PUBLISHED

MAY 25, 1943.

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DEVICE FOR HEATING SURFACES OF AIRCRAFT EXPOSED TO FREEZING

Filed April 10, 1939

Serial No. 267,138

Fig.1

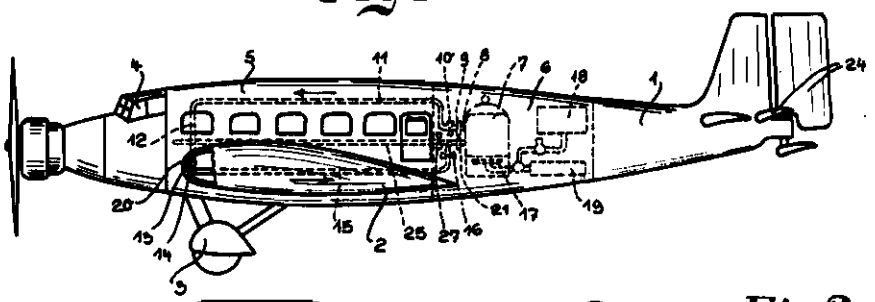

Fig.3

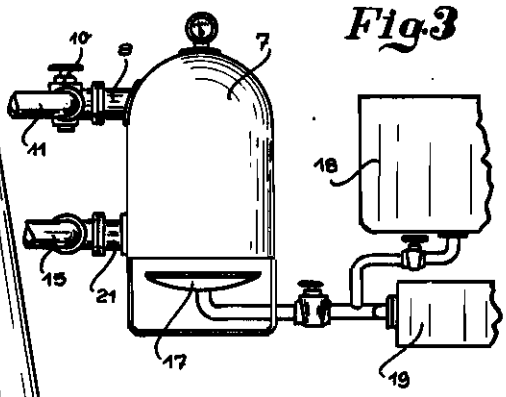

Fig.2

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Published May 25, 1943 Serial No. 267,138

ALIEN PROPERTY CUSTODIAN

DEVICE FOR HEATING SURFACES OF AIRCRAFT EXPOSED TO FREEZING

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Application filed April 10, 1939

To prevent the formation of ice on the lifting surfaces or other parts of aircraft, a known device is to fit heating tubes underneath the surfaces exposed to freezing, such as the front of the wing, through which heating tubes flows water from the engine cooling system or exhaust gases from the engine or in a further manner already proposed, whereby an electrical resistance heater is provided in the said planes. A further known device is to use engine exhaust gases for heating an air current which, by means of a compressor, is blown through an annular space formed by the double membrane of an airship cover. These devices are, however, not adequate, especially in the case of large aeroplanes, to effect a sufficient heating of the surfaces to be protected from freezing, and are particularly ineffective when it is necessary to provide against a considerable variation in temperature, as is the case on oversea and Polar flights.

The invention is likewise concerned with the problem of heating by a heated medium conducted past the surfaces to be heated, but in contradistinction to the known devices it provides for the construction of a heating plant with a separate heater and independent of the motive power of the aeroplane, in which plant the heating medium is circulated in a closed circuit, preferably under pressure. For this purpose a material having a high boiling point, such as oil, is used as the heating medium. This form has the advantage that, by having the heater (boiler) and the pipe line of suitable measurements, an adequate heating can be obtained, even for the largest types of planes. With the use of a special heater which can be removed when not required, the heating temperature can be adapted to exigencies at any time. The closed heat conductor circuit, the separate branches of which can be disconnected according to requirements, in conjunction with a heating medium having a high boiling point, makes it possible to bridge over considerable differences in temperature. Moreover, the device can be used for heating the pilot's cabin and saloon.

The boiler may be of small dimensions if the heating medium is circulated rapidly, so that the additional load on the aeroplane is likewise small. This additional load in comparison with aeroplanes in which the heating device is driven by the driving engine is, however, compensated by the fact that the power of the engine is taken up exclusively to the drive of the aeroplane. Moreover, the additional weight of equipment required for the heating device is likewise compensated by the fact that, by virtue of the small extra load involved, the now necessary safety factor in respect of freezing can be kept low or even eliminated.

