

Oct. 5, 1937.

A. O. SAMUELS

2,095,223

FAN

Filed Oct. 2, 1935

2 Sheets-Sheet 1

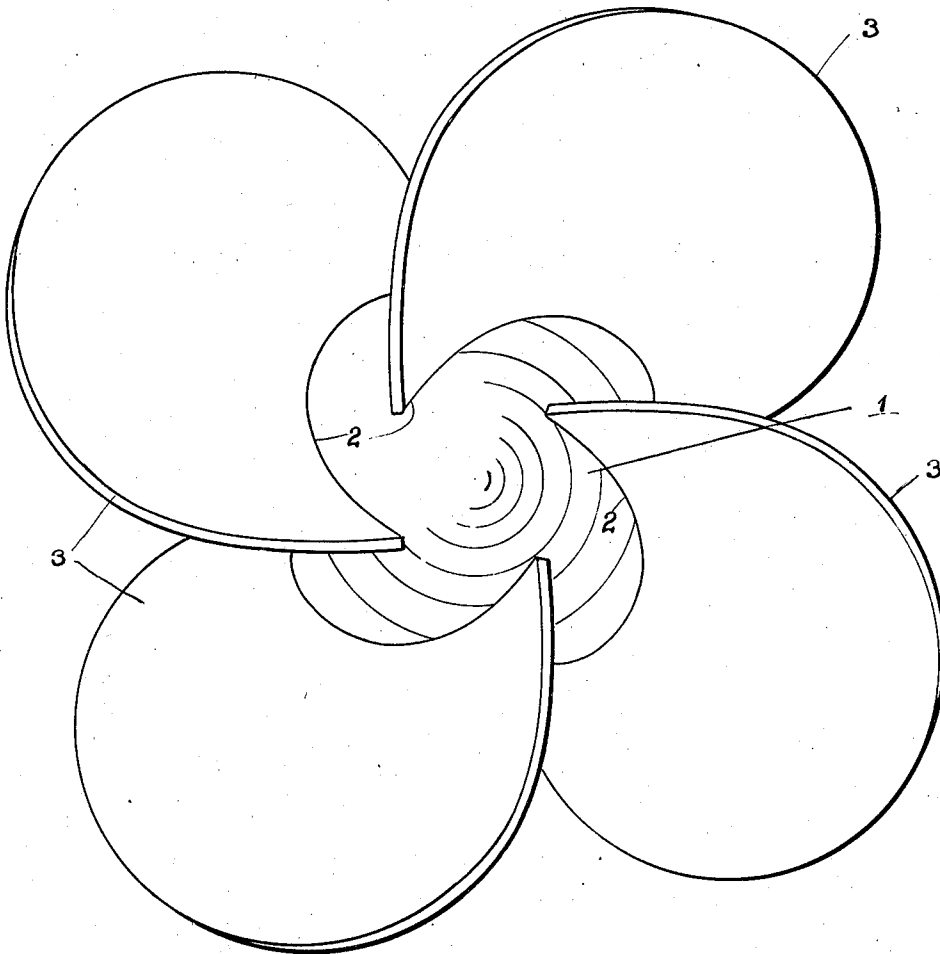


FIG. 1.

INVENTOR
ABE O. SAMUELS
BY *Richard King*
ATTORNEY

Oct. 5, 1937.

