May 28, 1929. H. P. MASSEY 1,714,609

AIRPLANE

Filed May 25, 1928

Fig. 1.

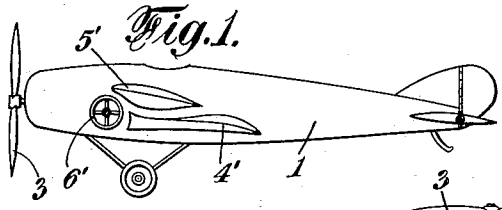


Fig. 2.

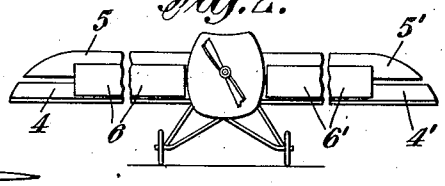


Fig. 3.

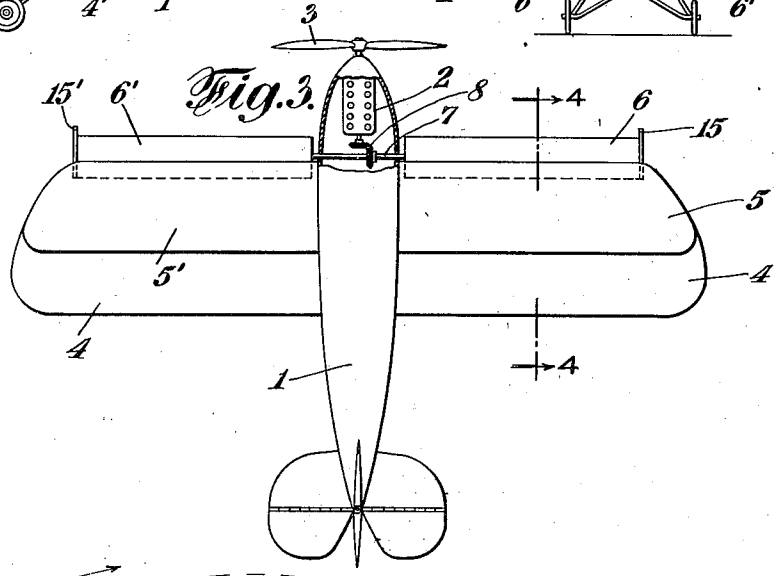


Fig. 4.

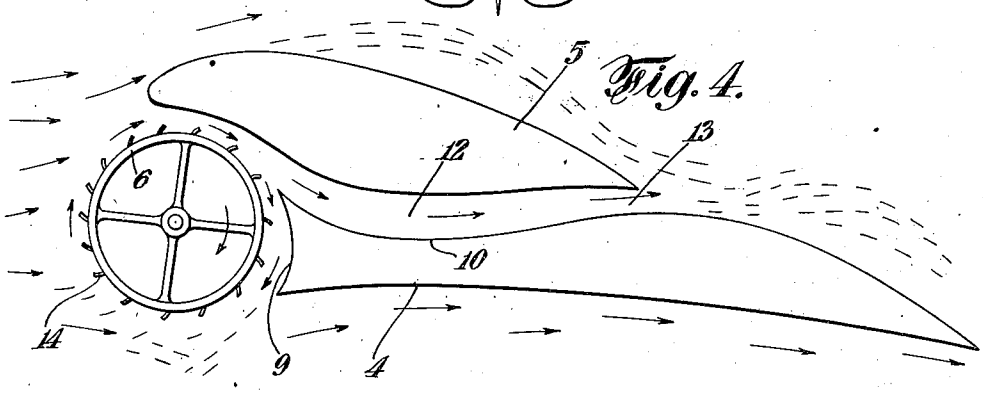
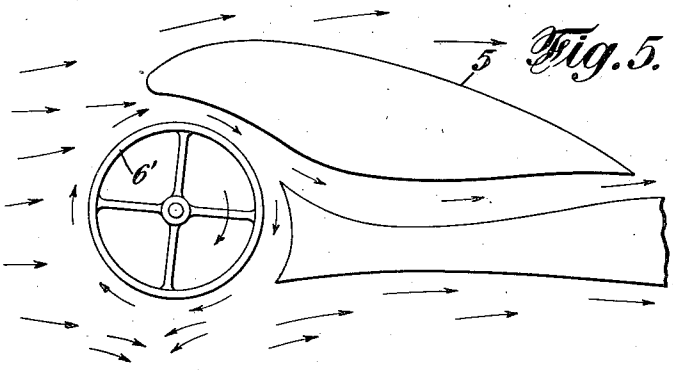


Fig. 5.



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UNITED STATES PATENT OFFICE.