The new design is principally intended for large planes engaged in overseas and Polar service in which the danger of freezing is great.

The heater can be of any desired construction and is preferably operated by the same fuel as the engines. It is of advantage to use a blower burner which delivers an atomised spray of oil and air and which develops a high heating temperature with a small weight.

The use of the special heater has the further advantage that, when the driving engines of the planes are driven with heavy fuels, such as crude oil or Diesel engine oil, these fuels can be preheated by the heater.

In the case of short distance planes, the boiler can be replaced by a container provided with a rotary pump, the wall of which container is fitted with a heat-insulating materiaal. Before the commencement of the flight, the container is filled with the preheated medium. By virtue of the heat insulation of the container, the temperature of the heating medium is kept sufficiently high to prevent freezing over short flights.

In order that the invention may be clearly understood and readily carried into effect, reference may be had to the accompanying drawings on which:—

Figure 1 shows diagrammatically a side elevation of an aeroplane showing the invention applied thereto.

Figure 2 is a plan view, and

Figure 3 illustrates, on an enlarged scale, the heater for the heating arrangement.

The drawings show a monoplane with a fuselage or body 1, planes 2 and landing gear 3. At the forward end of the fuselage is arranged the pilot's cabin 4, behind which is situated the saloon 5. Behind the saloon 5 is a compartment 6 in which is arranged the receptacle 7, from the upper end of which emerges an outlet pipe 8 which is connected to a T-piece 9. Each arm of the T-piece 9 is connected to a lead pipe 11 by way of a shut-off valve 10, the pipe 11 passing along the side wall of the fuselage 5 and which pipe 11 connccts with a descending pipe 12 to the mouth of the plane 2. In the nose 20 of each plane 2 is arranged, from end to end, a lead pipe 13 with the return pipe underneath. The lead pipe 13 is connected with the pipe 11, whilst the return pipe 14, by way of the lead 15, is connected through the union pipe 21 with the

receptacle 7. The valve 16 in the lead 15 forms a non-return, that is to say shuts off the back flow.

The receptacle 7 may be adapted to contain heating material under pressure and particularly oil. For this purpose the heating material is suitably heated in the receptacle 7. Under the receptacle 7 is a burner 17 which receives fuel to be sprayed from the receptacle 16. For this purpose the fuel is sprayed from the burner jet which is connected to the compressed air container.

To start the heating arrangement the burner 17 is lighted and the valves 10 and 16 are opened. The heat is circulated through heating pipe lines 13 and 14 by way of the pipes 11 and 12 and back through the pipe 15 to the receptacle 7. The pipes 13 and 14 are arranged in the leading edge and formation of ice is prevented. The pipes 13 and 14 being arranged in the interior of the nose 20 of the planes form part of the supporting structure. The flow of the heating material can be regulated by the valves 10 and 19. The burner 17 can be regulated so that the required temperature of the pipes 13 and 14 can be obtained. Furthermore the lead 11 behind the outlet 8 can be fitted with a pump, so that the heating material can be circulated as required. By means of the valves 19 and 16 and the union pipes 8 and 21, the container 7 can be disconnected from the burning arrangement. Furthermore the pipes 13 and 14 can be shaped to form an arrangement of pipes 22 and 23 passing to the rear of the plane, whilst the tail plane 24 can be similarly heated.

The heat arrangement can similarly heat the saloon 5 and also pilot's cabin 4. In the arrangement shown, the T-piece 9 is connected to pipe 25 which passes around the saloon 5 and back to the return lead 15. The valves 26 and 27 regulate the flow of the heating material in the pipe 25.

The supply and return conduits for the heating material to the pipes 13 and 14 as well as 22, 23 and 25 are heat insulated. In the case of small flights only, the heat container 7 can be used alone and without the burner construction. In this case the heat container, before the commencement of the flight, is filled with heated material and a rotary pump is placed between the union 8 and the T-piece 9, the rotary pump being driven by a small electric motor or other source of power.

The heating arrangement can be disconnected from the receptacle 7, together with the burner 17, the fuel receptacle 16 and pressure receptacle 19, for which purpose the valves 19 and 16 are only required to be closed.

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