

Jan. 20, 1942.

G. F. BAHR

2,270,575

FAN

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2 Sheets-Sheet 1

Fig. 1

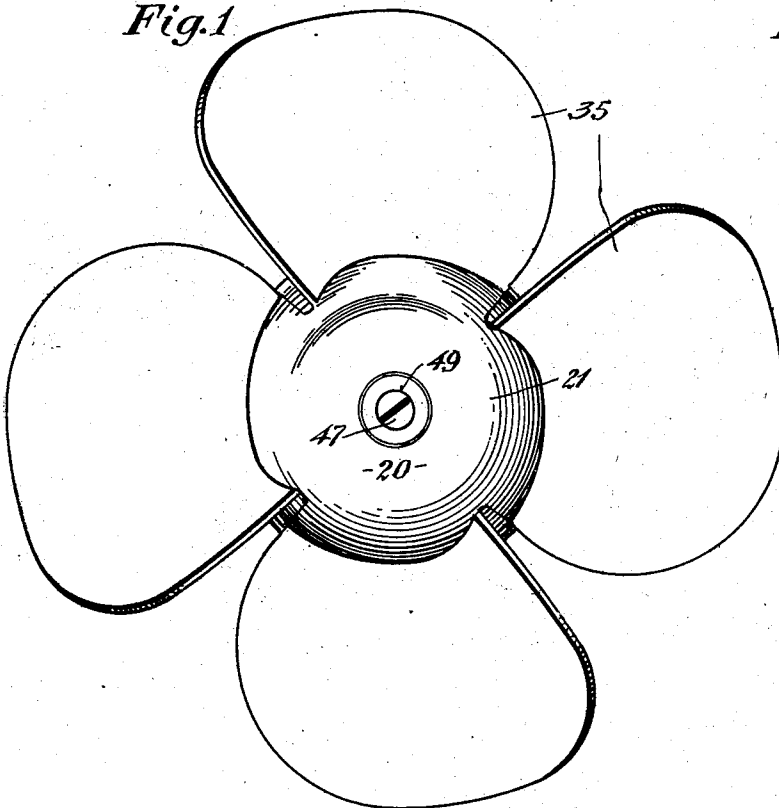


Fig. 2

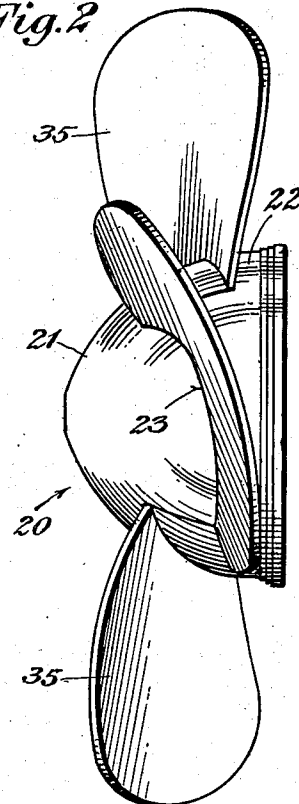


Fig. 3

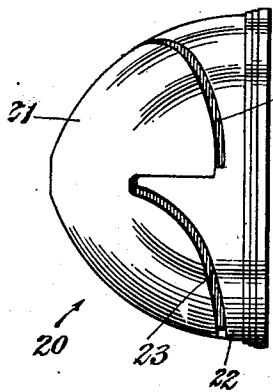


Fig. 4

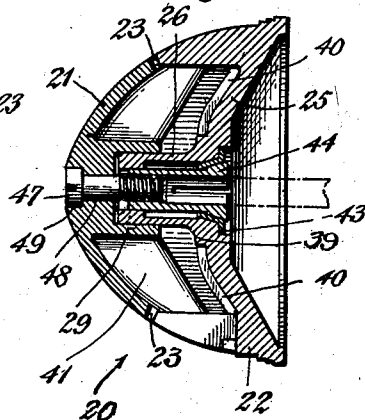
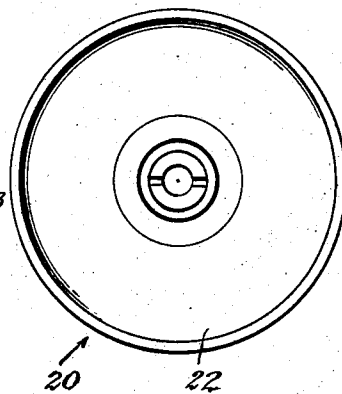


