

Aug. 15, 1961

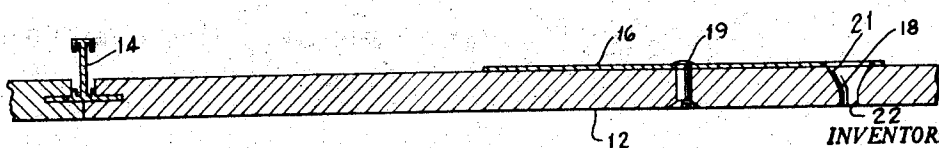
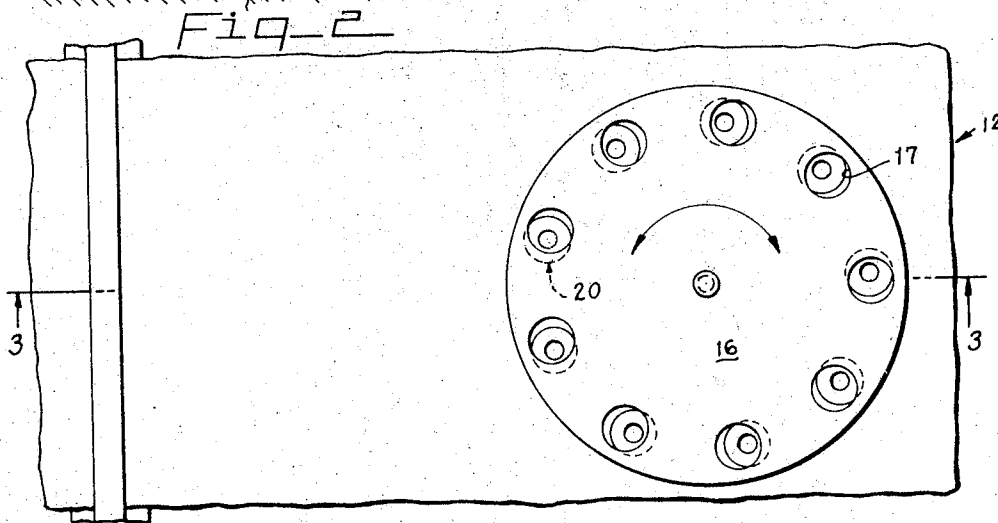
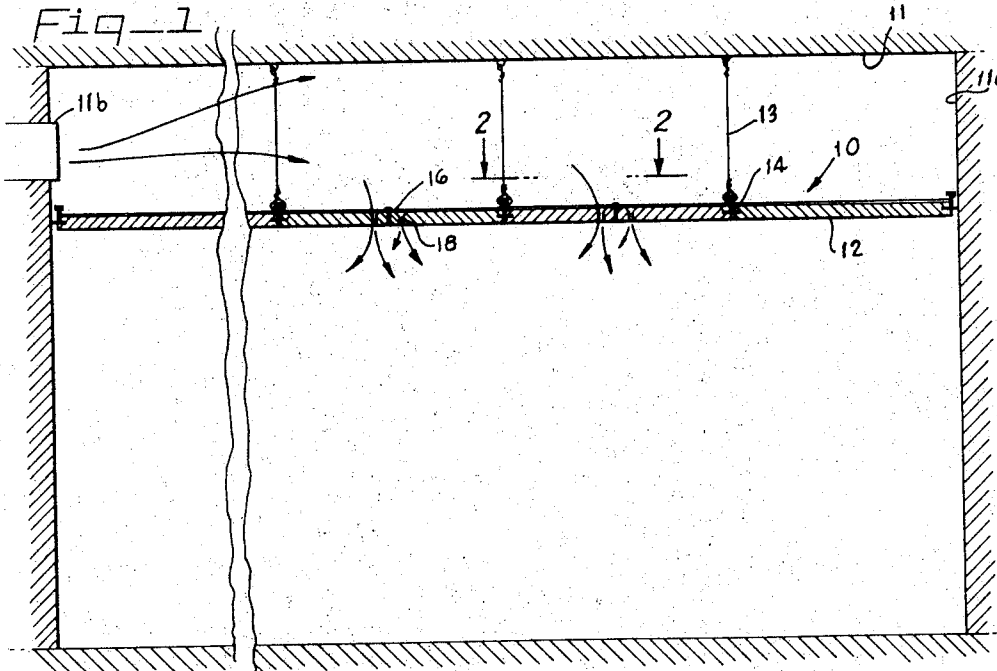
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2,996,138

