Aug. 9, 1949. S. TREY 2,478,726

AIRPLANE WING

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Fig. 1.

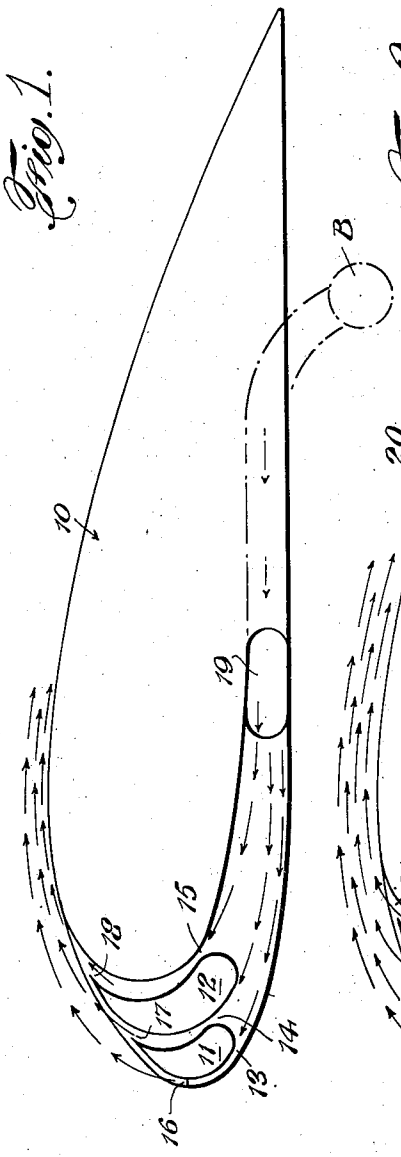


Fig. 2.

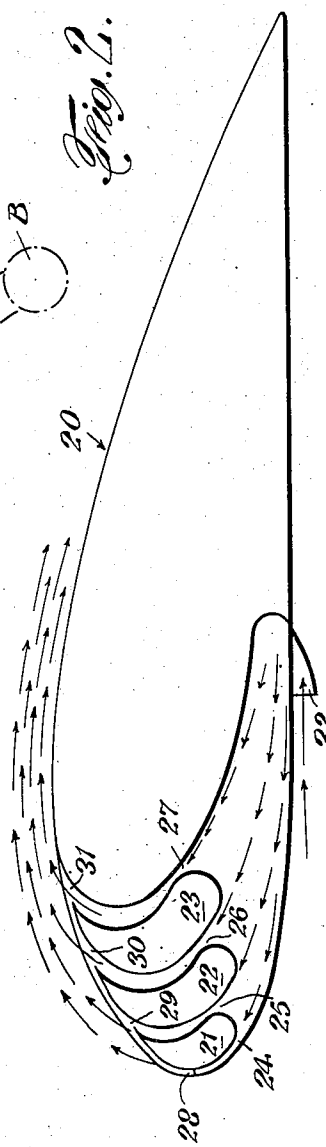
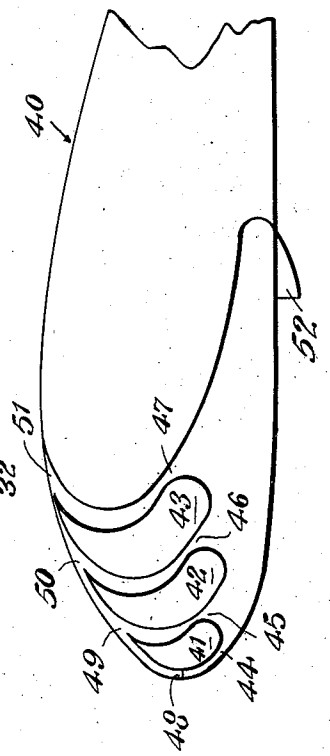


Fig. 3.



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AIRPLANE WING

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6 Claims. (Cl. 244—40)

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The invention is concerned with airplane wings the operation of which involves the use of air jets and, in particular, with wings of this character wherein the air jet is combined with air discharged out of the surface of the wing to raise the camber of the wing.

Raising the camber of a wing by structural means is a ticklish and generally unsatisfactory procedure. The object of the present invention is to raise the camber by producing an artificially created mass flow of air over the surface of the wing. It is also an object of the invention to produce this mass flow by discharging air from between vanes in the wing. A further object is to produce this mass flow in combination with a jet of air discharged from the leading edge of the wing. Still another object is to build up this mass flow out of superimposed streams of air of different velocities, the velocity of each stream being greater than the velocity of the stream below it. Another object of the invention is to cause the discharge from between the vanes to be in tangential relation to the surface of the wing. A further object is to constrict the air passages between the vanes near the entry of the air and to expand the passages towards the exits of the air. A still further object is to make the exits wider as they progress away from the leading edge of the wing. In some cases, it is an object of the invention to have the levels of the exits for the discharged air step down progressively towards the leading edge of the wing. Other objects, not specifically mentioned above, will be apparent from the specification which follows and from the accompanying drawing, in which

Figure 1 is a schematically drawn profile of a wing embodying the present invention. The wing contains only two of the vanes mentioned in the preamble.

