

- [54] VENTILATING UNIT FOR SOUND CONTROL ROOM
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- [51] Int. Cl. F24f 13/18
- [58] Field of Search 98/39, 43; 181/33 K, 33 A; 415/119; 417/363, 312, 313

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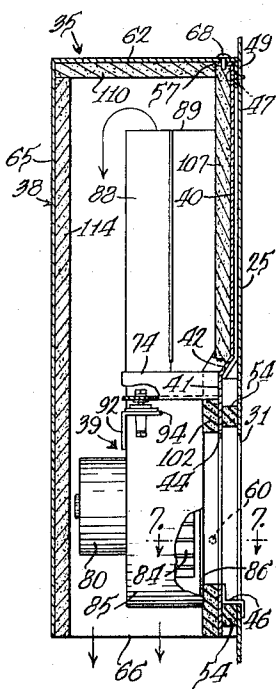
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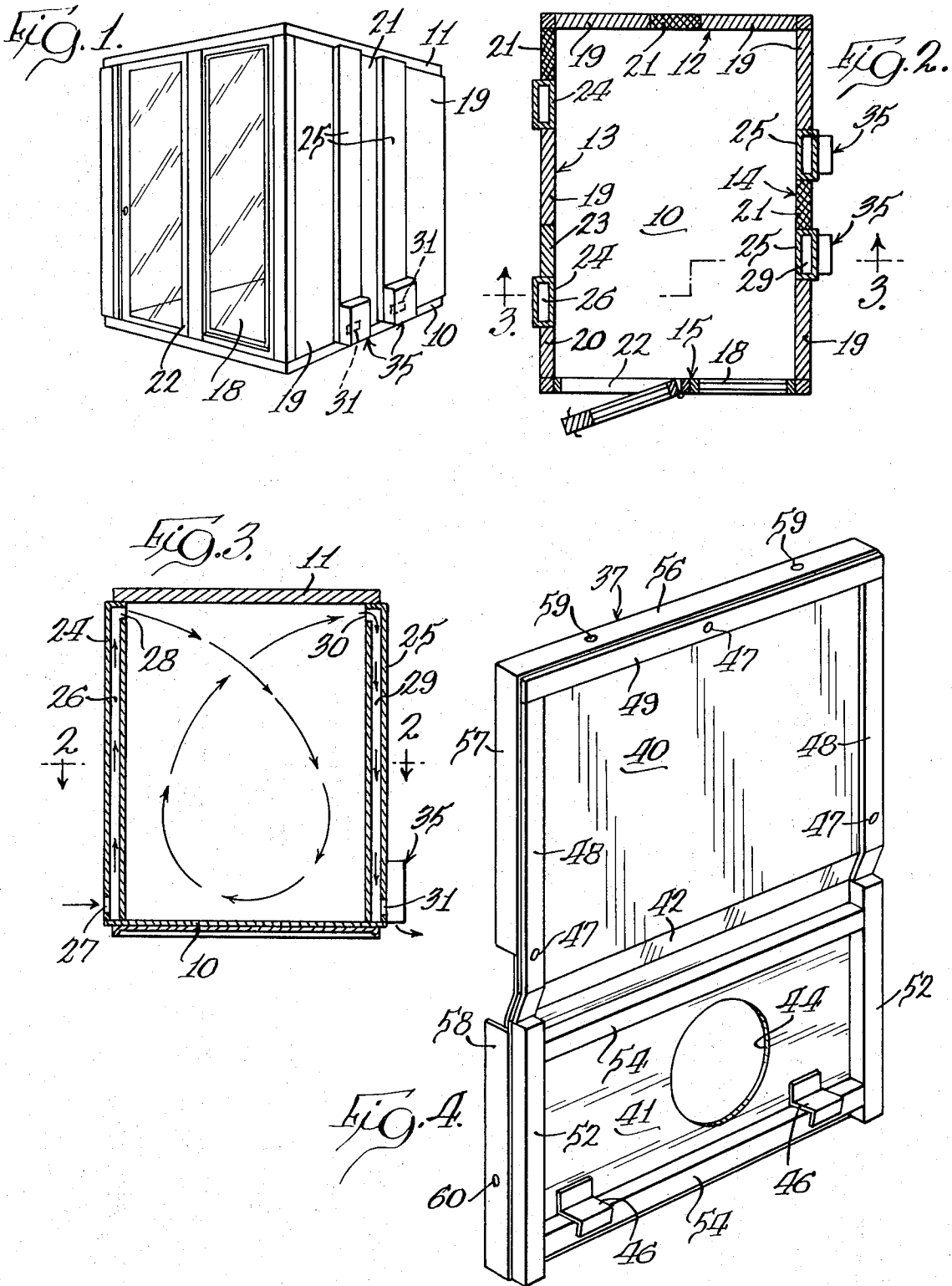
[57] **ABSTRACT**

