

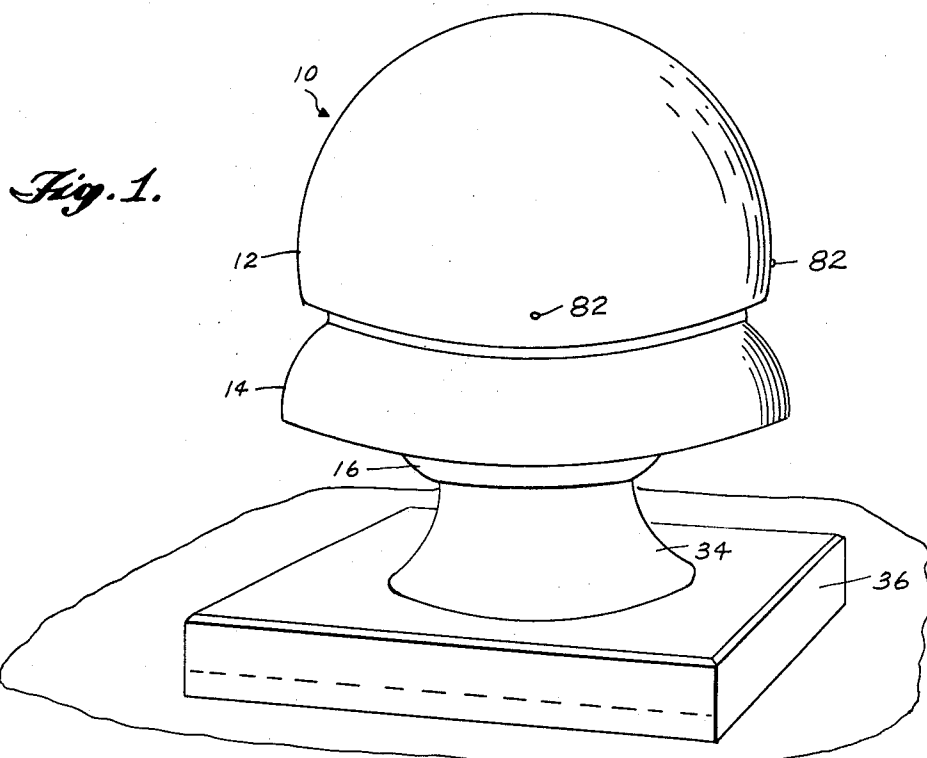
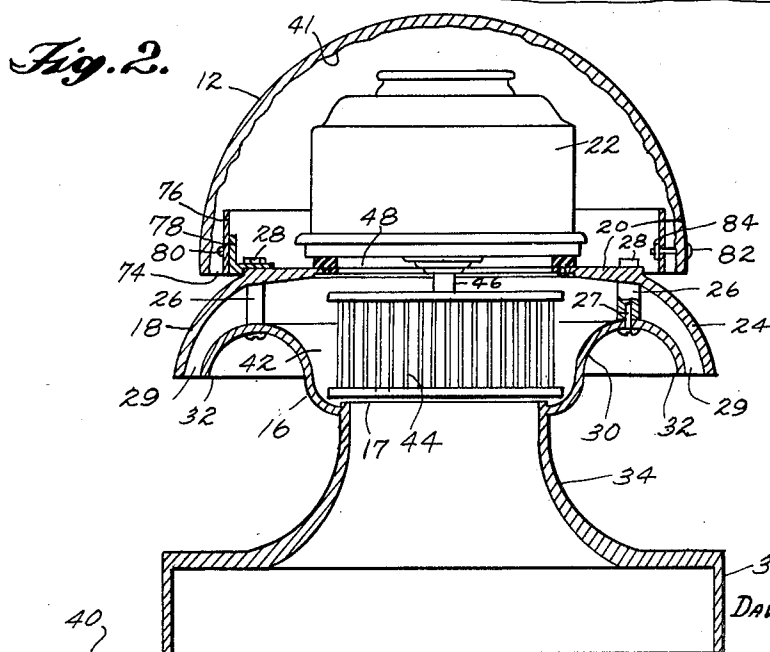
Sept. 22, 1964

D. M. SOLZMAN
AIR MOVING DEVICES

3,149,553

Filed Sept. 29, 1961

2 Sheets-Sheet 1



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Fig. 3.

