Aug. 20, 1940. H. WAGNER ET AL 2,211,871

MEANS FOR TRANSFERRING AIR FROM ONE PORTION OF THE SKIN LAYER TO ANOTHER

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Fig. 1

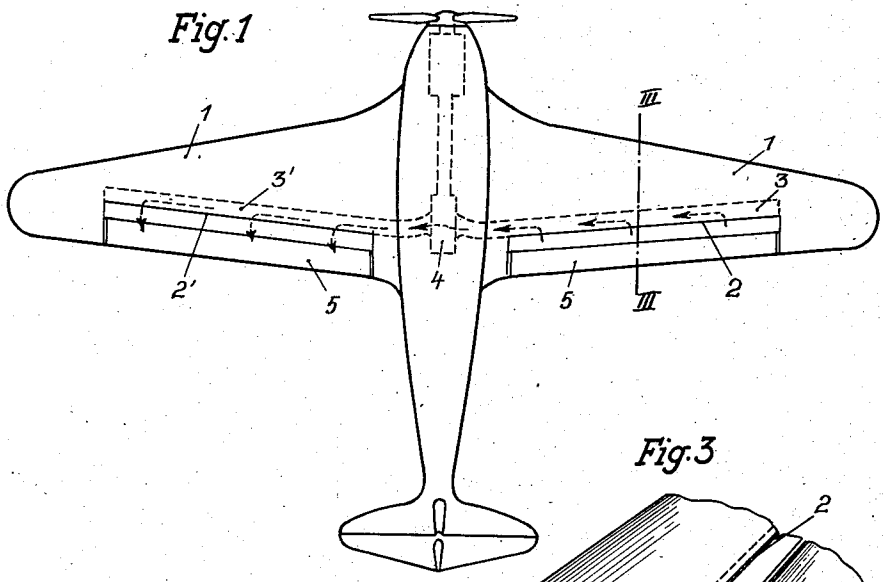


Fig. 3

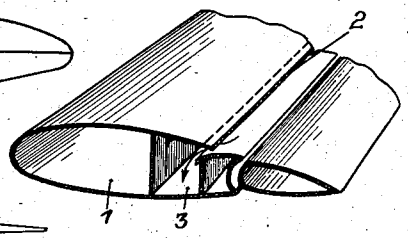
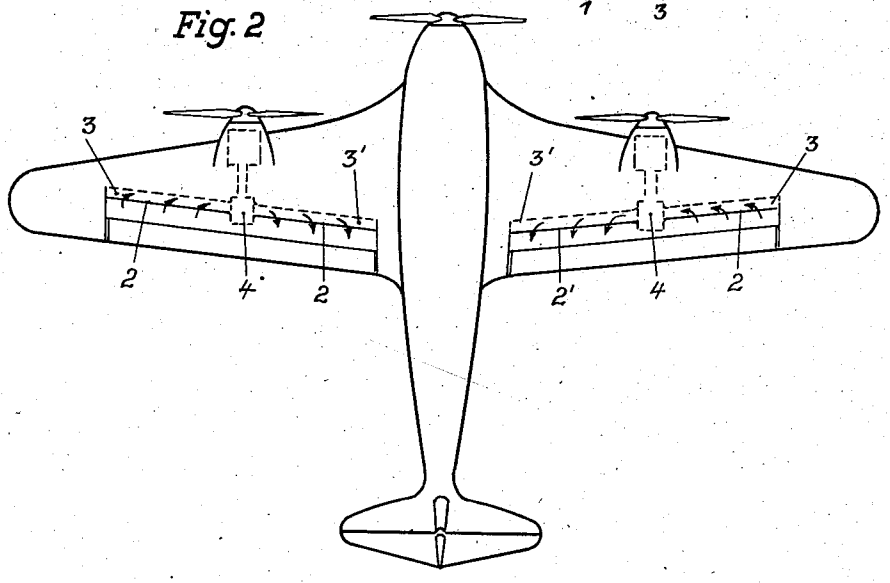


Fig. 2



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MEANS FOR TRANSFERRING AIR FROM ONE PORTION OF THE SKIN LAYER TO ANOTHER

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2 Claims. (Cl. 244—40)

This invention relates to means for transferring air from one portion of the skin layer to another, and refers particularly to an arrangement by which air may be transferred from the skin layer adjacent one zone of a wing structure and discharged into the skin layer adjacent another zone to increase the lifting capacity of the airplane.