Fig. 5



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Fig. 6

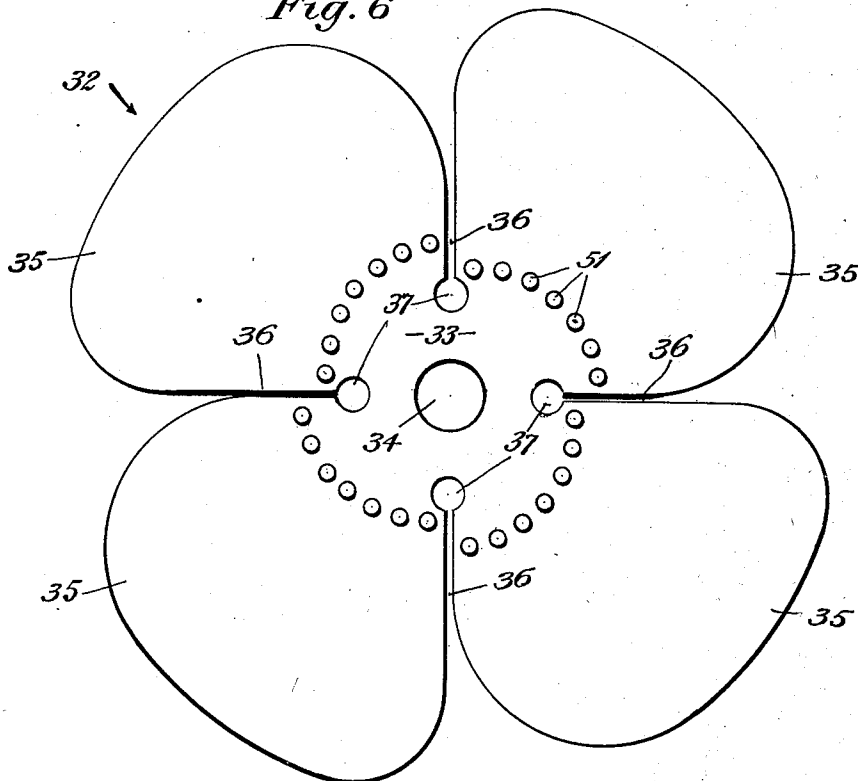


Fig. 7



Fig. 8

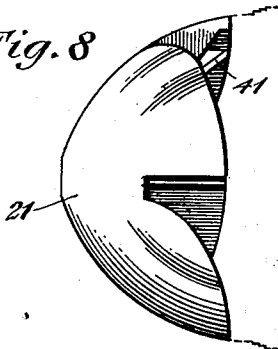


Fig. 9

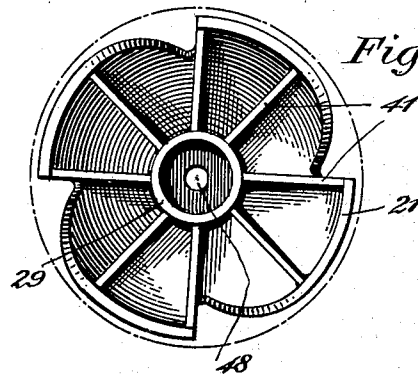


Fig. 10

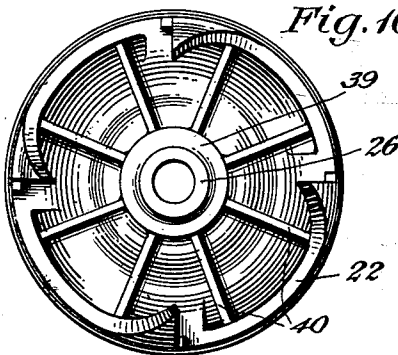


Fig. 11

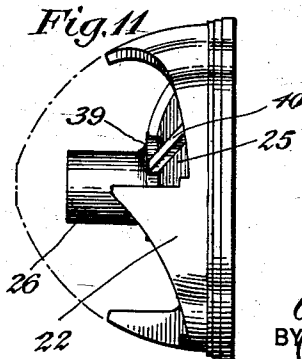
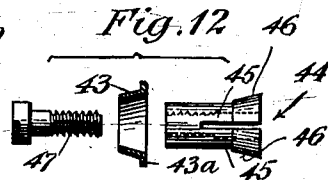


Fig. 12



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Application May 25, 1938, Serial No. 209,870

5 Claims. (Cl. 230—259)

This invention relates to fans, and, more particularly, to fans for circulating air.

