Nov. 12, 1940. W. I. LUCIUS 2,221,001

VENTILATING CEILING

Filed Oct. 27, 1936 2 Sheets-Sheet 1

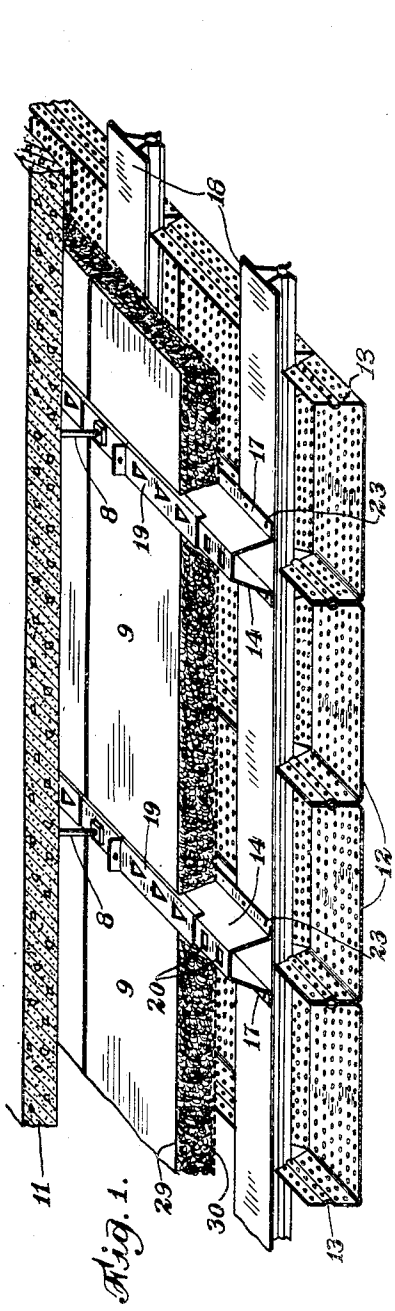


Fig. 1.

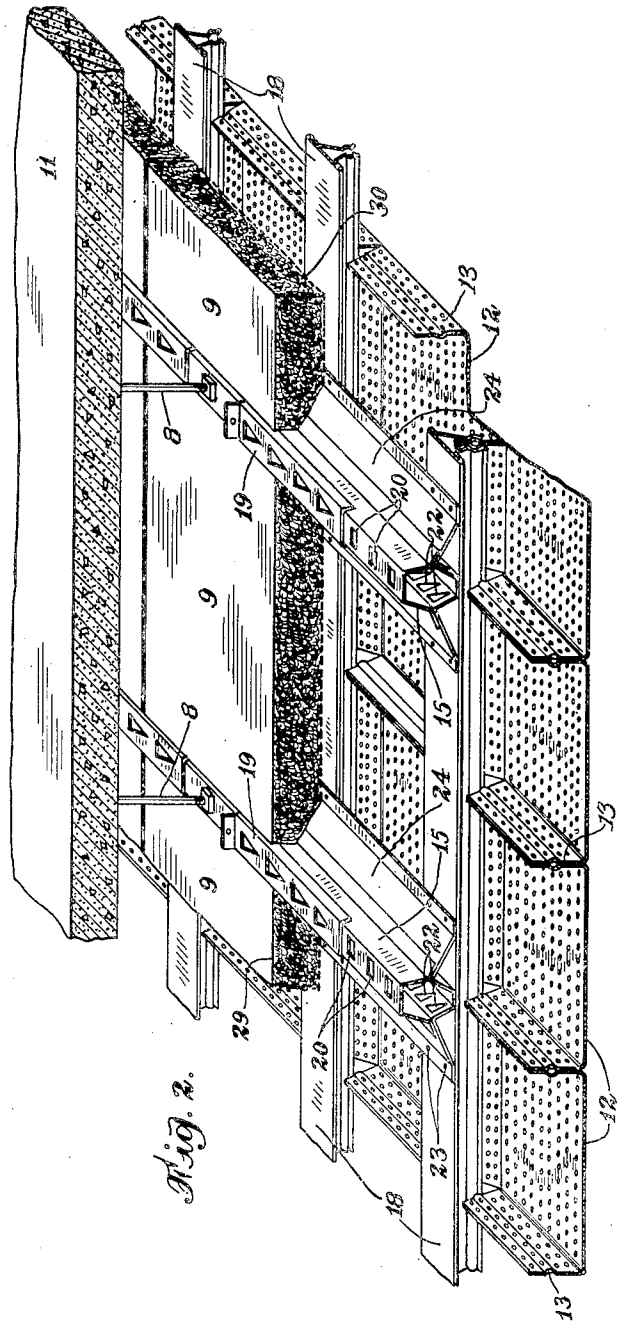


Fig. 2.