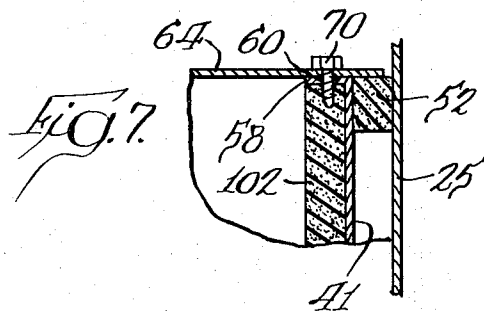
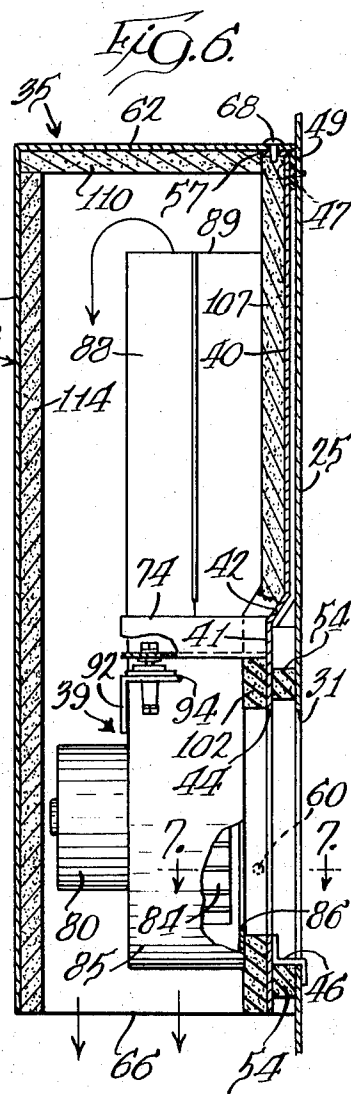
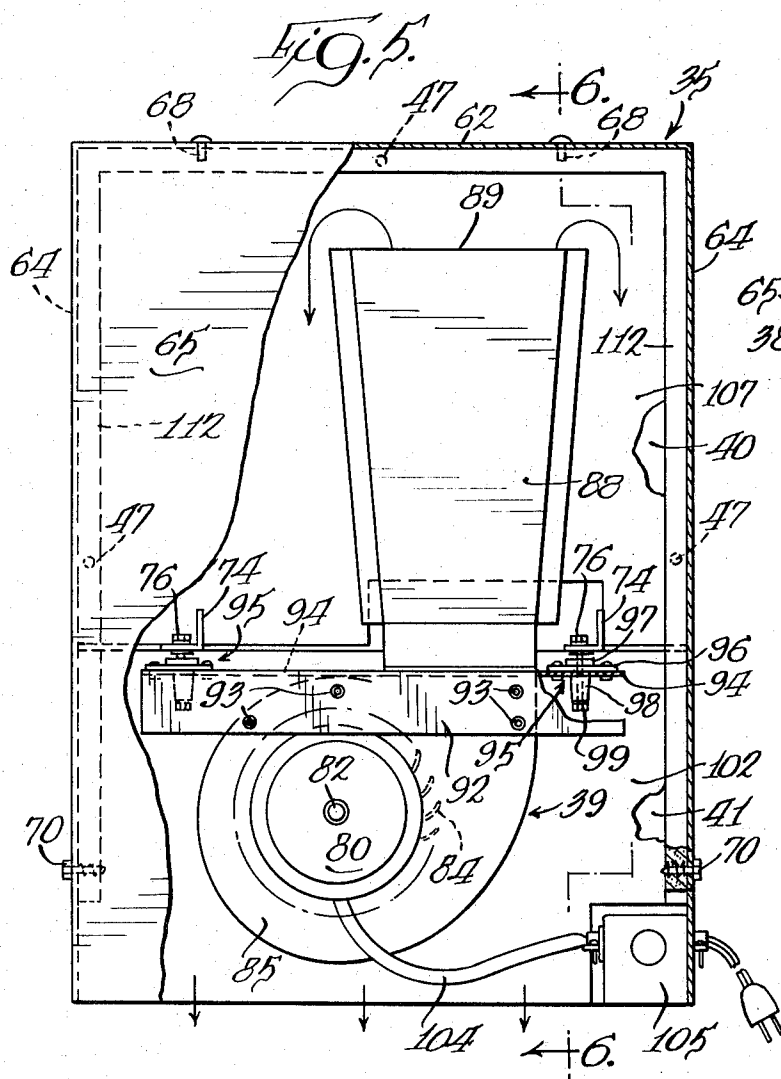
An enclosed ventilating unit for circulating air through a portable sound control room, including a casing adapted to be mounted on the wall of the sound control room, a fan unit in the casing, means resiliently mounting the fan unit in the casing to absorb vibration, and sound insulating means lining the interior of the casing to absorb sound, whereby the sound and the vibration of the fan unit and the sound of air flow are substantially minimized in the ventilating unit without transmission into the sound control room or to the surrounding space.