PERFORATED PANEL CONSTRUCTION

Filed July 10, 1959

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

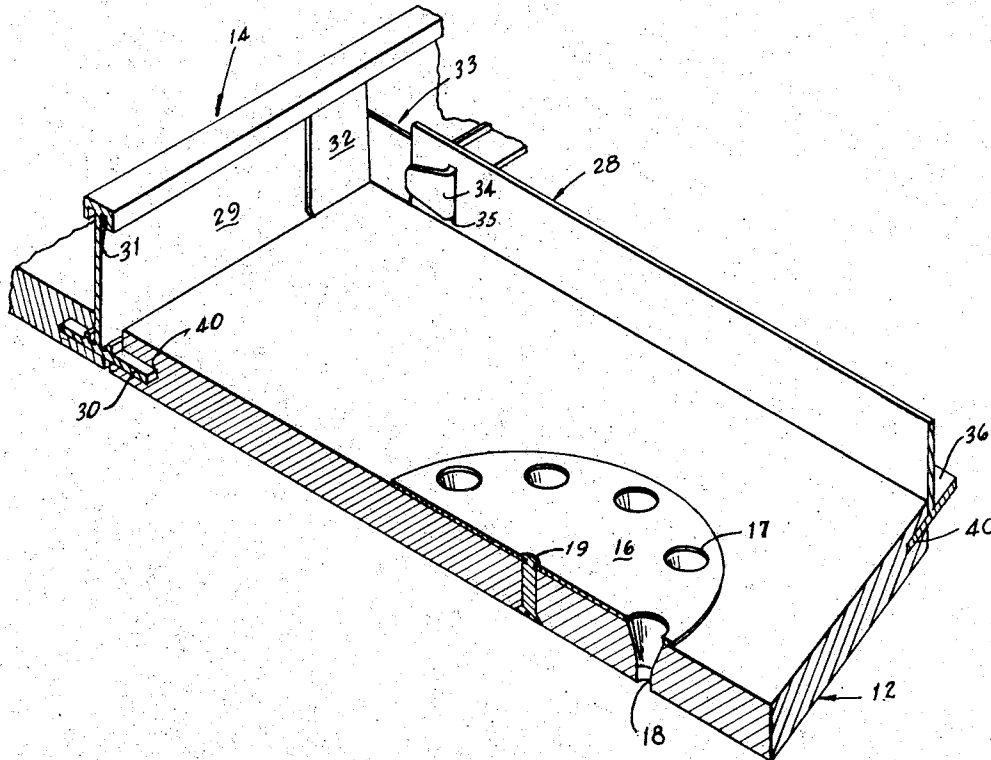


Fig-5

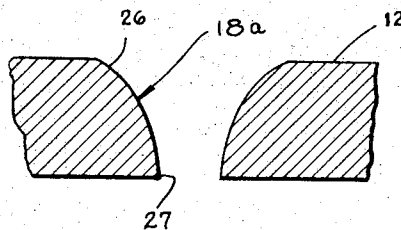


Fig-4

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2,996,138

PERFORATED PANEL CONSTRUCTION

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4 Claims. (Cl. 181—33)

This invention relates to ventilated, acoustical ceiling construction.

In the installation of acoustical ceilings it is a common practice to suspend a metal framework from the permanent ceiling of a room and to mount acoustical panels or tiles on the framework, such panels or tiles being of a solid but porous character. It is desirable, particularly in the case of large rooms, to ventilate the room by blowing air into the plenum (which is the space between the lower suspended ceiling and the upper, permanent ceiling) and providing air passages in the acoustical panels through which the air can pass into the room beneath the acoustical ceiling.

In a ceiling structure of this character it is advantageous to provide a means for adjusting the number and size of the air passages in the acoustical panels, and it is advantageous that such adjustment means be easily manipulated so that the number and/or size of the air passages can be varied.

There are a number of factors which determine the optimum number, size and distribution of air passages. These factors; hence the optimum air passage arrangement, will vary from one ceiling to the next, and they will vary with the same ceiling as conditions change. Typical relevant factors are the air pressure and volume rate of the source of air; the shape and dimensions of the plenum and the presence and nature of obstructions in the plenum; the relative volumes of the plenum and the room or rooms beneath; the presence and nature of obstructions in the room space beneath the plenum; other means which ventilate the room, etc. Clearly, the factors are such that a formula of general application relating air passage area and distribution to total ceiling area is not practicable. Of necessity, trial and error must be relied upon, and from time to time it may be necessary to make changes in the air passage area and/or distribution.