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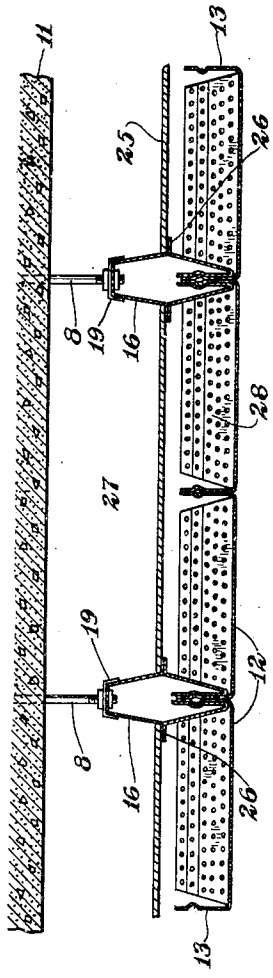


Fig. 4.

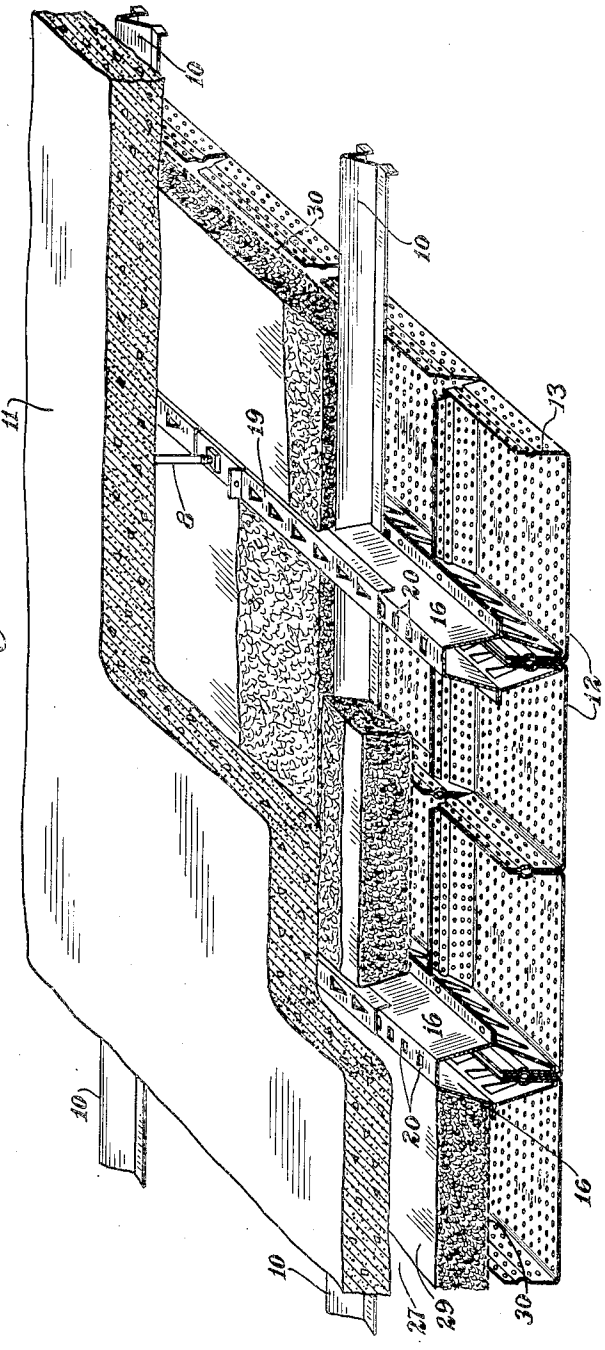


Fig. 3.

