

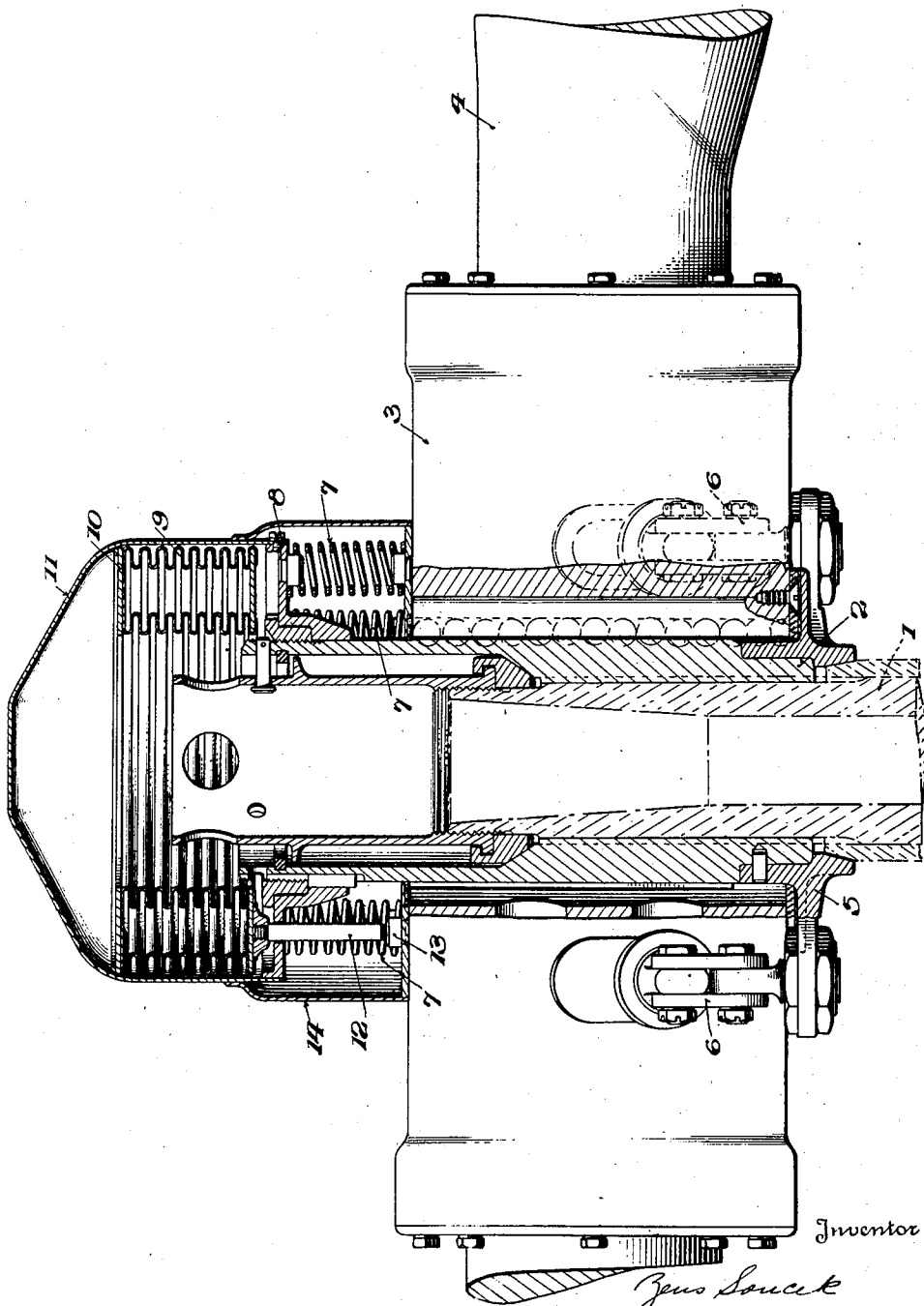
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Z. SOUCEK

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AUTOMATIC ALTITUDE PROPELLER

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AUTOMATIC ALTITUDE PROPELLER

Zeus Soucek, East Orange, N. J., assignor, by
mesne assignments, to Eclipse Aviation Corpo-
ration, East Orange, N. J., a corporation of
New Jersey

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The present invention relates to propellers and more particularly to propellers in which the pitch of the blades is automatically varied in accordance with variations in flight conditions.