For these reasons, it is desirable to employ a means whereby the air passage area and distribution can be controlled and varied at will and with ease, and wherein the disturbing effect of clogging and fouling of air passages is minimized.

Heretofore rather complicated means have been provided for the control of air passage area and distribution. Also, the air passage orifices have been in the form of slots and have been prone to become clogged with dust, which renders them inefficient and which also has a detrimental effect on appearance of the ceiling.

It is an object of the present invention to provide improvements upon acoustical ceilings.

It is a further object of the invention to provide an improved means of ventilating rooms having acoustical ceilings.

It is another and particular object of the invention to provide improved means of adjusting the air passages in an acoustical ceiling.

Yet another object is to provide an orifice of improved character for acoustical ceiling panels.

It is a particular object of the invention to provide an acoustical ceiling panel which can be inserted in and removed from an acoustical ceiling at will, such panel being provided with air passages of superior design which do not become readily clogged with dust, such panel being

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also provided with means for controlling the air passage area at will.

These and other objects will be apparent from the ensuing description and the appended claims.

One form of the invention is illustrated by way of example in the accompanying drawings, in which:

FIGURE 1 is a fragmentary view in vertical section of a room equipped with an acoustical ceiling in accordance with the present invention.

FIGURE 2 is a top plan view as seen along the line 2—2 of FIGURE 1, showing one of the ceiling panels on a larger scale than that of FIGURE 1 and showing the valve plate employed to adjust the effective size of the air passages in the panel.

FIGURE 3 is a section taken along the line 3—3 of FIGURE 2.

FIGURE 4 is a fragmentary, sectional view of an acoustical panel with a different and preferred type of air passage.

FIGURE 5 is a fragmentary perspective view showing one way in which the ceiling panels of my invention can be mounted.

Referring now to the drawings and preliminarily to FIGURES 1, 2 and 3, in FIGURE 1 a room is shown equipped with an acoustical ceiling 10 which is suspended from a permanent ceiling 11 and which forms a plenum 11a into which a blower 11b blows air. The acoustical ceiling is formed by acoustical panels 12 which may be of any suitable type of construction of solid, porous character which is both heat insulating and sound absorbing. The ceiling 10 is suspended from the permanent ceiling 11 by means of wires or rods 13 attached to longitudinal frame members 14, such frame members and the cooperating cross members being shown in detail in FIGURE 5 and being described hereinafter.

Each panel 12, or in many cases only certain of the panels 12, are provided with valve plates 16. Each valve plate 16 is formed with openings 17 intended to register with air passages or orifices 18 formed in the respective panel. The valve plate 16 is rotatably mounted on and held against the upper surface of the panel 12 by means of a shaft or pin 19 which is preferably flush with the lower surface of the panel 12. The connection between the upper end of each shaft or pin 19 and its valve plate 16 is rigid so that by inserting a screw driver in the head of the shaft 19 and rotating it, the valve plate 16 will be rotated correspondingly. By this means it will be apparent that rotation of the valve plate 16 is very easy, and requires nothing more in the way of equipment than an ordinary screwdriver. Also this rotating means is conveniently accessible from below, and it does not require removal of any of the panels or access to the plenum 11a. It should be pointed out that the valve plates 16 can also be rotated from above, e.g., during installation of the ceiling, but it is very advantageous that they can be rotated from below after a ceiling has been installed, thereby avoiding the necessity of removing any of the panels 12 to gain access to the valve plate 16, and avoiding the need for any complex or difficult operations, or any skill or of special tools or instruments. Instead of a rotary valve member such as the valve plate 16 a sliding valve plate (not shown) may be used, but a rotary plate is preferred.

Referring now more particularly to FIGURE 3, it will be seen that each of the air passages 18 comprises an upwardly and outwardly flaring frusto-conical portion 21 and a lower, more or less vertical cylindrical portion 22. Such a shape is easily formed by a drill. In the case of an acoustical panel which is formed with sound absorbing holes which do not extend through the panel, the air passages 18 may be formed by drilling some of these

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holes completely through the panel and giving them the shape shown.

