

Oct. 13, 1953

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2,655,348

HEAT EXCHANGE AND SOUND ABSORBING WALL UNIT

Original Filed March 3, 1949

Fig. 1.

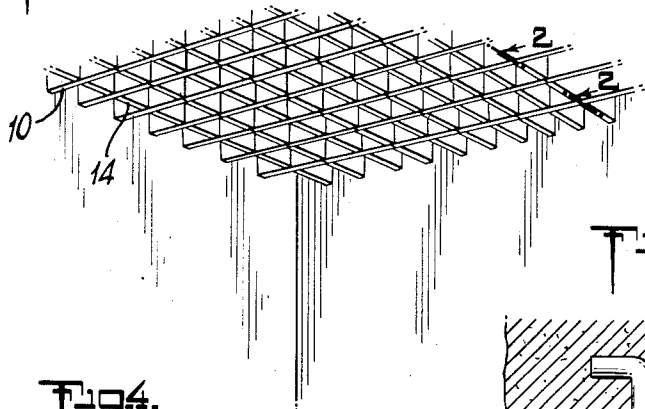


Fig. 4.

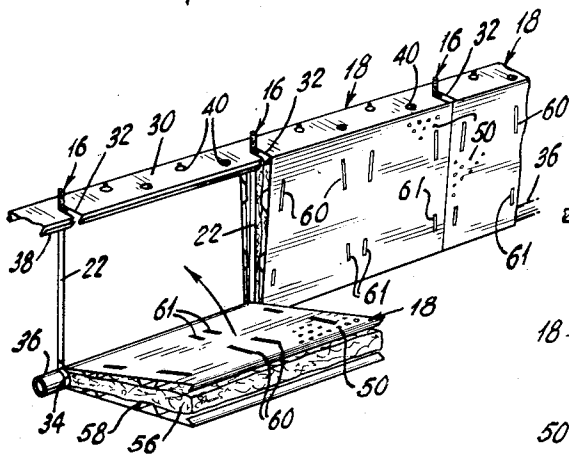


Fig. 3.

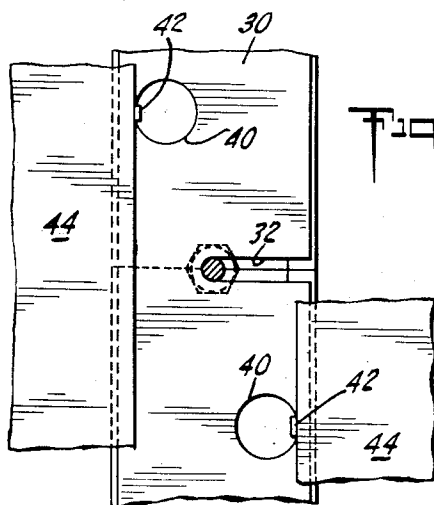
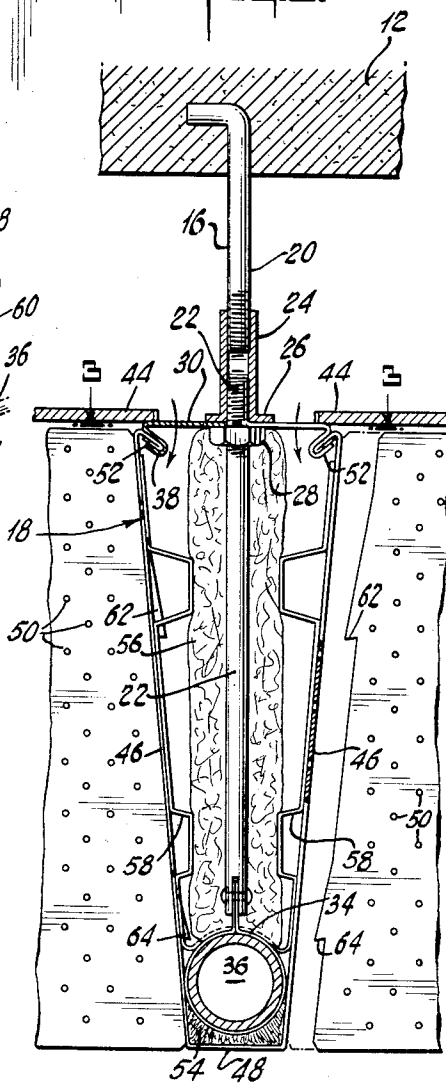


Fig. 2.