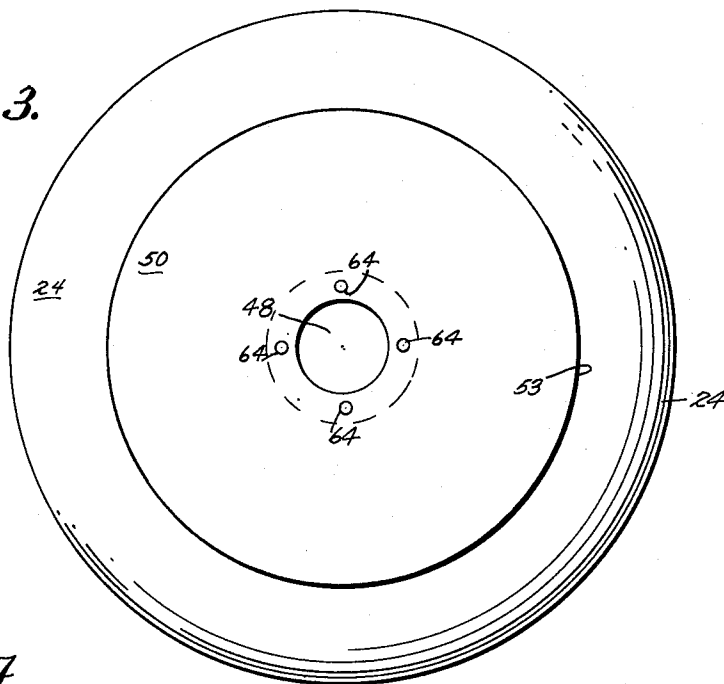


Fig. 4.

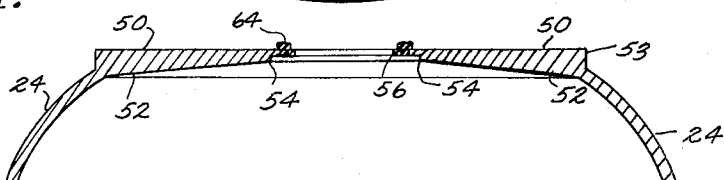
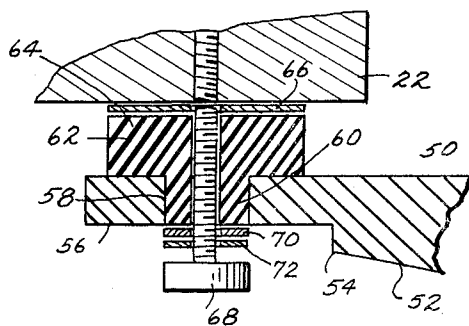


Fig. 5.



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6 Claims. (Cl. 98-43)

The present invention relates to certain improvements in air moving devices such as air exhausters or the like. The improvements described herein are of particular importance in connection with air exhausters of the type described in U.S. Patent 2,526,290 and U.S. Patent 2,987,983 but may also be used to advantage in other forms of air moving devices as will be hereinafter apparent.

The air exhauster of 2,526,290 includes a fan, a motor for driving the fan, and separate housings for the fan and motor. The fan housing comprises two parts, a lower hood which is provided with an air inlet passage and an upper hood which includes an inwardly extending transverse portion constituting means for supporting the motor within the motor housing and an outwardly and downwardly depending flange portion which forms an air outlet passage with the upper end of the lower hood. The air passages are so designed as to minimize air turbulence and sound.

The air moving device of 2,987,983 represents an improvement over structures of the type shown in 2,526,290. More specifically, the fan and motor housings comprise sound absorbing, non-resonant, fiber-reinforced plastic material, e.g. Fiberglas or the like, the interior surface of the motor housing being roughened to absorb sound. The fan housing also includes a glass smooth surface, over at least a portion of its air passageway to effect an even greater reduction in air turbulence and noise than heretofore possible.

The principal object of the present invention is to provide further improvements in air exhausters of the type described in 2,526,290 and 2,987,983 and related air moving devices. A more specific object is the provision of a novel form of housing which, in addition to functioning as a support for the fan and motor and directing the air stream through the device, provides additional damping of sound and vibration through flexure thereby effecting an even greater noise reduction than heretofore possible. A particular object of the invention is to provide an improved upper hood for the fan housing and motor support which is characterized by its flexure characteristics. Another object of the invention is to provide a lower hood of such flexure as to provide an air exhauster of significantly quieter and smoother operation. Other objects will also be hereinafter apparent from the following detailed description of the invention and the accompanying drawings wherein:

FIGURE 1 is a perspective view of one form of air exhauster according to the invention;

FIGURE 2 is a vertical sectional view of the exhauster of FIGURE 1 showing the improved upper hood and motor support means of the present invention;

FIGURE 3 is a top plan view of the upper hood and supporting means according to the invention;

FIGURE 4 is a vertical sectional view of the motor supporting means and upper hood; and

FIGURE 5 is a vertical sectional view of part of the upper hood and motor supporting means.

