May 30, 1933. T. R. MacMECHEN 1,911,376

PROPELLER

Original Filed May 16, 1929 3 Sheets-Sheet 1

Fig. 1.

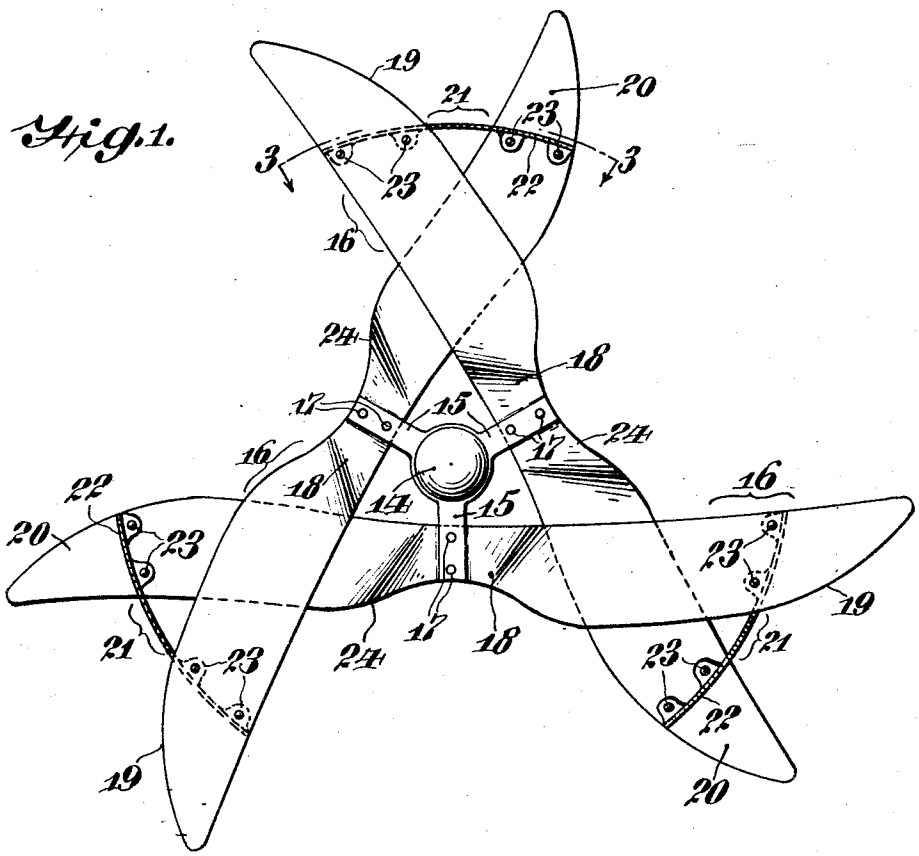


Fig. 2.

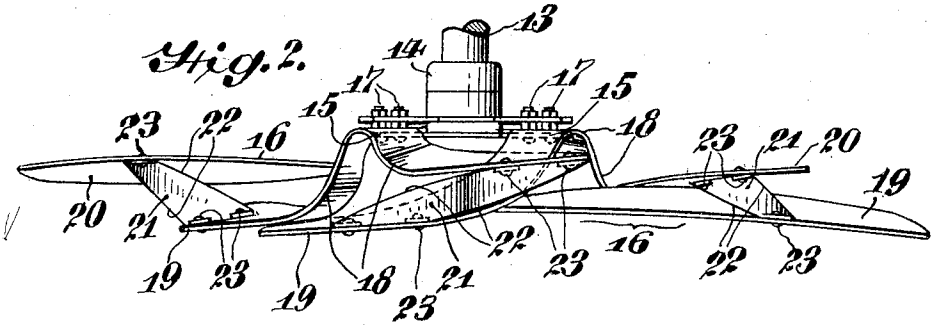
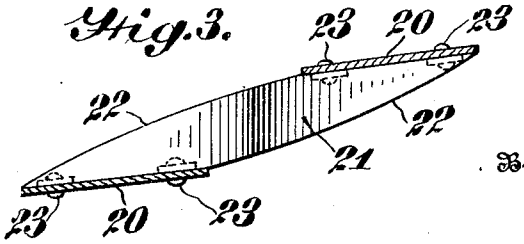


Fig. 3.



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Fig. 4.

