Jan. 12, 1937. E. NEWNHAM 2,067,410

FLEXIBLE BLADE FAN

Filed Feb. 18, 1936

Fig. 1.

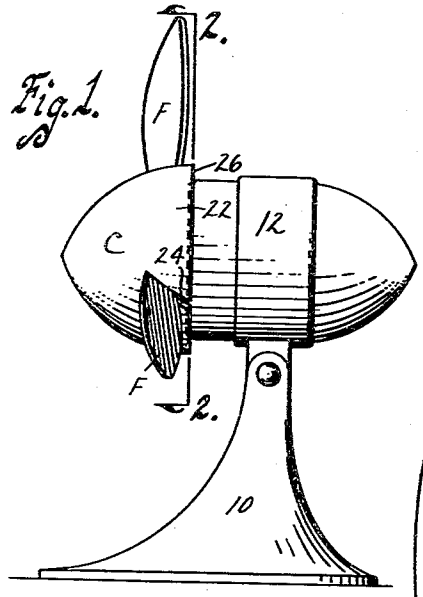


Fig. 2.

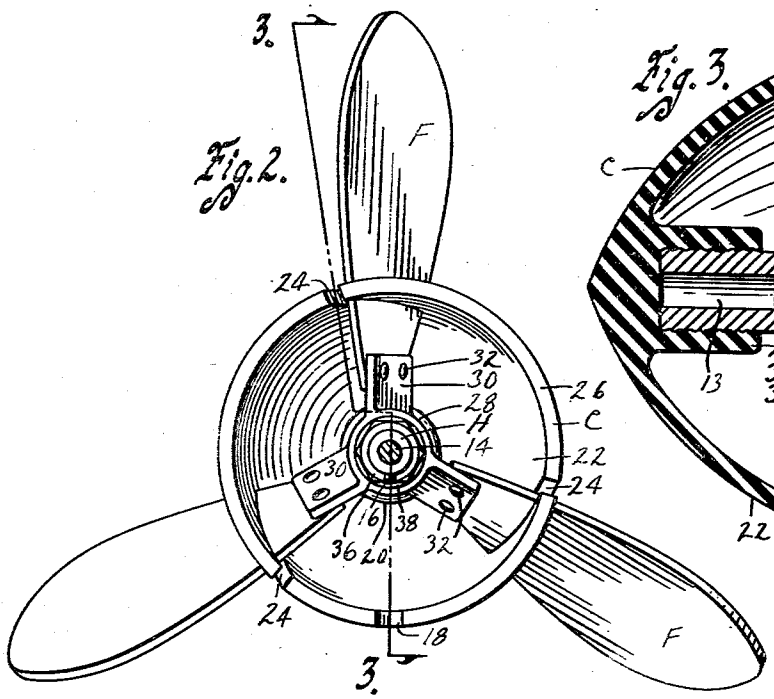
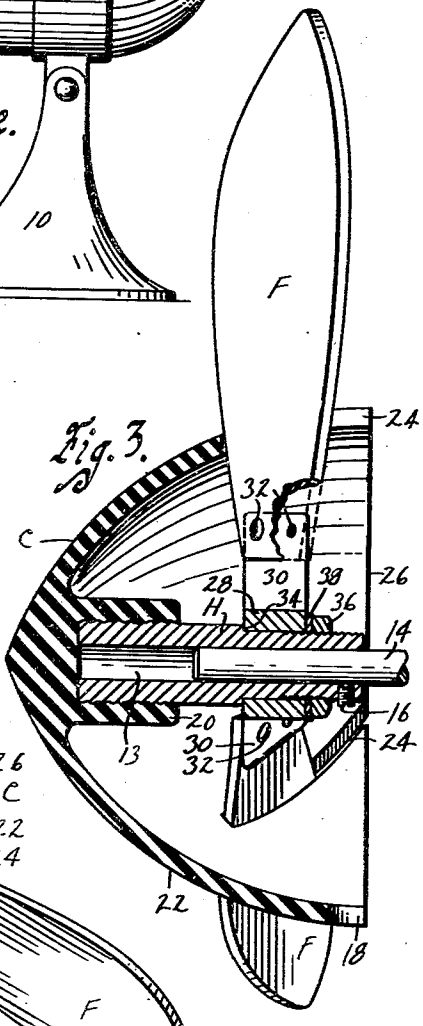


Fig. 3.



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FLEXIBLE BLADE FAN

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14 Claims. (Cl. 170—173)

An object of my invention is to provide a flexible blade fan in which simple and inexpensive construction is provided for mounting flexible fan blades relative to a motor shaft or the like.