10 Claims, 7 Drawing Figures



SHEET 1 OF 2





VENTILATING UNIT FOR SOUND CONTROL ROOM

BACKGROUND OF THE INVENTION

This invention relates to a ventilating unit adapted to be mounted on the outside of a portable sound control room for circulating air through the room.

In the past, it has been conventional to construct portable sound control rooms of materials providing an acoustically isolated environment in a larger surrounding space. Such sound control rooms have many uses in buildings of various kinds, including schools, factories and stores. In educational buildings, the rooms may be used for music practice, study, private instruction, counseling, rehearsal and the like. In industrial buildings, the rooms may be utilized for isolation of noisy machines, for office space within a noisy factory area, and for conference rooms or the like. In retail business establishments, the rooms may be utilized for customers to try musical instruments or records, and switchboard operators or the like may be isolated.

In the past, it has been conventional to construct sound control rooms of the type described from modular panels which may be quickly and repeatedly dismantled and reassembled with common hand tools so that the rooms are readily movable from one location to another as desired. Modular panels are used not only for the four side walls but also for the floor and ceiling. When assembled, the rooms are substantially self-contained with lighting, wiring and ventilation. In order to provide adequate flexibility, the modular panels have conventionally been made in various ways, so that some panels are opaque, some are glass, some provide access doors, and some provide ventilation, for example. Though there may be variations in the panels, they are all constructed of materials to provide acoustical isolation, and various panels are interchangeable to provide flexibility.

