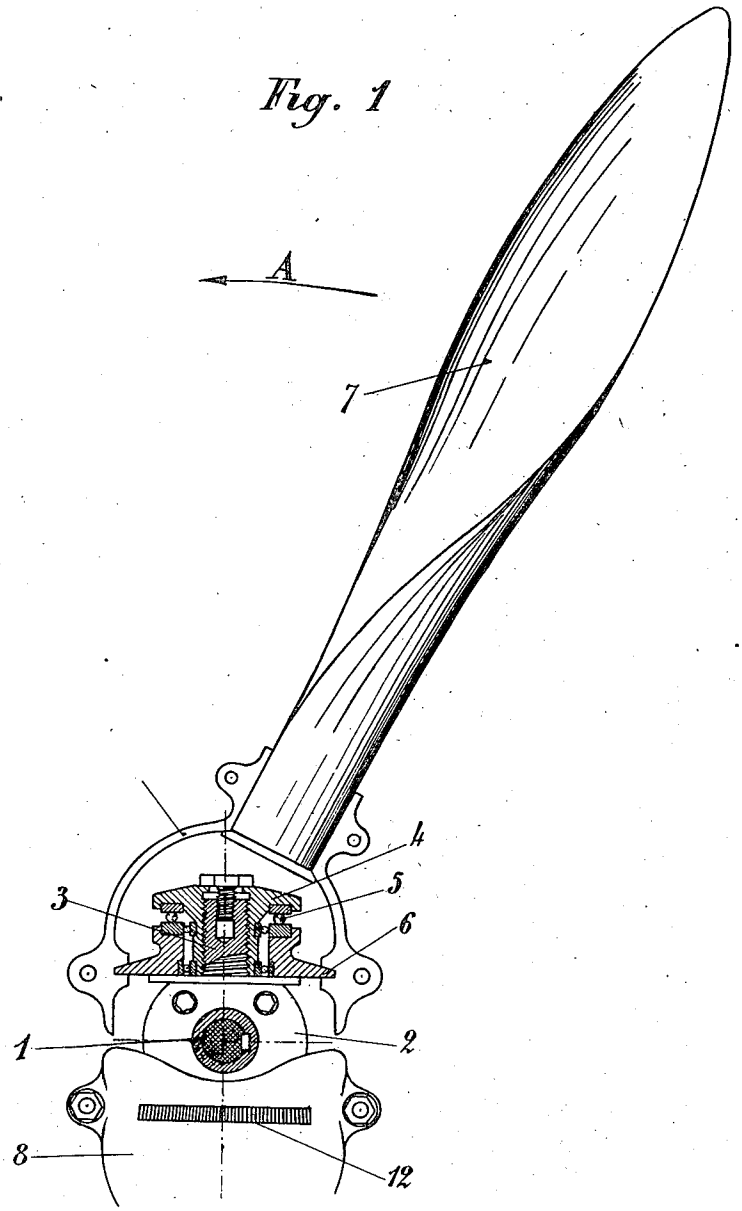
May 15, 1923. 1,455,442

R. LEPARMENTIER

PROPELLER FOR AERIAL MACHINES

Filed Feb. 16, 1922 2 Sheets-Sheet 1

Fig. 1



WITNESSES

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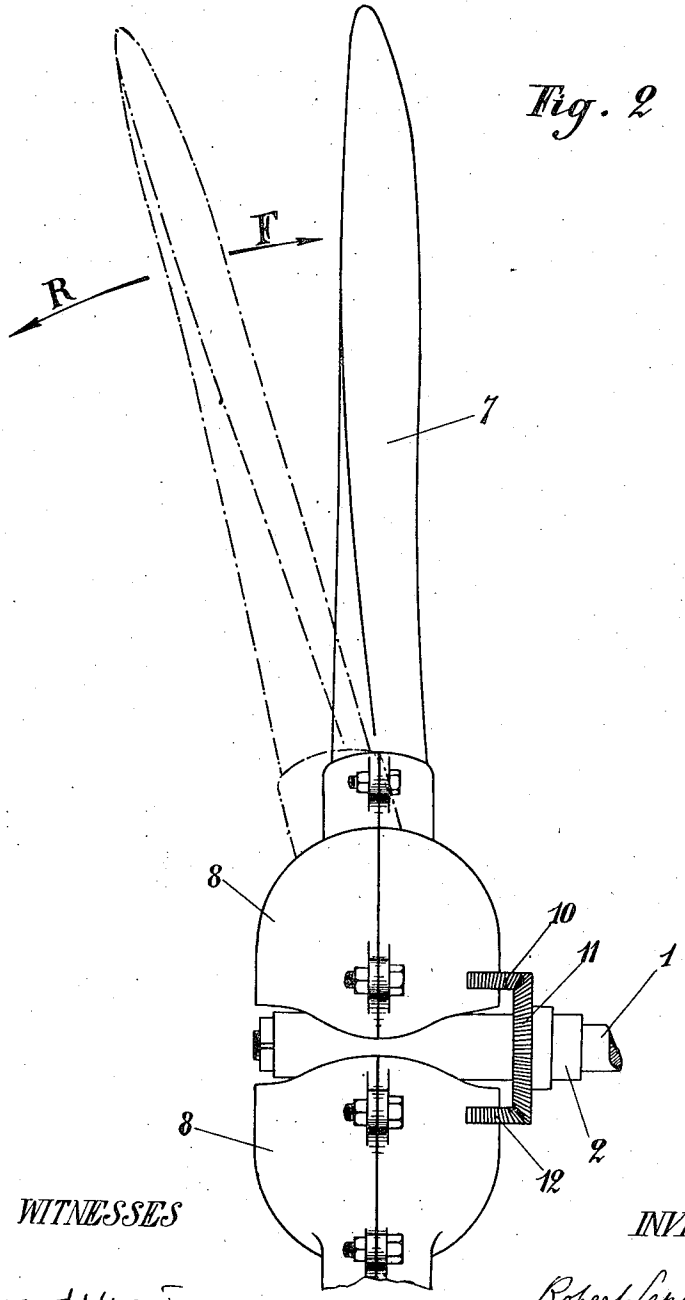
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Fig. 2



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UNITED STATES PATENT OFFICE.

ROBERT LEPARMENTIER, OF BORDEAUX, FRANCE.

PROPELLER FOR AERIAL MACHINES.

Application filed February 16, 1922. Serial No. 537,052.

To all whom it may concern:

Be it known that I, ROBERT LEPARMENTIER, a citizen of the French Republic, residing at Bordeaux, France, have invented new and useful Improvements in Propellers for Aerial Machines, of which the following is a specification.

Since the inauguration of extra feed devices for the motors of aerial machines, a number of investigators have studied propeller systems having variable lead in action, either at the option of the pilot, or automatically.

It is immaterial as to which class it belongs, the arrangement nearly always consists of a blade pivoted upon an axis perpendicular to the axis of rotation of the motor, the blade being itself situated in an extension of the axis of articulation.

The disadvantages of these arrangements are of two kinds:

In a controlled system, there exists the inconvenience that, as the blade is not stabilized in relation to its articulation, a time comes when the effort to be overcome by the pilot is too great which thereby causes the propeller to become locked in relation to its articulation. Further, even with perfect running, the pilot is always preoccupied with the operation of the propeller. Automatic systems existing in France or elsewhere are based upon centrifugal action, which has the effect of not keeping the speed of the motor constant. Finally, in most instances, the running is ensured by arrangements which are subject to all kinds of modifications.

The propeller with variable lead, according to this invention, is characterized by the fact that the blade is not arranged in axial alinement, but is disposed at an angle which can be definitely settled in such a manner that the propeller acts as an automatic speed regulator for the motor by the increase or decrease of speed of the blade occasioned through the variations of speed or action of the aerial machine caused by difference in altitude (the influence due to the density of the air) and by the trajectories of rising and descending.

