Dec. 12, 1933. R. B. BOURNE 1,938,799

FAN

Filed Jan. 9, 1931

Fig. 1.

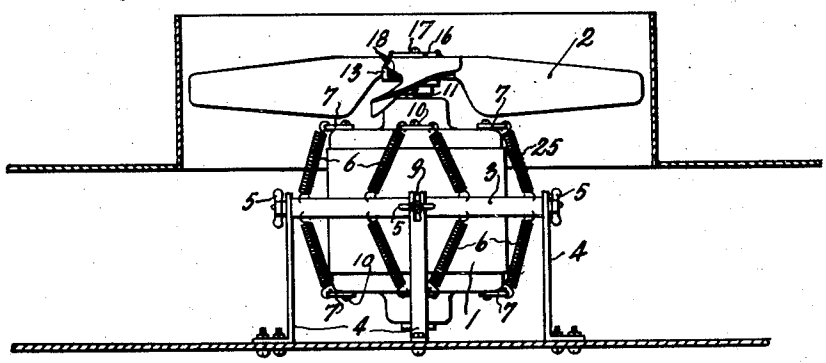


Fig. 2.

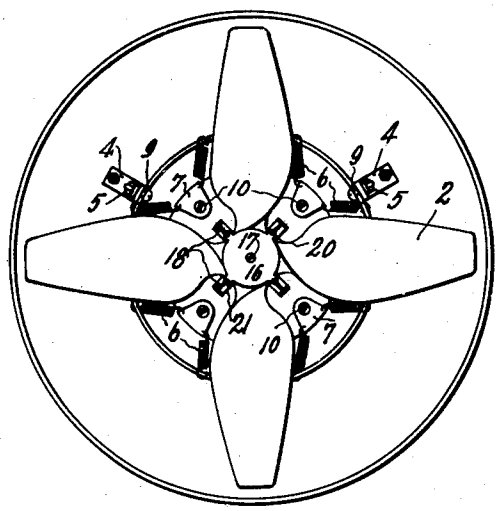


Fig. 3.

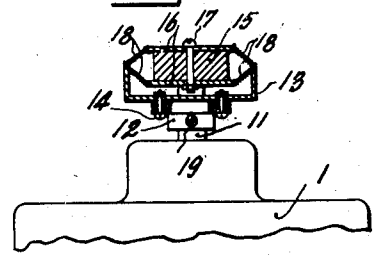
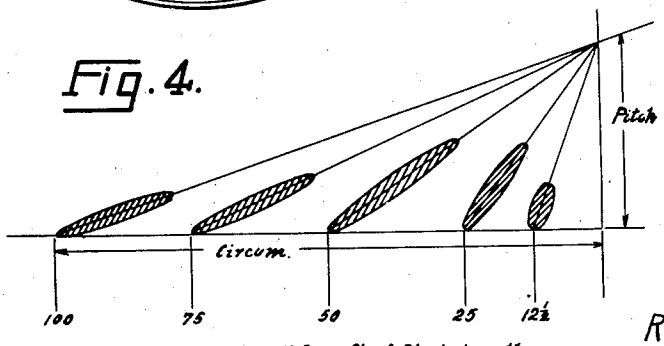


Fig. 4.



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Patented Dec. 12, 1933

1,938,799

UNITED STATES PATENT OFFICE

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FAN

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Application January 9, 1931. Serial No. 507,634

2 Claims. (Cl. 230—273)

This invention relates to fans or fan blowers of the propeller type and is particularly adapted for use in installations where quiet operation is an important consideration. The total noise emanating from a fan blower is made up of several components, the so-called air noise occasioned by the motion of the fan blades through the air, the noise due to the motion of the air past the motor, and mechanical noises given off by the motor and fan.