In the prior sound control rooms, circulation of air through the room has usually been provided by one or more ventilation panels in each of two or more walls of the room. In one form, a ventilation panel has included a duct extending longitudinally from top to bottom through the panel and terminating at one end in an outwardly directed opening and terminating at the other end in an inwardly directed opening. Typically, the lower terminus of the duct opens outwardly and the upper end of the duct opens inwardly. With two such panels disposed in opposite walls of the room, air may be drawn into the lower end in one panel and discharged from the upper end of the panel into the interior of the room. After circulation through the room, the air is drawn into the upper end of the opposed panel and exhausted from the lower end of the panel into the surrounding space.

In order to force the circulation of air through the room, one arrangement in the past has made use of a fan installed in one panel at the lower end adjacent the exit from the duct for drawing air through the room. However, there have been some disadvantages in such construction in some installations. For example, the panel is relatively thin and the space for installing a fan within the interior of the panel is relatively confined, as a result of which the capacity of the fan is unduly limited. Further, installation of the fan directly into the panel sometimes results in transmission of vibrations

into the interior of the room when it is preferable that the room be free from such distraction. Additionally, the limited space available in the panel restricts the use of sound insulating material which might reduce the transmission of noise to the surrounding space outside the room.

It is desirable to provide a ventilating unit for sound control rooms of the type described in which the sound and vibration of the ventilating unit are substantially absorbed in the ventilating unit without transmission into the sound control room or into the surrounding space.

SUMMARY OF THE INVENTION

It is a primary object of the present invention to provide an enclosed ventilating unit for circulating air through a sound control room wherein the sound and vibration of the ventilating unit are substantially absorbed in the unit without transmission into the sound control room or into the surrounding space.

As illustrated herein, a ventilating unit embodying the principles of the present invention includes a casing adapted to be mounted on the outside of a wall of a sound control room and including an inlet aperture adapted to register with a ventilating aperture in the wall, as well as an outlet aperture leading from the casing to the surrounding space, together with a fan unit in the casing including a motor driven fan and a fan housing having an inlet adjacent the inlet aperture in the casing and an outlet opening into the casing, in an arrangement utilizing means in the casing for absorbing the sound and vibration of the fan unit.

Preferably, the ventilating unit includes means resiliently mounting the fan unit in the casing to absorb vibration, and sound insulating means lining the interior of the casing to absorb sound therein.

In the preferred embodiment illustrated herein, the fan housing includes a diffuser of increasing cross section leading to an outlet and reducing the velocity of the air discharged by the fan into the casing, and the outlet from the casing is disposed in a position remote from the diffuser outlet.

In order to reduce leakage at air tight the various interfaces of the parts, resilient sealing means is utilized on the casing around the inlet aperture to engage the wall of the sound control room, sealing resilient lining means is utilized around the inlet to the fan housing, between the fan housing and casing.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a sound control room with ventilating units according to the present invention mounted thereon;

FIG. 2 is a horizontal sectional view through the sound control room illustrated in FIG. 1, taken at about the line 2—2 of FIG. 3;

FIG. 3 is a vertical sectional view through the sound control room, taken at about the line 3—3 of FIG. 2;

FIG. 4 is a perspective view of the outside of a support panel for the ventilating unit, adapted to be mounted on the outside of the sound control room;

FIG. 5 is an outside elevational view of a ventilating unit according to the present invention, with the outer wall of the casing partly broken away to show the interior of the ventilating unit;

FIG. 6 is a vertical sectional view taken at about the line 6—6 of FIG. 5; and

FIG. 7 is a fragmentary sectional view taken at about the line 7—7 of FIG. 6.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENT

Referring now to the drawings in more detail, a sound control room as illustrated in FIGS. 1, 2 and 3, includes a floor 10, a ceiling 11, and four vertical walls including a rear wall 12, side wall 13, side wall 14, and front wall 15. As seen best on viewing FIG. 2, each of the vertical walls 12, 13, 14 and 15 includes a plurality of upright modular panels of substantially uniform height but which may vary in width and in construction. For example, there is a panel as at 18 of a pane of insulating glass. There are several relatively wide panels as at 19 which include a perforate inner lining. There is a relatively narrow panel as at 20 which includes a perforate inner liner. There are several relatively narrow panels at 21 which include an imperforate inner liner, and a panel at 22 with a swinging glass door. There is a relatively narrow panel at 23 which includes electrical power supply. There are ventilating panels at 24 and 25. The various panels in the side walls and the floor and ceiling are secured together to form a rigid sturdy construction by appropriate fastening means which forms no part of the present invention and need not be described in detail herein.

