

April 25, 1939.

H. D. AUSTIN

2,156,103

SPRAYING DEVICE FOR AIRPLANE PROPELLERS

Filed Dec. 27, 1935

2 Sheets-Sheet 1

FIG. 1

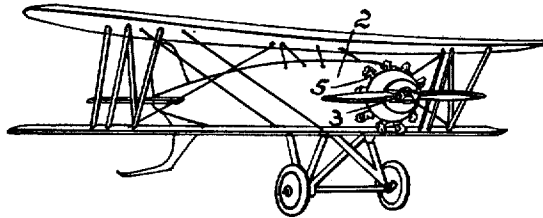


FIG. 2

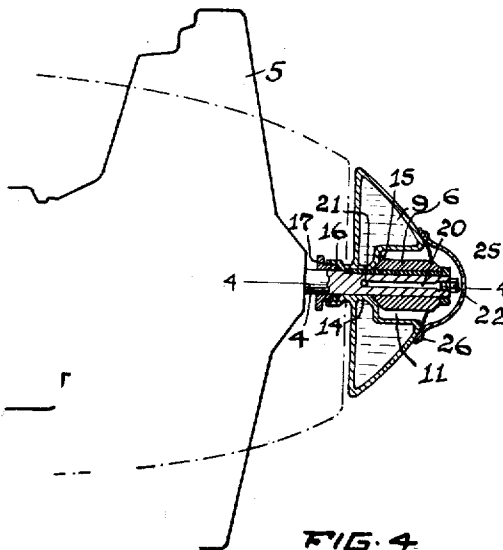


FIG. 3

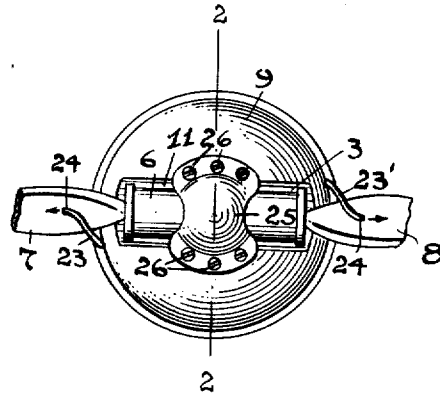


FIG. 4

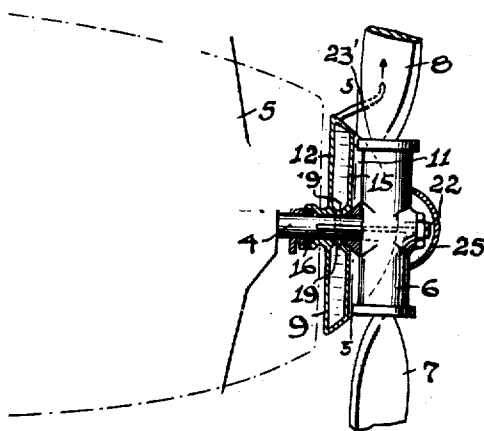
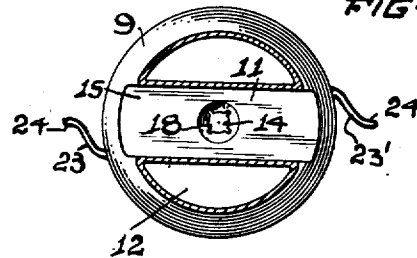


FIG. 5



HARVEY D. AUSTIN
INVENTOR

BY *Gustav R. Wolff*
ATTORNEY.

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H. D. AUSTIN

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FIG. 6

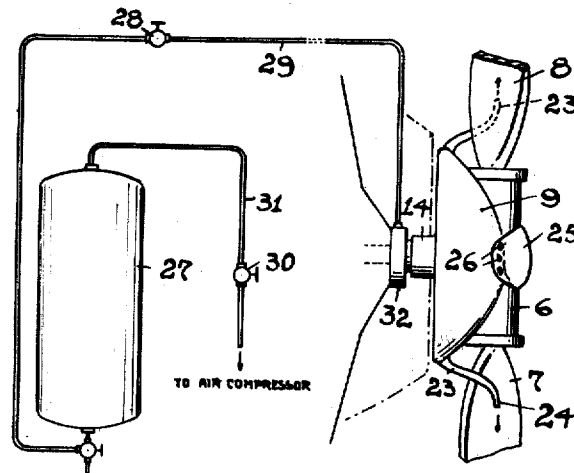
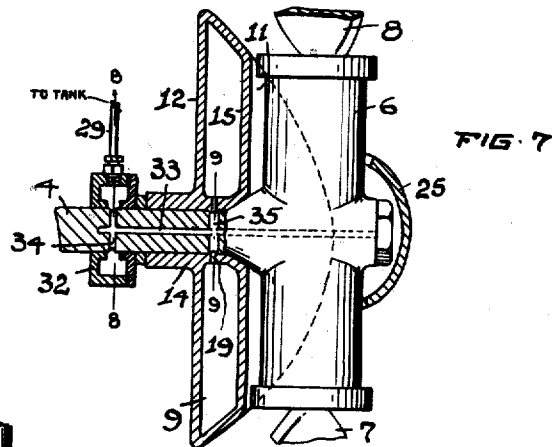
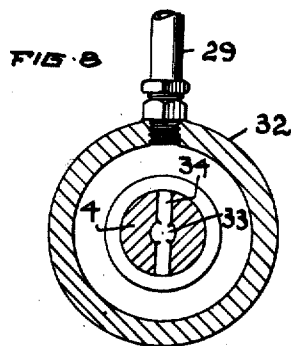
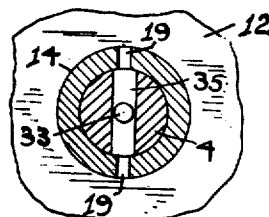


