

May 21, 1940.

E. GRANAT

2,201,896

ELECTRIC VARIABLE PITCH LOG

Filed Nov. 5, 1938

2 Sheets-Sheet 1

FIGURE 1

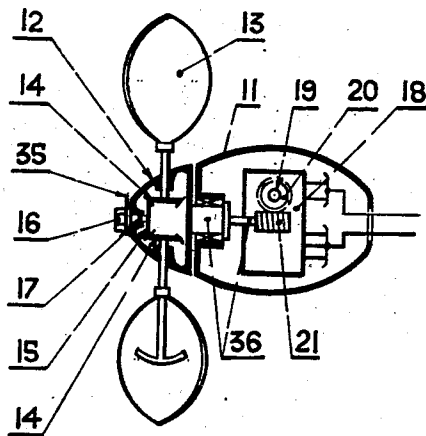
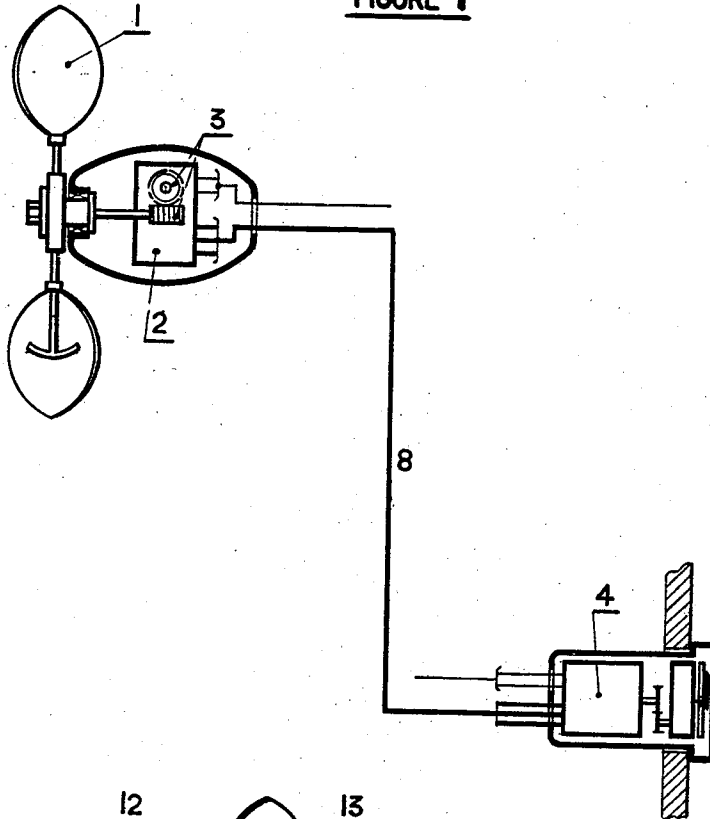


