July 11, 1939. H. E. McLAUGHLIN 2,165,757

PROPELLING AND LIFTING MECHANISM

Filed June 2, 1938

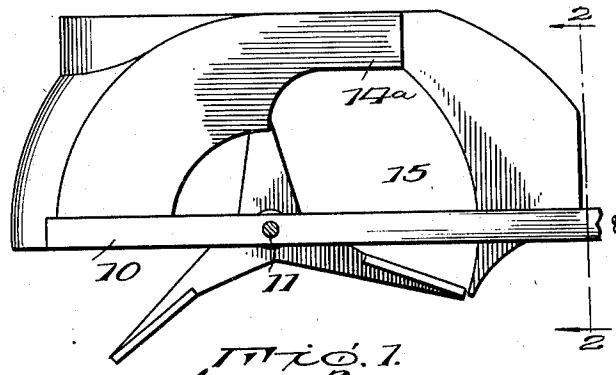


Fig. 1.

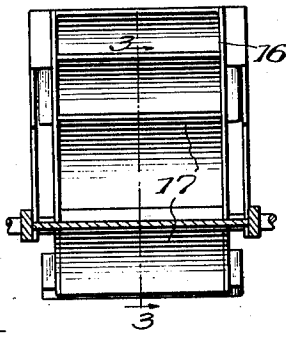


Fig. 2.

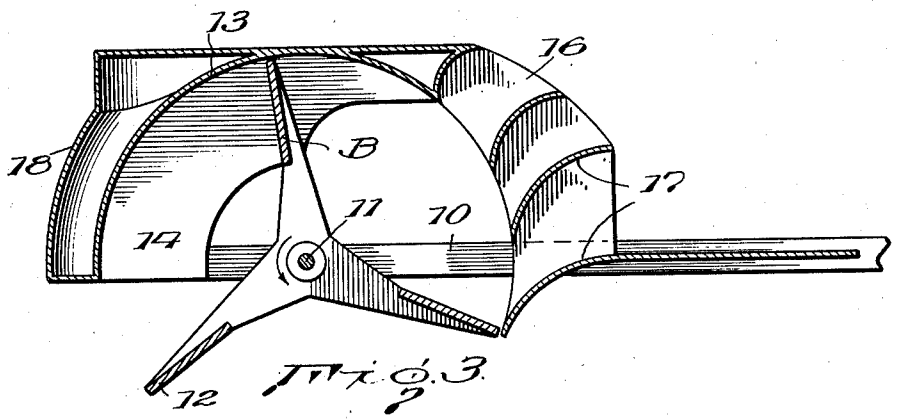


Fig. 3.

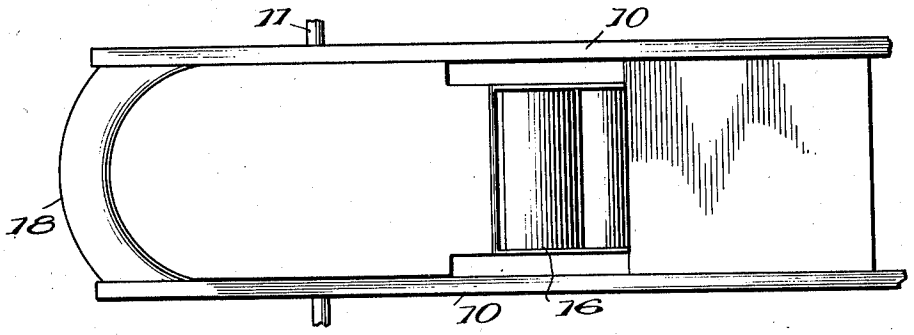


Fig. 4.

Inventor
Hugh E. McLaughlin,

By Church & Church
His Attorneys

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PROPELLING AND LIFTING MECHANISM

Hugh E. McLaughlin, New York, N. Y.

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3 Claims. (Cl. 244—19)

This invention relates to propellers and, particularly, to a combined propelling and lifting mechanism for air vehicles, for instance, aeroplanes.