As best seen in FIGS. 2 and 3, each ventilating panel 24 includes at least one vertically extending duct as at 26 which terminates at the lower end in an outwardly opening inlet 27 and which terminates at the upper end in an inwardly directed outlet 28. Each panel 25 may be of similar construction, and it includes at least one vertically extending duct as illustrated at 29, which terminates at the upper end in an inwardly directed inlet 30 and which terminates at the lower end in an outwardly directed outlet 31.

In order to circulate ventilating air through the sound control room, a ventilating unit 35 according to the present invention is installed on the outside of the ventilating panel 25 over the outlet opening 31. The ventilating unit 35 includes a fan for drawing air into the unit from the duct 29 and discharging the air from the unit 35 into the surrounding space. The draft created through the duct 29 draws air from the interior of the room, and as such air is drawn from the room, fresh air is drawn into the room through the duct 26 in the panel 24. The ventilating unit 35 draws warm air from the top of the sound control room, whereas the air drawn into the room from the surrounding space is drawn from the floor so that it is cooler. As a result, the air circulates throughout the interior of the room as indicated generally by the arrows in FIG. 3, rather than passing directly from the duct 26 to the duct 29.

Referring now to FIGS. 4—7, the ventilating unit 35 comprises a casing including a support panel 37 adapted to be attached to the wall of the sound control room and a cover 38 secured to the support panel 37 and enclosing a fan unit 39 supported on the panel 37. The panel 37 is of rectangular configuration, and includes an upper portion 40 and a lower portion 41. The upper and lower portions are connected by a relatively short intermediate portion 42 disposed at an angular inclination such that the plane of the lower portion 41 is offset from the plane of the upper portion 40 in a di-

rection away from the wall of the sound control room to which the unit is attached. The lower portion 41 includes an aperture 44 adapted to register with the ventilating aperture 31 at the bottom of the ventilating panel 25 of the sound control room, when the ventilating unit is mounted as illustrated in FIGS. 1, 2 and 3.

In order to mount the support panel 40 on the panel 25 of the sound control room, the lower portion 41 of the panel includes a pair of rigidly secured brackets 46 of inverted L-shaped configuration adapted to be hung on the wall panel 25 at the bottom edge of the ventilating aperture 31 in the wall panel. The upper portion of the panel 37 includes relatively small apertures as at 47 adapted to receive screws for holding the panel fixed on the wall of the sound control room.

To eliminate any noise of vibration of the panel 37 on the wall of the sound control room, the upper portion 40 of the panel is provided at the side edges and top edges with a resilient gasket material as indicated at 48 along the side edges and 49 along the top edge. The gasket material is adhesively secured to the panel 37. In order to seal the lower portion 41 of the panel to the outer surface of the wall of the sound control room around the perimeter of the ventilating aperture 31 in the wall of the control room and around the aperture 40 in the panel 37 of the ventilating unit, the perimeter of the lower portion of the panel is provided with relatively thick soft resilient foam sealing material along the sides as indicated at 52, and along the top and bottom as indicated at 54. The sealing material 52, 54 is secured to the panel 37 by suitable adhesive means.

In order to provide for mounting of the cover 38 on the panel 37, the panel is formed with an outwardly directed peripheral flange including an upper horizontal portion 56, upper side portions as at 57, and lower side portions as at 58. The upper flange 56 is formed with apertures as at 59, and the lower side flange 58 is formed with an aperture as at 60, for purposes which will appear presently.

