March 10, 1936. R. K. LEE 2,033,345

FAN BLADE

Filed March 4, 1931

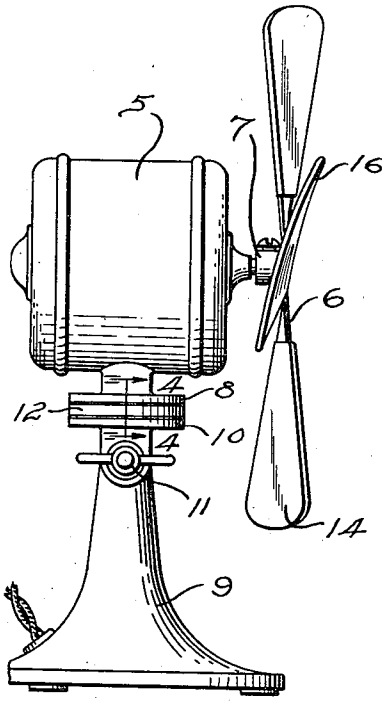


Fig. 1.

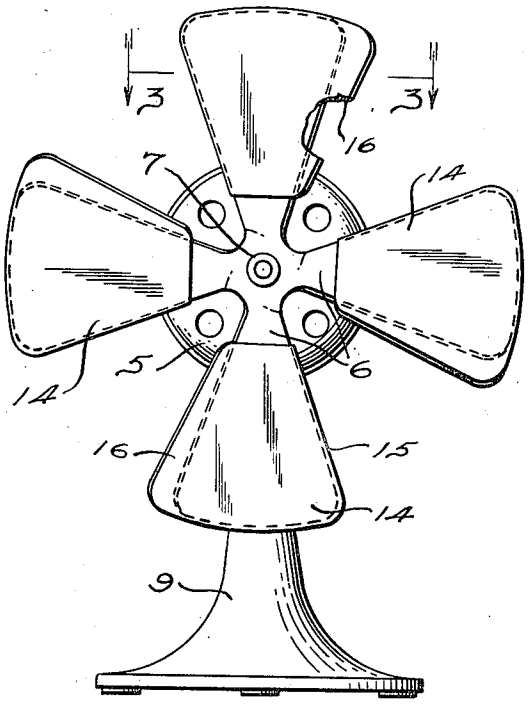


Fig. 2.

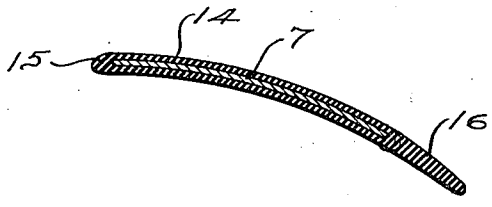


Fig. 3.

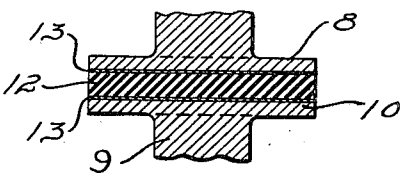


Fig. 4.

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Patented Mar. 10, 1936 2,033,345

UNITED STATES PATENT OFFICE

2,033,345

FAN BLADE

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Application March 4, 1931, Serial No. 520,051

4 Claims. (Cl. 170—161)

My invention relates to fans and more particularly to improved mounting means for fans and an improved construction of the fan blade.

Ordinary electric fans, such as are generally employed for blowing and circulating air, create noises and sounds during their operation, which are objectionable when the fan is used under certain conditions and in certain places such, for example, as in homes, offices, hospitals, schools and many other places where silence is desirable. This noise is caused in a large measure by the vibrations of the motor which causes a hum, and the action of the air on the blades while rotating at a high rate of speed which causes a whirring and singing noise. As the air strikes and is deflected from the surfaces of the blade, and as the edges of the blades cut through the air, eddy currents are formed which cause a great part of the objectionable noise. The harmonic vibrations of the blades set up because of the high rate of speed at which they are operated causes the metal to ring, creating further noise.

The general object of my invention is to decrease the noises caused by the operation of a fan.

It is another object of my invention to prevent transmission of sounds caused by the vibration of the operating motor.

Another object of my invention is to provide silently operating blades or vanes for an electric fan.

A further object of my invention is to reduce sounds, caused by the action of the air striking the front edges and side surfaces of the fan blades, and sounds caused by the eddy currents formed about the rear edge of the blades, to a minimum.

A still further object of my invention is to prevent sounds caused by the harmonic vibrations of the blades in operation.

