Nov. 5, 1940. A. M. OSTROWSKI ET AL 2,220,658

PROPELLING MEANS FOR AIRCRAFT

Filed June 9, 1939

Fig. 1.

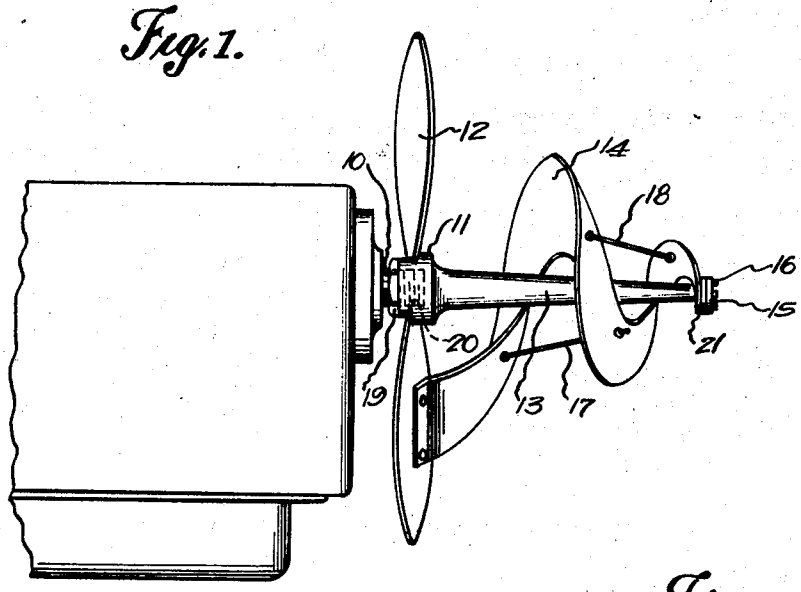


Fig. 2.

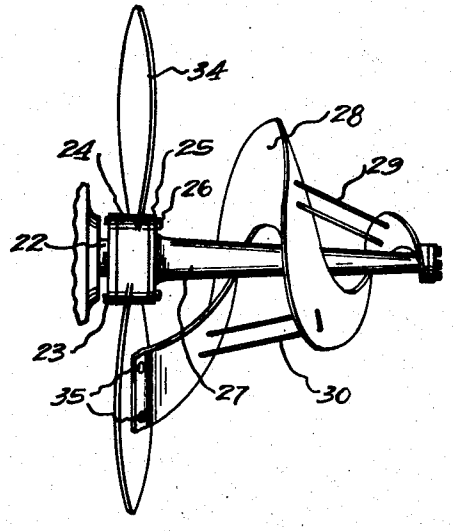


Fig. 3.

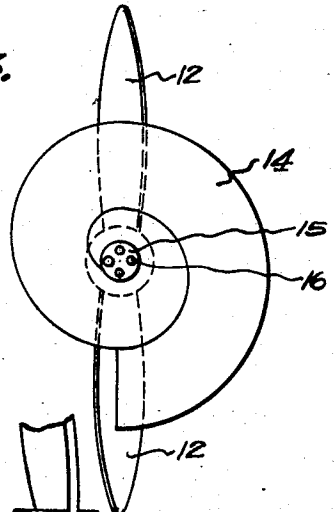
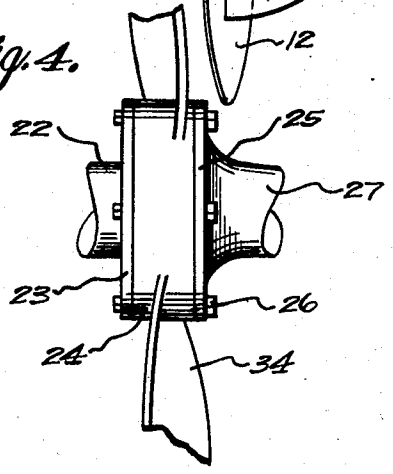


Fig. 4.



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PROPELLING MEANS FOR AIRCRAFT

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1 Claim. (Cl. 170—156)

The purpose of the invention is to provide a propeller of higher efficiency, in which, by the expenditure of no larger quantity of power than is ordinarily used, more satisfactory results and higher speed can be obtained. It is well known that when an aircraft goes through the air propelled or pushed forward by the ordinary propellers, the greatest pulling or pushing force is exerted by those parts of the blades of the propeller, which are quite distant from the hub. Putting it reversely, it is known that the propelling power of a conventional propeller near the hub is very low. It is also known that when an airplane is proceeding through the air, the air right in front of the hub of the propeller is compacted or compressed so as to impede the progress of the aircraft travelling through the air. The purpose of our invention, therefore, is to accomplish two purposes: (1) To increase the efficiency of the propeller, that is, to bring it closer to what is known as the theoretical pitch of the propeller. (2) To devise a propeller by the use of which the resisting force of the compacted air right in front of the propeller would be minimized. To accomplish these results, we have devised the novel form of propelling means comprising our invention, which will be described with reference to the accompanying drawing, in which:

Fig. 1 shows a side view of our improved propeller as mounted at the front of an airplane.

Fig. 2 shows the side view of said propeller with some modifications.

Fig. 3 shows the front or end view of said propeller.

Fig. 4 shows a fragmentary view of a mounting of the hub of our propeller.