The cover 38 includes a top wall 62, side walls as at 64 and an outer wall 65. The bottom of the cover 38 is open at 66 for exhausting air to the surrounding space.

For securing the cover 38 in place on the support panel 37, the upper wall 62 includes a pair of rigidly attached pins as at 68 adapted to be positioned in the apertures 59 in the flange 56 of the panel 37. Additionally, each of the side walls 64 of the cover includes an aperture adapted to receive a screw as at 70 threadable in the aperture 60 in the flange 58 of the panel 37.

In order to support the fan unit 39, the support panel 37 is provided with a pair of outwardly projecting support members 74 illustrated herein as angle irons having inner ends welded to the panel 37. Each angle iron is formed adjacent the outer end with an outwardly opening slot in the horizontal flange thereof for receiving a bolt as at 76 for supporting the fan unit.

The fan unit 39 includes an electric motor 80 having a drive shaft 82 supporting a cylindrical squirrel cage fan wheel 84. The fan rotates in a scroll-shaped housing 85 having a circular inlet 86 coaxial with the fan and adapted to register with the aperture 44 in the support panel 37. The fan housing includes a tangential outlet communicating with an upwardly directed diffuser 88 of increasing cross section leading to a terminus 89 where the air from the fan is discharged into the upper

end of the cover 38, remote from the outlet 66 leading to the surrounding space. The diffuser 88 is secured to the housing 85, and the increasing cross section provides for reduction in the rate of air flow in order to reduce the noise of high velocity flow.

To provide for support of the fan unit, a transversely extending angle iron 92 is secured to the fan housing 85 by means such as rivets or screws illustrated at 93. The angle iron 92 includes a horizontally extending flange 94 carrying resilient suspension means 95 at opposite ends attached to the bolts 76 releasably mounted in the supports 74 on the panel 37. The resilient suspension means at each end of the flange 94 comprises a thin metal plate 96 secured to the flange 94 and carrying a flexible rubber diaphragm or disc 97 secured thereon. The central portion of the rubber diaphragm 97 is secured to the upper end of a hard rubber tube 98. The tube 98 receives the shank of the bolt 76, and a nut 99 on the lower end of the bolt retains the hard rubber tube 98 so that the fan unit is suspended by the resiliently flexible soft rubber diaphragms 97. Thus, the fan unit is removably mounted in a manner which permits limited movement vertically and which also permits limited movement of the fan unit laterally toward and away from the support panel 37.

In order to seal the inlet 86 to the fan housing against the lower portion 41 of the panel 37, resilient foam sealing material is utilized around the inlet as at 102 between the fan housing and the panel 37. As illustrated herein, the material 102 covers the entire lower portion of panel 37 and is secured thereto.

In operation, the resilient suspension means permits the fan unit to move rather freely. As a result, when the fan is started, a pressure differential is created on opposite sides of the support panel 37, and the pressure differential has the effect of moving the fan unit toward the panel 37 in a manner to compress the relatively soft resilient foam sealing material 102. It will be understood that the sealing material 54 around the aperture 44 in the panel 37 provides an air-tight seal between the panel 37 and the outer surface of the wall of the control room, while the material 102 provides an air-tight seal between the panel 37 and the fan housing 85. Thus, there will not be any significant air leakage which contributes to undesirable noise. In addition to providing an air seal, the material 102 also aids in absorbing vibration of the fan unit during operation so that such vibration is not transmitted to the wall of the sound control room.

Electric power is supplied to the fan motor 80 by means of an appropriate electrical cable 104 leading to a terminal box 105 mounted on the lower corner of the support panel 37.

In order to reduce the sound of the fan and moving air in the interior of the ventilating unit, it is lined with suitable sound insulating material. To this end, the upper portion of the panel 37 is covered with an adhesively secured sheet of felt insulating material as illustrated at 107. The material 102 on the lower portion of the panel 37 functions as sound insulating material around the outside of the fan housing 85. The entire inner surface of the cover 38 is covered with felt insulating material, including a sheet 110 on the upper wall 62, sheets 112 on the side walls 64 and a sheet 114 on the outer wall 65.