A. O. SAMUELS

2,095,223

FAN

Filed Oct. 2, 1935

2 Sheets-Sheet 2

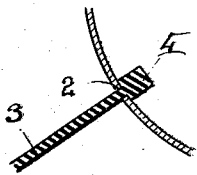
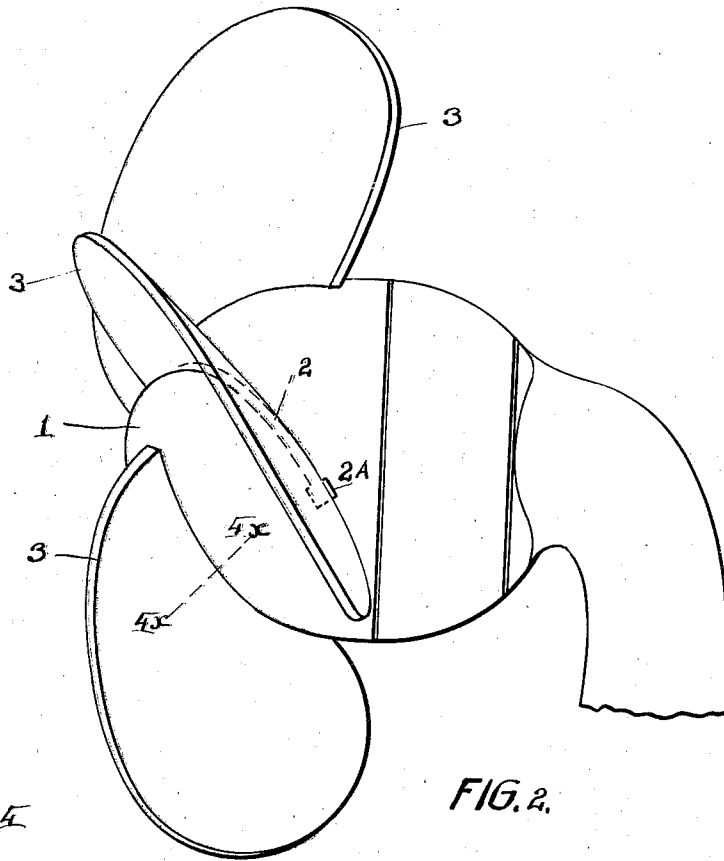


FIG. 4.

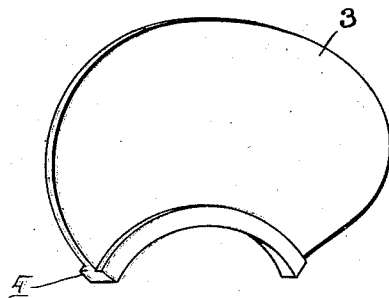


FIG. 3.

INVENTOR
ABE O. SAMUELS
BY
Eric Schinger
ATTORNEY

UNITED STATES PATENT OFFICE

2,095,223

FAN

Abe O. Samuels, Rochester, N. Y., assignor to
Samson-United Corporation, Rochester, N. Y.

Application October 2, 1935, Serial No. 43,237

18 Claims. (Cl. 230—261)

In electric and other fans as ordinarily employed in localities such as the house and the office, the blades provided are formed of unyieldingly rigid metal or other rigid material which will not yield if any object is intruded into the path of such blade, but will cut or destroy such object. The fingers of persons in the room are often seriously injured by such accidents, and important papers are often destroyed when encountering the fan blade. The guard screen conventionally provided about the fan blades often proves inadequate to prevent such accidents. My invention provides a fan and a blade therefor wherein the blade yields when an object is intruded into the blade path, and such object is deviated from the blade path without injury. Such structure dispenses with the necessity for the guard screen.

This invention relates to fans for producing air currents and has for its principal object to provide such a fan with flexible fan blades of suitable material and shape to give the blades stability for an efficient operation of the fan combined with sufficient flexibility to cause any portion of the moving blades to yield when a stationary rigid or semi-rigid member is brought in contact with them, and to be self-restoring to normal position when the intruded member is withdrawn.

Another object of this invention is to so construct and mount the blades of the fan that a temporary deflection of a portion of the fan blades will not prevent the fan from operating to produce a movement of air.

A further object of this invention is to construct the fan with flexible material which may have suitable ballast incorporated therein to properly balance the fan blades and provide a steady operation of the fan.

A further object of this invention is to provide the fan blades with novel fastening means and a novel mode of mounting to provide for a quick and efficient attachment of the blades to the rotating member in a normally radial position thereto.