FIGURE 2

E. Granat
Inventor

W. Glascock Downing & Leebell
Attys.

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FIGURE 3

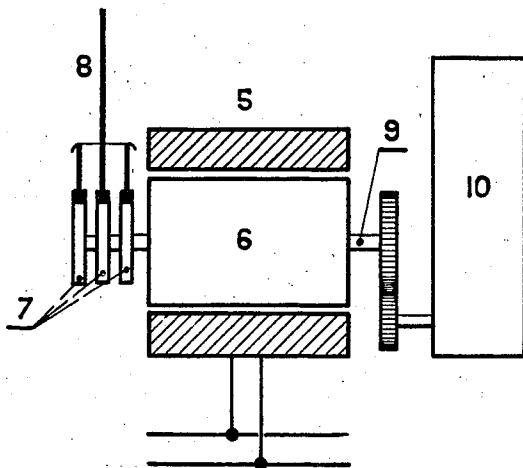


FIGURE 4

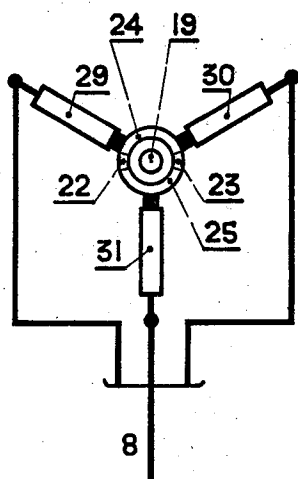
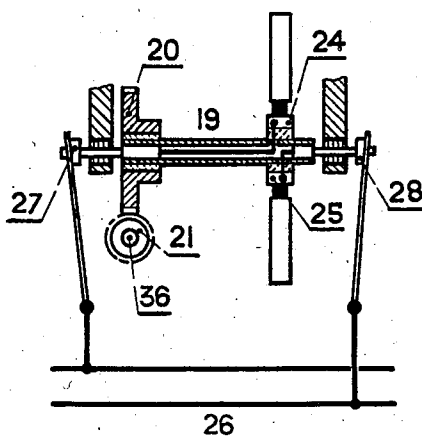


FIGURE 5



E. Granat
Inventor

By: Glascop Downing & Selbold
Attys.

UNITED STATES PATENT OFFICE

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ELECTRIC VARIABLE PITCH LOG

Elie Granat, Paris, France, assignor of one-half to Compagnie des Forges et Acieries de la Marine et d'Homecourt, Paris, France, a company of France

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1 Claim. (Cl. 73—2)

Among the logs used for determining the speed of airplanes with reference to the atmosphere some are based on the property of propellers of rotating at speeds which are functions of their linear speed of displacement along their axis of rotation. Consequently, logs of this type include generally a detecting part constituted by a vane wheel comprising one or more helical surfaces, the movement of which is transmitted to an indicating part constituted by a speedometer.

However, when such logs are mounted on airplanes, the calibration made at the blower plant may appear untrue by reason of the necessity of arranging said logs in the vicinity of the wings or of the fuselage of the airplane, the surfaces of which produce a slight deformation of the air stream-lines acting on the vane wheel; one is thus led either to provide the readings on the speedometer with a predetermined coefficient the value of which is ascertained experimentally during the tests, or else to modify the existing ratio between the movement of the vane wheel and that of the speedometer.

The first method which consists in providing with a coefficient the values appearing on the indicator is but little practical. The second method meets with difficulties in the execution of means for continuously varying the ratio existing between the number of revolutions of the vanewheel and that of the shaft driving the indicator.

Now the present invention relates to a device which provides a log having a variable ratio without any modification in the mechanical reducing ratio between the vanewheel and the indicating means, through the agency of a variable pitch impeller forming the detector.

In accordance with this arrangement the vanewheel includes means for adjusting its pitch, the adjustment being effected once for all during the experiments made with a stationary base while mounting the apparatus on the airplane. This generally slight correction of the pitch of the impeller has for its result to provide the values appearing on the indicator with a substantially constant coefficient which is equal to the coefficient of modification of pitch of the vanewheel.

Although this coefficient does not seem to be absolutely constant at all speeds, it is sufficient in practice to choose the value corresponding to the normal cruising speed of the aircraft in order that the pilot may make satisfactory use of the indications given by the log.

The invention is applicable on any aircraft,

whatever may be its type, on which the apparatus is mounted.

Appended drawings show the invention as applied to a log of the synchronous type, wherein the vanewheel acts on a transmitter which actuates synchronously an electrical receiver controlling mechanically an indicator of instantaneous speeds.

Fig. 1 is a general view of the arrangement.

Fig. 2 shows in detail the variable pitch vanewheel.

Fig. 3 is a detail view of the receiver.

Figs. 4 and 5 are views of the transmitter proper.

In the form of execution illustrated the vanewheel 1 shown in Fig. 1 controls a transmitter 2 through a suitable mechanism 3. This transmitter actuates at a distance a synchronous electric receiver 4 the shaft of which drives a speedometer of any type including a scale of instantaneous speeds. The speedometer may of course include or not include totalizers giving out the number of revolutions.

Fig. 2 shows diagrammatically by way of example a form of execution of the transmitter with a variable pitch vanewheel. This transmitter comprises a stationary casing 11 an extension of which is formed by a movable streamlined rotary part 12 which forms the hub on which are arranged a certain number of blades 13 constituted each by a portion of helical surface having a given pitch. These blades may move round their axes and the variation of pitch is obtained by a slight rotation round their axes. This displacement may be obtained by any known mechanical means such as that shown by way of example in Fig. 2 wherein each blade is provided with a bevel pinion 14 and the whole system of pinions 14 is controlled by a bevel pinion 15 the rotation of which is controlled from the outside of the movable casing 12 through rotation of the spindle 17 rigidly secured to said bevel pinion 15 and provided with a squared end and a lock nut 16.