HENRY P. MASSEY, OF MONTCLAIR, NEW JERSEY.

AIRPLANE.

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My invention relates to aircraft in general and the main object of the invention is to provide an improved lifting arrangement for aircraft. In its particular contemplated usefulness it is adapted for use with airplanes.

Further and more specific features and advantages will more clearly appear from the detailed description given below taken in connection with the accompanying drawings, which form a part of the specification.

In the drawings:

Fig. 1 shows an airplane in side elevation,

Fig. 2 shows a front elevation of the same,

Fig. 3 shows a plan view of the same,

Fig. 4 shows in diagrammatic form a cross section taken at 4—4 of Fig. 3, and

Fig. 5 shows a similar view and illustrates a slight modification.

Referring to the drawings: the body of the airplane will be designated as 1, and carries a motor 2 at the forward end thereof adapted to drive a propeller 3. An aerofoil 4 is suitably attached to and supported by the body. A second aerofoil 5 is positioned above the aerofoil 4 and spaced slightly therefrom and is slightly staggered in a forward direction to produce a positive stagger with respect to the lower aerofoil 4. A cylindrical drum 6 is suitably supported for rotation and is positioned adjacent the leading edges of aerofoils 4 and 5, extending laterally thereof substantially the entire span of said aerofoils. The corresponding aerofoils 4 and 5 and drum 6′ are similarly positioned on the opposite side of the body 1. The cylinders 6 and 6′ are adapted to be rotated by driving shaft 7 which is in driven engagement with the motor through the intermediary of bevel gears 8, or other suitable means.

The arrangement of the aerofoils and the cylinder will now be more particularly described with reference to Figs. 4 and 5. The lower aerofoil 4 is provided with a recessed leading edge 9, and, in the present embodiment, the forward part of the upper camber is slightly concave in cross section, while the rear part of the upper camber is convex in cross section and in general in the form of the usual upper camber of the usual aerofoil. The upper aerofoil 5 is provided with a suitable upper cambered surface and the under camber adjacent the leading edge is slightly concave in cross section, as at 11, and in the preferred embodiment conforms in general to a continuation of the curvature of the leading edge 9ª of the lower aerofoil; and the concavities thus formed approach the arc of a circle. The lower camber to the rear of this concavity is convex in cross section in the present embodiment. The aerofoils 4 and 5 are so positioned that a slot 12 is formed between the lower camber of the aerofoil 5 and the forward part of the aerofoil 4, such as at 10. This slot converges slightly rearwardly to thereby provide a somewhat restricted outlet at 13, adjacent the upper convex camber at the rear of the aerofoil 4. The upper camber of aerofoil 4 to the rear of the trailing edge of the aerofoil 5 will be referred to as the free upper camber of the aerofoil 4. The drum 6 is positioned in spaced relation with respect to the leading edge 9 of the aerofoil 4 and with respect to the portion 11 of the aerofoil 5. The drum 6 may be provided with peripheral serrations or air engaging portions designated as 14, if desired, although these portions are not deemed essential. A form of drum having a smooth periphery is illustrated in Fig. 5, in which the aerofoils are identical with those illustrated in Fig. 4.

The advantages obtained by the rotating cylinder may be explained by reference to the well known Magnus effect, and the beneficial result which I utilize is in accordance with Bernoulli's theorem, which states that where the velocity of air is the greatest, the pressure is the least; and conversely, where the velocity is least, the pressure is greatest, I have made use of the rotating drum, in combination with aerofoils, to produce an improved lifting arrangement.

With reference particularly to Fig. 4, the drum is continuously rotated during the operation of the aircraft. Under the attractive force of the propeller 3, the aircraft is moved forward and the resultant lifting effect is diagrammatically illustrated in Fig. 4; from which it will be seen that the relative movement of the air with respect to the lifting means, comprising aerofoils 4 and 5 and drum 6, acts in the following manner. The drum is rotating in a clockwise direction, as viewed in Fig. 4, and due to its skin friction drags the adjacent air along with it, thereby causing an increase in velocity of air adjacent its upper periphery,

and, due to its counteracting effect, causing a decrease in velocity of air adjacent its lower periphery. It therefore follows, according to Bernoulli's theorem, that the pressure is decreased above the drum and increased beneath the drum, causing a corresponding reaction exerted to lift the drum and the airplane attached thereto.