Other objects and advantages of my invention will become more apparent throughout the reading of the following description and accompanying drawing, in which:

Figure 1 is a side elevational view of an electric fan employing the improvements of my invention,

Figure 2 is a front elevational view of this fan, with the covering of one of the blades partially broken away to illustrate certain details more clearly,

Figure 3 is an enlarged cross-sectional view of one of the fan blades taken on the line 3—3 of Fig. 2 looking in the direction indicated by the arrows, and

Figure 4 is an enlarged cross-sectional view of the mounting means taken on the line 4—4 of Fig. 1 and looking in the direction indicated by the arrows.

I accomplish the objects of my invention and provide a silently operating fan by mounting the operating motor of the fan in a resilient manner and by covering the blades of the fan with a non-resonant substance in a certain manner and design for the purposes hereinafter set forth which insure their silent operation.

Referring now to the drawing in which like numerals designate like parts throughout the several views, the numeral 5 designates an electric motor of any well known design, having a shaft protruding from the housing on which are mounted the usual type of fan blades 6 joined at a hub 7 which is secured to the motor shaft in any suitable manner. A flat base plate 8 is formed on the lower part of the motor housing and the usual supporting pedestal 9 has a complementary flat top plate 10 formed thereon or secured thereto in some suitable manner. The plate 10 may be formed on a swivel unit, if desired, such as shown at 11.

I secure a block 12 of rubber or other suitably resilient non-resonant material between the flat base plate 8 of the motor and the plate 10 of the supporting standard. The rubber is applied by first coating the metal of the bottom of the plate 8 and the top of the plate 10 with brass as indicated by the numeral 13 in Fig. 4, which is well known in the art of vulcanizing rubber to metal. The rubber block 12 is then placed between the plates and vulcanized to the brass coated metal. Thus the motor is securely mounted on the pedestal in a resilient manner, the rubber acting to absorb all shocks and dampen vibrations of the operating motor and preventing the transmission of noises to the pedestal or the object on which it stands.

Each blade of the fan is covered with a coating of rubber 14 or other suitable non-resonant material which is applied to the metal blade 16 by brass coating the metal and vulcanizing the rubber thereto as in the application of the rubber block 12. The rubber coating 14 of the blades is of approximately the thickness of the blade and conforms to the side surfaces in the exact shape of the blade. The front edge of the blade is coated at 15 with rubber of a slightly greater thickness than the side surfaces. The rear edge of the blade is provided with a rubber lip or fin

16 which is molded integral with the rubber coating 14 of the sides and extends rearwardly of the fan blade a desirable distance, being tapered toward the edge. This lip is flexible and during the rotation of the fan blades will move or curve in the path of the air current to assume a position in the plane of the rotation of the blades, thus acting to prevent the formation of eddy currents about the rearward edge of the blade and allowing the air deflected on each side of the blade to flow from the rear edge thereof in a smooth and unbroken path.

In ordinary fan blades now in use the angle or pitch of the blade creates a vacuum at the rear edge which causes a swirling of the air currents and forms a pocket or vacuum void which creates an undesirable humming and singing noise. The flexible lip 16 acts to streamline the path of the flow of the air, regardless of the degree of pitch of the blades or speed of their rotation, the pressure of the air on each side causing the fin to assume the position where the void or pocket would otherwise be formed and thereby preventing the formation of eddy currents and eliminating the resultant objectionable noises, the fin 16 in effect acting as a flexible and self aligning stream lining device.

The resilient coating of rubber at the forward edge of the blade prevents some sound caused by the cutting of the blades through the air and the coating of the side surfaces likewise prevents sounds caused by the striking of the air against the surfaces of the blades and sudden changes of pressure on the surfaces. The rubber coating entirely surrounding and being vulcanized to the fan blade acts as a vibration dampener, which absorbs the effect of harmonic vibration set up in the fan blades due to the high speed of the rotation of the fan and prevents howling or squealing of the blades caused by vibration.

From the foregoing, it will be seen that my invention is characterized by numerous advantages, features and improvements which are cooperatively related to produce an electric fan silent in operation and free from objectionable sounds caused by motor vibration, action of the air upon the fan blades, or harmonic vibrations set up in the blades themselves. It is apparent that the construction and arrangement of the fan parts may be varied without departing from the principle and nature of the invention and from the scope of the appended claims.

I claim:

1. A fan blade including a center member, a covering of non-resonant material thereon, and a flexible fin formed along one edge of the blade.

2. A fan blade including a center member, a covering of non-resonant material thereon and a fin of the same material formed along one edge of the blade.

3. A fan blade including a center member, a covering of non-resonant yielding rubber material thereon, a flexible fin of the same material formed along one edge of the blade and a thickened portion of said material formed along the opposite edge of the blade, the covering being connected respectively to the fin and thickened porton.

4. A fan provided with blades having a flexible rubber fin formed along the lagging edge of each blade, the fins being adapted to flex as the blades rotate and avoid noises caused by eddy currents of air.

ROGER K. LEE.