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VENTILATING CEILING

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Application October 27, 1936, Serial No. 107,756

7 Claims. (Cl. 98—33)

This invention relates to a ventilating partition and, more particularly, to one adapted both for ventilation and sound absorption.

Partitions which include sound absorbing units, such as pads of felted fibres of rock wool, asbestos, or the like, and sheet facing elements which are perforated at close intervals to admit incident sound to the pad are widely used as ceilings and side walls of rooms. In such constructions it is usual to support the pads by means of perforated pans or trays removably secured to spring fasteners in the form of T-bars and to support these bars by cross members that may be referred to as furring strips, the furring strips being suitably held in established relationship to the permanent side wall or ceiling.

I have discovered that the supporting or furring strips, or the equivalent thereof, may be used in effecting desirable distribution of air for ventilation.

It is an object of the present invention to provide a partition which is capable of absorbing sound and at the same time providing ventilation facilities for the room of which it forms a part.

It is another object of this invention to provide a partition structure in which the supporting members for the facing portion thereof also serve as air conveying and distributing members.

It is a further object of this invention to provide a partition which can be rapidly and economically erected and which will be strong and durable and present an attractive finish after erection.

In the drawings:

Fig. 1 is a perspective view, broken away for clearness of illustration, of a partition constructed in accordance with the present invention;

Figs. 2 and 3 are perspective views showing two modifications of the invention illustrated in Fig. 1, and

Fig. 4 is an elevational sectional view of still another modification.

There is shown in all of the figures a substantially air impermeable member 11 constituting a side wall or ceiling of a room and being of conventional material as, for example, a slab of concrete or a plastered wall.

Disposed in front of the member 11, extending generally parallel and in spaced relationship thereto, are sheet facing elements 12. These elements are provided with spaced openings adapted to admit incident sound and to make the elements readily air-permeable. While various perforated sheet materials may be used, as, for example, asbestos-cement or wood, the construction illustrated uses perforated metal pans to provide the facing. The pans may have upturned and beaded edges 13 adapted for interlocking relationship with suitable T-bars.

In the construction shown in Fig. 1, the support or furring member indicated at 14 is of modified channel shape, the flanges flaring in the forward direction and, suitably, being provided at their forward edges with outturned heels 17 extending approximately parallel to the back or web of the channel.

The supports are secured, as at their backs, to the impermeable member 11 as, for instance, by rods 8. The support members 14 are spaced from the member 11, at certain positions, at least, so that air may circulate freely between the backs of the supports and the member 11. At their forward portions the supports are secured to the facing elements by means of intermediate members 18 which may be the T-bars heretofore mentioned. The member 18 and supports 14 may be suitably connected as by spot-welding at points 23, and the upturned edges 13 of the pans 12 may be snapped into the T-bars.

Sound absorbing units of the kind described above or of other suitable composition fit between the sides of adjacent support members 14, preferably, snugly. These units define an air-filled plenum with the member 11 and define also a space with the facing elements.

Means are provided, such as a blower, for maintaining the air in the said plenum at a pressure slightly different from atmospheric, that is, for changing the air in the plenum, as by the introduction of air thereinto or withdrawal of air therefrom. Generally, it is considered desirable to introduce the air into the plenum, and the structures to be described are arranged particularly for such operation. However, the structures are suitable for circulation of air in either direction, as will be readily understood. Since the blower and lines are conventional, they are not illustrated. In accordance with the usual practice, the blower may be suitably situated outside the room and the air conveyed to the plenum, or from the plenum if such is desired, through a duct communicating with the plenum.

To permit the flow of air between the plenum and the space adjacent to the facing elements, that is, in front of the units 9, there are provided openings 20 permitting free communication between the plenum and the space within (the interior of) the hollow support members, as well

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as free communication between the interior of the hollow support and the space defined between the sound absorbing material and the facing elements. Adjustable dampers 19 may be laid over the closely perforated back of the supports. The dampers may be slidably adjusted, to control the amount of free opening through the backs of the support members.

The flaring flanges of the hollow supports 14 (Fig. 1) define therebetween a space that becomes wider and of greater area of cross section in forward direction, that is, towards the open side of the channel. As a result, the air which enters the openings 20 decreases in velocity as it is delivered through the support 14, this support serving also as a delivery member. This slowing down of the rate of delivery of air, into the space adjacent to and behind the facing elements, promotes evenness of flow and distribution of the air through the perforated facing elements and into the room to be ventilated and upon which the said elements face.

