Oct. 1, 1946. F. M. OWNER 2,408,677

PROPELLER SPINNER

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Fig. 1.

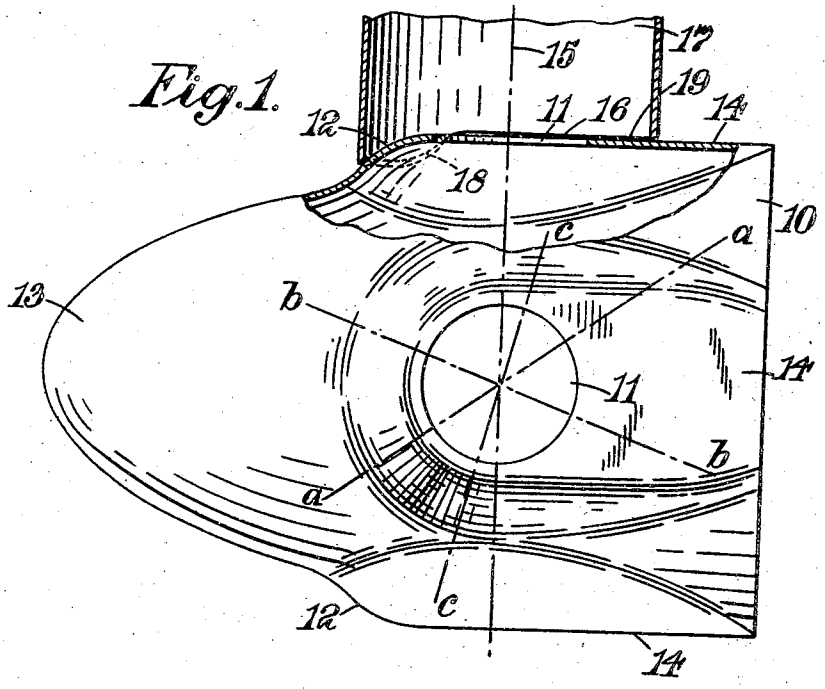
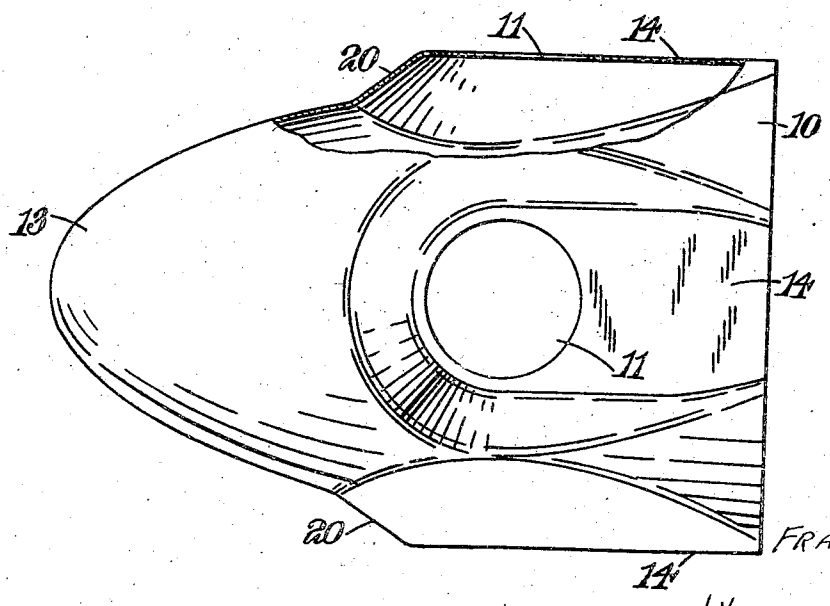


Fig. 2.



