Aug. 9, 1949. S. TREY 2,478,725

AIRPLANE WITH WING JET SLOT

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Fig. 1.

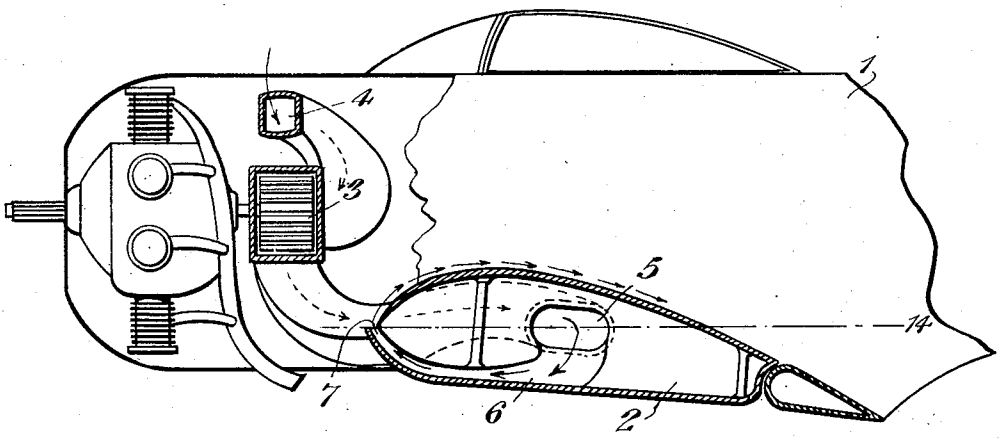


Fig. 2.

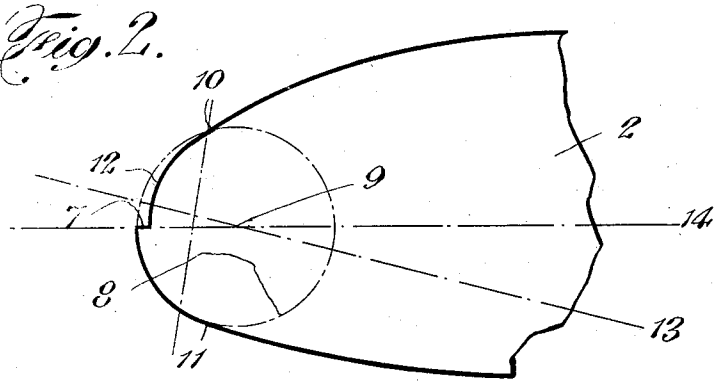
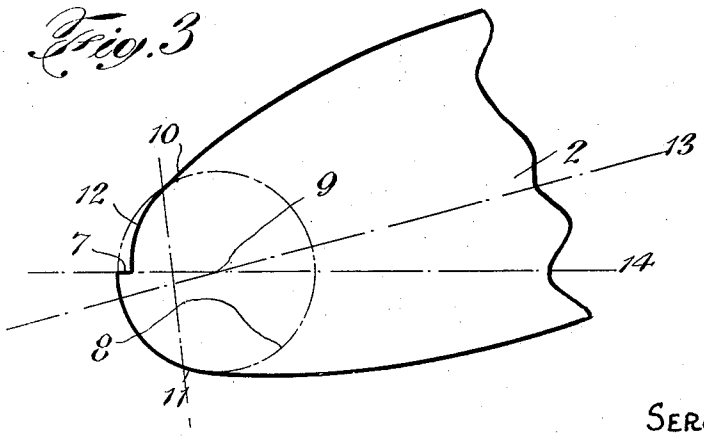


Fig. 3



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Fig. 4.

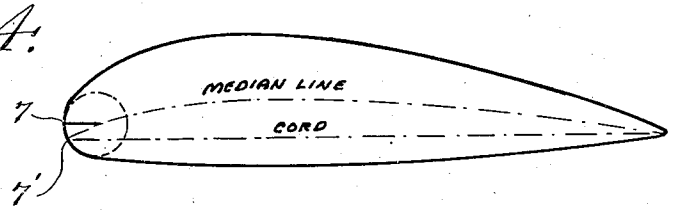


Fig. 5.