In order that the invention may be clearly understood and readily carried into effect, a constructional embodiment of same is given by way of example in the accompanying drawings, in which:—

Figure 1 is a vertical section on a line passing through the axis of articulation of the blade and at right angles to the shaft 1 of the motor; Fig. 2 is a side view corresponding to Fig. 1.

On the motor shaft 1, is fitted a sleeve which acts as the metallic hub of the propeller 2. On this sleeve and in the same manner as an ordinary propeller is disposed the axis of articulation 3; on this axis is screwed a mushroom-headed nut 4, which is intended to receive the upper washer for the ball race 5. The lower washer, of thicker form, forms an abutment washer as well as the ball race; it fits on a member 6 which can turn freely around the articulation by reason of the ball race, shown on the drawing. The propeller blade 7 is secured on the member 6 by means of two half shells of steel 8 forced tightly against each other by bolts.

Change of speed of the propeller which corresponds to the various positions of each blade around its axis of articulation 3, are automatically caused by the variations of the air resistance pressure.

If we take for instance such a motor whose direction of rotation is shown by the arrow A, Fig. 1, the blades of the propeller will have, for a pre-determined speed of the machine, a position such as indicated in dot and dash lines at Fig. 2; this position corresponds to a state of equilibrium between the centrifugal force which acts upon the blades in the direction indicated by the arrow F Fig. 2 and the reaction of the air which acts in the direction of the arrow R, Fig. 2.

If the speed of the aerial machine varies owing to an increase in its height or to the trajectory followed in the descent for example, the reaction of the air on the blades of the propeller will diminish; consequently these blades under the influence of centrifugal force, will turn on their axis of articulation 3 to take up another position such as shown in full lines at Fig. 2.

However, in this case of an additionally fed motor, the blades will be lagging, in respect of the direction of rotation of the propeller, on their shafts 3, see Fig. 1. As a result hereof, in the position indicated in

full lines at Fig. 2 the blades will have greater incidence, the speed of the blade will be increased and the effort to be overcome for the rotation of this blade will be greater. This increase of speed of the propeller will compensate for the decrease in the air reaction which would have occasioned an increase of the speed of the motor, so much so that the latter will always rotate at a practically constant speed no matter what may be the actual speed of the machine.

If, instead of diminishing the air reaction, there had been an increase due to a drop in the altitude of the machine or the trajectory followed in rising, the position of the blades of the propeller around their articulation would have been in the reverse direction and the speed of this blade would on the contrary be lessened.

The axis or articulation will generally be perpendicular to the axis of rotation of the motor; in certain cases, however, it might be arranged at an acute angle towards the front of the axis of rotation of the motor.

The blade preferred is one of metal but there is no particular objection to the use of a wooden blade. The angle at which the blade is set in respect of the axis varies in each application but is in the neighborhood of 30 degrees for aerial machines presently in use.

The movements of both blades are united by the use of an arrangement of two toothed sectors 10, 12 Fig. 2 in engagement with a pinion wheel 11 which is loose on the sleeve, the two toothed sectors being respectively secured to each of the two blades of the propeller.

I claim:

1. An aerial machine, a motor connected therewith, a motor-shaft leading from the motor, a variable-load propeller turnably secured to the motor-shaft and comprising blades pivoted upon studs projecting at right angles from the motor-shaft, and means mounted on said studs for maintaining the blades at an acute incident angle relatively with said studs.

2. In a variable-load propeller for aerial machines, a propeller shaft, diametral studs connected with the shaft, means forming a ball-race connected with each stud and comprising an outermost stationary member and an innermost revoluble member, and means fixed to said revoluble member for carrying a propeller blade at an acute incident angle in relation to the axis of said stud.

3. A variable-load propeller on the shaft of an aerial machine, consisting of a bossed sleeve-hub, diametral screw-threaded studs fast thereon, a mushroom-headed nut fast on each stud, a revoluble disc-member retained by said nut, ball-bearings between said nut and the disc-member, a divided shell fixed to said member, and a propeller blade fixed thereto at an acute incident angle in relation to the axis of each stud.

ROBERT LEPARMENTIER.