A still further object of my invention is to provide a fan which is almost entirely noiseless in operation.

All these and other objects and attendant advantages will become more readily apparent from the detailed description of one embodiment of the invention which follows, reference being had to the accompanying drawings in which

Figure 1 is a front elevation of my novel fan.
Figure 2 is a side elevation thereof.

Figure 3 is a detail perspective view of one of the fan blades.

Figure 4 is a sectional view of the point of attachment of one of the blades, the section being taken on the line 4x—4x of Figure 2.

In the several figures of the drawings like reference numerals indicate like parts.

The novel fan construction forming the subject matter of my present invention eliminates all danger from accidents caused by contact with the moving fan blades and therefore does away with any type of guard or housing now used to protect a fan.

In the embodiment of the fan illustrated in the figures of the drawings the flexible blades of the fan are mounted on the rotating motor housing or casing 1 which thus serves as the hub for the fan. While other means or forms of mounting the blades on the hub may be provided, within the scope of my invention, a preferred form is that illustrated, wherein the peripheral surface of the hub or casing 1 is provided with the slots 2, 2 which extend forwardly of the housing and are obliquely curved so as to hold the flexible blades at the proper curvature for an efficient displacement of air thereby, and to hold the blades in a normally radial position on the housing. The slots 2 are enlarged at 2A for a purpose that will presently appear.

The fan blades 3, 3 are preferably made up of flexible rubber, although any other suitable resiliently flexible material may be used instead.

As shown, the blades are of a single sheet of material cut or molded into the form illustrated, but same may be formed of any desired material or materials of one or more pieces; and same may be cut, molded or otherwise constructed or formed into any desired conformation to produce the desired results. For the best results, the blades are preferably relatively wide and sufficiently rigid, that is, stable, to be self-sustaining, and may extend substantially perpendicularly or radially with reference thereto at all times. At a given point on the hub outer surface, the radial line perpendicular to the plane tangential to the hub surface at that point, passes substantially through the blade.

The blades are made substantially flat and uniform in cross section, except for a locking ridge shoulder 4 which extends along the base edge of the blade and projects from the sides thereof. The base of each blade with its locking ridge is curved so as to follow the contour of the housing 1 at the slot 2 and have the locking ridge engage the under side of the housing

each side of the slot after the blade is inserted thereinto. This is done by sliding the fan blade, which has substantially the thickness of the width of the slot, into the slot with the locking ridge passing thru the enlargement 2A thereof until the locking ridge is located on the inside of the casing 1 below the slot. This holds the blade anchored to the housing and prevents it from being pulled out of the slot by centrifugal force on the rotation of the fan. The slots 2, 2 in the casing thus hold each fan blade against endwise and outward movement on the casing and at the same time hold the bases of the blades curved or cupped to provide sufficient rigidity for each blade, to have it extend radially in its normal position from the hub and assume a shape that will efficiently displace air on the movement thereof, the blades thus being self-supporting and substantially the entire area of the blade being so held semi-rigidly.

The resilient flexible blades which have been described are resilient as to displacements from their respective normal undeformed rest positions, and will spring back to the normal rest position when the deforming pressure is removed. Such a resiliently flexible blade as described will also deform only a relatively small amount under the continuous application of air pressures of the magnitude ordinarily applied to the blades of an air fan in operation at normal speeds, that is, in normal operation such a blade will be substantially rigid or stable and will substantially maintain its pitch angle upon rotation for effective air delivery. That is, it may be said that these resiliently flexible blades when positioned on the hub are self-restoring to a normal position when distorted or deformed from such normal position, as for instance upon striking an object in the blade's path of rotation, and at the same time are of sufficient rigidity when so positioned on the hub as to be substantially maintained in a self-sustaining radial position on the hub and at a predetermined pitch angle upon rotation for effective air delivery. By "rigid" I mean substantially form-maintaining or stable in position under normal operating conditions, and it is to be understood that the blades will yield without fracture or permanent distortion under the application of a relatively strong force such as striking an object.

