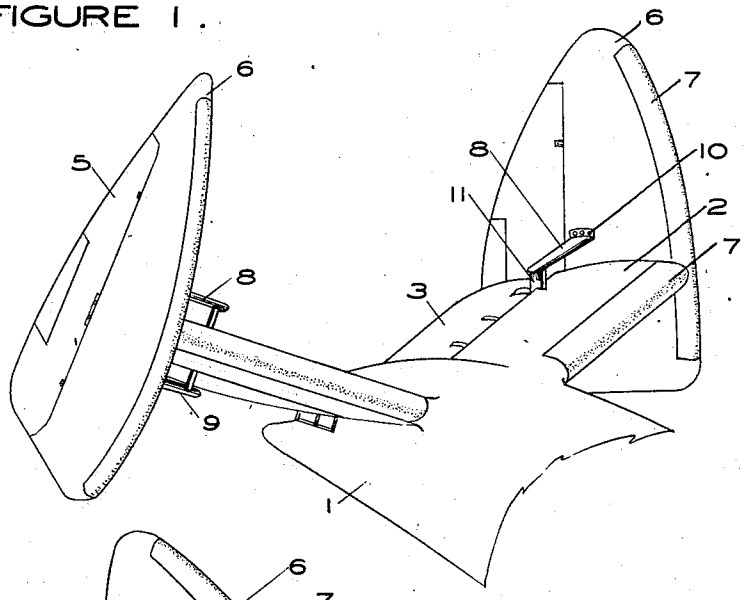
July 18, 1944. E. D. SHANNON 2,353,856

AUXILIARY AIRFOIL

Filed Nov. 21, 1942 2 Sheets-Sheet 1

FIGURE 1.



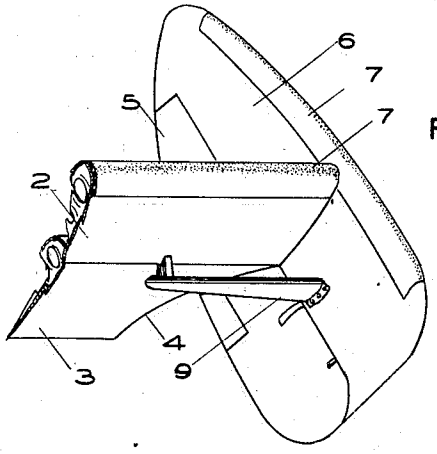


FIGURE 2.

FIGURE 3

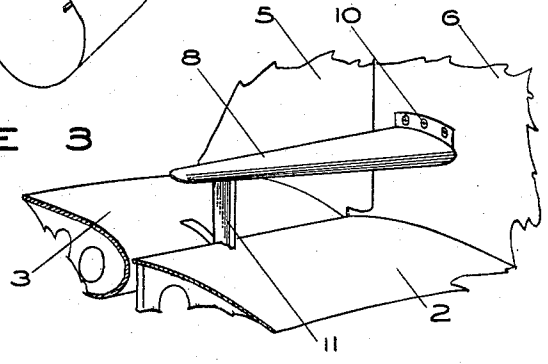


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FIGURE 4.

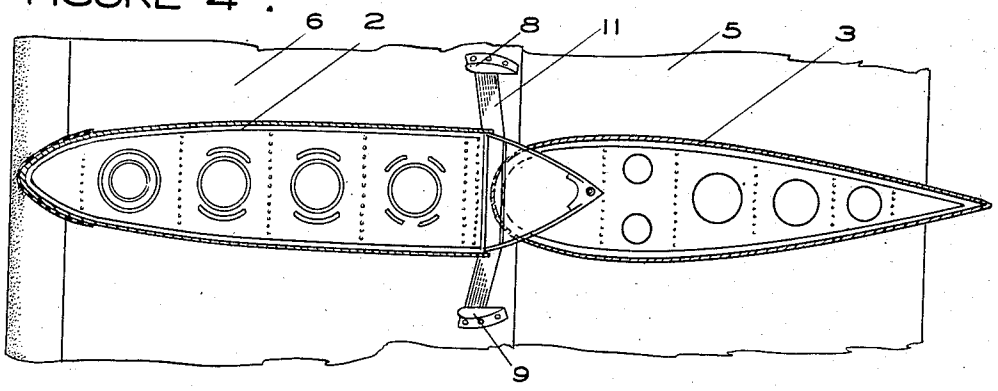


FIGURE 5.

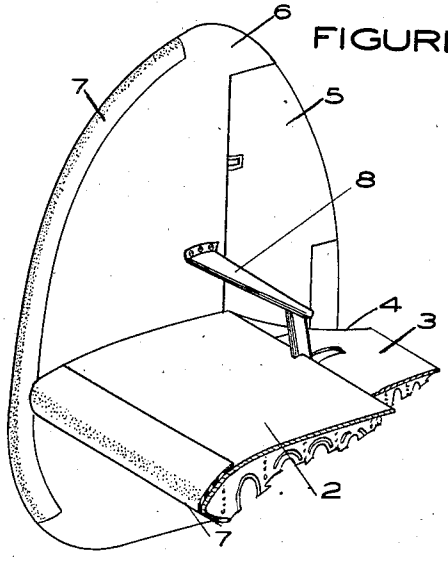
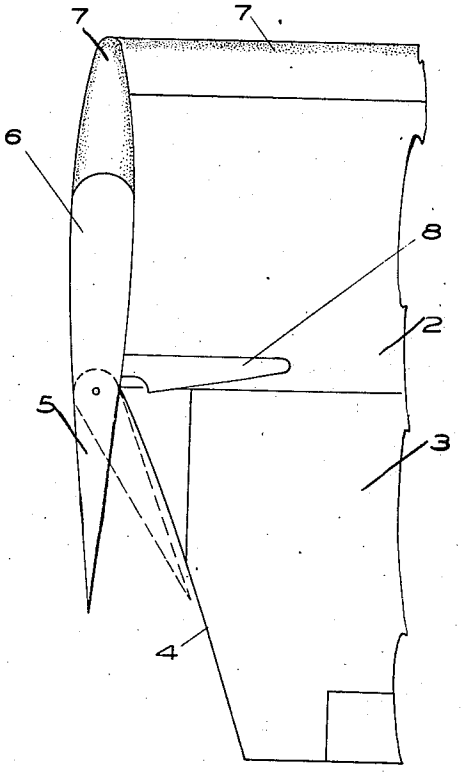