FIG. 9



Inventor

HARVEY D. AUSTIN

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Guinter A. Woff
Attorney

UNITED STATES PATENT OFFICE

2,156,103

SPRAYING DEVICE FOR AIRPLANE
PROPELLERSHarvey D. Austin, Akron, Ohio, assignor to Bendix
Aviation Corporation, a corporation of Dela-
ware

Application December 27, 1935, Serial No. 56,325

15 Claims. (Cl. 244—134)

This invention relates to aircrafts and more particularly to propellers for aircrafts. As well known, propellers for airships and planes are designed to fit the requirements of the aircrafts, such as their speed, the R. P. M. and H. P. of their engines, etc. These requirements necessitate a predetermined pitch of the propeller blades, generally called the geometric pitch and proportionate to the effective pitch, which latter pitch includes the slip ratio of the propeller per revolution. It is also known, that a change of the pitch of the propeller unbalances the aircraft by changing its thrust and rolling moments. Undesirable changes in the pitch of a propeller are often caused by the formation of ice-layers on the propeller blades during cold weather and storms, particularly, when the propeller is made of metal, such as steel, duralumin, etc.

It is the primary object of this invention to provide a propeller with means adapted to prevent the formation of ice-layers on its blades and dissolve ice-layers previously formed or while being formed.

Another object of the invention is the provision of a propeller with means adapted to discharge an anti-freeze liquid upon the propeller blades, so as to prevent the formation of ice-layers on the blades.

A further object of the invention is the provision of a propeller with liquid discharge means adapted to be controlled for selectively discharging an anti-freeze liquid upon the propeller blades, so as to prevent the formation of ice-layers on the blades of the propeller.

In addition the invention has other marked improvements and superiorities, which radically distinguish it from presently known structures. These improvements or superior characteristics embodying certain novel features of construction are clearly set forth in the appended claims, and a preferred form of embodiment of the invention is hereinafter shown with reference to the accompanying drawings, forming part of the specification.

In these drawings:

Figure 1 is a perspective view of an airplane embodying a propeller and means for preventing ice formation on the propeller blades, all in accordance with the invention.

Figure 2 is an enlarged transversal sectional view through the head of the propeller of the airplane shown in Fig. 1, the fuselage and the motor being shown diagrammatically, and the section being taken on line 2—2 of Figure 3.

Figure 3 is a fragmentary front view of the propeller head shown in Figure 2.

Figure 4 is a horizontal sectional view through the propeller head shown in Figure 2, the section being taken on line 4—4 of Figure 2.

Figure 5 is a cross sectional view through the head of the propeller when disconnected from the crank shaft of the engine, the section being taken on line 5—5 of Figure 4.

Figure 6 is a side view of a propeller head, similar to the propeller head shown in Figure 2 to 5, this propeller head being in communication with a liquid storage tank, adapted to feed an anti-freeze solution to the head.

Figure 7 is an enlarged transversal sectional view through the head shown in Figure 6, the view disclosing the feeding of the antifreeze solution to the revolving head.

Figure 8 is a cross sectional view taken on line 8—8 of Figure 7, and

Figure 9 is a cross sectional view taken on line 9—9 of Figure 7.