Slowness of movement of air in the space behind the facing elements is promoted, also, by the relatively large spacing of the sound absorbing units from the said elements. Thus the units, at their nearest points, may be spaced from the facing elements by about the width of the upstanding edges 13 of the pans 12, say, an inch or more and preferably about 1 to 2 inches.

Flow of air between the units 9, at the joints between edges thereof extending at right angles to the drection of the said supports in any of the embodiments shown, is prevented by joint closing means such as the strips 10 (Fig. 3) of metal, wood, or the like. Preferably, the strips 10 are of substantially inverted V-shape in cross section, as clearly illustrated in Fig. 3, the downwardly and outwardly flaring sides defining the V-shape serving to somewhat compress the edges of the units 9 to insure against passage of air between the units and the strips. The ends of strips 10 preferably rest upon and are supported by the horizontal flanges 17 of the supports 14 when employed in the embodiment of Fig. 1 and upon the similar flanges of the supports 15 and 16 when employed in the embodiments of Figs. 2 and 3, respectively. The strips 10 also serve as additional supports for the units 9.

To promote further the desired and relatively uniform distribution of air in the space behind the facing elements, so that the air may pass rather uniformly through all of the openings therein, supports of the type shown at 15 in Fig. 2 may be used.

In these supports, the back portions are also perforated at close intervals and the forward portion is enclosed except for apertures 22 which place in communication the space within the hollow supports and the space adjacent to and just to the rear of the facing elements. Each of these apertures may be of varying width decreasing in a forward direction, as, for instance, triangular, with the point of the triangle directed towards a facing element. Also, the said forward portions of the supports may include sides that converge in forwardly direction, as illustrated, so that the planes in which these sides lie are sloped with respect to the plane of the facing elements and so that the air forced through the said apertures issues therefrom in direction at an acute and small angle to the rear of a facing element.

The supports 15 may be secured to the facing elements in any suitable manner. Thus, if the T-bars 18 are used as intermediate supports, the support members 15 may be spot welded, bolted or screwed thereto, as at positions 23, and the T-bars, in turn, may engage the beaded edges of the facing elements in the same manner as in the construction illustrated in Fig. 1.

For some purposes there may be used the flanges 24 extending from a point behind the apertures 22, in front of the sound absorbing units, and at an acute and small angle to the plane of the rear of the facing elements. With such a construction, air issuing through the holes 22 moves substantially uniformly into the space between the sound absorbing units and the facing elements. The flanges 24 extend laterally, and preferably forwardly, from the sides of the supports. The units 9 fit snugly behind and against these flanges or against the sides of the supports 15.

The partitions shown in Figs. 3 and 4 include hollow supports or furring members 16 which combine the functions of a ventilating furring strip and a T-bar directly engaging the facing elements. The forward portions of these supports 16 have sides converging in forward manner and providing means for engaging therebetween the facing elements. Thus, the pan facing elements 12 may be engaged by inserting their upstanding edges 13 between the said converging sides.

The partition shown in Fig. 4 also includes the hollow support members 16 as well as the other features of the partitions shown in the other figures, except that the sound absorbing pads, or the like, are replaced by substantially sound impermeable members 25. These members, like the sound absorbing units of the other figures, rest upon a shoulder or flange 26, or against some other part of the side of the hollow support member, and define a plenum 27 with member 11 and a space 28 with the facing elements 12. The members 25 may be constituted of air-impermeable material, as, for example, glass, insulating fibreboard, or asbestos cement sheeting. A partition as illustrated in Fig. 4 absorbs a substantial amount of sound incident upon its face.

For best results the units 9 and sheets 25 should be barriers to the passage of air therethrough, from back to front, that is, from the plenum into the said space, or vice versa. These barriers as illustrated extend between and close the space between adjacent supports, as between the midportions of the sides thereof. When the units are constituted largely of a porous fibrous pad or the like, they should have a backing, such as a sheet of paper, light metal or other air-impermeable material disposed continuously over the rear side of the unit and preferably extending into the place of meeting of the units with the supports. Suitably, the units 9 include a case having back and sides of asbestos paper 29 and an air-permeable front 30, as, for example, one of fine wire gauze, cheesecloth, or the like. Such units may be made as described in U. S. Patent 1,984,190 issued to Huffine on December 1, 1934. The case or backing may be omitted, however, if it is not desired to prevent passage of air completely through the unit, from back to front.

