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RADIANT HEAT EXCHANGE AND ACOUSTICAL
STRUCTURE FOR BUILDINGS
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Fig. 1.

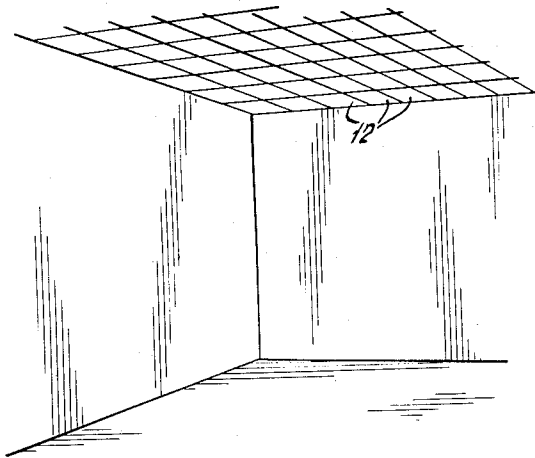


Fig. 2.

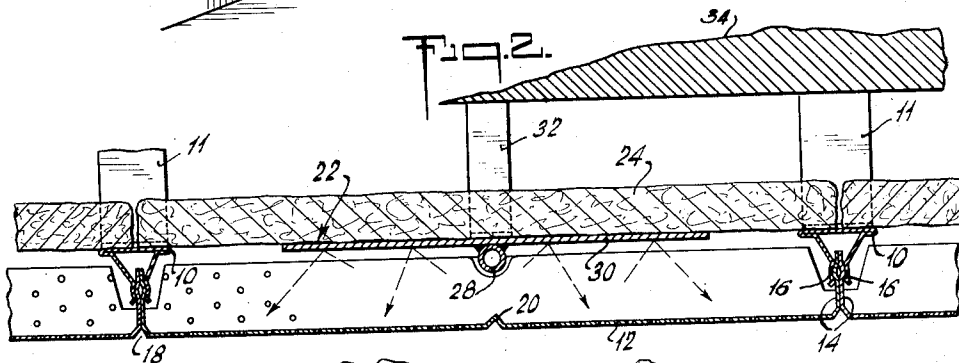
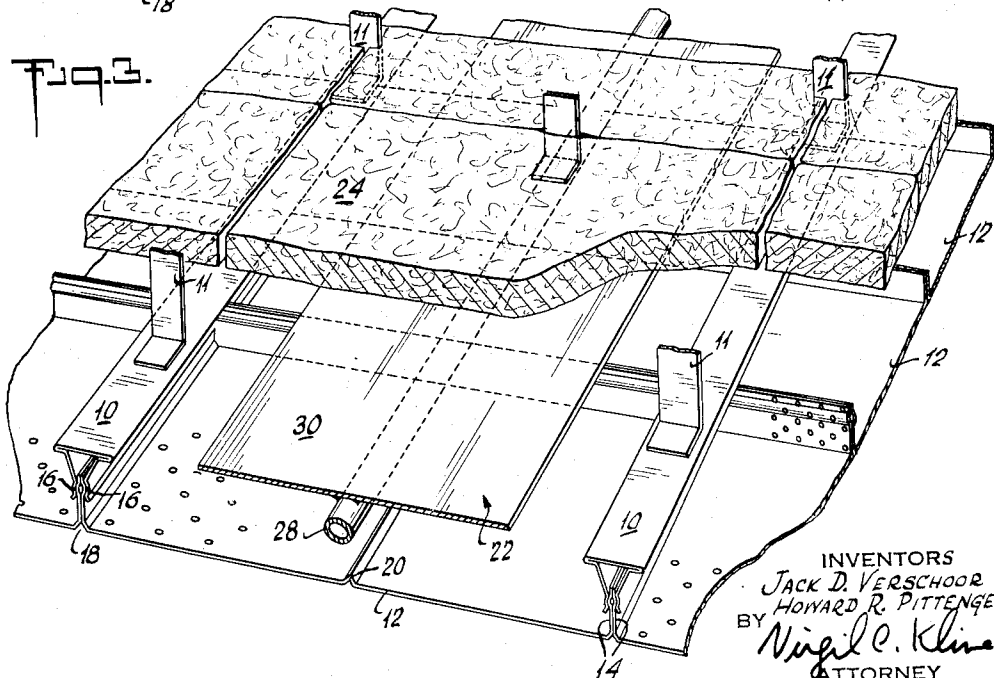


Fig. 3.



