which will not be likely to become broken or out of order in any way.

Another object of the invention is to provide a propeller of this character in which the individual blades are mounted for movement relative to each other.

A further object of the invention is to provide means for synchronizing the action of the blades.

Other objects and advantages of the invention will become apparent during the course of the following detailed description when read in conjunction with the accompanying drawing, wherein;

Fig. 1 is a side elevation of an embodiment of the invention applied to an aeroplane,

Fig. 2 is a front elevation thereof,

Fig. 3 is a view partly in elevation and partly in section showing the propeller with one half of the hub removed,

Fig. 4 is a sectional view on the line 4—4 of Fig. 1, and,

Fig. 5 is a sectional view taken on the line 5—5 of Fig. 3.

Referring now to the details of the drawing, wherein like numerals refer to like parts throughout the same, 10 designates the nose of a conventional aeroplane which houses an engine for driving the propeller shaft 11 upon which my improved propeller 12 is secured as by a nut 13.

The propeller 12 comprises a hub or boss 14 formed of two substantially identical sections 15 and 16 securely fastened together by clamping bands 17 or the like. Each of the hub sections 15 and 16 is formed with registering depressions in the meeting faces thereof to provide bearings for the shafts and clearance for the gearing to be hereinafter described.

In the embodiment of the invention shown, two propeller blades 18 and 19 are carried by the hub, each of said blades being formed at its

shank end with a ball 20 and 21 journalled in said hub sections. The ball ends 20 and 21 are formed with substantially parallel pivot shafts 22 and 23 respectively which are disposed in a place at right angles to the axis of the propeller shaft and at an angle of approximately 45° to a line at right angles to the axis of the propeller shaft and passing through the center of the respective ball ends 20 and 21.

In order to allow a slight forward and lateral movement in the nature of a combined tilting and twisting motion of each of the propeller blades under conditions to be hereinafter described, an arcuate slot 24 is formed in each end of the hub section 16 extending inwardly or forwardly from the center face thereof, said slots 24 merging with depressions 25 in the face of the hub section 15 within which the shanks of the blades rest when they are disposed in their normal position at right angles to the shaft 11. The dotted lines in Figure 4 indicate the position of the slot 24 at the opposite end of the hub 14.

In order to assure synchronous action of the blades 18 and 19, the pivot shafts 22 and 23 are geared together by a train of gears comprising a bevel gear 26 on the inner end of the pivot shaft 22 which meshes with a bevel gear 26a on the end of a center shaft 27, said shaft 27 carrying a bevel gear 28 adjacent the other end thereof meshing with a bevel gear 29 on the end of a cross shaft 30 which carries a bevel gear 31 on its opposite end in turn meshing with a bevel gear 32 on the inner end of the pivot shaft 23.

The propeller blades 18 and 19 are normally maintained in their normal full line position at right angles to the axis of the propeller shaft 11 by a spring 33 surrounding and having one end secured to the center shaft 27 as at 34 and having the other end thereof anchored to the hub member as at 35.

It will be understood that the hub member 14 may be counterweighted in any desirable manner to compensate for any uneven distribution of weight resulting from the gearing arrangement or from the pivotal mounting of the blades themselves.

In the operation of the embodiment illustrated, wherein the propeller is designed to rotate clockwise when viewed from the front, with the craft at a standstill and the propellers maintained in the full line position by the spring 33, when the engine is accelerated, the load imposed on the propeller will cause the blades to

tend to lag or flex against the action of the spring 33 and to pivot about the shafts 22 and 23 until the shanks rest against the inner ends of the slots 24. Due to the angular setting of the shafts 22 and 23 the blades will be partially rotated as they are tilted forwardly to decrease the pitch of the blades as well as the distance between the tips thereof, thereby reducing the load on the motor at the start.

As the craft gains altitude and levels off for ordinary flight, the decreased load on the propeller will allow the spring 33 aided by centrifugal force to gradually return the blades to full line normal position of greatest pitch and length from tip to tip.

It will thus be seen that there is provided a fully automatic control of the pitch and diameter of the blades in response to changing load conditions which will result in a constant load on the motor for the given horsepower and a more even and wider distribution of the air stream on the airfoil of the plane.

While a preferred embodiment of the invention has been shown and described, it will be understood that various modifications in the details of construction and operation may be resorted to without departing from the spirit of the invention as defined in the appended claims which form a part hereof.

I claim:

1. In a propeller, a hub member comprising a pair of complementary half sections, a plurality of propeller blades, each formed at its shank end with a ball journalled in said hub, pivotal axes formed with each of said ball ends and disposed in a plane at right angles to the axis of rotation of said hub member and at an angle to the longitudinal axis of the blades, each of said half sections being formed with complementary bearing surfaces in their meeting faces to provide bearings for said propeller blade ends when assembled.

2. In a variable pitch propeller of the class described, a propeller shaft, a hub member mounted thereon, a plurality of propeller blades mounted in said hub member, each of said blades formed with a ball at its shank end journalled in said hub member, each of said ball ends having substantially parallel pivot shafts journalled in said hub, said pivot shafts being disposed in a plane at substantially right angles to the propeller shaft and at an angle of approximately 45° to a line at right angles to the propeller shaft passing through the centers of the ball ends, means for permitting limited pivotal movement of said propeller blades about

said pivot shafts, and spring means normally urging said blades to one extreme of said pivotal movement.

3. In a variable pitch propeller of the class described, a propeller shaft, a hub member mounted thereon, said hub member comprising two complementary half sections, a plurality of propeller blades mounted in said hub member, each of said blades formed with a ball at its shank end journalled in said hub member, each of said ball ends having substantially parallel pivot shafts journalled in said hub, each of said complementary hub sections having bearing surfaces formed in their adjacent faces to provide bearings for the ball ends and pivot shafts aforesaid.

4. In a variable pitch propeller of the class described, a propeller shaft, a hub member mounted thereon, said hub member comprising two complementary half sections, a plurality of propeller blades mounted in said hub member, each of said blades formed with a ball at its shank end journalled in said hub member, each of said ball ends having substantially parallel pivot shafts journalled in said hub, each of said complementary hub sections having bearing surfaces formed in their adjacent faces to provide bearings for said ball ends and pivot shafts, means for permitting limited pivotal movement of said propeller blades about said pivot shafts and spring means normally urging said blades to one extreme of said pivotal movement.

5. In a variable pitch propeller of the class described, a propeller shaft, a hub member mounted thereon, said hub member comprising two complementary half sections, a plurality of propeller blades mounted in said hub member, each of said blades formed with a ball at its shank end journalled in said hub member, each of said ball ends having substantially parallel pivot shafts journalled in said hub, said pivot shafts being disposed in a plane at substantially right angles to the propeller shaft end at an angle of approximately 45° to a line at right angles to the propeller shaft passing through the centers of the ball ends, each of said complementary hub sections having depressions formed in their adjacent faces to provide bearings for said ball ends and pivot shafts, means for permitting limited pivotal movement of said propeller blades about said pivot shafts, spring means normally urging said blades to one extreme of said pivotal movement and gearing connecting the respective pivot shafts of said blade ends to synchronize the pivotal movement of the blades.

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