5 It has heretofore been proposed to provide automatic variable pitch propellers operable in response to variations in conditions of flight. However, with propellers such as heretofore known, no means have been provided permitting
10 an adjustment which would insure maximum propeller and engine efficiency for all atmospheric pressures and at all altitudes. In automatic variable pitch propellers heretofore utilized, an adjustment for maintaining the proper pitch
15 angle at one particular altitude would result in a pitch angle either too high or too low for maximum engine and propeller efficiency at a greater or less altitude. It is accordingly one of the objects of the present invention to provide a pro-
20 peller in which the pitch of the blades is automatically maintained at the correct value for maximum efficiency at all altitudes and under all conditions of atmospheric pressure.

Another object of the present invention is to
25 provide a propeller in which the pitch of the blades is controlled in accordance with variations in atmospheric conditions.

Another object is to provide a propeller in which the pitch changing mechanism is controlled in
30 accordance with variations in atmospheric pressure.

Still another object is to provide a propeller in which the thrust of the blades tends to decrease the pitch thereof and in which pitch decreasing
35 movement is variably resisted in response to variations in atmospheric pressure.

A further object is to provide in a variable pitch propeller a novel control device so arranged that a variable resistance to change in pitch is exerted
40 thereby in accordance with changes in barometric pressure, whereby the pitch of the blades will at all times be such as to maintain the propeller and engine efficiencies at a maximum, regardless of changes in altitude.

45 Other objects and advantages will appear from the following description when taken in connection with the accompanying drawing which shows one embodiment of the invention. It is to be expressly understood, however, that the drawing
50 is for the purpose of illustration only and is not to be taken as a definition of the limits of the invention, reference being had for this purpose to the appended claims.

55 In the drawing the single view is a plan view

partly in section of one embodiment of the present invention.

Referring to the drawing, the embodiment shown therein, is constituted by a driving shaft 1 having a driving block or sleeve 2 rigidly secured
60 thereon in any suitable manner, a hub 3 having blades 4 rotatably secured in sockets therein being associated with the sleeve 2 so as to be drivable therewith but axially movable with respect thereto. A plate 5 is suitably secured to the
65 sleeve 2 and is connected to the root ends of the blades by any suitable means such as link mechanisms 6 so that upon movement of the hub axially of the sleeve 2 the blades will be rotated in their sockets and the pitch thereof will be changed. 70

During operation of the above described structure, the thrust of the blades 4 will urge the hub forwardly on the shaft, this action tending to decrease the pitch of the blades, and in order to
75 yieldingly oppose this movement a plurality of compression springs 7 are arranged between the hub 3 and a plate 8 suitably secured to the sleeve 2 forwardly of the hub. Should the propeller be operated at varying altitudes, as for example
80 a relatively high altitude, the decreased atmospheric pressure or density will cause the thrust of the blades to decrease resulting in a slight increase in pitch. This slight increase in pitch at
85 higher altitudes is not, however, sufficient to maintain the propeller and engine efficiencies at a maximum. Under these conditions, the engine speed will materially increase, especially in the event that supercharging is utilized.

Accordingly, in order to compensate for these difficulties there is provided by the present inven-
90 tion novel means for variably affecting the pitch changing mechanism in accordance with changes in altitude. As shown, such means comprises a suitable pressure responsive device such as a
95 closed metallic bellows or aneroid 9 secured at one end to a plate 10 which is mounted in a cap member 11 rigidly attached to the plate 8 in any suitable manner. A plurality of pins 12 are carried by the free end of the device and bear against
100 projections 13 on the hub 3. If desired, a sleeve member 14 may be secured to the hub, slidably engaging the cap 11 to prevent entry of foreign substances into the operating mechanism.