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2,655,348

HEAT EXCHANGE AND SOUND ABSORBING
WALL UNIT

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Continuation of application Serial No. 79,349,
March 3, 1949. This application November 17,
1949. Serial No. 127,963

8 Claims. (Cl. 257-124)

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The instant invention relates to treatments for walls such as ceilings, and more particularly to treatments which will provide for both heat distribution and sound absorption.

In my copending application, S. N. 79,349, filed March 3, 1949, of which the present application is a continuation as to all common subject matter, I have disclosed a novel structure comprising sound absorbing partitions extending inwardly from and supported by the ceiling, and cross partitions between and supported by the main partitions to provide a checkerboard or egg crate effect with the ceiling exposed between the partitions. The construction provides an efficient acoustical treatment and, at the same time, enables the ceiling to be used for radiant heating, the exposed areas defining the heat radiating surfaces.

A principal object of the instant invention is the provision of an acoustical treatment of the general type of that referred to above and employing a number of its construction features, but which utilizes the walls of the partitions as the radiant heating surfaces.

Another object of the invention is the provision of a structure comprising sound absorbing partitions having heat conducting and radiating side walls in heat conducting relationship with conduits conveying a heating medium such as hot water, the partitions and conduits being suspended from the permanent ceiling.

Another object of the invention is the provision of a structure of the type referred to in which the conduits are suspended at intervals by hangers, the hangers having longitudinally extending supports spaced above the conduits. U-shaped casings, which define the partitions, are mounted to surround the conduits with the upper edges of the side walls or face panels of the casings secured to the supports.

A further object of the invention is the provision of a ceiling structure which permits the circulation of air from a plenum chamber into the U-shaped casings and through perforations in their walls to enter the room as a distributed air flow.

Another object of the invention is the provision of an acoustical treatment combined with radiant heating, the construction features promoting easy assembly and disassembly.

My invention will be more fully understood and further objects and advantages thereof become apparent when reference is made to the following detailed description of a preferred embodiment and to the accompanying drawings in which:

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Fig. 1 is a perspective view of a room interior illustrating a ceiling of the instant invention;

Fig. 2 is a sectional view, on an enlarged scale, taken on the line 2-2 of Fig. 1;

Fig. 3 is a sectional view, taken on the line 3-3 of Fig. 2; and,

Fig. 4 is a perspective view illustrating the manner of assembly of the partitions.

Referring now to the drawings, there is shown a treatment in accordance with the instant invention applied to a ceiling of a room. However, it will be appreciated that other walls may be similarly treated. The structure comprises spaced partitions 10 extending preferably from wall to wall of the room and suspended from a base or ceiling slab 12, and cross partitions or units 14 supported from the partitions 10. The support for the units 14 is of the type disclosed in my copending application and will be more specifically described later. In the preferred embodiment partitions 10 and 14 are both sound absorbers. The partitions are of suitable depth, say 6" to 12".

Referring now particularly to Figs. 2, 3 and 4, the construction features of the partitions and the supporting structure will be described. Hangers or rods 16 are secured to the ceiling slab 12 in rows, the rows being spaced at suitable intervals, depending upon the desired spacing of the partitions. For example, the rows may be 24" apart. The hangers of each row are spaced apart a distance approximately equal to the length of individual units 18 (see Fig. 4) making up the main or longitudinal partitions. Each of the hangers is made up of an upper section 20 and a lower section 22 in left and right-hand threaded engagement, respectively, with a connecting sleeve 24, the latter having a flange 26 at its lower end. A nut 28 is threaded on the section 22 below sleeve 24, the flange and nut being adapted to embrace a strip 30. Strip 30 extends longitudinally of the row of hangers and is provided with notches 32 opposite the hangers whereby it may be laterally inserted into position. The lower end of section 22 carries a loop 34. A conduit 36 extends longitudinally of the row of hangers and through the aligned loops. The conduits 36 of the several rows are connected to supply and return headers (not shown), or are in the form of a coil connected to supply and return lines, whereby a heating medium such as hot water may be circulated through the conduits. Strip 30 is spaced above the bottom of conduit 36 a distance substantially equal to, but preferably slightly less than the height of the partition.

Strip 30 has its lateral edges bent backwardly and then forwardly into U-shapes to define pockets 38. The strips are also provided with openings 40 at intervals to permit the passage of air or other fluid through them. Lugs 42 are struck up from the metal of the strips at suitable intervals, the lugs preferably, as shown, being formed from a portion of the metal removed in forming openings 40. The lugs define stops for panels 44 forming an inner or false ceiling, the panels having their marginal edges resting on the strips.

Panels 44 may be of any suitable material to provide the desired decorative or other effect. For example, they may be translucent panels and lighting means may be placed above them whereby a diffused lighting effect is obtained. On the other hand clear glass or panels of asbestos cement or other decorative materials may be used.

