

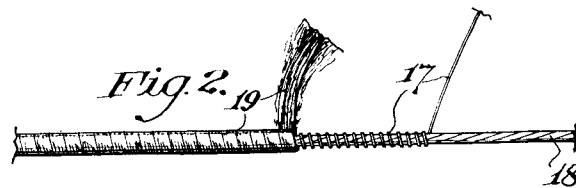
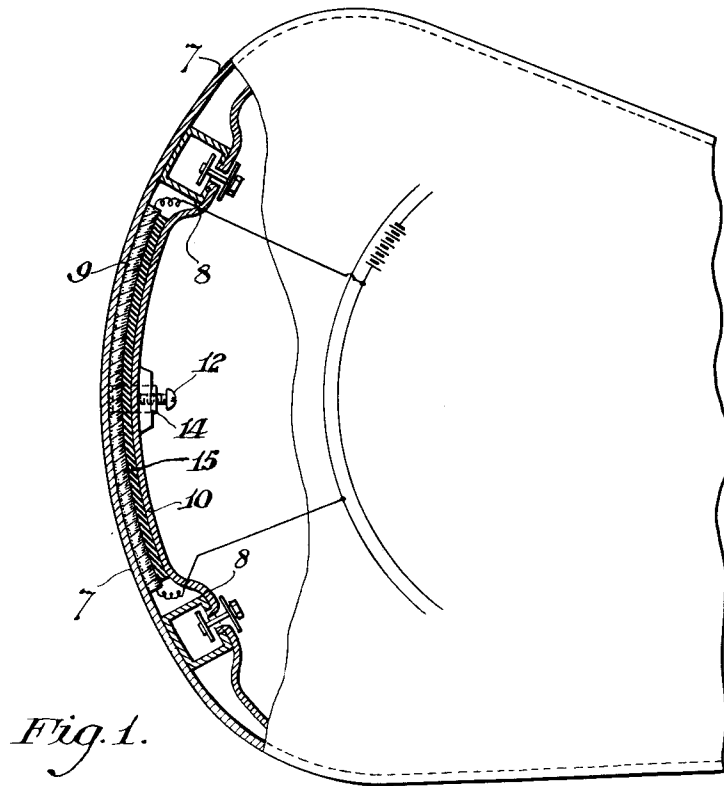
Feb. 2, 1943.

G. VAN DAAM

2,309,682

MEANS FOR HEATING WINGS OF AIRPLANES

Filed June 27, 1939



BY

INVENTOR:
Gerrit Van Daam,
Ind. Croz, dale
ATTORNEY.

UNITED STATES PATENT OFFICE

2,309,682

MEANS FOR HEATING WINGS OF
AIRPLANES

Gerrit Van Daam, Buffalo, N. Y.

Application June 27, 1939, Serial No. 281,332

1 Claim. (Cl. 219—19)

The invention relates to improvements in method and means for communicating heat to the walls of airplane wings, especially the cambered or leading edge of the wings.

The invention comprises, preferably a black heat electric resistance, in the form of a flexible body, adapted to fit and press against the inner surface of said cambered wall, so that the heat generated by an electric current passing through the resistance shall be communicated directly to said wall to defrost or prevent the accumulation of frost upon the outer surface of said wall.

The invention also comprises means whereby the resistance heater is maintained in close thermal contact with said wall.

The invention also comprises the special character and construction of the electric resistance heater or grid, whereby the said heater may be held in immediate contact with the inner surface of said wall.

The invention comprises means whereby the said grid may be held in perfect thermal contact throughout its contacting face or surface, with the inner surface of said wall, and so that this thermal contact shall be maintained by adjustable resilient pressure, adapted automatically to adjust the contacting face of the heater to distortions in said wall, under conditions arising during flight.

Referring to the drawing, which illustrates, merely by way of example, a suitable embodiment of my invention—

Fig. 1 is a fragmentary cross-section of the front wall of the wing showing the arrangement of the resistance heater and the securing means; the illustration being more or less diagrammatic.

Fig. 2 is a fragmentary view showing the construction of the resistance strand.

Similar numerals refer to similar parts throughout the several views.

In the example herein illustrated the reference numeral 7 indicates the cambered front wall of the wing. These wings are usually reinforced by channels or hollow beams as indicated by 8. These channels are spaced apart and form parts of the reinforcing frame of the wing.

Between these channels 8 are fitted the resistance grids or heaters 9, so that the same will be pressed evenly against the adjacent area of the inner surface of said wall 7.

The means which I provide, by way of example, for pressing the resistance grid 9 against the wall 7 and for maintaining said even and effective pressure between grid and wall, is the flexible plate 10. This plate 10 is held primarily in

position by engagement, as to its side margins, with the channels 8. Special securing bolts 11 are provided to permit slight adjusting movements between plate 10 and channel 8.

In order to insure constant, effective and resilient pressure between the resistance heater 9, and wall 7, I provide the pressure plate 10 which is adapted to assume a curve to correspond to the normal contour in cross-section of wall 7. It will also be understood that the resistance heater 9 will assume the same contour.

The pressure of plate 10 may be adjusted from time to time by a suitably supported set-screw 12, operating in a bracket 14 properly positioned on the longitudinal middle line of said plate 10. The brackets 14 may be secured to the framework associated with channels 8.

The pressure plate 10 is so supported and controlled by the set-screw or similar adjusting device, as to have a limited movement to exert a constant yielding pressure on the resistance grid or heater, even when distortion of the wall 7 is caused under certain flying conditions.

A heat insulating layer 15 is preferably placed between the clamping plate 10 and the resistance heater 9, in order to prevent undue heat losses.

These resistance grids or heaters 9, and the clamping plates 10 may be in suitable sections and distributed over such areas of the inner wing wall, as the circumstances may require.

A suitable resistance grid or heater is of course desirable for the best results of the above described combination. Such a heater may be made of a relatively fine wire 17 of an alloy of pure nickel and iron, wound upon a flexible non-conductive and non-combustible core 18. For example a cord of asbestos strands forms a satisfactory core, upon which the resistance wire may be wound. This wire wound core is then thoroughly covered with a winding or wrapping 19 of glass yarn or fiber. Such a cover or wrapping is electrically non-conductive and practically non-combustible and is especially adapted for the purpose herein described, since it can be pressed directly against the inner surface of the wing wall, whereby the transfer of heat is made most effective.

The resistance and its control are such that only "black heat" is produced.

This "black heat" is known as a "low watt" density element where the working temperature does not exceed 800° F.

As contrasted with what is generally known as red heat resistance, the black heat resistance

is to be preferred in connection with the devices and uses herein described.

What I claim is:

In means for heating the wings of airplanes having a wall inherently subject to distortion under varying conditions of stress, the combination of a reinforcing frame on the wall, including spaced apart beams, an electric heating grid positioned between said beams and coextensive

with the space between said beams and having surface engagement with said wall, and a resilient pressure plate supported, as to its side margins, by the beams and coextensive with said grid, means on the wall intermediate said beams for maintaining a continuous surface pressure upon the grid, by said wall and said plate which cover the opposite sides of said grid.

GERRIT VAN DAAM.