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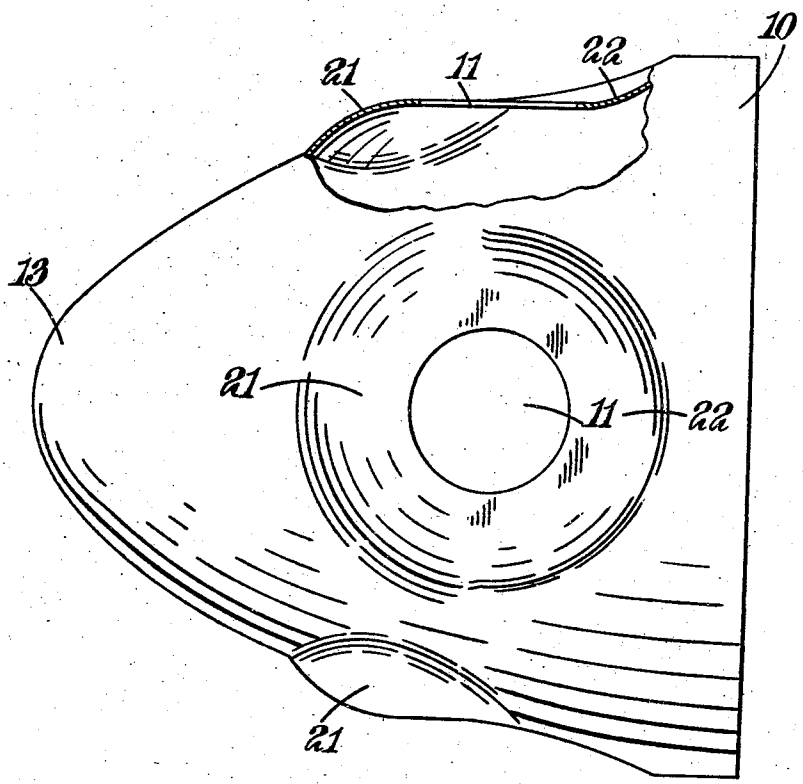
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Fig. 3.



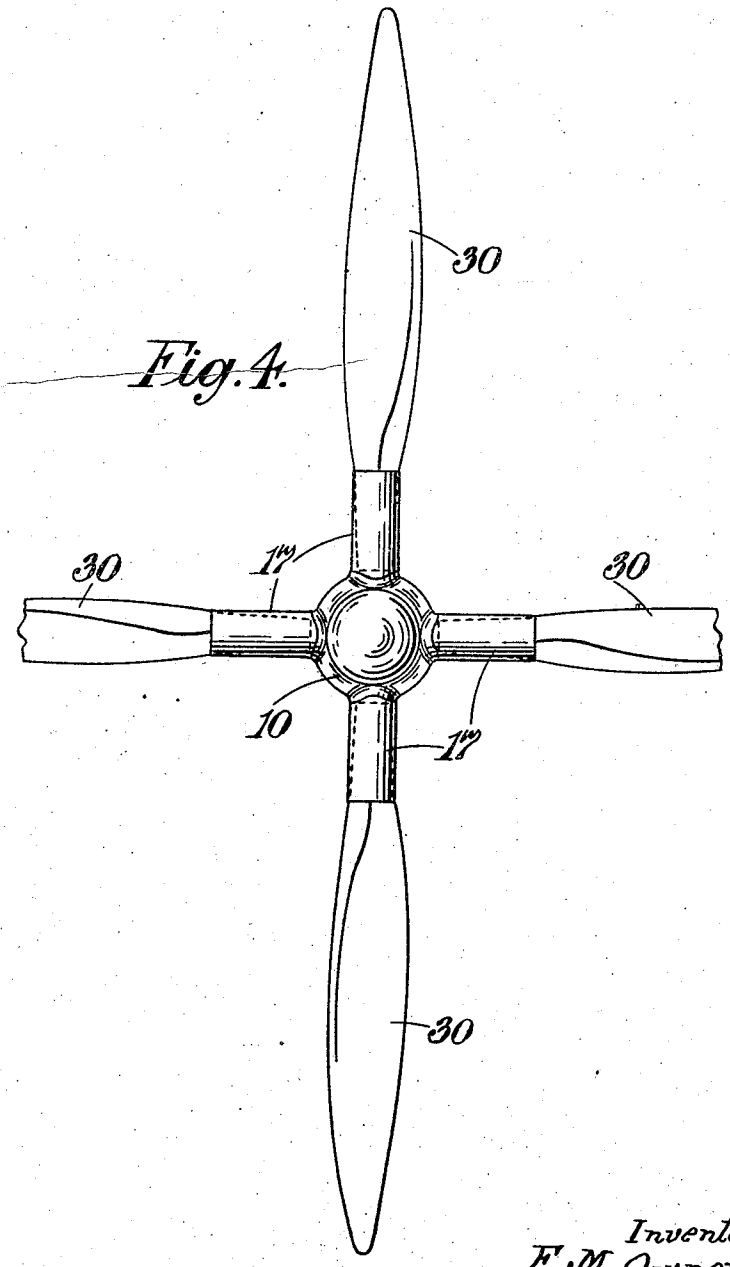
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PROPELLER SPINNER

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Fig. 4.