In fans used for this purpose, and especially of the type wherein rubber blades are used, many manipulations have been required in assembling the blades on the hub to adequately secure them in place.

According to the present invention, the hub is made in sections which can be readily assembled and secured in proper relation to one another. The sections are so constructed that they can have fan blades readily positioned between their adjoining faces to be held in place by the clamping of the two sections together.

In my copending application Serial No. 160,806, one form of the invention is disclosed in which the blades, which are adapted to be clamped between the sections of the hub, are individual blade members held in the slots formed in the hub in the line of jointure of the two sections by the gripping action of the sections thereon, and provided with means on their inner edges for engaging the inner surface of the hub to prevent the blades from moving radially, due to centrifugal force, when the fan is rotated.

In the present form of the invention, all of the blades are interconnected and can be readily located in the hub in a single operation.

For this purpose, the blades are made from a single blank of rubber-like material with the edges of the blank shaped to form a plurality of radiating blades which are adapted to project beyond the surface of the hub when the blank is clamped in position between the two sections of the hub.

Accordingly, when the blades are made in a single piece, all of the blades for each fan can be produced in a single operation, as the blank can be readily molded into the desired shape, or a sheet or blank of material can be used and the blades formed by cutting away portions of the blank or sheet as desired. Decreasing the number of operations necessary to produce the blades will reduce the cost of production, which is an important factor in competitive manufacture.

In forming the blades on the blank, a plurality of radiating slots are formed therein, which separate the adjoining edges of the blades. Inasmuch as the blades are helically disposed on the hub, the edges of the adjacent blades must be spread longitudinally of the hub. The blank is provided with means whereby this can be readily accomplished.

One of the sections of the hub is provided with

an inwardly projecting sleeve in which the clamping means for holding the sections together is disposed. The blank, which is positioned between the sections, is provided with a central aperture adapted to be slipped over the tubular sleeve, which aperture enables the blank to be quickly and properly assembled on the hub and resists any bodily movement of the blank with respect to the hub.

The hub, according to the present invention, is formed with means for adequately supporting the central portion of the blank, or that part which is disposed within the hub, when the sections are in clamped relation.

As in the above-mentioned application, the means for clamping the two sections of the hub together is so designed that it also clamps the assembled hub to a motor shaft to be driven.

To prevent any radial movement of the blades with respect to the hub due to centrifugal force when they are in assembled relation and driven at high speeds, each of the blades is provided with means adjacent the base for engaging the inner wall of the hub and hold the blades securely therein.

Other features and advantages of the invention will be apparent from the specification and claims when taken in connection with the drawings, in which:

Figure 1 shows a front view of the hub and blade assembly.

Fig. 2 shows a side view of the hub and blade assembly.

Fig. 3 is a side view of the front and back sections of the hub in assembled relation.

Fig. 4 is a longitudinal sectional view of the hub shown in Fig. 3.

Fig. 5 is a rear view of the hub.

Fig. 6 is a plan view of the blank.

Fig. 7 is a side elevational view of the blank.

Fig. 8 shows a side view of the front section of the hub with the back section in dotted lines.

Fig. 9 is a view looking from the right of Fig. 8 with the back section in dotted lines.

Fig. 10 is a front view of the back section.

Fig. 11 is a side view of the back section showing the front section in dotted lines.

Fig. 12 is an exploded view of the securing means.

As shown in the drawings, the fan of the present invention comprises a hub 20 having a plurality of blades projecting therefrom and secured thereto to form a unit which is adapted to be mounted on the shaft of a motor or other driving means.

In the illustrated form of the invention, the hub is divided into two sections, a front section 21 and a back section 22. The line of jointure between the two sections extends around the hub and is shaped so as to produce a plurality of helical slots 23 extending along the surface of the hub from adjacent the base of the hub to the forward end thereof in which the blades are to be located.

When the two sections are interfitted so that the slots are formed by their line of jointure, an inwardly projecting tubular sleeve 26 extending from a back wall 25 of the back section will be disposed within a central sleeve 29 formed on the interior of the front section and the two sections will be held in assembled relation against bodily shifting movement, as shown in Fig. 4.

The two sections of the hub are adapted to have fan blades positioned therebetween when assembled, and, when secured together as shown in Figs. 1 and 2, hold the blades in place.

According to the present invention, all of the fan blades for each fan are interconnected and can be readily located in proper position between the two sections of the hub so that the blades extend outwardly therefrom through the helical slots. The blades, being of resilient material, will be flexed and given the desired pitch angle by the helical slots.