Still a further object is to provide a fan structure in which a cap is provided with slots through which fan blades extend, the inner ends of the fan blades being secured together as by a collar or the like to position the blades radially with respect to the cap.

A still further object is to provide a hub structure especially designed for mounting flexible blades of rubber or similar material, so that they are maintained at the proper pitch angle, although upon striking an object they can bend backwardly for the purpose of preventing breakage of the blades and/or damage to the object.

More particularly it is an object of my invention to provide a cap moulded or otherwise fixed relative to a hub and provided with slots at the proper pitch angle through which the fan blades may extend, the inner ends of the blades being secured together to retain them in positon relative to the cap against the action of centrifugal force when the cap is rotated.

With these and other objects in view, my invention consists in the construction, arrangement and combination of the various parts of the device, whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in my claims, and illustrated in the accompanying drawing, in which:

Figure 1 is a side elevation of a flexible blade fan embodying my invention.

Figure 2 is an enlarged sectional view of the same on the line 2—2 of Figure 1; and

Figure 3 is a further enlarged sectional view on the line 3—3 of Figure 2.

On the accompanying drawing I have used the reference numeral 10 to indicate a support in the form of a base for a fan motor 12. The shaft of the fan motor is indicated at 14. My improved fan structure comprises a hub H, a cap C and fan blades F.

The hub H is bored as indicated at 13 to receive the shaft 14, and is permanently mounted on the shaft by a set screw 16. For affording access of a screw driver to the set screw 16 I provide a notch 18 in the cap C.

The cap C is moulded on one end of the hub H and has a central boss 20 engaging the hub H. The hub H may be knurled or otherwise roughened to afford a good joint between the hub H and the boss 20.

The cap C extends from the boss 20 back over the hub H and is provided with an annular portion 22, which completely surrounds the hub and conceals it. The annular portion 22 is provided with a plurality of slots 24 cut inwardly from the back face or base 26 of the cap C. These slots are arranged at the desired pitch angle for the blades F, so as to maintain the blades normally at their pitch angle.

The blades F are of a material sufficiently rigid to normally maintain their pitch angle, yet flexible enough to bend upon striking an object, so that the blades are not thereby broken and do not injure the object they strike, such as a person's hand. I have found rubber to be a suitable material. This eliminates the necessity of providing a shield on the fan.

The blades F are retained against outward movement, caused by centrifugal action, by a collar 28 having a plurality of arms 30. The arms 30 may also be arranged at the desired pitch angle, or substantially parallel to the slots 24, as is obvious in Figure 2. The arms 30 are connected as by rivets or the like 32 to the inner ends of the blades F. Thus the blades are retained against radial outward movement through the slots 24 upon rotation of the fan.

The hub H is provided with a shoulder 34. The collar 28 is seated against the shoulder and retained thereagainst by a lock nut 36. A washer 38 is interposed between the lock nut and the collar.

In the mounting of flexible blades relative to a hub, which of necessity must be rigid, problems are involved which are overcome in a simple manner by the construction I have devised. My construction is inexpensive and readily assembled. The cap C may be of any suitable material, although I prefer to use bakelite, hard rubber or the like. The present device provides a very ruggedly constructed fan, yet one which has the advantage of the flexible blades which require no guard to protect the user from injury upon coming in contact with the rapidly rotating blades of the fan.

Some changes may be made in the construction and arrangement of the parts of my device without departing from the real spirit and purpose of my invention, and it is my intention to cover by my claims any modified forms of structure or use of mechanical equivalents which may be reasonably included within their scope.

I claim as my invention:

1. A flexible blade fan comprising a hub, a plurality of blades each formed of material sufficiently flexible upon striking an object to bend and of itself to re-assume its original position without permanent distortion, and sufficiently rigid that during rotation it will maintain its pitch for the purpose of air delivery, said blades having their inner ends secured to said hub and a cap connected with said hub, said cap having slots to receive said blades at points spaced outwardly from their inner ends, said slots being arranged at the desired pitch angle relative to the axis of rotation of the cap.

2. A flexible blade fan comprising a hub, a plurality of blades each formed of material sufficiently flexible upon striking an object to bend and of itself to re-assume its original position without permanent distortion, and sufficiently rigid that during rotation it will maintain its pitch for the purpose of air delivery, said blades having their inner ends secured to said hub and a cap connected with said hub, said cap having slots to receive said blades at points spaced outwardly from their inner ends, said slots being arranged at the desired pitch angle relative to the axis of rotation of the cap, the slots of said cap opening at one face thereof whereby said blades may be inserted edgewise into the slots during assembly.