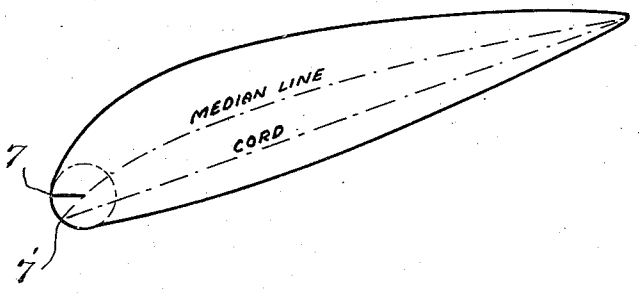


Fig. 6.

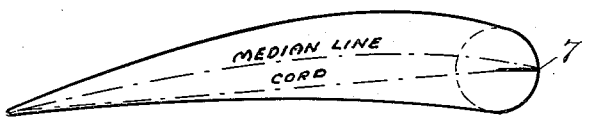
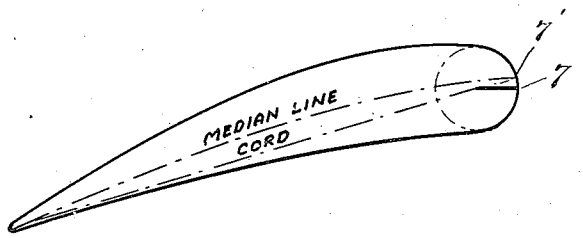


Fig. 7.



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AIRPLANE WITH WING JET SLOT

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Application May 25, 1946, Serial No. 672,246

4 Claims. (Cl. 244—40)

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The invention is concerned with aerofoils provided with a jet of air emanating under pressure from the leading edge.

The jet of air is created by a blower or other appropriate means, is led into the leading edge of the aerofoil, and is caused to escape therefrom in an upward direction through a suitable opening at the leading edge. Before proceeding further, it is proper to recall certain definitions well understood in the art.

The leading edge of an aerofoil is defined by a circle tangent to the profile of the aerofoil at its forward end. For convenience, this circle hereinafter will be designated as the "leading edge circle" and the points of tangency between this circle and the aerofoil profile as the upper and lower "limit points" of the leading edge. The chord of an aerofoil is defined as the line joining the extremities of the median line of the profile. The angle between the chord and the horizontal, which is the line of flight, is designated as the built in angle of attack. When the built in angle of attack is zero, the chord is horizontal.

According to the present invention, the jet opening, usually in the form of a slot, is located at the intersection of the leading edge with a plane drawn horizontally through the center of the leading edge circle. The correct location of the jet opening is one of the main objects of the present invention. It is also the object of the invention to increase the efficiency of the aerofoil by effecting more favorable aerodynamic conditions, to increase the lifting capacity of the aerofoil and to decrease the drag. The artificially created flow of air over the top of the aerofoil relieves the pressure on the nose of the aerofoil. The inclination of the lift force from the vertical is diminished, thereby increasing the lift component, at the same time creating a negative drag component. When this negative drag component is greater than the positive drag component inherent in the aerofoil without the operation of the air jet, the final resulting drag is negative, i. e. a force of propulsion is created. Other objects of the invention, not specifically mentioned above, will become apparent from the specification which follows and from the appended drawing, in which

Figure 1 is a side elevation of an aeroplane the wing portion of which is shown in vertical cross section. Figures 2 and 3 are diagrammatic views of wing profiles embodying the present invention, Figure 2 for the case of a positive built in angle of attack, and Figure 3 for the case of a negative built in angle of attack.

Figures 4 to 7 are diagrammatic views of various

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wing profiles serving to illustrate the invention.