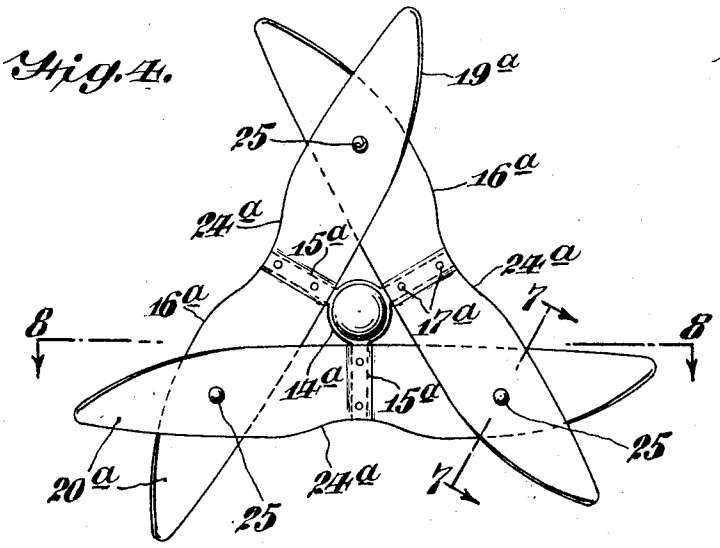


Fig. 5.

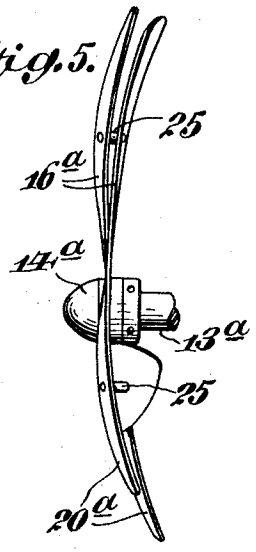


Fig. 6.

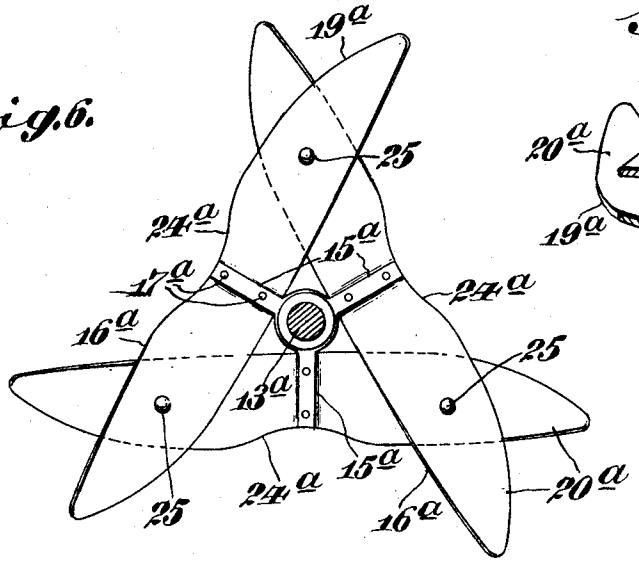


Fig. 7.

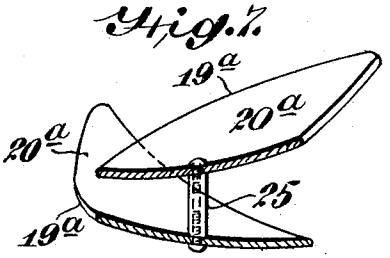
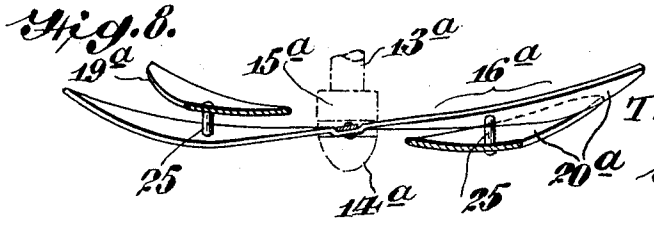


Fig. 8.



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Fig. 9.