For convenience, the invention is illustrated in the drawings by an air exhauster of the type generally described in 2,987,983. It will be recognized, however, that the inventive concepts disclosed herein may also be used with other forms of air moving devices.

As shown in FIGURE 1, the exhauster includes the casing, generally indicated by the numeral 10, which may be formed of any suitable sound absorbent, non-resonant

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composition such as "Fiberglas" or other material which is appropriately flexible. This casing 10 comprises an upper motor housing 12 and a lower fan housing 14. The fan housing includes a lower hood portion 16, as best shown in FIGURE 2, provided with an air inlet 17 and an upper hood portion 18. The upper hood portion includes a transverse section 20 on which the motor 22 is supported within the upper motor housing 12 and an outwardly, and preferably downwardly, extending flange 24. The lower and upper hood portions 16 and 18, respectively, are held in a spaced relationship by suitable spacing members 26 including, for example, fixing screws 27 and nuts 28, to form an annular air discharge passage 29 between the lower and upper hoods. To this end, the lower hood includes the curved upwardly extending intermediate portion 30 which may either terminate just beyond the connecting or spacing member 26 or curve outwardly and downwardly from the spacing member 26 to form a depending annular end flange 32. In other words, it is only important for present purposes to provide an appropriate discharge area 29 between the lower and upper hoods. Optimum air flow is realized using the disclosed design of lower hood but the shape of this member may be varied, if desired, by the above mentioned elimination of the downwardly depending flange 32, modification of the curvature and angular disposition of the section 30, or otherwise, without departing from the scope of the present invention.

As shown, the air inlet of the lower hood includes the depending flared Venturi sleeve 34 which is shaped at its lower end to form a horizontal base member 36. As will be appreciated, the base member may be positioned over an appropriate opening 38 in the roof or wall 40 of a building.

Desirably, the lower hood, including the Venturi sleeve 34 and base 36 comprises a one-piece member of sound-absorbent, non-resonant flexible material such as Fiberglas. Additionally, the inner surface of this member and desirably the opposed surfaces of the upper and lower hoods forming air discharge passage 29, or at least the surface of flange 32 which faces flange 24 are smooth to facilitate air flow and minimize air turbulence and sound. It will be appreciated, however, that the scope of the invention includes even rough air-handling surfaces although the optimum results are attained with smooth surfaces. Preferably, the inner surface of the motor housing 12, which is also desirably a single piece of molded "Fiberglas" or equivalent sound absorbent material, is roughened, as shown at 41, to cut down on the amount of motor noise reflected back down into the building.

As best shown in FIGURE 2, the lower and upper hoods 16 and 18 form a chamber 42 directly above the inlet 17, the chamber being adapted to receive any suitable type of fan, such as a squirrel cage blower wheel or turbine fan 44. The fan may be driven by suitable means, e.g. a motor 22 through an appropriate driving connection 46 and to facilitate this driving arrangement, the transverse portion 20 of hood 18 terminates in an opening 48 through which the driving connection 46 is passed to operatively associate the fan and motor.

The construction and design of the motor and fan supporting portion 20, lower hood 30 and base section 36 as well as the means for affixing the motor on portion 20, constitute important aspects of the present invention and are disclosed more fully in FIGURES 4-5. As noted above, a unique feature of the air moving device herein is the fact that the upper and lower hoods are so constructed that flexure therein causes damping of sound. The same applies for the construction of the base section 36, of the exhauster.

More particularly, it has been found that a desirable degree of flexure and resultant damping of vibration and

sound can be attained by using for the upper hood structure the construction shown in vertical section in FIGURE 4. The exact reasons for the damping effect resulting from this structure are not fully understood but it appears that axial and radial components of vibration, created by the motor, are taken up by the supporting portion which offers increased resistance to the passage of vibration as it is flexed. This improvement is particularly evident in the case where the support portion or flexure member comprises a non-resonant, sound-absorbent and flexible material such as "Fiberglas."

The support portion 20 of FIGURE 4 comprises the top supporting surface 50 and an inner or lower surface 52. The lower surface 52 is gradually tapered upwardly from the outer periphery 53 adjacent flange 24 to the point 54 where the thickness of the support is reduced to form a supporting member 56 about the inner periphery of the upper hood. In the case where the support portion 20 comprises Fiberglas, the taper of the lower surface 52 is desirably such that the thickness of the hood at the point 54 is 50 to 75% of the thickness at the outer edge 53 of the support portion. However, the exact degree of taper will vary depending on the flexible material utilized. Thus, in the case of hard rubber, the degree of taper may be significantly less but the important feature, in any event, is that the support portion have flexure, i.e. flexibility, at least between the inner edge 56 and the outer edge 53 to give the desired sound and vibration damping.