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UNITED STATES PATENT OFFICE

2,408,677

PROPELLER SPINNER

Frank Morgan Owner, Bristol, England, assignor, by mesne assignments, to Rotol Limited, Gloucester, England

Application August 23, 1943, Serial No. 499,674
In Great Britain March 23, 1942

5 Claims. (Cl. 170—159)

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This invention concerns spinners for propellers having variable-pitch blades and has for its object to provide a spinner which in conjunction with the propeller blades passing therethrough will reduce the drag thereof to a minimum.

The invention is of particular application to propellers which have cuffs fitted to the shank of the propeller blades to impart an aerofoil form to the part of the propeller blades adjacent the spinner. Such propellers suffer from the disadvantage that if the edge of the cuff which is adjacent the spinner (hereinafter referred to as the lower edge of the cuff) is not in close proximity thereto over the operating range of the propeller, that is from the fine pitch position to the feathered position, the air ceases to flow over the spinner and around the cuffs with a minimum of turbulence and drag. To overcome this disadvantage various proposals have been made; in one the lower edge of the cuff entered a circular flat-bottomed dished recess formed in the spinner; in another a flat-topped "platform" was raised above the spinner line and over this the lower edge of the cuff rotated, the distance between the lower edge of the cuff and the platform being a minimum and the same for all positions of the propeller. These proposals whilst eliminating the drag produced by poor mating of the cuff and the spinner are unsatisfactory in that the recess or the platform produces considerable drag itself.

According to the present invention the combination of a propeller spinner and a propeller is characterized in that the spinner contour is modified adjacent each propeller blade cut-out so that over the operating range of the blade that part thereof which moves over the spinner surface is maintained in close proximity thereto.

Preferably the spinner contour is modified by providing a portion raised above the spinner line on the side of the cut-out adjacent the spinner nose, said portion having a surface of revolution formed by the rotation about the longitudinal axis of the propeller blade of a line inclined to said axis in the same sense as the spinner line.

The raised portion is faired into the spinner in order to ensure that streamline flow will take place over the spinner and around the base of the propeller blade or cuffs. The raised portion is also faired into a surface disposed on the other side of the cut-out, this surface preferably being flat and normal to the longitudinal axis of the propeller blade.

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The propeller or the lower edge of the cuff is shaped to similar outline as the modified spinner contour and is spaced therefrom by the smallest permissible amount.

Specific embodiments of the invention will now be described by way of example with reference to the accompanying drawings in which:

Figure 1 is a side view of a propeller spinner constructed in accordance with the invention, part being shown in section.

Figures 2 and 3 are similar views showing alternative forms the invention may take.

Figure 4 is a front elevation of a propeller constructed according to the invention.

Figure 5 shows the improved propeller in which the blades 30 fit through sleeves 17 into the spinner 10, the nose of which is indicated at 13.

The spinner 10 is adapted for use with a propeller having four blades each of which receives a cuff to impart an aerofoil form to the shank of the blade adjacent the spinner. Each blade protrudes through a cut-out 11 formed in the wall of the spinner.

In the embodiment shown in Figure 1 a raised convex surface 12 is formed around the forward half of each cut-out, that is on the side thereof adjacent the spinner nose 13. This surface extends in a direction away from the spinner nose and around the rear half of the cut-out as a flat surface 14 normal to the longitudinal axis 15 of the propeller blade. The flat and convex surfaces (14 and 12 respectively) are suitably faired into each other and into the spinner surface.

The lower edge 16 of each cuff 17 is of similar outline to the spinner contour, that is the half thereof directed towards the spinner nose is concave (18) and the half remote therefrom is flat (19).

With this construction the lower edge of each cuff can be made accurately to follow the modified spinner contour over the operating range of the propeller (that is between lines *a*—*a* and *b*—*b*) but not when the propeller blades are moved to the zero pitch position (indicated at *c*—*c*) when the rear part of each cuff leaves the flat raised surface which is restricted in its dimensions circumferentially of the spinner for physical reasons, and the distance between the rear part of its lower edge 16 and the spinner contour increases with consequent increase in drag. This is no disadvantage since when the blades assume the negative pitch position it is desirable to have a high value for the drag.

As shown in Figure 2 the convex surface 12 of

Figure 1 is replaced by a conic surface **20**, the flat surface **14** being retained.