Referring to FIGURE 4, an orifice 18a of a different and preferred shape is there shown, which is more rounded from top to bottom, having a rounded flaring portion 26 at the top which tapers inwardly and uninterruptedly to a restricted throat at 27.

Referring now to FIGURE 5 an acoustical panel 12 is there shown which is fitted with a valve plate 16 and is formed with air passages 18, such panel being mounted on a longitudinal member 14 and a transverse member 28. The longitudinal member 14 comprises an upright body portion 29 and horizontal flanges 30 at the bottom and it has guide and supporting grooves or guideways 31 on each side and at top and bottom which are intended to slidably receive the head 32 of a connector clip 33 whose tip 34 extends through a slot 35 formed in the cross member 28, such tip being bent back upon the cross member 28 as shown. The cross members 28 are also formed with horizontal oppositely extending flanges 36. As will be seen each panel 12 is slotted along its edges at 40 for reception of the flanges 30 and 36 of the longitudinal and cross members 14 and 28, respectively, and it is recessed above the slots so that the lower edges of adjacent panels can be brought together to conceal the frame members 14 and 28. A grid of frame members 14 and 28 is employed to support acoustical panels in this manner and to form an acoustical ceiling. Further details of this type of framework and ceiling construction will be found in Schwartz and Lindheim United States Patent No. 2,888,113, issued May 26, 1959.

Among the advantages of the construction thus illustrated and described may be mentioned the following: The valve plates 16 are very easily manipulated. Their holes 17 are arranged to register precisely with the air passages 18 so that each valve plate 16 can be adjusted to wide open, completely closed and all intermediate positions of the air passages 18 or 18a. Such adjustments, as noted, can be made very easily by means of an ordinary screwdriver from beneath the ceiling.

The air passages or orifices 18 and 18a are advantageous because they do not plug up and clog nearly as much as passages of other shapes, for example, slots or cylindrical passages of uniform diameter. The air passages 18 and 18a conform to the natural flow of air. On the basis of experience and tests the number and placement of the perforated panels 12 and the setting of the plates 16 can be adjusted for a given room and set of conditions. Then final adjustments can be made at the time of installation and from time to time thereafter merely by manipulating the shafts 19.

It will, therefore, be apparent that a novel ventilated acoustical ceiling construction and a novel type of panel therefore have been provided which are very advantageous.

We claim:

1. A solid, porous acoustical panel having two parallel faces and formed with air passages extending between said faces for passage of air through the panel, said passages having a generally frusto-conical shape in

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cross section, said panel including a rotary valve member having openings adapted to register with said air passages, said valve member being rotatably mounted on said panel adjacent the wide ends of said air passages, and means accessible from the other face of the panel for rotating said valve member.

2. A solid, porous acoustical panel having two parallel faces and formed with air passages extending between said faces for passage of air through the panel, said passages having a tapered cross section tapering from a widest portion at one face to a narrowest portion at the other face, said panel including a rotary valve member having openings adapted to register with said air passages, said valve member being rotatably mounted on said panel adjacent the wide ends of said air passages, and means accessible from the other face of the panel for rotating said valve member.

3. An acoustical panel of solid, porous construction having an upper face and a lower face, said panel being formed with a plurality of air passages extending between said faces and adapted to pass air through the panel, said passages being of circular cross section and tapering in width from the upper face to the lower face, and a valve plate mounted rotatably on the upper face of the panel and formed with openings adapted to register with said air passages when the plate is in a predetermined angular position, said plate being rotatable from and to said position and being adapted to be rotated to other positions to adjust said air passages between fully closed and fully opened positions, said panel also having a shaft extending through the panel, one end of which is accessible from the lower face and is rotatable from such position, the other end of said shaft being fixed to said plate to rotate therewith.

4. An acoustical panel of solid, porous construction having an upper face and a lower face, said panel being formed with a plurality of air passages extending between said faces and adapted to pass air through the panels, said passages being of circular cross section and tapering in width from the upper face to the lower face, a valve plate mounted on the upper face of the panel and formed with openings adapted to register with said air passages, and a shaft extending through said panel, fixed at its upper end to the center of said plate to rotate therewith and to hold the plate against the upper face of the panel, the lower end of said shaft having means for engaging a screwdriver to bring about rotation of the shaft and panel.

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