Pumping devices have been utilized for exhausting air from the skin layer to avoid disrupting or tearing the latter when the wing structure is inclined at a considerable angle of incidence; and pumps have also been used for transferring air from the skin layer adjacent one wing zone to the skin layer adjacent another wing zone, but in such cases the two zones have been longitudinally spaced one behind the other, and large pumps of considerable power have been necessary to handle the large volume of air which must be moved to produce an effective increase in lifting capacity.

Means have also been provided heretofore for exhausting air from one low pressure zone to a zone of lower pressure, such arrangements are used for banking only, because they do not increase the total lifting capacity of the airplane. In yet another known arrangement means have been provided for transferring air from the skin layer adjacent the central portions of wings and discharging it in zones on both sides thereof; however when this is done the proportionate sizes of the delivery and suction zones must be in a ratio of about 5 to 1 so that the suction must be of greater intensity and very large pumping equipment is necessitated.

In such arrangements wherein the suction zones are materially smaller than the delivery zones, the fact that the air to be discharged into the delivery zone must be exhausted from a much smaller suction zone necessitates the pumping of more air than is necessary to produce the lifting power required in these zones, and, as a result, proportionately very large pumps are needed to handle this excess air which add unduly to the weight of the equipment.

We have now established that a certain minimum volume of air must be transferred in order to obtain lifting power from both the suction and delivery zones, and that the volume should be substantially the same in both zones. It is therefore an object of this invention to provide means for obtaining increased lifting capacity by the transfer of smaller volumes of air than could be advantageously transferred by arrangements hitherto known, and to position the suction and delivery zones from one another so that this transfer may be accomplished with a minimum expenditure of power, thereby rendering it possible to use blowers or injector pumps driven by exhaust gases from the motors. Thus we aim to provide a light and efficient means wherein materially less power is required for the operation of a relative small pumping device of conventional construction to satisfactorily accomplish our purpose.

Another object of the invention is to provide such an air transfer means wherein the suction and delivery zones are laterally spaced from one another and are of substantially the same size so that the proportionate zone sizes vary between 0.5 and 1.5 to 1.0 so that substantially the same amount of air is withdrawn from one zone as is discharged into the other. Thus we obviate unnecessary pumping.

It may also be added that if the zones were longitudinally spaced from one another, instead of the lateral spacing employed in this invention, and the zones were of the same size, approximately twice the volume of air would have to be pumped per unit of area to obtain the same result, and in addition greater losses in transfer must occur when the zones are longitudinally spaced from one another.

We will now describe our invention with the aid of the accompanying drawing, wherein:

Figure 1 illustrates a plan view of an airplane wherein air is exhausted from the skin layer adjacent the wing surface on one side of its longitudinal axis and is discharged into the skin layer adjacent the wing on the other side of the said axis.

Figure 2 is a plan view showing a modified arrangement wherein air is exhausted from the skin layer adjacent one zone of each wing and is discharged into the skin layer adjacent another zone of the same wing.

Figure 3 is a section on the line 3—3 of Figure 1.

Referring first to Figures 1 and 3; in the upper surface of the wings 1 laterally extending and substantially aligned passages 3 and 3^1 having longitudinal openings 2 and 2^1 respectively therein are provided. The adjacent extremities of the passages 3 and 3^1 terminate at the suction and discharge sides respectively of an air transfer device 4, such as a blower, to which they are suitably connected.

If the wings 1 or flaps 5 are at a considerable angle of incidence the air transfer means is put in operation. Air from the skin layer is then

drawn into the opening 2, through the passage 3 to the air transfer means 4, and is delivered from the latter through the passage 3^1 and discharged through the opening 2^1.

In Figure 2 the arrangement shown and its operation is the same except that two air transfer means 4 are provided each substantially centrally of the width of one of the wings 1, and a suction opening 2 and passage 3 and a discharge passage 3^1 and an outlet opening 2^1 are provided in each wing.

It will be noted that in both cases the inlet and discharge openings 2 and 2^1 are substantially in lateral alignment and are of substantially the same size and length so that the zones from and into which air is transferred are of approximately the same size. By this arrangement an uninterrupted aero-dynamic flow of the skin layer is produced, and sufficient air may be transferred by the aid of a relatively small air transfer device to produce an effective increase in lifting power.

What we claim is:

1. An arrangement for transferring air from the skin layer adjacent one wing zone to the skin layer adjacent another wing zone comprising a wing structure having two substantially aligned passages therein, air transfer means connected to the adjacent extremities of the passages, and said passages having longitudinal openings therein of substantially the same size whereby air from the skin layer adjacent one opening is adapted to be drawn therethrough and delivered by the transfer means through the other opening.

2. An arrangement including the combination set forth in claim 1, wherein both openings face in the same direction and their proportionate size is between 0.5 and 1.5 to 1.0.

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