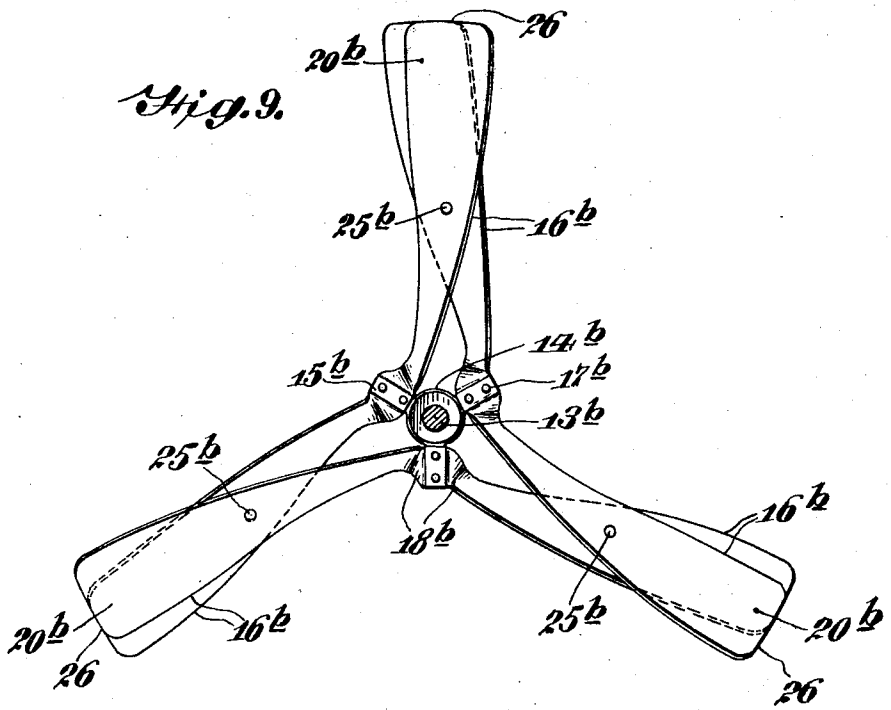
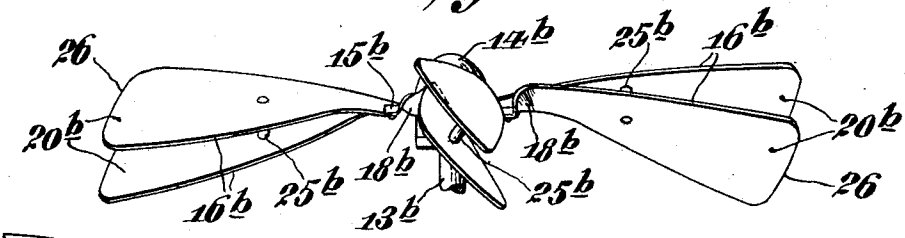


Fig. 10.



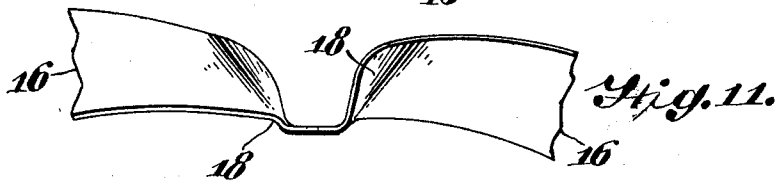
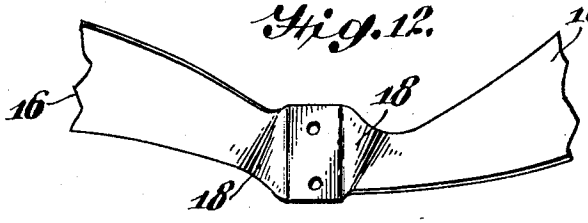


Fig. 11.

Fig. 12.



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UNITED STATES PATENT OFFICE

THOMAS R. MacMECHEN, OF NEW YORK, N. Y.

PROPELLER

Application filed May 16, 1929, Serial No. 363,459. Renewed March 2, 1933.

This invention relates generally to means designated "propellers or fans", while it has more particular reference to devices adapted to set up a reaction between a rotating body and the element in which it operates. More specifically propellers or fans, whether used in air or liquid, embody blades usually radiating relative to the axis of rotation and decreasing in pitch angle from said axis to their tips.

With propellers now in common use the air, gas or liquid acted upon is disturbed in its rotational aspect but very little, while the blades are generally shaped to "slip" or pass through the medium with a minimum resistance around the axis of rotation; and, consequently, there exists a pronounced reactive thrust or negative power influence with resultant loss in efficiency.

A general object of this invention is to provide a device of the noted character which radically departs from all known types of propellers or fans in that it is of unusual set up and function; or, in other words, my novel propeller or fan deviates entirely from prevailing constructions and is productive of a markedly effective manner of functioning, irrespective of the medium in which it operates.

Another object of this invention is to provide a propeller or fan in which the blades are disposed equi-angularly and off-center so as to increase and utilize the two pronounced and complementary forces, centrifugal and propulsive; or, in other words, the blades are located and adapted so that, when in operation, their effect is to rotatively-hold or cling to the medium before the final "kick". Incidentally it may be here noted that a much greater reactive effect or "kick" is attainable when operating on air "in motion", than when operating in still air.