Referring more particularly to the drawings reference numeral 2 represents an airplane of standard construction embodying a propeller 3, secured to the crank shaft 4 of an engine 5. The propeller 3 has rigidly or rotatably secured to its hubmember 6 two blades 7 and 8, and the hubmember being secured to the crank shaft 4 in any suitable manner. The hubmember 6 is partly enclosed by a substantially cone-shaped, preferably cast, liquid storage member 9, which member is splined to the crank shaft 4. Thus the liquid storage member 9 is diametrically recessed to form a wide channel 11 for the hubmember 6, so as to bring the propeller blades 7 and 8 into proximity of the base 12 of the liquid storage container or member 9. The member 9 embodies a central, grooved sleeve portion 14, which portion extends from the bottom wall 15 of channel 11 to and through the base 12 and thus permits of sleeving the liquid storage member 9 upon the splined crank shaft 4. A packing ring 16 in a stuffing box 17 prevents liquid from escaping through the grooves 18 of the sleeve portion 14. This sleeve portion is perforated at 19 to permit of the liquid storage member 9 being filled with an anti-freeze liquid from the front end of the crank shaft 4. For this purpose the crank shaft 4 is provided with a longitudinal bore 20, and a cross sectional bore 21, which latter bore is in communication with the perforations 19 in the sleeve portion 14. A plug 22 at the front end of the shaft 4 closes the

bore 20 and thus prevents liquid from escaping from the liquid storage member 9.

The liquid storage member 9 carries at its peripheral edge, closely adjacent to the blades 7 and 8 liquid discharge spouts 23, 23', the free ends 24 of which rest against the blades 7 and 8 respectively. Each of these spouts is provided at its free end 24 with a small outlet opening, so as to effect capillary action of the outlet when the propeller is at rest, and permit of discharge of a fine stream of liquid upon the blade, when the propeller is rotating and the liquid in the liquid storage member 9 is under the influence of centrifugal forces. A plate 25 attached to the storage member 9 by screws 26, arranged at opposite sides of the channel 11, bridges the hubmember 6 and reinforces the front end of the container 9.

When the propeller and the liquid storage member are rotated, then the antifreeze liquid in the storage member is forced under the centrifugal forces outwardly and forcibly discharged through the spouts 23, 23' until the vacuum created in the storage member balances the centrifugal forces, which act upon the liquid in said storage member and force the liquid through the spouts. At this time a further discharge of liquid through the spouts 23, 23' is impossible, however such a discharge of liquid can easily be effected. Thus a slight throttling of the engine will decrease the rotary speed of the engine and therewith the centrifugal force acting upon the liquid in the storage member 9, and then the atmospheric pressure will force air through the spouts 23, 23' into the storage member. An increase in the rotary speed of the engine will step up the centrifugal forces acting upon the liquid and therefore effect a new discharge of liquid until the vacuum in the storage member again balances the centrifugal forces acting upon the liquid. In this way the operator may readily control the amount of liquid to be discharged from the storage member 9.

In the structure shown in Figures 6 to 9 the storage member 9 is coupled and communicates with a tank 27, having an antifreeze liquid stored therein. Preferably the liquid in tank 27 is under pressure to more readily feed liquid into the storage member 9. A valve member 28 in a pipe line 29 controls the feed of liquid from the tank 27 to the storage member 9, and a valve 30 in a pressure line 31 controls the amount of pressure acting upon the liquid in the tank 27. The liquid, discharged from the tank 27 into the line 29 flows into a housing 32, which housing is preferably secured to the motor block. This housing communicates through a longitudinal bore 33 and crossbores 34, 35 in the crank shaft 4 with the container or storage member 9, from where the liquid is discharged in the manner described above.

Having thus described my invention:
What I claim is:

1. In an aircraft an engine, a propeller secured to the engine for rotation thereby, a liquid storage means adapted to be secured to said engine, and liquid supply means communicating between the storage means and to the blades of said propeller, said liquid supply means being adapted to feed an anti-freeze liquid from said storage means to the blades of said propeller.

2. In an aircraft an engine, a propeller including blades having front and rear faces secured to said engine for rotation thereby, a liquid storage means associated with the engine for rotation with said propeller, and liquid leads extending from said storage means to the blades of said pro-

peller adapted to feed a liquid from said storage means to the front faces of the blades of said propeller.

3. In an aircraft an engine having a driving shaft, a propeller having blades including front and rear faces secured to said shaft, a circular liquid storage member secured to said shaft behind said propeller and adjacent thereto, and liquid guiding means extending from the periphery of said storage member to the blades of said propeller opposite the front faces thereof, said liquid guiding means being adapted to spray an anti-freeze liquid upon the blades of said propeller during its rotation.

4. In an aircraft an engine having a main shaft, a propeller including blades having front faces secured to said shaft, a cone-shaped liquid storage member adapted to be secured to said shaft behind and adjacent to said propeller, and tubular liquid guiding means extending from the periphery of said storage member to the blades of said propeller opposite the front faces thereof, said liquid guiding means being adapted to spray an anti-freeze liquid upon the blades of said propeller, when liquid is discharged by centrifugal force from said storage member into said liquid guiding means.