The partition shown in Fig. 4 in addition to providing the desirable ventilating features illustrated in the other assemblies is particularly useful as an acoustical construction when it is desired to absorb sounds of certain frequencies to a much larger extent than sounds of other frequencies. Thus, there may be used, for sounds of rela-

tively low frequencies, such a construction in which the openings in the facing elements are holes of area of cross section equal approximately to the area of circles $\frac{3}{32}$ to $\frac{3}{16}$ inch diameter, the openings being spaced on about one-fourth to one-half inch centers, and the members **25** being spaced from the sides of the facing elements at a distance of about ½ to 2 inches.

The details that have been given are for the purpose of illustration, not restriction. It is intended, therefore, that variations within the spirit of the invention should be included within the scope of the appended claims.

What I claim is:

1. A ventilating partition comprising an impermeable member constituting a wall or ceiling, air-permeable facing elements, hollow supports for said facing elements, means suspending said support directly from said member, and substantially air-impermeable barriers extending between and closing the space between the sides of adjacent supports, defining an air-filled plenum with the said member and defining a space with the facing elements, the hollow supports being provided with perforations placing the interior of the supports in communication with the said plenum and space.

2. A sound-absorbing and ventilating partition comprising an impermeable member constituting a wall or ceiling, sheet facing elements extending generally parallel to the said member in spaced relationship thereto, said sheet facing elements being provided with closely spaced openings adapted to admit incident sound, units of sound-absorbing material disposed between the facing elements and said member and defining an air filled plenum with the said member and a space with the facing elements, means directly connected to said impermeable member for supporting the facing elements and said units and for delivering air for ventilation from the plenum into the space between said units and facing elements, said means including a hollow member comprising outwardly diverging depending flanges and having passages opening from its hollow interior to said plenum and to said space, respectively.

3. A sound absorbing and ventilation partition of the kind described comprising an impermeable member constituting a wall or ceiling, sheet facing elements extending generally parallel to the said member, in spaced relationship thereto, and provided with closely spaced openings adapted to admit incident sound, units of sound absorbing material disposed between the impermeable member and facing elements and defining an air-filled plenum with the said member and a space with the facing elements, and a hollow support secured to the impermeable member, supporting the facing elements, and including flanges spaced from the facing elements, the said units fitting against the sides of the support members and resting on the flanges, and the support members being provided with openings to permit passage of air from the plenum, through the support members, and into the space between the facing elements and the said flanges.

4. A sound-absorbing and ventilating partition comprising a substantially air-impermeable member constituting a wall or ceiling, sheet facing elements extending generally parallel to said member in spaced relationship thereto and having closely spaced openings for the admission of incident sound, units of sound-absorbing material arranged between the facing elements and said member to define an air-filled plenum with said member and a space with said facing elements and hollow supporting means carried directly from said member and supporting said sound-absorbing material and facing elements, said hollow supporting means having passages providing communication between their hollow interior and said plenum, said hollow interior opening into said space, whereby there is provided direct passages for air between said plenum and said space.

5. A sound-absorbing and ventilating partition comprising a substantially air-impermeable member constituting a wall or ceiling, sheet facing elements extending generally parallel to said member in spaced relationship thereto and having closely spaced openings for the admission of incident sound, sound-absorbing material arranged between the facing elements and said member to define an air-filled plenum with said member and a space with said facing elements, and hollow supporting means carried from said member and supporting said sound-absorbing material and facing elements, each said supporting means comprising a channel including a base and depending flanges, said base having a plurality of openings therein to provide direct passages for air between said plenum and said space.

6. A partition as defined in claim 4 including means securing the hollow supporting means to the sheet forming elements, said securing means comprising cross strips secured on one side to the supporting means and on the other side to the facing elements.

7. A partition as defined in claim 4 including air-impermeable means for closing the joints between the edges of contiguous ones of the units of sound-absorbing material.

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