A further object of this invention is to provide a propeller or fan characterized by serial or multiple equi-angularly disposed relatively-overlapping inter-connected blades, said blades having their major dimension tangentially directed in the plane of rotation.

A still further object is to provide a propeller or fan of the typified character embodying non-contacting blades with respect to the hub, each said blade constituting a tangentially directed entity with reference to the axis of rotation and the series being equi-angularly disposed with regard to each other.

With the foregoing and other objects in view, and in order that the various aspects of my invention may be appreciated, as well as its points of superiority over proir art fully comprehended; typical embodiments thereof will now be described in conjunction with the accompanying drawings.

Fig. 1 is an end view of a practical embodiment of this invention as adapted more particularly, although not essentially, for aeronautical usage.

Fig. 2 is a plan view, looking downwardly from above Fig. 1.

Fig. 3 is a somewhat enlarged sectional detail, as viewed in the direction of the arcuate arrows 3—3 on Fig. 1.

Fig. 4 is an end view of a modified form of my novel propeller or fan embodying means whereby the screw pitch may be adjustably varied.

Fig. 5 is a side view looking toward the left hand of the preceding illustration.

Fig. 6 is an elevational view in reverse with respect to Fig. 4.

Fig. 7 is a sectional view, taken approximately on the plane designated 7—7 in Fig. 4, but drawn to a larger scale. Fig. 8 is a sectional view, taken on the plane marked 8—8 in Fig. 4.

Fig. 9 is an end view of a further form of my novel propeller or fan.

Fig. 10 is a view looking downwardly from above the preceding illustration.

Fig. 11 is a fragmentary edge view illustrative of a convenient manner of shaping the medial portion of the propeller blades, per se, for supporting-connection angularly-offset relative to the axis of rotation; and,

Fig. 12 is a face view thereof, or looking upwardly relative to Fig. 11.

In all the views like parts are designated by the same reference symbols, while those

components varying in essential characteristics have distinguishing suffices so as to avoid conflict in description.

Referring firstly to Figs. 1 to 3 inclusive, which exemplify a typical embodiment of the novel principles involved in this invention, and illustrate a propeller useful for operation in air or gas, the numeral 13 designates the tail of the propeller shaft, and 14 the hub thereof that is provided with three (for example only) radially-directed off-center arms 15 that constitute supporting media for the blades 16. As will be seen I conveniently, although not essentially, utilize three blades 16 disposed at approximately 120° to each other with their outer portions intersecting or crossing one another in spacial relation; so that as one blade 16 is pushing the air or gas with a cupping or holding action and setting up a vortex motion, the following blade or blades 16 pick up such action without diminution and impart an augmented "kick" thereto. In other words, it will be noted, I aim in a measure to confine all the vortex within the field of rotation of the propeller, and thereby greatly increase the reaction between the blades 16 and the air vortex thus created, which is equivalent to materially augmenting the density of the air and thereby introducing a new multiplying coefficient for propeller data. The effect of this new coefficient in propeller data may be comparable to stored energy, but it is not asserted as a method of getting something out of nothing, but rather a novel manner of sacrificing a small amount of energy to establish a base to push against; the decreased "slips" affording a large increase in reaction, similar to pushing against a still or revolving gyroscope. In other words I have demonstrated by water vortices or air smoke rings that successions of such gyroscopic vortices are thrown-off by my novel propeller in action.

Referring again to the exemplary type of blades 16 shown, it will be noticeable that, in the form of my invention under consideration, each said blade is attached medially of its major dimension by means, such as rivets or bolts 17, to the foresaid hub arms 14; as well as being suitably shaped to provide flanking substantially-paralleling flares 18 which sharply merge into their junction with said arms and taperingly sweep outwards in the direction of rotation. These blades 16 are configured to, also, have their greatest area in the plane of rotation with hyperbolic curvatures 19 throughout a portion of the following edges of their tips 20 inwards, such curvatures being determinative of the "pitch", and said blades being never set in excess of twenty-two-and-a-half degrees (22½°) relative to the axis of the hub 14. A further feature noticeable, is that the tips 20 are fastened together, for example, by means of arcuate fins 21 which rigidly maintain the determined pitch and, incidentally, reduce vibration to the extreme minimum, prevent distortion of the propeller as a unit, as well as materially strengthening the blades 16 in the region of said tips. The fins 21 also follow a circumferential path, relative to the axis of the hub 14, with their opposed edges 22 merging into the leading and trailing edges of the blades 16. Conveniently the fins 21 may be provided with appropriate fastening means 23 whereby they are secured to the blades 16, or they may be otherwise rigidly connected to said blades in any of the well known and obvious manners; while said blades are reduced laterally by opposing curvatures 24 where their following edges merge into the arms 15.