Figure 2 is a similar profile of a wing containing three vanes.

Figure 3 is a similar profile, with three vanes, but the exits of the air passages are stepped down towards the leading edge.

Referring to the figures in detail, in Figure 1, 10 is the profile of a wing embodying the present invention, 11 and 12 are vanes, separated by the air passage 14, and from the main body of the wing by the air passage 15. The air passage 13 separates the vane 11 from the leading edge 16. The air passages 14 and 15 are constricted near the entry of the air and widened at the exits of the air, 17 and 18. It will be noted further that the exit 18 is wider than

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the exit 17, and that the vanes 11 and 12 are in tangential relation to the upper surface of the wing. The air in this illustration is supplied by a blower B from which the air is led to the wing through the opening 19. The air discharged from the exit 18 will form a stream close to the surface of the wing, the air discharged from the exit 17 will form a stream over the one discharged from 18. The air discharged from the slot in the leading edge 16, referred to here as the air jet, tops the two streams discharged from 17 and 18. Owing to the fact that the exit 18 is wider than the exit 17, and that both of them are wider than the opening in the air jet slot 16, the velocity of the several streams will be different, namely, highest on top, i. e. where the stream emanates from the leading edge slot, and lowest at the bottom, i. e. where the stream emanates from the exit 18. Owing to the fact that the strictures of the passages at the entry of air into the passages 14 and 15 reduce the width of these passages to the width of the slot 16, the velocity of the air at the entry into the passages 14 and 15 will be the same as the velocity of the airjet, but as the passages 14 and 15 widen towards the exits, the velocities of the air in these passages will decrease as the air is discharged. This relationship of the streams, both as to position and as to velocity, causes a compact, uniform flow of a mass of air over the surface of the wing, functioning just as would a structural raising of the camber.

Referring to Figure 2 in detail, the wing profile 20 is similar to the wing profile 10 of Figure 1, but the air is supplied through an linet 32 instead of from a blower. The wing has three vanes 21, 22 and 23, the entries of air being again constricted at 25, 26 and 27 to a width substantially equal to the width of the slot 28 in the leading edge of the wing, and expanded exits 29, 30 and 31 are provided for the passages which also increase in width from 29 to 31. The vanes are again in tangential relation to the upper surface of the wing to insure close adherence to this surface. The mass flow over the wing in this case is composed of four superimposed streams, the top stream being the one emanating from the slot in the leading edge, the stream below it emanating from the exit 29, and so on, the lowest stream, emanating from the exit 31 being the one closest to the wing surface. The velocities of these streams, as in the former case, decrease from the top stream to the bottom stream.

Wings with more than three vanes exhibit the same characteristics and need not be illustrated.

Referring to Figure 3, the only difference between this case and the one illustrated in Figure 2, is that the exits **49**, **50** and **51** are in a step formation, the exit **49** being below the exit **50**, and the exit **50** below the exit **51**. In some cases, this modification of the invention is desirable in order to enhance the camber raising property of the created mass flow of air over the wing.

It is believed that the above illustrations are ample to clarify the scope of the invention, which is expressed in the following claims.

I claim:

1. In an airplane wing, means for increasing the flow of air over the upper surface of the wing, said means comprising an air duct within said wing, said duct having an outlet to the upper surface of the wing extending from the leading edge thereof rearwardly and means located in the duct dividing the outlet thereof into openings for providing a plurality of superimposed airstreams, said means being so shaped and proportioned as to provide decreasing emission velocities of said airstreams from the forwardmost stream rearwardly, whereby the camber of the wing is increased.

2. An airplane wing according to claim 1, wherein the air for the ducts is supplied through an entry underneath the wing.

3. An airplane wing according to claim 1, wherein the air for the ducts is supplied by power means.

4. In an aircraft wing, means for increasing the flow of air over the upper surface of the wing, said means comprising an air duct within said wing, said duct having an outlet to the upper surface of the wing extending from the leading edge thereof rearwardly and vanes located in the duct dividing the outlet thereof into passages, the inner portion of said vanes being enlarged so as to provide uniformly constricted passages in the interior of the wing and expanded passages near the wing surface, said vanes being further so shaped and proportioned that the width of the passages at their exits progressively increase from the leading edge rearwardly whereby a plurality of superimposed streams of different velocities decreasing from the forwardmost stream rearwardly is produced.

5. An airplane wing according to claim 4, wherein the ducts at the place of stricture are substantially of the same width as the width of the air passage between the leading edge of the wing and the first one of the vanes.

6. An airplane wing according to claim 4, wherein the exits from the ducts are in step formation.

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