The movable part 12 includes an extension forming a spindle 18 adapted to rotate inside the stationary casing 11 and controlling the transmitter proper 19.

In the form of execution illustrated by way of example in Figs. 4 and 5, the transmitter is constituted as follows: a hollow shaft 19 controlled by the toothed wheel 20 and the worm 21 carries in a plane perpendicular to said shaft two conducting segments 24 and 25 separated from one another by the two insulating parts 22 and 23.

The segments 24 and 25 are electrically connected to contacts at the ends of the shaft by means of conductors extending longitudinally of the hollow shaft 19. The segments 24 and 25 are fed by the D. C. mains 26 through the brushes 27 and 28 cooperating with corresponding contacts connected with the segments and arranged respectively at the two ends of the hollow shaft 19 and this arrangement is devised with a view to reducing to a minimum the resistant torque produced by friction. On the cylindrical periphery of the segments 24 and 25 are arranged three equally spaced stationary brushes 29-30 and 31, connected with the transmission wires 8. The arrangement requires consequently, beyond the two feed wires, three line wires between the transmitter and the receiver.

Fig. 3 shows with further detail the indicator. The latter comprises a synchronous receiver 4 constituted for instance by a stator 5 forming the field piece and by a polyphase rotor 6 which receives the current from the transmitter 2 through the feed rings 7 and the wires 8. The shaft 9 of the synchronous receiver operates a speedometer 10 of known type including a totalizer if desired.

By reason of the extremely reduced friction in the abovedescribed transmission system, the propeller 1 assumes a speed of rotation which is a practically linear function of its speed of displacement along the air stream. This movement is transmitted to the shaft 19 of the transmitter which produces a continuous distribution of the potentials from the feed mains 26 into the wires of the transmission line 8 and consequently into the polyphase winding of the synchronous receiver 6.

The working diagram of this transmission shows that each shifting through one twelfth of a revolution of the transmitter shaft 19 produces an equal rotation of the rotor 6 of the synchronous receiver 4. The movement continues thus in synchronism and in a continuous manner whatever the speed of the transmitter may be.

The synchronism between transmitter and receiver is ensured even in the case of a temporary disconnection between the mains and the receivers; synchronism is resumed as soon as the

receivers are fed as the receiver is the seat of a rotary field produced by the rotation of the transmitter; the receiver starts then as an asynchronous motor and comes into step so as to move synchronously with the transmitter.

The windings of the receiver are designed in a manner such that the maximum speed allowed for the speedometer may be reached without any falling out of step of the transmission.

When the system is mounted on an airplane, the blades of the impeller 1 are arranged in a position corresponding to zero correction, or at the nominal pitch for which they are constructed.

During the tests, the eventual lag is ascertained as a percent of the speedometer. The operator then acts on the adjusting spindle 17 so as to slightly reduce the pitch of the blades of the vanewheel until the values read correspond to the values calculated. The correction made is of course valid for a given speed which is preferably the normal cruising speed of the airplane.

These pitch adjusting means may be completed by a pointer 35 moving over a stationary scale on the hub 12. This scale may either be empirically graduated or express the correction in percents of the pitch.

What I claim is:

An electric log for aircrafts comprising a speedometer, a receiver controlling the speedometer, a transmitter including a hollow rotary shaft, a contact carried at each end of said shaft, stationary means for feeding current to said contacts, a distributor secured to the rotary shaft and constituted by conducting segments and insulating parts separating the segments, means arranged longitudinally of the rotary shaft for connecting the contacts thereof to the corresponding conducting segments, stationary brushes adapted to engage said conducting segments, polyphase wires connecting said brushes with the receiver for controlling the same, and a vanewheel adapted to rotate at a speed depending on the speed of flight of the aircraft and comprising at least one variable pitch blade and a rotary shaft therefor drivingly connected with the hollow rotary shaft of the transmitter.

ELIE GRANAT.