In the preferred form of the invention, the blades are formed from a single flat blank 32 of resilient material with all of the blades secured together as an integral unit. In the broader aspects of the invention, however, the blades may be separate and secured to a common center member so that they will always have the same relation to one another.

When the blades are made in the form of a single blank, all of the blades for each fan can be readily produced by a single operation. They can be either molded into the desired shape, or a sheet or blank of rubber-like material can be used and the blades formed by a single cutting operation which will remove portions of the blank or sheet as desired. The forming of all of the blades for each fan in a single operation, where heretofore each of the blades was made individually, brings about a decrease in the number of operations necessary to produce the device, and, therefore, decreases the cost of production.

The blank 32 of the present invention comprises a central hub-engaging part 33 having a central aperture 34. The edge of the blank is so shaped as to form a plurality of radially extending blades 35. The adjacent edges of the adjoining blades are formed by radial slots 36 in the blank extending into the central hub-engaging portion.

When the blank is disposed between the two sections of the hub, it will be properly located therein by the central aperture 34 formed in the portion 33 thereof which is adapted to fit over the tubular sleeve 26 on the base member. The aperture 34 preferably snugly engages the sleeve and will always properly position the blades on the hub and will resist bodily shifting of the blank radially of the hub due to centrifugal force.

In order to properly support the hub-engaging part of the blank when the hub and blades are assembled, the wall 25 of the back section is made concave so that its mid-portion extends into the hub and forms a seat 39 at the point where the tubular sleeve 26 extends therefrom and against which the center of the blank bears. The rest of the hub-engaging portion of the blank is sup-

ported by a plurality of ribs 40 formed on the inner surface of the concave wall 25 of the back member, the ribs being spaced therearound and extending from the seat 39 to the rim of the hub, and by a plurality of similar ribs 41 formed on the inner surface of the front member and oppositely disposed to those on the base.

The hub, which is preferably made of moldable material, is also reinforced by the spaced ribs 40, 41, formed on the interior thereof, against strains set up therein while in use.

After the blank has been properly located between the two sections with the blades radiating from the hub through the helical slots therein, the two sections are clamped together to hold the blades in place.

As shown in Fig. 2 of the drawings, the ends of the adjacent slots are displaced longitudinally of the hub, that is, the end of one slot will be disposed near the nose of the hub, and the beginning of the next slot will be displaced rearwardly of the hub in order to produce the desired helical path on the surface of the hub.

When the flat one-piece blank is clamped between the two sections of the hub, it will be distorted so that the blades can assume their proper pitch angle as defined by the helical slots. To permit the blades to assume this relation without undue strains being set up in the blank, the slots 36 have been enlarged at their inner ends as at 37 so as to extend into the blades, which enlargement gives the blades more freedom whereby their edges can be separated and displaced longitudinally of the hub as required.

The assembled hub and blade unit can be secured together as desired. In the preferred form of the invention, this is accomplished by inserting a tapered collar 43 having a flange 43a at the back end of the tubular sleeve on the back section, with the flange engaging the back wall. A hollow sliding member 44 is disposed within the tubular sleeve and provided with a pair of resilient elements 45 having cam surfaces 46 thereon extending into cooperative abutting relation with the tapered collar.

A draft means, in the form of a screw 47, is mounted in a bore 48 in the front section with the head thereof disposed in a recess 49 in the nose of the front section. The draft means extends into threaded engagement with the slidable member disposed in the tubular sleeve. Upon rotation of the draft means, the threads move the slidable member along the tubular sleeve and bring the camming faces into abutting relation with the collar and draw the two sections together.

The hub and blade assembly of the present invention can be assembled as a unit at the factory and shipped as an assembled unit to be applied to the shaft of a motor or suitable driving means, or the elements can be shipped in disassembled relation and readily assembled at the point of use.

The assembled unit can be readily mounted on the shaft of the motor so that the back of the hub will lie close to the casing of the motor, whereby the outer surface of the hub can merge into the outer surface of the casing and effect a streamlining of the two. If the motor housing is provided with the usual projecting housing for the shaft bearing, this housing will be received in the concavity of the back wall of the back section and the hub can be still positioned close to the motor casing.

To mount the unit on the drive shaft, the

draft means 48 is loosened and the shaft of the motor is inserted into the bore in the slidable member. The draft means is then tightened and the action of the cams on the collar will cause the resilient elements to move into gripping engagement with the end of the shaft. This single mechanism not only holds the hub sections in assembled relation with the blades, but also holds the assembled unit securely to the end of the draft shaft.