As shown, an advantageous arrangement is to have a tapered curved surface for a free closed end of housing or hub 1, and to have slots 2 and blades 3 concave toward the free tapered end of the hub and toward the axis of the hub, which gives good displacement of air.

The width of the blades is substantially the same as the length of the base so that when a blade is fastened to the hub, in the manner above described, the centrifugal force on the rotation of the fan will additionally tend to hold the full width of each blade in a fixed semi-rigid position from which only a portion of the fan blades will be disturbed whenever any part of these blades is brought into contact with a stationary rigid or semi-rigid member.

A convenient shape of the blades is with a width relatively wide with reference to its length radial to the hub, and with reference to the width of blades commonly employed on electric fans. I find a ratio of one-to-one, or even a width greater than the radial length, a suitable arrangement, as shown in the drawings. However, I do not intend to limit my invention to any particular width of blade, and I may employ

any structure of blade which will produce the results to which my invention is directed. In this way a contact of the rotating fan blades with the stationary member will simply bend a portion of the fan blades sufficiently to allow the remainder of the blades to pass the obstruction. As shown, the several different blades are mounted substantially symmetrically on the hub.

In making the fan blades of rubber they may be molded into the proper shape and in molding the weight of the blades is distributed in the body thereof to make them balance when mounted to their hub or motor housing.

Since the ridge 4 as well as the rest of blades 3 are made of rubber or other resilient elastic material, when the fan rotates, the centrifugal force tends to throw the blades out and a tension is applied to the locking ridge 4, compressing it radially and expanding it laterally, which increases the grip of the ridge on the sides of the slot on the hub casing surface.

Of course the embodiment of the fan shown and described may be changed and variations may be required under certain conditions, therefore, while some of the constructional details are deemed preferable and I have shown and described these specifically, it is to be understood that I do not limit myself to such precise construction, but consider that I am at liberty to make such changes and alterations as fairly come within the scope of the appended claims.

The term "hub" appearing in said claims is used to designate any central rotating member to which the blades are held, whether formed of one or more parts. Also, the use of the term "blades" in the claims is not intended to restrict them to a structure having a plurality of blades, and they are intended to apply to and cover a structure having but a single blade.

I claim:

1. A fan comprising a hub with radially projecting blades carried thereby, said blades being formed at their outer portions of material sufficiently flexible to bend readily without permanent distortion, and the inner end portions of said blades being of a construction and configuration such that said blades are sufficiently rigid to maintain a substantially radial position at all times.

2. A fan comprising a hub with radially projecting blades carried thereby, said blades being formed at their outer portions of material sufficiently flexible to bend readily without permanent distortion, and the inner end portions of said blades being of an obliquely curved configuration and a construction such that said blades are sufficiently rigid to maintain an effective pitch angle upon rotation.

3. A fan comprising a hub with radially projecting blades formed of material sufficiently flexible to bend readily without permanent distortion, the inner end portions of said blades being maintained sufficiently rigid by said hub and of a configuration to increase the resistance of said blades to axial thrusts without materially increasing their resistance to deformation upon encountering an object in their path of rotation.

4. In a fan, a hub, a plurality of blades, means coaxing with said hub and portions of said blades to secure the latter to the former at a predetermined pitch-angle, said blades being sufficiently flexible and resilient to be self-restoring when distorted from normal position and of sufficient rigidity when positioned on said hub by the

means aforesaid to substantially maintain their pitch angle.

5. In a fan, a hub, a plurality of flexible blades, and means engaging base portions of said blades for securing the latter to the hub and maintaining said blades in a self-sustaining substantially radial position at all times, said blades being formed of a material sufficiently flexible and resilient to be self-restoring when distorted from normal position.

6. In a fan, a hub, a plurality of flexible rubber blades, and means coacting with said hub and base portions of said blades to maintain said blades in a self-sustained radial position on said hub oblique to the axis of rotation, said blades being sufficiently flexible and resilient to be self-restoring after striking an object in its path of rotation and of sufficient rigidity to substantially maintain a pitch angle upon rotation effective for air delivery.

