

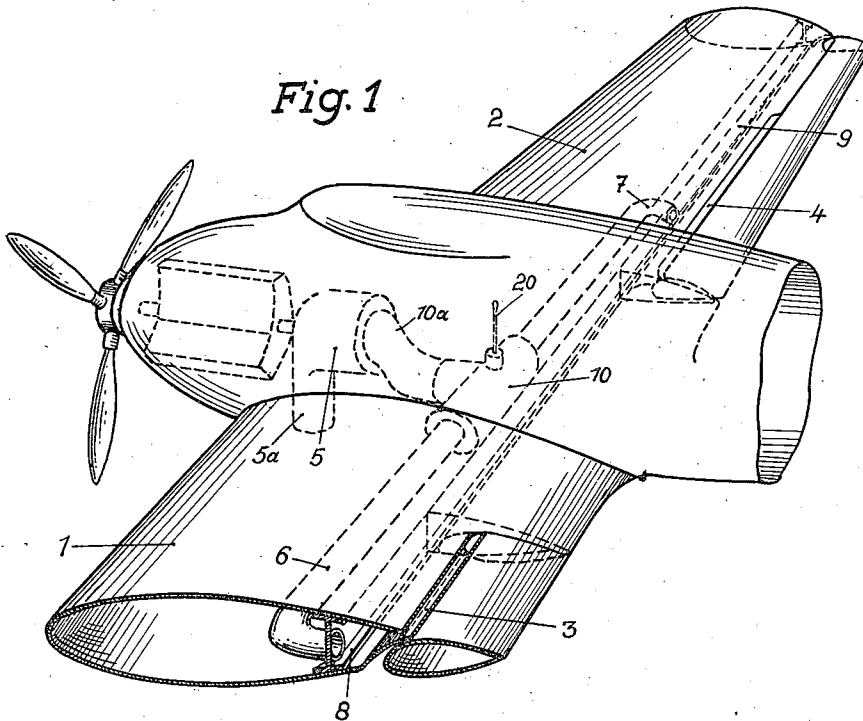
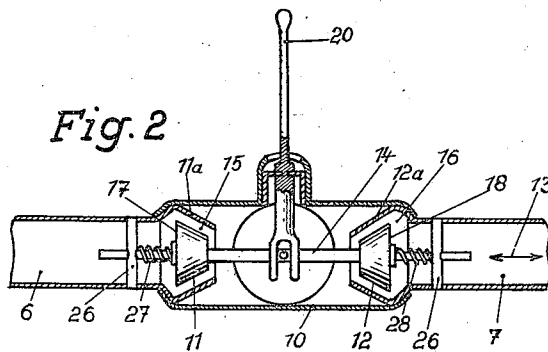
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MEANS FOR EQUALIZING THE AIRFLOW FROM OR INTO THE SKIN LAYER

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MEANS FOR EQUALIZING THE AIR FLOW
FROM OR INTO THE SKIN LAYER

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9 Claims. (Cl. 244—40)

This invention relates to means for equalizing the airflow from or into the skin layer adjacent airplane surfaces in order to obtain uniform distribution of suction or delivery through openings provided on both sides of the longitudinal axis of an airplane.

In cases where inlet or discharge openings for the suction or delivery of air or gas from or into the skin layer, particularly adjacent to wings, on opposite sides of the longitudinal axis of an airplane, it is very necessary that this suction, particularly, from both sides of the said axis be equalized to eliminate torques about the said longitudinal axis that might otherwise occur, as such torques might prove very dangerous specially if they occurred while the airplane was starting or landing.

It is an object of the invention to provide such a means for equalizing the airflow for installation in systems wherein pumping means are provided for exhausting or discharging air or gas from or into the skin layer on opposite sides of the longitudinal axis of an airplane, so that the amounts of air or gas exhausted from or discharged into the skin layer on the opposite sides may be equalized or otherwise proportioned on both sides of the said longitudinal axis.

Another object of the invention is to provide such a means for equalizing the airflow whether air is being drawn inwardly through slots on opposite sides of the wings or being discharged therethrough; and which functions automatically when air is being exhausted through the slots towards the pump. Thus if the suction of air on one side of the longitudinal axis is partially obstructed by the formation of ice in the slot through which that suction occurs, the equalizing means operates automatically to reduce the flow passing through the slot on the other side of the said axis until it only equals the reduced flow through the obstructed slot.

Having thus briefly stated some of the purposes and advantages of the invention I will now proceed to describe an embodiment thereof with the aid of the accompanying drawing, in which:

Figure 1 is a perspective view showing my invention connected to an arrangement for discharging air into or exhausting air from the skin layer adjacent the wings on both sides of the longitudinal axis of an airplane.

Figure 2 is an enlarged sectional view through the invention which is shown connected to the adjacent ends of passages extending on opposite sides of the longitudinal axis of the airplane.

Referring to the drawing, the wings 1 and 2, extending on opposite sides of the longitudinal axis of an airplane, are provided with passages 3 and 4 which are longitudinally slotted at 3 and 4 respectively. One open extremity of a pipe 6 terminates in the passage 3 and at its other extremity is suitably connected to one end of an equalizing device 10; and a pipe 7 extends from the other end of the said device 10 and terminates at its opposite extremity in the passage 4. A connection 10a extends centrally from the device 10 to a pump 5 from which a second connection 5a projects, into which air or gas may be drawn by suction by the said pump or through which air may be discharged from the latter.