One object of the invention is the provision of a simple and efficient propeller construction, by means of which a high degree, both of tractive and lifting force, may be exerted.

Another object of the invention is the provision of a lifting and propelling mechanism consisting essentially of a propeller of the rotary type which will function with maximum efficiency.

A still further object contemplated by the invention is the provision of a propelling and lifting mechanism wherein upward movement of the propeller blades is utilized for exerting propelling force, thus increasing the efficiency of the apparatus.

Another object is the provision of a propelling and lifting mechanism, wherein the propeller blades during the major portion of their upward movement will exert a propelling force and during their forward, downward and rearward movement will exert both a lifting and propelling force.

More specifically, the invention contemplates a combined propelling and lifting mechanism comprising a series of rotary propeller blades adapted to pass through a housing located above the propeller blade shaft, said housing being open at the rear of the propeller shaft and formed with radial, outwardly extending side walls, between which transverse vanes are provided whereby air forced upwardly during the upward movement of the propeller blades will impinge against the transverse vanes and exert a propelling force while, on the other hand, the casing, forward of the propeller shaft, is provided with side walls extending radially inward and is closed at its periphery. The cross-sectional area of this closed portion of the casing corresponds to the surface of the individual propeller blades and the blades move forwardly and downwardly through this closed portion, with the result that the air forced forwardly by the blades impinges against the outer wall of the housing or casing and exerts both a lifting and propelling force at its exit at the lower end of the casing.

With these and other objects in view, the invention consists in certain details of construction and combinations and arrangements of parts, all as will hereinafter be more fully described and the novel features thereof particularly pointed out in the appended claims.

In the accompanying drawing—

Figure 1 is a side elevational view, illustrating, more or less diagrammatically, a propelling and lifting mechanism embodying the present invention;

Fig. 2 is a vertical sectional view on the line 2—2 of Fig. 1;

Fig. 3 is a vertical longitudinal section on the line 3—3 of Fig. 2; and

Fig. 4 is a top plan view.

A portion of the fuselage or frame of the aeroplane or other vehicle is illustrated more or less diagrammatically at 10, the same consisting of elongated members disposed longitudinally of the vehicle. Journaled in these members 10 is a shaft 11, to which power is supplied from any suitable source. In the present illustration, shaft 11 is adapted to be rotated in a counterclockwise direction, as indicated in Figs. 1 and 3.

Mounted on shaft 11 are a plurality of propeller blades 12 of paddle-like formation, the individual blades preferably being flat or plane-surfaced. In order to increase the lifting and propelling effect of the rotating blades, they are adapted to pass through a casing or housing for substantially one-half a revolution. This casing or housing is located substantially entirely above the members 10 and is substantially semi-circular in cross-section, as viewed from the side thereof. Forwardly of the propeller shaft 11, the casing or housing is closed at its periphery by an outer wall 13 and, extending radially inwardly at opposite side edges of said outer wall, there are side walls 14. Thus, the side walls and the outer wall 13 jointly form a three-sided casing which is of a cross-sectional area and contour corresponding to the contour and surface area of the individual propeller blades 12. This so-called closed portion of the casing or housing extends approximately throughout 90° of the circular path of the propeller blades or what, for convenience, might be termed the upper, forward quadrant of the circular path of the blades. The rear extremities of the side walls are of tapered or reduced height, as at 14^a, so that comparatively large openings 15 are provided at the sides of the housing. The outer wall 13 extends a short distance to the rear of the propeller shaft but terminates a considerable distance above the structural members 10, so that the casing is open throughout this latter portion or at the rear thereof. However, this rearward portion is provided with side members 16 but, in this instance, the side members extend radially outward from the path of the propeller blades, as distinguished from the side walls 14 which extend radially inward with respect to the propeller blades and shaft.