7. In a fan, a hub, rubber blades, means engaging portions of said blades for maintaining them in a normally radial and substantially cupped position on said hub, said blades being of such flexibility and resilience as to be self-restoring upon distortion from normal position and of sufficient rigidity when assembled to substantially maintain a predetermined pitch position on the hub.

8. In a fan, a hub having slots therein and a plurality of flexible blades having portions thereof fitted into said slots, said blades being sufficiently resilient to be self-restoring upon striking an object and of sufficient rigidity when assembled on said hub to substantially maintain their pitch angle.

9. In a fan hub and blade structure, a hub having slots in its periphery to receive fan blades, and fan blades of material sufficiently flexible to permit bending thereof upon striking an object and of sufficient rigidity to substantially maintain their pitch angle upon rotation for effective air delivery, said fan blades having enlarged shoulder portions on their mounting ends, said fan blades being received into said slots by their said shoulder portions.

10. In a fan hub and blade structure, a hub having slots in its periphery to receive fan blades, and a plurality of fan blades having enlarged shoulder portions on their mounting ends, said fan blades being formed of material sufficiently flexible and resilient to be self-sustaining and to be self-restoring when distorted from their normal positions, said fan blades being received into said slots by their said shoulder portions and held in a substantially radial position on said hub.

11. In a fan, a rotatable hub provided with peripheral slot-like sockets oblique to the axis of rotation thereof, and a plurality of fan blades formed of material sufficiently flexible to permit bending thereof upon striking an object and of sufficient rigidity to substantially maintain their pitch angle upon rotation for effective air delivery, said blades being provided on their mount-

ing edges with enlarged shoulder portions respectively engageable in said oblique sockets.

12. In a fan, a hub having sockets extending along its periphery, each of said sockets having an enlarged portion at one of its ends, a plurality of blades having shoulder portions engageable in said slots and insertable through said enlarged portions of said slots, said blades being formed of material of such flexibility and resilience as to be self-restoring upon distortion from normal position and of such rigidity as to maintain said blades in a self-sustaining substantially radial position on said hub at all times.

13. A fan comprising a rotatable hub having a plurality of oblique arcuate slots and a plurality of normally flat, rubber blades adapted to be supported on said hub and maintained in cupped position by said slots.

14. A fan comprising a rotatable hub having a plurality of oblique arcuate slots and a plurality of normally flat, flexible and resilient blades adapted to be supported on said hub and maintained in cupped position by said slots, said blades being relatively wide with respect to their radial dimension.

15. A fan comprising a hub with radially projecting blades carried thereby, said blades being formed of material sufficiently flexible to bend readily without permanent distortion, the inner end portions of said blades being of a construction and configuration such that said blades are sufficiently rigid to substantially maintain their pitch angle upon rotation, and said blades being relatively wide with respect to their radial dimension.

16. In a fan, a hub having slots therein and a plurality of flexible blades having portions thereof fitted into said slots, said blades being sufficiently flexible to permit bending without permanent distortion upon striking an object and of sufficient rigidity when assembled on said hub to substantially maintain their pitch angle, said slots and blades being shaped so that the centrifugal force of the blades tends to tighten the blades in the slots.

17. A fan comprising a hub having a plurality of slots, the ends of said slots overlapping circumferentially, blades engaged in said slots, said slots having an obliquity to the axis of rotation such that the blades engaged therein are maintained at an effective pitch angle, said blades being formed of material sufficiently flexible and resilient to be self-restoring upon distortion from normal position.

18. A fan comprising a hub with radially projecting blades carried thereby, said blades being formed of a material sufficiently flexible to bend readily upon striking an object without permanent distortion, the inner end portions of said blades being of a construction and configuration such that said blades are sufficiently rigid to maintain an effective pitch angle at all times.

ABE O. SAMUELS.