If desired, the blades can be provided with means for preventing radial movement thereof with respect to the hub due to centrifugal force when the hub is rotated at high speeds. In the present form of the invention, this is accomplished by providing a series or row of projections 51 extending in a helical path across the base of each blade. While the projections may be separate elements mounted thereon, in the preferred form of the invention they are formed on the blank at the time the blank is made. These projections are so disposed on the blades that when the sections of the hub are drawn together the projections will engage the inner walls of the hub adjacent the helical slot and securely anchor the blades in place.

Variations and modifications may be made within the scope of this invention and portions of the improvements may be used without others. I claim:

1. In a fan, a motor having a shaft, a hub comprising a plurality of interfitting sections with their lines of jointure formed to include a plurality of slots which extend helically around the same and are adapted to receive fan blades; a plurality of resilient blades radiating from an integral central portion, each slot having one of said blades positioned therein; and clamp means operative by a single actuation for locking the sections together in clamping relation with the blades and for securing the clamped together hub and blades to an end of the motor shaft.

2. In a fan, a drive shaft; a flexible blade member having a plurality of blades radiating therefrom; a two-part hub member, the two parts of said hub member having a plurality of pairs of companion meeting edges inclined relative to the plane of rotation of the fan at the desired pitch angle for the blades, one of said parts being hollow and the other of said parts having an axially disposed sleeve projecting into the hollow part; means carried by the hollow part and disposed in said sleeve adapted to clamp the two parts assembled relative to each other with the blades of said blade member interposed between said meeting edges and to secure the assembled hub member and blades to an end of the drive shaft extending into said sleeve; and exteriorly engageable means carried by said hollow part for causing said last-named means to simultaneously clamp the two parts together with the blades therebetween and to secure the so assembled parts and blades to the end of the drive shaft.

3. In a fan, a drive shaft; a single piece blade member formed of flexible material of generally uniform thickness, said member comprising a plurality of counterpart and equally spaced blades radiating from a centrally perforated central portion of the blade member; a two-part hub mem-

ber coaxial with the blade member and being of larger diameter than said central portion of the blade member, the two parts of said hub member having counterpart companion faces spirally in the same direction rotationally of the hub member, each pair of said companion faces being similarly curved, said faces being equal in number to said blades and each blade having a similar portion thereof extending between, engaged by and formed for air propelling surfaces by said companion faces; and clamp means coaxial with said hub member, including an actuator extending through the central perforation in the blade member operable to simultaneously clamp the two parts of the hub member together on opposite sides of the blade member and secure the clamped together parts of the hub member to the end of the drive shaft.

4. In a fan, a motor having a shaft; a hub comprising a plurality of hollow sections having a plurality of pairs of meeting faces inclined relative to the axis of said shaft adapted to receive fan blades therebetween, one of said sections having an axially disposed internal sleeve projecting into the other of said sections; a blank of resilient material positioned between the sections and having the edge thereof formed with blades projecting from the hub, said blank having an aperture to receive the sleeve on the hub section; a tapered collar disposed in one end of the bore of the projecting internal sleeve; a sliding member mounted in the bore of the sleeve and provided with resilient arms having cam surfaces to cooperate with the inner surface of the tapered collar; and draft means extending through the other section and into threaded relation with the sliding member for clamping the sections together with the blades disposed between the meeting faces, the resilient arms of said slidable member being cammed laterally inward into gripping relation with the shaft to mount the assembled hub onto the end of said shaft.

5. In a fan, a motor having a drive shaft; a single piece blade member formed of flexible material and comprising a plurality of equally spaced blades radiating from a centrally perforated central portion; a two-part hub member, the two parts of said hub member having a plurality of pairs of companion meeting edges inclined relative to the plane of rotation of the fan, said meeting edges being equal in number to said blades and each blade having a similar portion thereof extending between, engaged by and formed for air propelling surfaces by said meeting edges; an internally carried sleeve axially projecting into the hollow portion of one of said parts of the hub member and provided with a camming surface in the bore thereof; and a sleeve slidably mounted in the bore and having one end slit so as to form clamping elements adapted to cooperate with said camming surface, and the other end threaded to engage a bolt mounted in the other part of said hub member to extend axially of the same whereby when the bolt is turned the second-named sleeve will slide and move the clamping elements laterally into gripping relation with the shaft and the two parts of the hub member together to clamp the blades between the meeting edges.

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