Spinners in which the slope of the spinner line is considerable may require a raised portion of excessive height and accordingly in an alternative construction particularly applicable to such spinners and shown in Figure 3, there is provided adjacent the forward half of the cut-outs **11** a raised convex surface **21** whilst adjacent the rear half of the cut-outs, there is provided a depression having a concave surface **22**. The surfaces **21**, **22** are faired into each other and into the spinner whilst the cuffs are provided with a modified lower edge to match the spinner.

In the construction shown in Figure 3 the surfaces **21** may be replaced by a conic surface and/or the surface **22** by an inverted conic surface.

It will be observed from the figures that surfaces **12**, **20**, **21** and **22** are generated by a line of appropriate shape which is rotated about the longitudinal axis **15** of the propeller and is inclined thereto in the same sense as the spinner line.

The spinner contour may be modified as above referred to by a pressing operation which imparts the desired shape thereto or alternatively the part of the shape in which it is desired to modify the spinner may be formed and subsequently secured as by riveting or welding to the spinner.

The invention is capable of application to propellers and spinners whether cuffs be fitted to the propeller blades or not. When the propeller blades are of metal, steel or magnesium, cuffs are normally fitted. If the propeller blades are of wood the aerofoil section of the blade may be continued so far towards the root of the blade as not to warrant the fitting of cuffs. In the first case referred to, the cuff would cooperate with the inclined portion of the spinner and in the second case referred to the blade itself would perform this function. Accordingly, the term "blades" as used in the claims refer to propeller blades with or without cuffs, the cuffs being considered to form a part of the blade and not to be a separate entity.

I claim:

1. The combination of a propeller having blades each rotatable about its own longitudinal axis, and a spinner mounted on said propeller having cut-outs through which the blades project, said spinner being shaped to provide on the side of each cut-out adjacent the spinner nose, a portion raised above the general contour line of the spinner, said portion having a surface of revolution formed by the rotation about the longitudinal axis of a blade, of a line inclined to said axis in the same sense as the spinner line, a flattened portion adjacent each cut-out on the side away from the spinner nose, said flattened portion being normal to the longitudinal axis of the blade and faired into said raised portion, said blades having root portions shaped to overlap said raised portion in a direction axially of the blade.

2. The combination of a propeller having blades each rotatable about its own longitudinal axis, and a spinner mounted on said propeller and having cut-outs through which the blades project, said spinner being formed at the side of each cut-out adjacent the spinner nose with a portion raised above the spinner line and generated as a surface of revolution by the rotation about the longitudinal axis of the blade, of a line inclined to said axis in the same sense as the spinner line, a flattened surface formed on the spinner adjacent said raised portion at the side thereof remote from the spinner nose, said flattened portion being normal to the longitudinal axis of the propeller blade, and being merged into the contour of the spinner at the end remote from the nose thereof by a surface generated by rotation about the longitudinal axis of the blade of a line inclined to the spinner axis at an angle greater than the adjacent part of the spinner surface, said blades being shaped at their root portions to overlap said raised portion in a direction axially of the blades.

3. The combination of a propeller having blades each rotatable about its own longitudinal axis, a spinner mounted on said propeller and having cut-outs through which the blades project, said spinner being shaped to provide on the side of the cut-out adjacent the spinner nose, a portion raised above the general contour line, said portion having a surface of revolution formed by the rotation about the longitudinal axis of the propeller-blade of a line inclined to said axis in the same sense as the spinner line, and a cuff secured on each blade adjacent the spinner, said cuff on each of said blades having a radially inward extension on its forward edge overlapping said raised portion.

4. The combination of a propeller having blades each rotatable about its own longitudinal axis, a spinner mounted on said propeller and having cut-outs through which the blades project, and having a portion surrounding each cut-out on the side adjacent the spinner nose, said portion being inclined to the spinner axis at a larger angle than the adjacent part of the spinner and being generated by rotation of a line about the blade axis, said blades having root ends overlapping the inclined portion of the spinner in a direction axially of the blades.

5. The combination of a propeller having blades each rotatable about its own longitudinal axis, a spinner mounted on said propeller and having cut-outs through which the blades project, and having a portion surrounding each cut-out on the side adjacent the spinner nose, said portion being inclined to the spinner axis at a larger angle than the adjacent part of the spinner and being generated by rotation about the blade axis of a straight line inclined to the spinner axis at a larger angle than the adjacent surface of the spinner to provide a conical surface, said blades having root portions overlapping the inclined portions in directions axially of the blades.

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