3. A flexible blade fan comprising a hub, a plurality of blades radiating therefrom and being formed of material sufficiently flexible to permit bending thereof upon engaging an object during rotation of the fan, yet sufficiently rigid to maintain its pitch angle during rotation for effective air delivery, a cap secured to and surrounding said hub and having slots inwardly from the base thereof arranged at an angle relative to the axis of the cap, said blades extending from said hub through said slots and thereby maintained beyond the cap at the desired pitch angle.

4. A flexible blade fan comprising a hub, a plurality of blades radiating therefrom and being formed of material sufficiently flexible to permit bending thereof upon engaging an object during rotation of the fan, yet sufficiently rigid to maintain its pitch angle during rotation for effective air delivery, a hollow cap secured to and enclosing said hub and having slots inwardly from the base thereof arranged at an angle relative to the axis of the cap, a collar on said hub concealed within said cap, the inner ends of said blades being secured to said collar and the outer ends thereof extending through said slots.

5. A fan structure comprising a hub, a plurality of fan blades having their inner ends secured thereto and means spaced radially from said hub and fixed relative thereto for determining the pitch angle of said blades, said means having slots for receiving said blades edgewise, each slot being arranged at an angle relative to the axis of rotation of said hub.

6. A fan structure comprising a hub, a plurality of fan blades having their inner ends secured thereto and means spaced radially from said hub and fixed relative thereto for determining the pitch angle of said blades, said means being annular in character and having a closed end, said means enclosing said hub.

7. In a device of the class described, a hub, blades of sufficiently rigid material to normally maintain their pitch angle for the purpose of propelling air, yet sufficiently flexible to permit bending thereof upon coming in contact with an object, said blades having their inner ends secured to said hub and extending substantially radially from the hub and means also extending from the hub and engaging the blades throughout the width of each at a point radially outwardly from the hub to determine the pitch angle of the blades.

8. In a device of the class described, a hub, blades of sufficiently rigid material to normally maintain their pitch angle for the purpose of propelling air, yet sufficiently flexible to permit bending thereof upon coming in contact with an object, said blades having their inner ends secured to said hub and extending substantially radially from the hub and means also extending from the hub and engaging the blades radially outwardly from the hub to determine the pitch angle of the blades, said means comprising a cap having slots receiving said blades.

9. In a device of the class described, a hub, blades of sufficiently rigid material to normally maintain their pitch angle for the purpose of propelling air, yet sufficiently flexible to permit bending thereof upon coming in contact with an object, said blades having their inner ends secured to said hub and extending substantially radially from the hub and means also extending from the hub and engaging the blades radially outwardly from the hub to determine the pitch angle of the blades, said means comprising a cap having its center portion mounted on one end of said hub and having an annular portion provided with slots arranged at an angle relative to the axis of rotation of the cap and receiving said blades.

10. In a device of the class described, a hub, blades of sufficiently flexible material to bend upon striking an object, yet sufficiently rigid to normally maintain their pitch angle, a collar on said hub, the inner ends of said blades being secured to said collar and means extending from the hub and engaging the blades throughout the entire width of each to determine the pitch angle of the blades.

11. In a device of the class described, a hub, blades of sufficiently flexible material to bend upon striking an object, yet sufficiently rigid to normally maintain their pitch angle, a collar on said hub, the inner ends of said blades being secured thereto and means extending from the hub and engaging the blades radially outwardly from said collar to determine the pitch angle of the blades, said hub having a shoulder against which said collar abuts and a lock nut on said hub engaging the collar and retaining it in engagement with said shoulder.

12. A fan structure comprising a hub, a cap having a center portion mounted on one end of said hub and an annular portion surrounding and concealing the hub, said annular portion having slots to receive fan blades edgewise, fan blades received in said slots and means for attaching the inner ends of said fan blades to said hub.

13. A fan structure comprising a hub, a cap having a center portion, one end of said hub being embedded therein, said cap having an annular portion surrounding and concealing the hub, said annular portion having slots to receive fan blades edgewise, fan blades received in said slots and means within said annular portion for connecting said blades together and thereby retaining them against radial outward movement through said slots.

14. In a device of the class described, a hub, a hollow cap surrounding and enclosing said hub, fan blades extending through said cap to the space therewithin and means for connecting the inner ends of said blades together to retain them against outward movement relative to said cap upon rotation of the cap.

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