June 7, 1932. N. TUZZO 1,862,207

AIRPLANE PROPELLER

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Fig. 1.

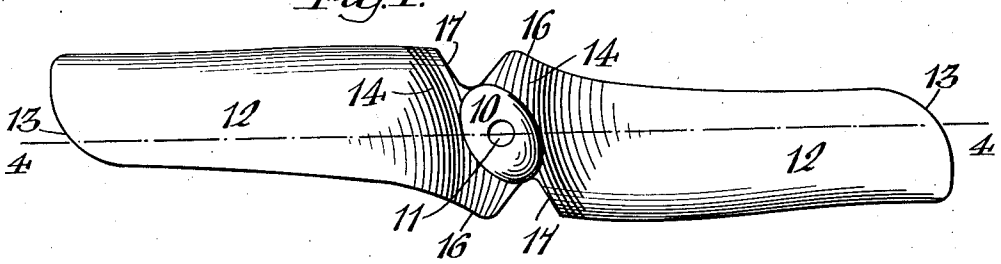


Fig. 2.

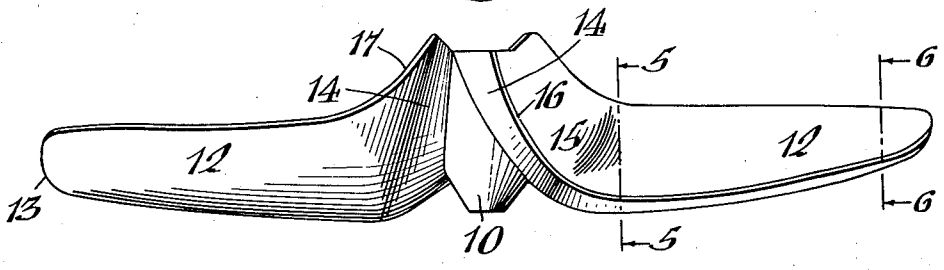


Fig. 3.

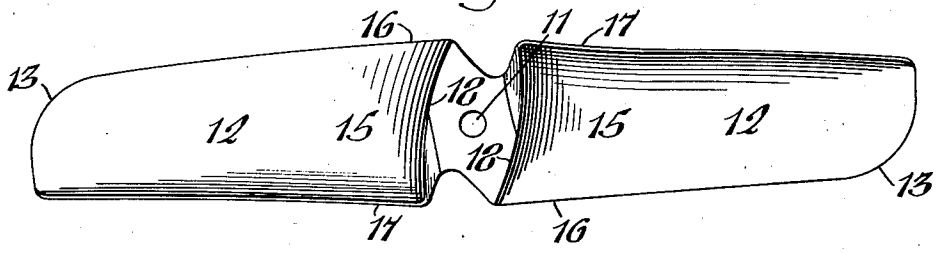


Fig. 4.

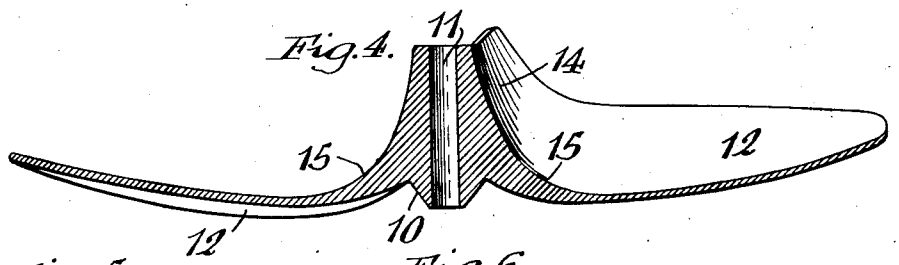


Fig. 5.

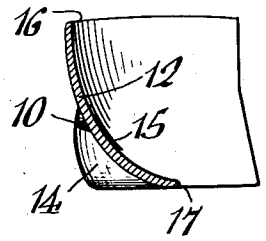
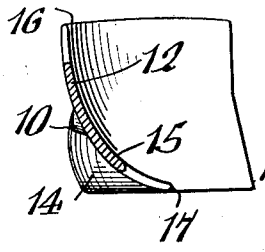


Fig. 6.



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Fig. 7.