5. The invention described in claim 4, wherein the cone-shaped liquid storage member is diametrically recessed to permit of the inner ends of the blades of said propeller being brought into proximity of the peripheral edge of said chamber.

6. The invention described in claim 3, wherein the circular liquid storage member embodies a central sleeve portion extending through said chamber, to permit of said storage member being sleeved upon and secured to the main shaft of said engine, and wherein said sleeve portion and said shaft communicate with each other through bores, one of said bores extending longitudinally through said shaft to the front end thereof to permit of filling of said storage member at the exposed front end of said main shaft.

7. The invention described in claim 4, wherein the outlets of said tubular guiding means are of capillary size to prevent leakage of liquid from said storage member, when said storage member is not rotating.

8. In an airplane an engine, a propeller secured to said engine for rotation thereby, means adapted to be secured to said engine for rotation with said propeller and adapted to feed an anti-freeze liquid to the blades of said propeller, and storage means for said liquid communicating with said first named means and adapted to feed an anti-freeze liquid to said first means.

9. In an aircraft an engine having a main shaft, a propeller secured to said main shaft, a circular centrally sleeved liquid discharge member having its sleeve portion perforated and secured to said shaft behind said propeller, liquid guiding means extending from the periphery of said discharge means to the blades of said propeller, stationary storage means for an anti-freeze liquid in communication with said discharge means, and means associated with said engine and shaft adapted to effect communication between said stationary storage means and said discharge means.

10. The invention described in claim 9, wherein said communication means between said storage means and said discharge means embody a stationary housing having said main shaft extended therethrough and longitudinal and cross bores in said shaft, one of said cross bores being aligned

with the perforations in the sleeve portion of said discharge means.

11. In an aircraft embodying an engine the combination of a propeller with liquid storage and discharge means, said propeller and said means being adapted to be secured to said engine for joint rotation, and said discharge means being adapted to discharge anti-freeze liquid upon the blades of said propeller, when said means and said propeller are rotating.

12. In an aircraft having a propeller, power means to drive the propeller, centrifugally actuated means associated with the propeller and power means to prevent ice from being deposited on the propeller, differential pressure actuated means to influence the operation of the centrifugally actuated means and manually operable means to control the centrifugally actuated means.

13. An aircraft propeller de-icer comprising centrifugally actuated means associated with the propeller and adapted for rotation therewith to discharge an anti-freeze liquid onto the propeller to remove ice from the propeller, differential pressure control means to counteract the force exerted by the centrifugally actuated means, and manual means to control the centrifugally actuated means.

14. In an aircraft, a propeller having blades, power means associated with the propeller to drive the aircraft, and centrifugally actuated means associated with the propeller to prevent the pitch of the blades from changing due to the formation of ice thereon, and manually operable means to control said centrifugally actuated means.

15. In an airplane including a propeller having blades, variable speed power means to rotate the propeller, a reservoir for anti-freeze liquid rotatable with the propeller, means including ducts interconnecting the reservoir and blades of the propeller to transfer the anti-freeze liquid from the reservoir to the blades, said reservoir being otherwise closed to the atmosphere in the vicinity of the propeller, the quantity of liquid discharged from the reservoir to the blades being controlled by the relation between the centrifugal force due to the rotation of the propeller and reservoir and the negative pressure created within the reservoir due to the discharge of anti-freeze liquid therefrom, and means to control the pressure within said reservoir.

HARVEY D. AUSTIN.

CERTIFICATE OF CORRECTION.

Patent No. 2,156,103.

April 25, 1939.

HARVEY D. AUSTIN.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 1, first column, line 15, for "formattion" read formation; page 2, first column, line 66, claim 1, strike out the word "to"; and second column, line 49, claim 8, for "airplane" read aircraft; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 12th day of March, A. D. 1940.

(Seal)

Henry Van Arsdale,
Acting Commissioner of Patents.

with the perforations in the sleeve portion of said discharge means.

11. In an aircraft embodying an engine the combination of a propeller with liquid storage and discharge means, said propeller and said means being adapted to be secured to said engine for joint rotation, and said discharge means being adapted to discharge anti-freeze liquid upon the blades of said propeller, when said means and said propeller are rotating.

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15. In an airplane including a propeller having blades, variable speed power means to rotate the propeller, a reservoir for anti-freeze liquid rotatable with the propeller, means including ducts interconnecting the reservoir and blades of the propeller to transfer the anti-freeze liquid from the reservoir to the blades, said reservoir being otherwise closed to the atmosphere in the vicinity of the propeller, the quantity of liquid discharged from the reservoir to the blades being controlled by the relation between the centrifugal force due to the rotation of the propeller and reservoir and the negative pressure created within the reservoir due to the discharge of anti-freeze liquid therefrom, and means to control the pressure within said reservoir.

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