FIGURE 2 shows in vertical section a desirable construction for the lower hood of the fan housing, including the venturi sleeve 34 and the base 36. This portion of the air moving device should also be so constructed, with "Fiberglas" or like material, as to have flexure over its entire length, but particularly from the point where the connecting member 26 joins the upper and lower hoods to the base 36. This may be accomplished, for example, by forming the lower hood with a gradually reduced or tapered thickness (not shown) from adjacent the inlet 17 to the connecting member 26 or to the outer edge 32 of the hood. Similarly, the venturi sleeve 34 may have a tapered thickness as shown in FIGURE 2 or the thickness may be tapered gradually and uniformly from the base 36 all the way to the edge 32 of the lower hood or to the connecting member 26. In lieu of this thickness variation, the lower hood, which for convenience may be considered as including the sleeve 34 and base 36 may be made of "Fiberglas" or other similar material which is of uniform thickness but sufficiently thin to give the desired degree of flexure as may be necessary to obtain damping of sound and vibration.

A preferred way for mounting or supporting the motor 22 on the upper hood 18 is best shown in FIGURE 5. According to this further aspect of the invention, the support member 56 is provided with suitably spaced apertures 58. Each aperture 58 is adapted to receive the male portion 60 of a suitable isolator 62. This isolator 62 includes the enlarged head section 64 which lies against the top surface of the member 56. When assembled, the motor 22 is supported on head 64 through an appropriate steel washer 66 or the like and suitably affixed to the upper hood by bolt or screw means 68, and appropriate rubber and steel washers, 70 and 72, respectively. While the present invention is not limited to the use of the mounting arrangement of FIGURE 5, this arrangement has been found highly effective in minimizing the vibration and noise of air moving devices as described herein.

FIGURE 3 shows the upper hood with four of the isolators in place around the periphery of the inner edge of the hood but it will be appreciated that the spacing and number of these isolators may be varied as desired.

As best shown in FIGURE 2, the lower end of the motor housing 12 is spaced from the outer edge 53 of the supporting surface 50 as at 74 so as to allow outside air to be introduced into the housing. Extending up-

wardly into the space 74 is a cylindrical sleeve 76, preferably of the same material as the housing 12. This sleeve 76 is connected to the supporting surface 50 of the upper hood 18 by any suitable means, e.g. circumferentially spaced L-shaped brackets 78 and the bolts or screws 80. Sleeve 76 is also rigidly secured to the inside of the housing 12 by appropriate fastening means such as the bolts 82 and nuts 84.

It will be appreciated that various modifications may be made in the invention described herein without deviating from the scope thereof as set forth in the following claims wherein:

I claim:

1. An air moving device comprising a fan, a motor for driving said fan, a top housing for said motor and a bottom housing for said fan, said fan housing including spaced upper and lower hoods with the fan positioned therebetween, said lower hood including an air inlet passage and said upper hood comprising a transverse motor and fan supporting portion which extends over said fan to support said motor in operative relationship with said fan, said supporting portion having a central opening therein for operatively connecting said motor to said fan and constituting an inner edge for said supporting portion positioned beneath said motor, said upper hood also including a flange portion which is integral with said transverse supporting portion and extends about the same and outwardly therefrom to form an air discharge passage with the upper end of the lower hood, said transverse supporting portion being tapered by gradually reducing the thickness thereof from adjacent said flange portion inwardly to said inner edge for flexure to dampen sound and vibration when said device is in operation.

2. The device of claim 1 wherein said housings comprise fiber-reinforced flexible plastic material.

3. The device of claim 1 including means for supporting the motor adjacent the inner edge of said transverse supporting portion, said supporting means including a plurality of apertures in said supporting portion, a resilient support positioned in each of said apertures, said support including an enlarged head adapted to rest against the top surface of said transverse supporting portion, and fixing means passing longitudinally through said resilient support for attachment to said motor.

4. The device of claim 3 wherein said fixing means comprise a screw threaded through said support and into said motor, the head of said screw lying adjacent the underside of said inner edge but being separated therefrom by a pair of washers, at least one of which comprises resilient material.

5. The device of claim 1 wherein said lower hood includes venturi inlet means and a supporting base, said venturi inlet means and base also having a tapered wall thickness for flexure to dampen sound and vibration.

6. The device of claim 1 wherein said lower hood includes a lower extension thereof constituting a base, said lower hood having a gradually tapered wall thickness over at least a portion of its length to provide sound and vibration damping flexure.

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