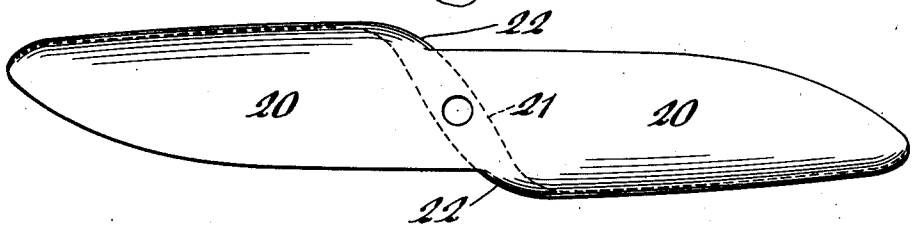


Fig. 8.

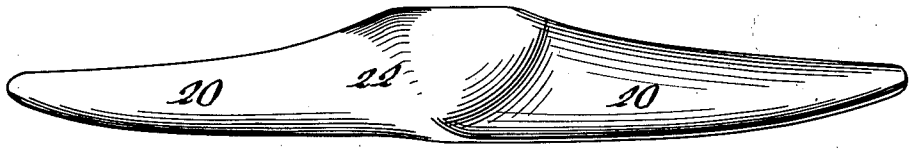


Fig. 9.

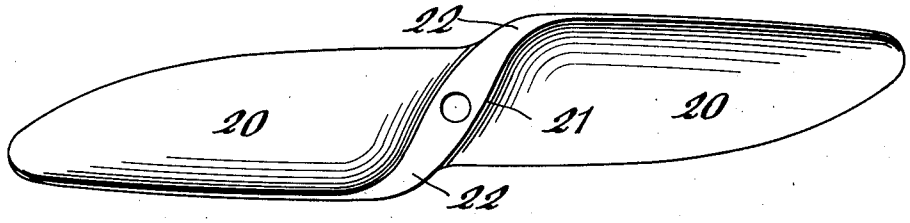
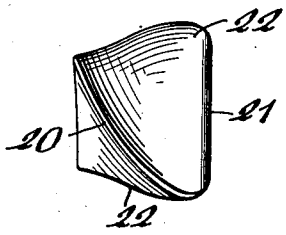


Fig. 10.



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Patented June 7, 1932 1,862,207

UNITED STATES PATENT OFFICE

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AIRPLANE PROPELLER

Application filed September 4, 1929. Serial No. 390,283.

This invention relates generally to improvements in propellers but more particularly to a propeller for aircraft.

Its chief object is the provision of a propeller of this character which is efficient in operation, and which will develop a greater pulling power than the present type of propellers at the same engine speed.

Another object of the invention is to provide an airplane propeller which is simple and durable in construction, and which is so constructed and designed as to develop a maximum propelling force and to reduce slippage to a minimum.

In the accompanying drawings:—

Figure 1 is a front view of a propeller embodying my invention. Figure 2 is a top plan or side view thereof. Figure 3 is a rear view of the same. Figure 4 is a horizontal section taken on line 4—4, Figure 1. Figures 5 and 6 are cross sections taken on the correspondingly-numbered lines in Figure 2. Figure 7 is a front view of a modified form of propeller. Figure 8 is a top plan view thereof. Figure 9 is a rear view of such modified propeller. Figure 10 is an end view thereof.

Similar characters of reference indicate corresponding parts throughout the several views.

In the preferred embodiment of the invention shown in Figure 1 to 6, inclusive, 10 indicates the hub of the propeller having an opening 11 therein for securing it to the driving shaft of the motor, the front or nose end of the hub being rounded into substantially convex form and then slightly coverging rearwardly, as seen in Figure 2. The blades 12, 12 extend in opposite directions from the hub and are substantially symmetrical in shape. At the outer ends of their leading edges the blades are preferably convexly curved, an indicated at 13.

The blades of the propeller are so designed that the working surfaces thereof extend from the tips of the blades to a point approximately at the axis of the hub 10, whereby the maximum pulling power is obtained. The main body portions of the blades are pitched in opposite directions at an angle of approximately 20 to 30 degrees to the vertical and they are of slightly concavo-convex shape in cross section, the convex surfaces facing forwardly and the concave surfaces facing rearwardly with the degree of curvature at the trailing edges of the blades being somewhat greater than that at the leading edges to present a deeper pocket or air-gripping surface during the downward turning movement of the blades, while offering a minimum resistance to the air on the upward turning movement of the blades.