The partitions 10 are composed of the endwise adjacent units 18, each comprising an elongated U-shaped metal casing of the type disclosed in my said copending application and consisting of side walls 46 connected at their lower edges by a bottom wall 48. The casings are of a length substantially equal to the spacing between hangers 16, as previously mentioned, and are of a suitable gauge of metal, such as sheet steel of 22 to 24 gauge. At least the side walls are provided with a multiplicity of closed spaced perforations 50 to permit the passage of sound to the interior of the casing. The size and spacing of the perforations conform to conventional practice in the art of perforated metal sound absorbing ceilings of the type as shown, for example, in patent to Norris, No. 1,726,500, issued August 27, 1929. The upper edges of the side walls are provided with turned flanges 52 for reception within pockets 38 at the margins of strips 30. As will be noted, pockets 38 are spaced apart a distance greater than the width of base 48 whereby the side walls flare upwardly and outwardly.

The casings making up a partition enclose the corresponding conduit 36, the latter lying adjacent the lower wall 48 of the casing. The width of the casing at this point is substantially equal to the diameter of the conduit whereby the side walls are in contact, or substantially in contact with the conduit. A mass of heat conducting material 54 is inserted between the bottom wall and the lower margins of the side walls to provide a heat conductive bed in which the conduit lies. The heat conducting material 54 may be a mass of tightly packed metal foil or iron filings, or the like.

The hollow interiors of the casings contain sound absorbing bodies 56, such as pads or mats of mineral wool or other fibrous material. The pads are centered within the casing, and the side walls are pressed resiliently outwardly from the pads by members 58 made of springy metal and spaced at suitable intervals longitudinally of the casing. Members 58 are suitably shaped, as shown, to have outwardly projecting sections contacting the panels, and intermediate, inwardly extending sections contacting the pad. The lower ends of the members are shaped to rest on conduit 36.

The side walls of the casings defining partitions 10 are provided with slits 60 and 61 (see Fig. 4). Single slits 60 and 61 are located adjacent the ends of the casings, the slits of endwise adjacent casings forming a pair to receive projections of opposite side walls of the units of

the cross partitions 14 as will be later more fully described. Also, pairs of the slits may be provided at an intermediate point where an intermediate cross partition is desired. It will be noted that the upper slits 60 of a pair are spaced further apart than the lower slits 61 to maintain the side walls of the cross partitions in upwardly and outwardly flaring relationship.

The units making up the cross partitions 14 are of similar type to the units of the longitudinal partition, except that no provision need be made for the reception of the conduit 36 and, hence, the pads and the springy spacing elements may extend the full height of the casings, the units preferably being the same as shown in my said prior application. The end edges of the casings are provided with upper projections 62 and lower projections 64 spaced apart the same distance as the slits 60 and 61 in the partitions 10.

In erecting the treatment of the instant invention, sections 20 of hangers 16 are mounted in any suitable manner in the ceiling slab to extend downwardly therefrom. Conduits 36 are mounted in the loops 34 of sections 22 of the hangers and the two hanger sections are connected together by sleeve 34. Due to the right and left-hand threads leveling of the conduits may readily be achieved. The longitudinal strip 30 overlying each partition is assembled on the hangers and nut 28 is tightened to embrace the strip between the nut and the flange 26. Panels 44 may then be placed in position with their marginal edges overlying the margins of the strips and abutting against stops 42. However, the panels may be mounted at a later time if desired.

The sound absorbing units are placed one at a time around the conduit and secured to plates 30, the manner of assembly being best illustrated in Fig. 4. The casing containing the bed of heat conductive material 54 adjacent its bottom wall is slipped laterally onto the conduit, and the spring element 58 and sound absorbing pad 56 inserted. The unit is then swung on the conduit as a pivot to an upright position, and flanges 52 inserted in pockets 38 of the strips 30. Inasmuch as the metal of the casings is of relatively light gauge and flexible, the casings may readily be deformed to the extent necessary to force them between the rods or hangers 16. The units, when in position, lie in relatively close, endwise relationship.

When the longitudinal partitions 10 are completed, the transverse units are mounted by forcing their side panels toward each other until they diverge to the same extent as the slits 60 and 61, and then springing the side panels of the partitions 10 inwardly to permit projections 62 and 64 to enter the slits. This operation is the same as that described in my copending application. The transverse units are held firmly in position, both by the pressure of the side panels of the partitions 10 against the ends of the units, and the outward pressure of the side walls of the transverse units. Whenever it is necessary or desirable to remove the transverse units for any reason, the side panels of the partitions 10 need only to be sprung inwardly sufficiently to permit the projections on the units to be released from the slits.