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RADIANT HEAT EXCHANGE AND ACOUSTICAL STRUCTURE FOR BUILDINGS

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3 Claims. (Cl. 257—124)

1

The instant invention relates to a treatment to adapt a wall surface to perform as a heating or cooling element and, more particularly, to provide a wall surface which, in the heating season, may radiate heat, and in the summer season, may serve as a cooled body to which heat may be transferred by radiation as well as by convection and conduction.

Radiant heat, as a principal or important means of heating homes and buildings, has recently been emphasized, the proposals most often requiring hot water or steam lines, or other source of heat, to be embedded in the plaster or the base slab of the room wall. It will be appreciated that the term "wall" is used herein to refer to the ceiling and floor, as well as the side walls of a room. Such systems operate satisfactorily where the radiating surface is exposed, but are inefficient if the surface is covered as, for example, in the case where the ceiling slab is to be used as the radiant surface and conventional types of acoustical treatments which involve fibrous absorbers are beneath the slab.

The instant invention has for its principal object the provision of an improved system which provides for the incorporation of radiant heating and/or cooling means in a structure embodying an acoustical system or the like requiring a false ceiling suspended from the base ceiling or slab.

More specifically the invention has for an object the provision of radiant heating means embodied in an acoustical system of the type shown in patent to Norris #1,726,500, issued August 27, 1929, and which consists of a perforated facing or layer, usually in the form of a plurality of individually mounted sound-pervious metal pans, with sound-absorbing material supported behind the faces of the pans. In the conventional structure the walls or flanges of the pans are engaged in runners or T-bars suspended from the base wall or ceiling at spaced intervals and a sound-absorbing pad is placed in each pan. In accordance with the instant invention, improved means are provided for heating and/or cooling the faces of the pans.

Another object of the invention is the provision of a wall structure carrying an acoustical treatment of the type referred to and including means behind the facing and beneath the sound-absorbing medium to transmit heat to the facing by radiation whereby the facing, in turn, radiates heat to the interior of the room. More specifically an object of the invention is the provision of a structure including a heating element in heat conductive relationship to a mem-

2

ber or plate having a heat radiant surface toward and in spaced relationship to the facing. The sound-absorbing material is placed behind the plate whereby it serves not only as a sound-absorber, but also as a thermal insulator to prevent dissipation of heat by convection or conduction in the plenum chamber between the facing and the base wall.

A still further object of the invention is the provision of a system as described above in which the radiant surface of the plate is of high heat emissivity.

A still further object of the invention is the provision of a construction as described above in which the heating means is suspended independently of the facing.

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

Fig. 1 is a perspective view of a partial room interior illustrating the appearance of the ceiling treatment;

Fig. 2 is a sectional view, on an enlarged scale, taken through the ceiling treatment of Fig. 1; and,

Fig. 3 is a perspective view, on an enlarged scale and with parts broken away for clearness of illustration, looking downwardly upon the ceiling treatment.

Referring now to the drawings, a basically conventional acoustical treatment is shown including features of the construction disclosed in the previously referred to patent to Norris, #1,726,500. The treatment consists of longitudinally extending T-bars 10 supported at suitable intervals by hangers 11 from a building structure 12 partially illustrated in Fig. 2. The T-bars, which are formed of any strong, light gauge material, preferably steel, support a plurality of shallow metal pans 13, each having upstanding walls or flanges 14 provided with integral beads 16 for interlocking engagement between the lips of the T-bars. Conventionally the pans are made 12 x 24" and are supported by their end flanges, the T-bars being spaced 24" O. C. However, pans of other dimensions may be used and the T-bars spaced accordingly. To give a tiled appearance to the ceiling, as illustrated in Fig. 1, the pans are beveled at their edges to provide a V-groove 18 between adjacent pans and, where 12 x 24" pans are used, a centrally located groove or indentation 20 may be provided to simulate the division of the pan into two square panels.

In accordance with the instant invention,

sound-absorbing material 24 of any suitable type, such as pads or blankets of mineral wool, glass wool, wood fiber, or the like, is mounted above the T-bars to provide room for the radiant heating means, indicated generally at 22. As illustrated, the sound-absorbing material 24 may have its edges resting on the bases of the T-bars and its central portion supported by the heating element 22, although this is not essential, and the absorbent material may be mounted in any other suitable way. For example, it may be secured by an adhesive or other means to the ceiling slab behind the treatment.