Referring to the figures in detail, 1 is the fuselage of the aeroplane, and 2 its wing portion, with a positive built in angle of attack; 4 is an opening for the intake of air; 3 a blower for creating the jet of air which is led through the opening 5 into a duct 6 and hence outward through the jet opening 7 in the leading edge of the wing 2. The leading edge circle in Figures 2 and 3 is designated by the numeral 8, and its center is at 9. The upper and lower limit points of the leading edge, i. e. the points of tangency of the circle 8 with the profile of the wing, are 10 and 11 respectively. The upper portion of the wing profile is recessed inwardly into the faring 12 which passes through the inner rim of the slot forming the opening of the air jet 7, tangentially to the wing profile back of the circle 8. The line 9—13 is parallel to the chord of the aerofoil. The line 9—14 is horizontal and represents the line of flight. The air driven by the blower 3 follows the path indicated by the arrows in Figure 1 and flows over the top of the wing after escaping from the slot 7. It will be noted that the jet opening lies above or below the line 9—13 according as the built in angle of attack is negative or positive, and that the angle formed by the lines 9—13 and 9—14 is equal to the built in angle of attack. It will be noted also that the jet opening lies between the upper and lower limit points of the leading edge, as these points have been defined above.

To further illustrate the relative locations of the jet opening, some characteristic wing profiles are shown diagrammatically in Figures 4 to 7. The slot of the jet opening is indicated in the diagrammatic figures merely by the numeral 7, while the numeral 7' is the point of intersection of the median line of the profile with the leading edge. Figures 4 and 6 are for the case of a built in angle of attack zero, while Figures 5 and 7 are for the case of substantial built in angles of attack. In Figures 4 and 5, the cambers of the upper and the lower lines of profile are different. In Figures 6 and 7, the profiles are also asymmetrical except at the nose where the profile is symmetrical. It will be noted that in all cases of wings with built in angles of attack the jet opening is at some distance from 7', i. e. from the intersection of the median line of the aerofoil with its leading edge. Only in one case does the point 7 coincide with the point 7', and that is in the case of a zero built in angle of attack and a completely symmetrical wing profile or one with a symmetrical nose profile. This case is illustrated in Figure 6 which is a diagrammatic reproduction

of the wing disclosed in the Patent No. 1,979,298, issued to Trey and Howard. In such a case, as illustrated in Figure 6, the location of the jet opening is at the intersection of the median surface of the aerofoil with the leading edge, as stated in that patent. When the wing has a built in angle of attack, the location of the jet opening may be quite a distance away from the intersection of the leading edge with the median surface of the wing.

I claim:

1. An aircraft comprising a fuselage and a sustaining wing, the chord of said wing being set at a predetermined angle of incidence with respect to the longitudinal axis of said fuselage, a portion of the profile of the leading edge of said wing being disposed in a circular arc, an upwardly facing jet discharge opening formed in the leading edge of the wing, said opening being so located that a line drawn in profile of said wing from said opening to the center of said circular arc forms an angle with the wing chord equal and opposite to said angle of incidence.

2. An aircraft comprising a fuselage and a sustaining wing, the chord of said wing being set at a predetermined angle of incidence with respect to the longitudinal axis of said fuselage, means for creating a stream of air in said aircraft, a portion of the profile of the leading edge of said wing being disposed in a circular arc, an upwardly facing opening for the escape of said air formed in the leading edge of said wing at the intersection of said leading edge with a horizontal plane drawn through the center of said arc, and means connecting said opening with said first named means for conveying air to said opening.

3. An aircraft comprising a fuselage and a sustaining wing, the chord of said wing being set at a predetermined angle of incidence with respect

to the longitudinal axis of said fuselage, means for creating a stream of air in said aircraft, a portion of the profile of the leading edge of said wing being disposed in a circular arc, an upwardly facing opening for the escape of said air formed in the leading edge of said wing at the intersection of said leading edge with a horizontal plane drawn through the center of said arc, said opening being below or above a line drawn through the center of said arc parallel to the chord of said wing, according as said angle of incidence is positive or negative, and means connecting said opening with said first named means for conveying air to said opening.

4. An aircraft comprising a fuselage and a sustaining wing, said wing having a profile section wherein the upper and lower portions of the leading edge are formed as upper and lower circular arcs, respectively, both arcs being of equal radius, the centers of both arcs being located in a line which passes through the leading edge and which is parallel to the longitudinal axis of the fuselage, the center of the upper arc being spaced rearwardly from the center of the lower arc, to provide an upwardly facing jet opening between the forward ends of said arcs.

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