The increased air flow passes over the top of the cylinder and is deflected downwardly by the under side of the upper aerofoil 5 with the following effect. A part of such deflected air passes to the rear of the cylinder, still under the influence of its skin friction drag, and in front of the leading edge 9; thereby creating a resultant lift reaction on aerofoil 5, due to its deflection downwardly. The remainder of the air flow passes through the slot 12 and out through the restricted opening 13 which further increases its velocity to thereby exert a lifting effect on the upper free camber of the aerofoil 4 relatively greater than would be caused by the normal air speed velocity. The air which is carried around behind the drum due to its rotation in a clockwise direction, and which passes in front of the leading edge 9, acts to decrease the velocity of the air at the rear lower side of the drum 6; assisting the cylinder action above referred to. The upper camber of the aerofoil 5 functions in the usual manner; although it might be pointed out that increased air flow created adjacent the top of the cylinder probably influences the air flow over the upper surface of this areofoil in a beneficial manner. The under camber of the aerofoil 4 functions in the usual manner.

Suitable discs 15, 15′ (Fig. 3) are attached to the ends of the cylinders 6 and 6′ to prevent the flow of air off the end of the cylinders during the forward movement of the aircraft and to thereby restrict the flow of air to its path of maximum usefulness.

Although my invention has been illustrated in connection with a monoplane construction, i. e. where the lifting means as a unit have been shown in monoplane form, it is to be understood that the invention is not to be so limited and is equally adaptable to be utilized in connection with multiplane machines wherein the lifting means are either superimposed, in tandem, or any combination of the same.

While I have described my improvements in great detail and with respect to one form thereof, and then largely diagrammatically, I do not desire to be limited to such form or detail since many changes or modifications may be made and the invention embodied in widely different forms without departing from the spirit and scope thereof in its broader aspects. The form and number of aerofoils and their location may be greatly varied, likewise the form of the rotating body may be greatly varied. It may for example have either a plain corrugated notched or corrugated and notched surface, or may have a cross section in the form of a cross or otherwise, or it may be one which is provided with curved blades and adapted to be adjustable in cross sectional size. In fact the body may have any symmetrical cross section and the position thereof with respect to the aerofoil may be considerably varied. Hence I desire to cover all changes and modifications coming within the language or scope of any one or more of the appended claims.

What I claim as new and desire to secure by Letters Patent is:

1. In an aircraft, the combination of a first aerofoil having a rearward upper free camber, a second aerofoil spaced therefrom and forming a slot between its lower side and the upper side of said first aerofoil, and a rotatable cylinder extending adjacent the leading edge of said aerofoils adapted to direct air through said slot and over said rearward free camber.

2. In an aircraft, the combination of a first aerofoil having a rearward upper free camber, a second aerofoil spaced therefrom and forming a slot between its lower side and the upper side of said first aerofoil, and a rotatable cylinder in front of the leading edge of said first aerofoil and below the leading edge of said second aerofoil adapted to direct air through said slot.

3. In an aircraft, the combination of a first aerofoil having a rearward upper free camber, a second aerofoil spaced therefrom and forming a slot between its lower side and the upper side of said first aerofoil, and a rotatable cylinder in front of the leading edge of said aerofoil and below the leading edge of said second aerofoil adapted to direct air through said slot and over the leading edge of said second aerofoil respectively.

4. In an aircraft, the combination of a first aerofoil having a rearward upper free camber, a second aerofoil spaced therefrom and forming a slot between its lower side and the upper side of said first aerofoil, said slot being restricted rearwardly in cross section, and a rotatable cylinder extending a substantial portion of the span of and adjacent the leading edge of said aerofoils adapted to direct air through said slot and over said rearward free camber.

5. In an aircraft, the combination of a first aerofoil having a free lower camber, a second aerofoil spaced therefrom and forming a slot between its lower side and the upper side of said first aerofoil, and a rotatable cylinder extending adjacent the leading edge of said aerofoils adapted to direct air through said slot and over said rearward free camber.

6. In an aircraft, the combination of a first aerofoil having a rearward upper free camber, a second aerofoil spaced therefrom and forming a slot between its lower side and the upper side of said first aerofoil, and a rotatable cylinder extending a substantial portion of the span of and adjacent the leading edge of said aerofoils adapted to direct air through said slot and over said rearward free camber at a greater velocity than the normal air-speed of the aircraft.

7. In an aircraft, the combination of a first aerofoil, a second aerofoil spaced above the first and overhanging the leading edge of the first, and a rotatable cylinder positioned in respective spaced relation in front of the leading edge of the first and beneath the leading edge of the second of said aerofoils and extending axially a substantial portion of the span of said aerofoils.

8. Aircraft lifting means comprising in combination two superimposed spaced aerofoils in positive staggered relation and whose respective forward adjacent portions are curved in cross section in substantial conformity to the arc of a circle, and a rotatable cylinder axially extending the major portion of the span of said aerofoils and whose outer circumference is in spaced relation to the curved portions of said aerofoils.

In testimony whereof I have signed my name to this specification.

HENRY P. MASSEY.