The noise of the flowing air is substantially absorbed by virtue of the diffuser which reduces the speed of the

air, by virtue of the location of the diffuser outlet 89 remote from the relatively large outlet 66 leading to the surrounding space, and by virtue of the sound insulating material lining the interior of the casing adjacent the flow of air from the outlet 89 to the outlet 66. Any vibration of the fan unit is absorbed by the resilient suspension means 95 and the resilient sealing material 102 so that substantially none is transmitted out of the ventilating unit. As a result of the absorption of sound and vibration, the ventilating unit operates quietly without transfer of undesirable noise to the sound control room or to the surrounding space.

We claim:

1. An enclosed ventilating unit for circulating air through a portable sound control room constructed of insulating materials providing an acoustically isolated environment in a larger surrounding space, said ventilating unit comprising,

- a. a casing adapted to be mounted on a wall of the sound control room, said casing including an inlet aperture adapted to register with a ventilating aperture in the wall and an outlet aperture leading from the casing to the surrounding space,
- b. a fan unit in the casing including a motor driven fan and a fan housing having an inlet adjacent the inlet aperture in the casing and an outlet opening into the casing,
- c. means resiliently mounting the fan unit in the casing to absorb vibration, and
- d. exposed sound insulating means lining the interior of the casing to absorb sound therein,
- e. resilient sealing means on the casing around the inlet aperture and engageable with the wall of the sound control room, and
- f. resilient sealing means around the inlet to the fan housing, between the fan housing and the casing,
- g. whereby the sound and vibration of the fan unit are substantially absorbed in the ventilating unit without transmission into the sound control room or the surrounding space.

2. A ventilating unit as defined in claim 1, wherein the fan housing includes a diffuser of increasing cross section leading to the outlet for reducing the velocity of the air discharged by the fan.

3. A ventilating unit for a sound control room, comprising,

- a. a support panel adapted to be attached to a wall of a sound control room with an inlet aperture in the panel in register with a ventilating aperture in the wall,
- b. a fan unit including an electric drive motor with a shaft, a fan wheel on the motor shaft and a fan housing around the fan wheel having an axial laterally opening inlet and a tangential diffuser of increasing cross section with an outlet directed away from the fan,
- c. means mounting the fan unit on the support panel with the inlet in register with the inlet aperture in the panel, and
- d. a cover on the support panel enclosing the fan unit and including an exhaust opening at the opposite side of the fan unit from the diffuser outlet.

4. A ventilating unit as defined in claim 3, wherein the tangential diffuser is upwardly directed, and the cover has an exhaust opening at the bottom thereof.