Where the fan is driven by an alternating-current motor, a torsional vibration exists in the motor, the frequency of which vibration is generally 120 cycles per second for a 60-cycle motor. Very little sound energy is radiated from the motor itself, but if the motor be in contact with any surface which can radiate sound readily, the noise level is materially raised. It is an object of this invention to mechanically isolate the motor from all large radiating surfaces, including those of the fan itself, in such manner as to substantially eliminate the radiation of noises originating in the motor. The air noises made by the fan are minimized by the shaping of the fan blades. Other and more specific objects will be apparent from the following specification and claims.

In the accompanying drawing which illustrates one embodiment of the invention:

Fig. 1 is an elevation of a fan blower unit mounted in a casing;

Fig. 2 is a plan view of the structure shown in Fig. 1;

Fig. 3 is a detail view, partly in section, showing the fan mounting; and

Fig. 4 is a diagram indicating a preferred form of fan blade.

In the illustrated embodiment of the invention, the fan is attached to the motor shafts by a damped spring suspension so constructed as to give a very low natural period in an infinite number of degrees of freedom. The vibration in the motor is thus prevented from reaching the fan. The motor as a whole is also hung on a similar damped spring suspension preventing the radiation of the motor hum by the casing or surface on which it is mounted.

Referring to the drawing, 1 indicates the motor which is suspended concentrically within the heavy ring 3 by means of the springs 6, extending from the ends of the motor casing, to which they are held by clips 7, to the ring. Clips 7 are held to the motor casing by machine screws 10. The ring 3 is adjustably supported by brackets 4 through slots 9 formed in the free ends of the brackets and the bolt and wing nuts 5 carried by the ring. The number and stiffness of the springs 6 are so chosen that the motor, while being held steadily in place, will be mechanically isolated, with respect to the surface to which it is attached. It is essential to keep the natural period of vibration of the unit as low as possible with respect to the frequency of vibration against which it is desired to discriminate.

Mounted on the motor shaft 11 is a flanged collar 12 secured on the shaft by a set screw 19. Mounted on the flange 12 by means of bolts 14 is a spider 13, the ends of the spider arms being bent outwardly as best shown in Fig. 3. The outwardly bent ends of the spider arms are positioned between the blades of the fan adjacent the hub 15 of the fan. Plates 16 are secured to the inner and outer faces of the hub by bolt 17 and are provided with ears 20 which are positioned at the inner and outer edges of the hub. Springs 18 connected to the ends of the spider arms engage in holes 21 formed in the ears 20 so that the fan is freely suspended, from the inner and outer edges of the hub, between the spider arms. This suspension isolates the fan from its driving shaft. Springs 18 as well as springs 6 are damped by lightly stuffing them with cotton wool, as indicated at 25 in Fig. 1.

The fan 2 is made of wood or other light material to provide quick starting of the unit and a degree of quietness not readily attained with other materials. By using a material of low density, an airfoil section may be used for the fan blades without an undue increase in weight An airfoil section suitable for the purpose is shown diagrammatically in Fig. 4. It is desirable to have the fan reversible and hence it is necessary that the fan blades be symmetrical in their cross sections. This results in the loss of a certain amount of "lift" but this loss may be reduced to a minimum by employing a shape that is substantially an ellipse, thus maintaining not only air efficiency but quiet operation.

It will be understood that the fan assembly of this invention has a general application to all uses where quietness of operation is desired, but it has a particular utility in silencing ventilators for windows and the like.

What I claim is:

1. A silent fan assembly comprising a motor, a support for the motor including an annular member, brackets supporting the annular member in a position substantially centrally of the motor casing, a plurality of damped springs connecting the ends of the motor casing to the an-

nular member, a fan, a spider secured to the shaft of the motor, the ends of the spider arms being bent outwardly to position them between the fan blades adjacent the hub of the fan, and damped springs connecting the bent ends of the spider arms to the inner and outer edges of the hub to freely suspend the fan within the spider arms.

2. In a motor driven fan, a shaft driven by the the motor, a fan, a spider secured to the end of the shaft, the ends of the spider arms being bent outwardly to position them between the fan blades adjacent the hub of the fan, and damped springs connecting the bent ends of the spider arms to the inner and outer edges of the hub to freely suspend the fan within the spider arms.

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