Referring now to Figs. 4–8 inclusive, all those parts corresponding with the preceding description are similarly designated by like reference symbols, with the suffix *a*; and, for the avoidance of repetitive explanation, I will herein only point out the distinguishing features thereover. In this connection, it is to be observed that I dispense with the arcuate fins 21 and in lieu thereof make use of connectors 25 having capacity for adjustment to vary the screw pitch, and it is to be particularly remarked that these connectors are allocated intermediate the hub 14*a* and blade tips 20*a* where most expedient to ensure rigidity and the avoidance of distortion.

In the form of my invention shown in Figs. 9 and 10, corresponding parts to those previously described are designated by like reference numerals with the suffix *b*. In this type of propeller, however, it is noticeable that the blades 16*b* are arranged in multiple or relatively-paralleling rotational planes; while Figs. 11 and 12 are illustrative on a somewhat larger scale of the flares 18 hereinbefore referred to in connection with Figs. 1–3. It is also to be seen that the blades 16*b* have somewhat equiform tips, that is to say, they are curved at their terminal edges 26 to follow a circumferential path relative to the axis of the hub 14.

The typified forms above described are simply by way of illustrating convenient examples of what may be termed a rotative triangular arrangement of the blades 16, 16*a*, and 16*b*, with their respective axes in the same plane or disposed at an angle from the plane of rotation; and, obviously it will be readily understood that while such triangular dispositions have been found exceedingly effective and strong under extensive tests, any multiple thereof may be equally well adopted in paralleling-tangential or diverging-radial relation.

Furthermore, while I have shown and

outlined certain practical embodiments of my invention, it is to be clearly understood the same are purely illustrative, as the fundamentals thereof may be otherwise embodied without departing from the spirit and scope of my said invention as defined in the appended claims; and by which it is intended to reserve all novelty inherent as broadly as possible.

Having thus set forth my invention what I claim, is:—

1. A propeller characterized by blades obliquely superposed relative to each other, with their outer portions intersecting and with their greatest dimension angularly disposed in the field of rotation, and fins overlappingly connecting said blades in spaced relation in their intersecting region of their tips.

2. A propeller characterized by blades offset relative to the hub and to each other having their greatest dimension angularly disposed within the zone of rotation radially directed arms connected medially of the major dimension of said blades, fins following a circumferential path relative to the axis of rotation, and rigidly connecting said blades intermediate the hub and their tips, and said fins having opposed edges merging into the leading and trailing edges of the blades.

3. A propeller characterized by blades offset relative to the hub and having their greatest dimension in its particular plane of rotation, each said blade embodying opposing flares at their medial portion and region of support away from the hub.

4. A screw propeller comprising angularly disposed relatively-overlapping and spaced inter-connected blades, offset from a hub, each of said blades being tangentially directed in the plane of rotation and having the medial portion thereof connected in spaced relation to said hub.

5. A screw propeller comprising angularly disposed relatively-overlapping and spaced inter-connected blades, offset from a hub, each of said blades being tangentially directed in the plane of rotation and having the medial portion thereof connected in spaced relation to said hub, said blades being supported free of contact with the axis of rotation and each blade embodying an essentially composite pitch, one component being at an angle to a particular plane of rotation and the other being angularly disposed to a predetermined radius.

6. A screw propeller comprising spaced interconnected blades obliquely superposed in the region of their tips and being offset from the hub with the greatest dimension angularly disposed to a plane of rotation, said blades being supported free of contact with the axis of rotation and each blade embodying an essentially composite pitch, one component being at an angle to a particular plane of rotation and the other being angularly disposed to a predetermined radius.

7. A screw propeller comprising angularly disposed and relatively-overlapping blades offset from the hub, each of said blades being tangentially directed in the plane of rotation and having the medial portion thereof connected in spaced relation to said hub, and fins interconnecting said blades, said fins following a circumferential path relative to the axis of rotation and rigidly connecting said blades intermediate the hub and their tips, said fins also having opposed edges merging into the leading and trailing edges of the blades.

8. A screw propeller comprising angularly disposed relatively-overlapping and spaced inter-connected blades, offset from a hub, each of said blades being tangentially directed in the plane of rotation and having the medial portion thereof connected in spaced relation to said hub, each of said blades embodying opposing flares at said medial portion and region of support away from said hub, the greatest dimension of the blades being in the particular plane of rotation thereof.

In testimony whereof I affix my signature at Philadelphia, Pennsylvania, U. S. A., this 13th day of May, 1929.

THOMAS R. MacMECHEN.