5. A ventilating unit for a sound control room, comprising,

- a. a panel adapted to be secured to the outside of a wall of a sound control room with an aperture in the panel in register with a ventilating aperture in the wall,
 - b. a fan unit including a drive motor with a shaft, a fan wheel on the motor shaft, and a fan housing around the fan wheel including a laterally opening inlet and an outlet directed away from the fan,
 - c. means resiliently mounting the fan unit on the panel adjacent the aperture in the panel comprising resilient suspension means permitting lateral movement of the fan unit toward the panel responsive to pressure differential on operation of the fan wheel,
 - d. resilient sealing means around the inlet to the fan unit housing and the aperture in the panel, between the housing and the panel and compressible on movement of the fan unit toward the panel, and
 - e. a cover on the panel enclosing the fan unit and including an exhaust opening.
6. A ventilating unit as defined in claim 5, including sound insulating material lining the interior of the cover and the surface of the panel cover. the cover
7. A ventilating unit for a sound control room, comprising,
- a. a panel adapted to be secured to the outside of a wall of a sound control room with an aperture in the panel in register with a ventilating aperture in the wall,
 - b. a fan unit including a drive motor with a shaft, a fan wheel on the motor shaft, and a fan housing around the fan wheel including a laterally opening inlet and an outlet directed away from the fan,
 - c. means resiliently mounting the fan unit on the panel adjacent the aperture in the panel for movement of the fan unit inlet toward the panel adjacent the ventilating aperture,
 - d. a cover on the panel enclosing the fan unit and including an exhaust opening, and
 - e. resilient sealing means along the perimeter of the panel on the surface thereof adapted to be disposed adjacent the sound control room.
8. A ventilating unit for a sound control room, comprising,
- a. a panel adapted to be secured on a wall of a sound control room with an aperture in the lower portion for the panel in register with a ventilating aperture in the wall,
 - b. fan support means on the panel,
 - c. a fan unit including a drive motor with a shaft, a fan wheel on the motor shaft and a fan housing around the fan wheel including a laterally opening inlet and a tangential diffuser with an outlet directed upwardly,
 - d. means resiliently mounting the fan unit on the fan support means with the inlet in register with the aperture in the panel,
 - e. a cover enclosing the fan unit and including an outlet at the bottom thereof,
 - f. means securing the cover to the panel,
 - g. resilient sealing means around the aperture in the panel adapted to engage the wall of the sound control room around the ventilating aperture in the wall,
 - h. resilient sealing means around the inlet to the fan unit housing and the aperture in the panel, between the housing and the panel, and

- i. sound insulating means lining the interior of the cover and the surface of the panel within the cover.

9. A ventilating unit for a sound control room, comprising,

- a. a panel adapted to be secured on a wall of a sound control room with an aperture in the lower portion of the panel in register with a ventilating aperture in the wall,
- b. fan support means on the panel comprising spaced outwardly projecting support members rigidly secured to the panel adjacent the aperture therein,
- c. a fan unit including a drive motor with a shaft, a fan wheel on the motor shaft and a fan housing around the fan wheel including a laterally opening inlet and a tangential diffuser with an outlet directed upwardly,
- d. means resiliently mounting the fan unit on the fan support means with the inlet in register with the aperture in the panel comprising resilient suspension means hung respectively from said support members and supporting the fan unit,
- e. a cover enclosing the fan unit and including an outlet at the bottom thereof,
- f. means securing the cover to the panel,
- g. resilient sealing means around the aperture in the panel adapted to engage the wall of the sound control room around the ventilating aperture in the wall,
- h. resilient sealing means around the inlet to the fan unit housing and the aperture in the panel, between the housing and the panel, and
- i. sound insulating means lining the interior of the cover and the surface of the panel within the cover.

10. A ventilating unit for a sound control room, comprising,

- a. a panel adapted to be secured on a wall of a sound control room with an aperture in the lower portion of the panel in register with a ventilating aperture in the wall,
- b. fan support means on the panel,
- c. a fan unit including a drive motor with a shaft, a fan wheel on the motor shaft and a fan housing around the fan wheel including a laterally opening inlet and a tangential diffuser with an outlet directed upwardly,
- d. means resiliently mounting the fan unit on the fan support means with the inlet in register with the aperture in the panel,
- e. a cover enclosing the fan unit and including an outlet at the bottom thereof,
- f. means securing the cover to the panel,
- g. resilient sealing means around the aperture in the panel adapted to engage the wall of the sound control room around the ventilating aperture in the wall,
- h. resilient means around the inlet to the fan unit housing and the aperture in the panel, between the housing and the panel,
- i. sound insulating means lining the interior of the cover and the surface of the panel within the cover,
- j. an inverted L-shaped bracket on the lower portion of the panel adapted to be inserted in a ventilating aperture in a wall of the sound control room upon removal of a louvered vent, and
- k. a plurality of small apertures in the upper portion of the panel adapted to receive screws for attaching the panel to the wall.