The inner portions 14 of the blades immediately surrounding the hub are curved rearwardly both transversely and longitudinally of the propeller, as shown in Figures 2 and 4, to present a convex front surface and a concave rear surface about said hub, the rear surface at this point forming with the remaining portion of the blade a comparatively deep pocket 15 which serves to exert maximum power upon the air in the vicinity of the propeller hub 10. The convex inner portions 14 of the blades blend into the hub and project somewhat above and below the same, the leading edges 16 of such blade-portions curving rearwardly on diametrically opposite sides of the hub to a point approximately in axial alinement with the hub, while the trailing edges 17 of said convex portions terminate at one side of the hub axis, as seen in Figure 2.

As shown in Figure 3, the rear sides of the inner portions 14 of the blades 10 are convexly curved about the hub, as indicated at 18, so that as the propeller turns, these portions cut through the air with a minimum of resistance.

In the modified form of the invention shown in Figure 7, the blades are indicated at 20, 20 and the hub at 21, the latter being formed by the inter-merging construction of the inner portions of the blades. These blades are likewise shaped to provide working surfaces extending from their tips to the axis of the hub to obtain the maximum pulling power and their body portions are pitched in opposite directions. The inner portions 22 of the blades are of concavo-convex form, the convex side of one blade at one side of the axis merging into the concave

side of the companion blade at the other side of the axis, this formation resulting in the front side of the hub being substantially flush with the convex faces of the blade and the rear side of the hub defining an elongated, substantially S-shaped contour, as seen in Figure 9. The rear or concave surfaces of the inner portion of the blades form pockets which effectively grip the air as the propeller revolves.

In both embodiments of my invention, an efficient propeller is provided which insures a maximum pulling power at a minimum expenditure of motive power; which affords a gripping surface extending from the tips of the blades to substantially the hub-axis, thereby insuring a maximum tractive effort and a compressed bank of air against which the propeller will operate at all times. Furthermore, the design of the propeller is such that slippage is reduced to a minimum and the shape of the blades, while effectively pocketing the air, also assists its escape after compression.

I claim as my invention:—

1. An airplane propeller, comprising a hub and radially disposed blades of opposing pitch and of gradually increasing width from the outer to their inner ends, the inner portions of the blades about the hub being convexly-curved on their front sides in opposing relation and concavely-curved on their rear sides in opposing relation to provide air-compressing pockets of a depth approximately equal to that of the length of said hub.

2. An airplane propeller, comprising a hub and radially disposed blades of opposing pitch, the inner portions of the blades about the hub having oppositely-facing air compressing pockets extending transversely from end to end of the hub and obliquely to its axis with the leading and trailing edges of the pocketed blade-portions terminating adjacent to the plane of the hub-axis and projecting beyond diametrically opposite sides thereof, respectively.

3. An airplane propeller, comprising a hub and radially disposed blades of opposing pitch, and of gradually increasing width from their tip to their hub ends, the inner portions of the blades about the hub being of a width to extend beyond diametrically opposite sides of the hub and convexly-curved on their front sides and concavely-curved on their rear sides in a direction both transversely and longitudinally of the propeller, the curvature being such as to cause the inner portions of the blades to intersect each other, if continued, at the axis of the hub and beyond its rear end.

4. An airplane propeller, comprising a hub and radially disposed blades of opposing pitch, and of gradually increasing width from their tip to their hub ends, the main body portion of the blades being concavo-convex in cross section with their trailing edges of more pronounced curvature than their leading edges, the inner portions of the blades about the hub being of a width to extend beyond diametrically opposite sides of the hub and convexly curved on their front sides and concavely-curved on their rear sides both transversely and longitudinally of the propeller, the curved inner portions of the blades being coextensive with and blending into said hub and the trailing and leading edges thereof, respectively, terminating at one side of the axis and approximately at the axis of the hub.

5. An airplane propeller, comprising a hub and radially disposed blades of opposing pitch and of gradually increasing width from their tip to their hub ends, the inner portions of the blades being of a width to extend beyond diametrically opposite sides of the hub and being convexly curved on their front faces and concavely-curved on their rear faces in a general direction axially of said hub to provide comparatively deep air-compressing pockets about the hub, the leading edges of the inner portions of the blades curving rearwardly on diametrically opposite sides of the hub to a point approximately in axial alinement with the hub and the trailing edges thereof curving in the same direction and terminating at the hub at one side of its axis.

NICHOLAS TUZZO.