Similar numerals refer to similar parts throughout the several views.

The propelling means of our invention comprise combination of a conventional propeller with a spiral plane extending in a helical formation in front of said conventional propeller. Numeral 10 indicates a shaft on which the propeller and our spiral plane is mounted. 11 is a hub of said propeller. Numeral 20 indicates a socket threaded reversely, by means of which the propeller is secured to shaft 10, while numeral 19 indicates a lock nut by which the propeller, once set upon the shaft, is retained in its operative position. Numeral 12 indicates the blades of the propeller. At this point we wish to remark that while we are showing in our illustrations a two-bladed propeller, a propeller of three or more blades may be equally well used as an element in the combination of propelling means shown by us. Extending from hub 11 and forming an extension of the shaft 10, is an auxiliary shaft 13, which may be integrally connected to the hub 11 or which may be made separate therefrom, as shown in Fig. 2. Said auxiliary shaft is quite thick at the hub, but tapers towards its free end. Winding around said auxiliary shaft 13, but at some distance away from it, is a spiral plane 14. This ought to be made preferably of cast metal or some synthetic material, such as Bakelite or Micarta, so that said plane may have a high degree of rigidity without easily being subject to vibration. One of the ends of said plane, the broad one, is attached to a blade of the propeller substantially to the leading edge of said blade and to the middle section thereof, the width of the spiral plane where it joins the blade of the propeller being about one-third of the length of said blade. Were the length of the propeller divided into three equal parts, the line of junction between the spiral plane and the blade of the propeller would occupy the middle section of said plane. As to the manner of junction between said propeller and the plane, a union of these two elements might be accomplished by welding in case where the parts are made of metal, or said plane might be secured to the blade by screws or bolts, as shown in Fig. 2, while in the case where the propelling means are made of some synthetic material, the propelling means shown by us might be molded as one unit.

Proceeding from said blade to the free end of the auxiliary shaft 13, said spiral plane tapers in width and forms somewhat more than two full convolutions around said auxiliary shaft but at a distance therefrom so that air may freely pass around said auxiliary shaft, that is, between the shaft and the inner edges of said spiral plane. At its narrower end, said plane 14 forms an annular member 21 fitting over the end of the shaft 13 and close to the end disc 15, to which said annular member is secured by means of screws or bolts 16. It might be desirable, in order to reduce the vibration of said spiral plane 14, to reenforce said plane by means of some stabilizing members. This has been accomplished in this case by struts or braces, which are indicated by numerals 17 and 18. When in place and seen from the side, the proportion of the plane to the blades of the propeller is such that straight lines drawn from the tips of the propellers to the tip of the free end of auxiliary shaft 13 will form substantially two sides of an equilateral triangle,

of which the line joining the tips of the propeller is the base.

A minor variation of the structure in Fig. 1 is shown in Fig. 2. In this case, it will be seen that our spiral plane **28**, supported on auxiliary shaft **27**, is attached to blade **34** of the propeller by screws **35**. In order that vibration be minimized, convolutions of our spiral plane **28** are bound together by guy wires **29** and **30**. The mounting of the propeller, following more conventional lines, comprises a flange **23** on motor shaft **22**, a hollowed hub **24**, provided with holes so that screws **26** may be inserted through said hub reaching flange **23**. Auxiliary shaft **27** is also provided with a flange **25** and it is by means of said screws **26** that hub **24** is held between said two flanges **23** and **25**. This construction allows the spiral plane with the auxiliary shaft **27** to be detached from hub of the propeller, shown in Fig. 2.

In practice, this combination of a conventional propeller with our helically-formed spiral plane accomplishes some very useful results. As stated above, the air right in front of the progressing plane is condensed. Such being the case, the blade of our spiral plane cutting in a screw action through said condensed air results in a substantial forward thrust without, however, impeding or interfering with the state of air right in front of the outer tips of the propeller. Owing to the tapering width of the plane, and such a construction that no part of one convolution overlaps the succeeding convolution, said spiral plane revolves in air which is entirely unspent but which would be of no particular value in securing traction by the blades of the propeller. The free spaces between the auxiliary shaft, on which the plane is mounted and around which said plane revolves, allow free passages to air between said auxiliary shaft and said plane, thus minimizing resistance which otherwise would be offered by air compacted in front of said blade and said propeller.

We believe this construction to be novel, useful and efficient. It will be obvious, however, that modifications may be made from the precise construction shown without departing from the spirit of our invention. What we wish to claim is as follows:

Propelling means for aircraft comprising a hub adapted to be mounted upon a drive shaft, an auxiliary shaft extending forwardly from said hub in axial alignment therewith, blades carried by the hub and extending radially therefrom, an auxiliary screw consisting of a strip extending spirally about the auxiliary shaft in radial spaced relation thereto with its convolutions gradually reduced in external diameter towards the front end of the auxiliary shaft, the rear end of said strip being fixed to the front face of one blade midway the width and the length of the blade, with the width of the strip disposed longitudinally of the blade, a collar at the front end of said strip fitting about the front end of the auxiliary shaft, fastening means carried by the front end of the auxiliary shaft for firmly securing the collar in place thereon, and bracing rods extending longitudinally of the auxiliary shaft between convolutions of the strip and firmly secured at their ends to the convolutions of the strip.

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