In the pipes 6 and 7 adjacent the device 10 suitable means, such as spiders 26, are provided for supporting a rod 14 for axial movement in the plane indicated by the arrow 13. Secured on the rod 14 and spaced from one another inwardly of the spiders 26 are two valves 11 and 12 between each of which and the adjacent spider 26 a coil spring 27 or 28 is provided which tends to urge the valve against which it bears towards an annular seat 11a or 12a respectively, which latter are supported by the casing of the device 10. Thus the springs balance one another and tend to retain the valves 11 and 12 equally spaced from their seats, so that the cross sectional area of the annular passages 15 and 16 formed between the seats and the valves remains the same.

If suction is being exerted by the pump 5 through the pipes 6 and 7 and the slot 3 becomes partly obstructed so that less air is drawn into the pipe 6, this reduces the air pressure on the face 17 of the valve 11 and correspondingly increases the air pressure on the face 18 of the valve 12. Consequently the rod 14 is moved axially until the size of the passage 16 is so reduced that only as much air can flow therethrough as flows through the passage 15. Then the volume of air drawn through the two pipes 6 and 7 is equalized.

If, for any purpose, it is desired to obtain a greater suction flow through one of the slots 3 or 4 than through the other such proportionate flow may be obtained by movement of the shift lever 20 so that the cross sectional area of one of the passages 15 or 16 is increased and the other reduced. Or if the volume of air to be discharged through the two slots 3 and 4 is unequal for any cause and it is desired to equalize it, or if a greater discharge is desired through one

slot than the other the cross sectional area of the two passages 15 and 16 may be varied in the same way by manipulation of the said shift lever 20.

While in the foregoing a preferred construction and arrangement has been described and shown it is understood that alterations may be made thereto provided the said alterations fall within the scope of the appended claims.

What I claim is:

1. An airplane arrangement comprising a fuselage, wings extending on opposite sides thereof and having slots therein, pumping means, a mechanism connected thereto, opposed pipes extending from opposite sides of the mechanism and terminating in said slots, said mechanism including rigidly connected valves spring-balanced in opposite directions mounted therein for movement in unison to increase the area of passage between said mechanism and the other pipe and seats mounted around said valves whereby the suction flow from the skin layer adjacent opposite sides of the wings to the pumping means is automatically equalized.

2. An airplane arrangement comprising a fuselage, wings extending on opposite sides thereof and having slots therein, pumping means, a mechanism connected thereto, opposed pipes extending from opposite sides of the mechanism and terminating in said slots, said mechanism including rigidly connected valves spring-balanced in opposite directions mounted therein for movement in unison to increase the area of passage between said mechanism and one pipe and to correspondingly decrease the area of passage between said mechanism and the other pipe, a shift lever, and means connecting the latter to said valves whereby the latter may be moved to vary the proportionate flow between the slots and the mechanism.

3. In an aircraft including oppositely disposed supporting surfaces, the combination of pumping means carried by the aircraft, slots in said surfaces, conduits extending from the pumping means and opening into each of the slots, a valve in each conduit, said valves being rigidly connected to one another for movement in unison, and balanced yielding means urging each valve in the same functional direction.

4. In an aircraft including oppositely disposed supporting surfaces, the combination of pumping means carried by the aircraft, slots in said surfaces, conduits extending from the pumping means and opening into each of the slots, a valve in each conduit, said valves being rigidly connected to one another for movement in unison, and balanced yielding means urging each valve into closed position.

5. In an aircraft including oppositely disposed supporting surfaces, the combination of pumping

means carried by the aircraft, slots in said surfaces, conduits extending from the pumping means and opening into each of the slots, a valve in each conduit, said valves being rigidly connected to one another for movement in unison, balanced yielding means urging each valve in the same functional direction, and means for positively moving said valves in either direction.

6. In an aircraft including oppositely disposed supporting surfaces, the combination of pumping means carried by the aircraft, slots in said surfaces, conduits extending from the pumping means and opening into each of the slots, valve ports in each conduit, each port including a valve seat on the pump side of the opening, rigidly connected valves so constructed and arranged that one port is fully open when the other is completely closed, and yielding means urging each valve into closed position.

7. In an aircraft including oppositely disposed supporting surfaces, the combination of pumping means carried by the aircraft, slots in said surfaces, conduits extending from the pumping means and opening into each of the slots, valve ports in each conduit, each port including a valve seat on the pump side of the opening, rigidly connected valves so constructed and arranged that one port is fully open when the other is completely closed, yielding means urging each valve into closed position, and means for positively moving said valves in either direction.

8. In an aircraft including oppositely disposed supporting surfaces, the combination of pumping means carried by the aircraft, slots in said surfaces, conduits extending from the pumping means and opening into each of the slots, valve ports in each conduit, each valve being so constructed and arranged with reference to said port as to close the same on movement in either opposite direction, means connecting said valves for movement in unison, and yieldable means acting upon said valves in opposed relation to one another to maintain the same in open position.

9. In an aircraft including oppositely disposed supporting surfaces, the combination of pumping means carried by the aircraft, slots in said surfaces, conduits extending from the pumping means and opening into each of the slots, valve ports in each conduit, each valve being so constructed and arranged with reference to said port as to close the same on movement in either opposite direction, means connecting said valves for movement in unison, yieldable means acting upon said valves in opposed relation to one another to maintain the same in open position, and means for positively moving said valves in either direction.

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