FIGURE 6.



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UNITED STATES PATENT OFFICE

2,353,856

AUXILIARY AIRFOIL

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Application November 21, 1942, Serial No. 466,445

2 Claims. (Cl. 244—87)

This invention relates to an auxiliary airfoil to prevent turbulent flow over a control surface. It is particularly adaptable on the empennage to smooth the flow over the stabilizer and elevator.

The primary purpose of this invention is to effect a smooth flow of air over the area adjacent the intersection of two stabilizers when one stabilizer control surface has to be cut to permit the deflection of the other.

In empennage of the twin rudder and stabilizer type, it is necessary to cut the elevator to allow for deflection of the rudders. This cut in the elevator causes irregular flow conditions which result in vibration or oscillation of the rudder, that is carried through the control system and causes annoying vibration of the rudder pedals and yoke, and may, of course, ultimately cause damage to the empennage.

The structure of this invention can readily be adapted to most twin rudder and stabilizer empennage, and can be installed with very little modification of the existing structure.

Further and other objects will become apparent from the description of the accompanying drawings which form a part of this disclosure and in which like numerals refer to like parts.

In the drawings:

Figure 1 shows a twin rudder and stabilizer empennage.

Figure 2 is a perspective of the underside of the stabilizer and elevator.

Figure 3 is a perspective view of the top side of the stabilizer and elevator.

Figure 4 is a sectional view through the stabilizer and elevator.

Figure 5 is a perspective view from the rear of the fuselage of the top side of the stabilizer.

Figure 6 is a partial plan view showing the elevator cut to allow for rudder deflection.

Figure 1 of the drawings, shows a twin rudder empennage attached to the rear end of the fuselage 1. The empennage comprises elevator stabilizers 2 so positioned on the fuselage that a dihedral angle is formed therebetween. Elevators 3 are attached to stabilizers 2, and are cut out as shown at 4 to afford clearance for rudder deflection. The rudders 5 are secured to stabilizers 6 which are mounted substantially normal to the stabilizers 2. Deicer boots 7 are shown on the leading edge of all stabilizers. The auxiliary airfoils 8 and 9 are mounted secured to the rudder stabilizer by brackets 10 and spaced from the elevator stabilizers by supports 11. The auxiliary airfoils are of a cambered profile and may be of rectangular or tapered planiform.

As shown in the drawings, particularly Figure 6, the length of auxiliary airfoil 8 is slightly greater than the lateral extent of the cut-out portion of airfoil 3. The length of the auxiliary airfoil should be long enough to affect a smooth flow of air over the cut-out portion of airfoil 3. In other words, the effective length of the auxiliary airfoil 8 should be substantially equal to the lateral extent of the cut-out portion.

The auxiliary airfoil may readily be attached to existing installations as the bracket 10 can easily be secured to the rudder stabilizer and the support 11 can be secured in the elevator hinge bracket slot. The auxiliary airfoil may have a cantilever support.

The auxiliary airfoil functions to cause a smooth and directed flow of air over and under the stabilizer and elevator in the area of the cut-outportion of the elevator where before, an unpredicted turbulence of air existed, with the new airfoil, the flow of air moves smoothly over the elevator and cut out space in the elevator with substantially no turbulence in the wake of the elevator.

It is to be understood that certain changes, alterations, modifications and substitutions can be made without departing from the spirit and scope of the appended claims.

I claim as my invention:

1. An aircraft empennage comprising a pair of intersecting stabilizers arranged substantially normal to one another, movable control airfoils secured to said stabilizers, one of said movable control airfoils having a cut-out portion extending from a point adjacent the intersection of the trailing edges of said stabilizers, to the trailing edge of said control airfoil to permit the movement of the other control airfoil, an auxiliary airfoil mounted on the stabilizer adjacent, and substantially parallel to, the leading edge of the cut-out movable airfoil, having a lateral extent substantially equal to and spanning the cut-out portion of said airfoil, to effect a smooth flow of air thereover.

2. An aircraft empennage comprising a pair of intersecting stabilizers arranged substantially normal to one another, movable control airfoils secured to said stabilizers, one of said movable control airfoils having a cut-out portion extending from a point adjacent the intersection of the trailing edges of said stabilizers, to the trailing edge of said control airfoil to permit the movement of the other control airfoil, an auxiliary airfoil mounted on the stabilizer adjacent and substantially parallel to the leading edge of the cut-out movable airfoil, said auxiliary airfoil having a lateral extent at least equal to and spanning the cut-out portion of said airfoil, to effect a smooth flow of air thereover.

ELLIS D. SHANNON.