The construction provides an attractive, easily assembled ceiling treatment which presents a large area of sound absorbing material to the sound to be absorbed. At the same time the side walls of the longitudinal partitions provide radiant heating surfaces to which heat is conducted from conduits 36. The spaced members

58 serve, in addition to their other functions, as conductors of heat to the upper portion of the walls, thus increasing the heat radiating effectiveness of the entire casing walls. Due to the slant of the side walls the heat rays are directed to all points of the room space. Although the longitudinal partitions 10 supply the major radiating surfaces, heat will also be conducted to the transverse partitions whereby they will also serve as heat radiating surfaces, at least to some extent. Fresh air, preheated or not as desired, may be introduced into the plenum chamber defined by the panels 44 and the ceiling slab, the fresh air entering the partitions through openings 40 and filtering into the room through the numerous perforations 50.

The system is extremely flexible. Any number of the transverse units may be employed to supplement the sound absorbing effect of the longitudinal partitions as well as to provide a desired ceiling pattern. Light diffusion is provided by the partitions and this may be augmented and the light source obscured by employing a light diffuser, such as a frosted glass or plastic for the panels 44, and locating the light source above the panels.

Having thus described my invention in rather full detail, it will be understood that these details need not be strictly adhered to but that various changes and modifications may suggest themselves to one skilled in the art, all falling within the scope of the invention as defined by the subjoined claims.

What I claim is:

1. In a treatment for a wall such as a ceiling, a conduit, means suspending the conduit from the wall, a sound absorbing partition having sound pervious heat conducting and radiating walls enclosing said conduit and in heat conducting relationship thereto, sound absorbing means between said walls, and means supporting said partition from said suspension means.

2. In a treatment for a wall such as a ceiling, a conduit, means suspending the conduit from the wall, a sound absorbing partition comprising U-shaped metal casings having sound pervious walls enclosing the conduit with the conduit adjacent the base of the U in heat conducting relationship therewith, sound absorbing means within said casings, and means supporting said casings from said suspension means.

3. In a treatment for a wall such as a ceiling, a conduit, means suspending the conduit from the wall, a sound absorbing partition comprising U-shaped metal casings having sound pervious walls, means positioning the casings with the walls enclosing the conduit and with the conduit adjacent the base of the U in heat conducting relationship with the casings, sound absorbing pads within said casings, and means spacing the pads from the side walls of the casings and adapted to conduct heat to the upper portion of the casings.

4. In a treatment for a wall such as a ceiling, a conduit, means suspending the conduit from the wall, a sound absorbing partition comprising U-shaped metal casings having sound pervious walls, means positioning the casings with the walls enclosing the conduit and with the conduit adjacent the base of the U in heat conducting relationship with the casing, said heat conducting

relationship being defined in part by a bed of heat conducting material between the conduit and the base of the casings, and means for absorbing sounds penetrating said casings.

5. In a treatment for a wall such as a ceiling, a conduit, rods suspending the conduit from the ceiling at intervals, a partition comprising U-shaped metal casings enclosing the conduit with the conduit adjacent the base of the casings and in heat conducting relationship with the casings, said casings including outwardly and upwardly extending side walls, supports carried by said rods above said conduit, and cooperating means on said side walls and supports for securing the casings to the supports.

6. In a treatment for a wall such as a ceiling, a conduit, members suspending the conduit from the ceiling at intervals, a partition comprising U-shaped metal casings enclosing the conduit with the conduit adjacent the base of the casings and in heat conducting relationship with the casings, said casings having sound pervious, upwardly extending side walls, supports carried by said suspension members above said conduit, cooperating means on said side walls and supports for securing the casings on the supports, and sound absorbing pads within said casings between said side walls.

7. In a treatment for a wall such as a ceiling, a conduit, means suspending the conduit from the ceiling, a partition comprising U-shaped metal casings enclosing the conduit with the conduit adjacent the base of the casings and in heat conducting relationship therewith, said casings having upwardly extending, perforate side walls, strips carried by the suspension means above the conduit, cooperating means on the strips and side walls to support the U-shaped members therefrom, and apertures in the strips to permit the entry of air to the interiors of the members.

8. In a treatment for a wall such as a ceiling, a conduit, means suspending the conduit from the wall, a sound absorbing partition comprising U-shaped casings having sound pervious heat conducting and radiating walls, means positioning each casing with its walls enclosing the conduit and with the conduit adjacent the base of the U in heat conducting relationship with the casing and sound absorbing means within said casings.

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