In order to increase the propelling effect of the blades 12 during their upward movement, at which time they normally exert a depressing influence, a number of more or less horizontally disposed vanes are located between the side wall 16 at the rear of the housing. These vanes, indicated at 17, are preferably arcuate in cross-section and extend radially outward between the side walls 16. The inner ends of the vanes 17 are spaced circumferentially and, as will be apparent, as the propeller blades 12 move upwardly, air forced upwardly by the blades at this time will escape between the side walls 16 and, of course, impinge against the several vanes 17. The force of this air impacting against the several vanes 17 and diverted rearwardly will exert a propelling influence on the housing and the housing being rigidly secured to the fuselage of the vehicle, this propelling action will be transmitted to the vehicle as a whole. In other words, instead of air lifted by the blades 12 tending to lower the vehicle, the same is utilized for increasing the propelling action of the apparatus, whereby the efficiency thereof is considerably increased.

As each blade passes forwardly beyond the last of the series of vanes 17, it enters the tunnel or casing formed by the side walls 14 and the outer wall 13 of the housing, and the air in advance of each blade is forced against the outer wall 13 and being driven downwardly exerts a lifting and also a propelling force as the vehicle advances. It will also be appreciated that, during the movement of the blades between the point where they emerge from the casing to a point more than 90° therefrom, which might be described as being a point rearwardly of the shaft 11, the effect of the moving blades is to drive the machine forwardly and, to a like extent, also elevate or lift the vehicle.

To better explain, or accentuate, the efficiency of the present mechanism, the effect of each blade will now be described by reference to the particular blade B in Fig. 3, assuming that said blade is rotating in a counterclockwise direction from the position shown in the figure. At first the blade will exert a lifting action by reason of the fact that it is driving the air downwardly. This effect will continue until the blade has reached a substantially horizontal position. After the blade passes below the horizontal, it will continue to exert the lifting action and also the forwardly driving action, although it is then in the open. These combined actions will continue until the blade reaches a perpendicular position below the shaft 11. From this point it will continue to exert a forwardly driving action but, as it starts to move upwardly, the normal tendency would be to depress the casing and vehicle. However, this tendency is overcome by the presence of the several vanes 17 and the opening at the rear of the casing, because this construction causes the air that is pushed upwardly by the blade to impinge against the vanes 17 and to be diverted rearwardly thus tending to propel the vehicle and neutralizing or overcoming the normal tendency of the upwardly moving blade to exert a depressing force. Thus, the mechanism operates with maximum efficiency both as regards its propelling and lifting actions.

If desired, a shield 18 may be provided over the casing, particularly at the forward portion thereof, so as to give a stream-lined effect and thus reduce resistance in the forward motion of the vehicle.

What I claim is:

1. In a lifting and propelling mechanism for air vehicles, the combination of a rotary shaft, propeller blades mounted on said shaft, a casing comprising arcuate side walls a substantial portion of which are above said shaft and an outer wall extending approximately one-half the length of the side walls, said casing being open rearwardly of the shaft, the side walls of the closed portion of the casing extending radially inwardly with respect to the outer wall and the side walls of the open portion extending radially outward, and circumferentially spaced vanes disposed transversely between the side walls of the open portion of the casing.

2. In a combined lifting and propelling mechanism for air vehicles, a rotary shaft, a series of propeller blades on said shaft, a casing through which said blades pass in the upper forward quarter of each revolution, said blades being exposed during substantially the lower half of each revolution, and said casing being open at its sides at the rear of said shaft, and means extending rearwardly from said casing above the shaft for deflecting air rearwardly from the open portion of the casing.

3. In a combined lifting and propelling mechanism for air vehicles, a rotary shaft, a series of propeller blades on said shaft, a casing located substantially entirely above said shaft, said blades being exposed below said casing throughout substantially 180°, said casing comprising opposite side walls and a peripheral wall with openings in the sides and periphery of said casing at the rear of the shaft, and circumferentially spaced vanes extending from the open rear portion of the casing, said vanes being arranged horizontally with respect to the side walls of the casing.

HUGH E. McLAUGHLIN.