The heating means or radiator 22 consists of a heating element, such as conduit 28, adapted to be connected to any suitable boiler or other source (not shown) of steam, hot water, or the like. Also, an electrical heating element can be substituted for the conduit, it being appreciated that the particular source of heat is not critical to the invention. A plate 30 of a highly heat conductive material, such as aluminum, copper, or steel, is supported in heat conducting relationship with the conduit 28 or heating element of other type. Where the conduit is used, preferably it is made of the same material as the plate, and the two are secured together by welding, soldering, or the like. The under surface of the plate, that is, the surface toward the facing, is preferably treated to give it a high radiant heat emissivity; that is, to reduce its heat reflective property. For example, it and the conduit as well may be given a dulling coating, such as black paint, although other surface dulling coatings or treatments may be applied. The plate 30 and conduit 28 thus constitute a radiator which is supported preferably independently of the T-bars by hangers 32 spaced at suitable intervals and fastened to the base ceiling or slab. It will be recognized that, although the heating element 28 and plate 30 have been shown between only one pair of T-bars, the same construction will be employed between other, if not all, of the remaining pairs of T-bars, so that the heating elements are at the required intervals throughout the area of the room. Depending upon the particular conditions in any given case, the plate will be so dimensioned and supported at such distance from the facing that the desired radiation will be obtained without unduly interfering with the sound-absorbing function of the system.

The system described above is particularly designed for heating by radiation and in such case hot water, steam, or the like is supplied to the conduits 28 and heat is conducted from the conduits to the plate 30 which radiates heat to the facing 12. The facing, in turn, radiates heat to the room below. It will be recognized that in this system, as in any radiant heating system, while emphasis has been placed on heat radiation, heat will also travel from the conduit 28 and plate 30 to the facing by conduction and convection. Also, the room below, although heated in part by radiation, will also be heated by convection and conduction. However, the present system promotes the transfer of heat by radiation.

The system is also adapted for room cooling. For example, a medium such as water at a lower temperature than the room may be circulated

through conduits 28. In such case plate 30 and facing 12 will be maintained at lower than room temperatures and heat will be lost to the fluid within the conduit via the plate 30 and facing 12 by radiation, as well as by convection and conduction.

The system of the instant invention permits the use of conventional acoustical treatments with only minor modification. Inasmuch as the heating or cooling system and the acoustical system may be independently supported, the systems may be readily installed and removed and also high temperature heating media, such as steam, may be used without posing contraction and expansion problems in the acoustical structure.

Having thus described our invention in rather full detail, it will be understood that these details need not be strictly adhered to and 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 we claim is:

1. A combined radiant heating or cooling and acoustic system for a space comprising a building structure, a perforated sound-pervious and heat-radiating metallic facing, means supporting said facing in spaced relationship with said structure, radiators spaced between said facing and said structure and spaced from said means, said radiators each including a plate in heat conducting relationship with a fluid conduit, and sound-absorbing heat-insulating material positioned between said radiators and said structure and acoustically exposed to said facing.

2. The construction specified in claim 1 wherein the plate portions of said radiators are flat and extend substantially parallel to said facing but cover a portion only of said sound-absorbing heat-insulating material.

3. A combined radiant heating or cooling and acoustic system for a space comprising a building structure, a perforated sound-pervious and heat-radiating metallic facing, means supporting said facing in spaced relationship with said structure, radiators spaced between said facing and said structure and spaced from said means, said radiators each including a fluid conduit in heat-conducting relationship with a metallic element having a heat-radiating surface, and sound-absorbing heat-insulating material positioned between said radiators and said structure and acoustically exposed to said facing.

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References Cited in the file of this patent

Number	Name	Date
2,172,771	Norris	Sept. 12, 1939
2,180,945	Morey	Nov. 21, 1939
2,221,001	Lucius	Nov. 12, 1940
2,469,963	Grosjean et al.	May 10, 1949
2,489,130	Harter	Nov. 22, 1949

FOREIGN PATENTS

Number	Country	Date
321,450	Great Britain	Nov. 11, 1929
335,634	Great Britain	Oct. 2, 1930
639,640	Germany	Dec. 9, 1936