The device 9 may be filled with air or other suitable fluid at any desired pressure, for example normal atmospheric pressure at sea level, and sealed so that the internal pressure thereof remains substantially constant. It will thus be apparent that the said device will have substan-
105 tially no effect on movement of the hub so long as

as the atmospheric pressure surrounding it is equal to its internal pressure. However, in the event that the atmospheric pressure decreases, the device will exert an increasing force tending to move the hub in a direction to increase the pitch of the blades. In this manner the pressure responsive device 9 compensates for variations in atmospheric pressure due to changes in altitude or to barometric disturbances and maintains the blade pitch at the correct value for maximum efficiency under all conditions of air density.

Thus there is provided by the present invention a propeller in which the proper pitch value for maximum efficiency is maintained under all operating conditions. The provision of the pressure responsive device results in an economical construction which is easy to manufacture, simple and reliable in operation and which has few moving parts.

While only one embodiment of the invention has been shown and described, it will be understood that the same is capable of being embodied in various mechanical forms without departing from the spirit of the invention as will be apparent to one skilled in the art. Reference will therefore be had to the appended claims for a definition of the limits of the invention.

What is claimed is:

1. A propeller comprising a driving shaft, a hub movable on said shaft in response to variations in operating conditions of the propeller, a plurality of blades adjustably mounted in said hub, means associated with said blades for changing the pitch thereof upon movement of the hub, and means operable in accordance with variations in atmospheric pressure for variably resisting movement of the hub.

2. A propeller comprising a driving shaft, a hub movable on said shaft in response to variations in operating conditions of the propeller, a plurality of blades adjustably mounted in said hub, means associated with said blades for changing the pitch thereof upon movement of the hub, and a pressure responsive device for variably resisting movement of the hub.

3. A propeller comprising a driving shaft, a hub movable on said shaft in response to variations in operating conditions of the propeller, a plurality of blades adjustably mounted in said hub, means associated with said blades for changing the pitch thereof upon movement of the hub, resilient means for resisting movement of the hub and supplemental means operable in accordance with variations in atmospheric pressure for variably resisting movement of the hub.

4. A propeller comprising a driving shaft, a plurality of blades, a hub carrying said blades and movable to change the pitch of said blades, resilient means for yieldably resisting movement of said hub, and supplemental means for variably resisting movement of said hub in accordance with variations in atmospheric pressure.

5. A propeller comprising a driving shaft, a hub mounted on said shaft, a plurality of blades adjustably mounted in said hub, said hub being axially movable on the driving shaft in response to the thrust of the blades, means associated with the hub and blades for changing the pitch of the blades in response to movement of the hub, and means variable in accordance with variations in atmospheric pressure for variably resisting movement of the hub.

6. A propeller comprising a driving shaft, a hub mounted on said shaft, a plurality of blades adjustably mounted in said hub, said hub being axially movable on the driving shaft in response to the thrust of the blades, means associated with the hub and blades for changing the pitch of the blades in response to the movement of the hub, and a pressure responsive device for variably resisting movement of the hub.

7. A propeller comprising a driving shaft, a plurality of blades, means for changing the pitch of said blades, said means operating in response to the thrust of said blades for decreasing the pitch thereof, and means variable in response to variations in atmospheric pressure for urging said last named means in a direction to increase the pitch of the blades.

8. A propeller comprising a driving shaft, a plurality of blades, means for changing the pitch of said blades, said means operating in response to the thrust of said blades for decreasing the pitch thereof, and a pressure responsive device variably resisting pitch decreasing movement of said means in accordance with changes in atmospheric pressure.

9. A propeller comprising a driving shaft, a plurality of blades, means for changing the pitch of said blades, said means operating in response to the thrust of said blades for decreasing the pitch thereof, resilient means urging said last named means in a direction to increase the pitch of the blades, and means variable in response to variations in atmospheric pressure for supplementing the effect of said resilient means.

10. A propeller comprising a driving shaft, a plurality of blades, means for changing the pitch of said blades, said means operating in response to the thrust of said blades for decreasing the pitch thereof, resilient means urging said last named means in a direction to increase the pitch of the blades, and a pressure responsive device carried by said shaft, variable in response to variations in atmospheric pressure for supplementing the effect of the resilient means.

11. In a variable pitch propeller having a plurality of blades and means for changing the pitch thereof, a closed atmospheric pressure responsive device yieldingly resisting pitch decreasing movement of said means.

ZEUS SOUCEK.