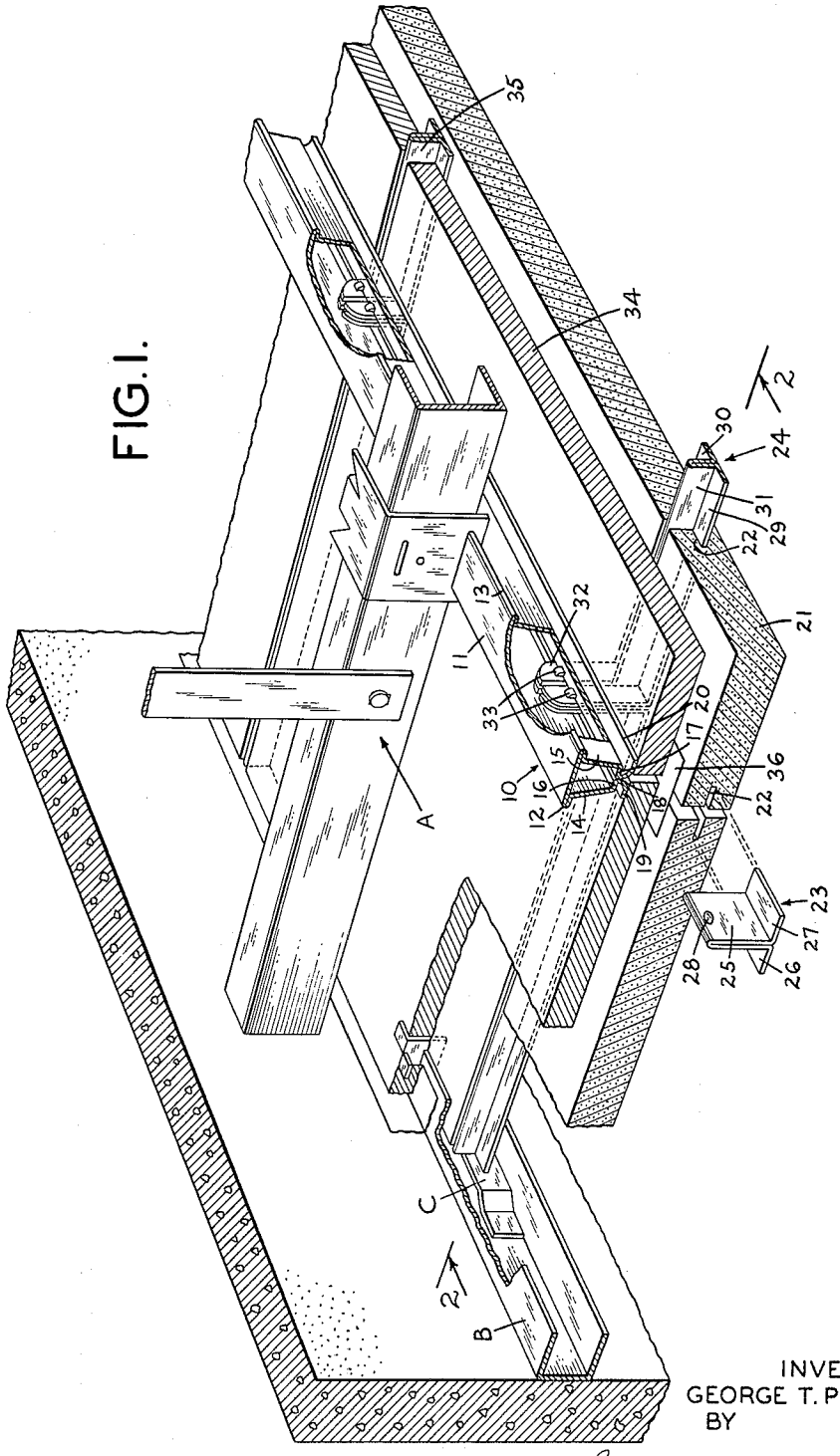
Oct. 16, 1962 G. T. PHILLIPS 3,058,172

SUPPORTING STRUCTURE FOR CEILINGS OF BUILDINGS

Filed Jan. 6, 1959 2 Sheets-Sheet 1

FIG. 1.



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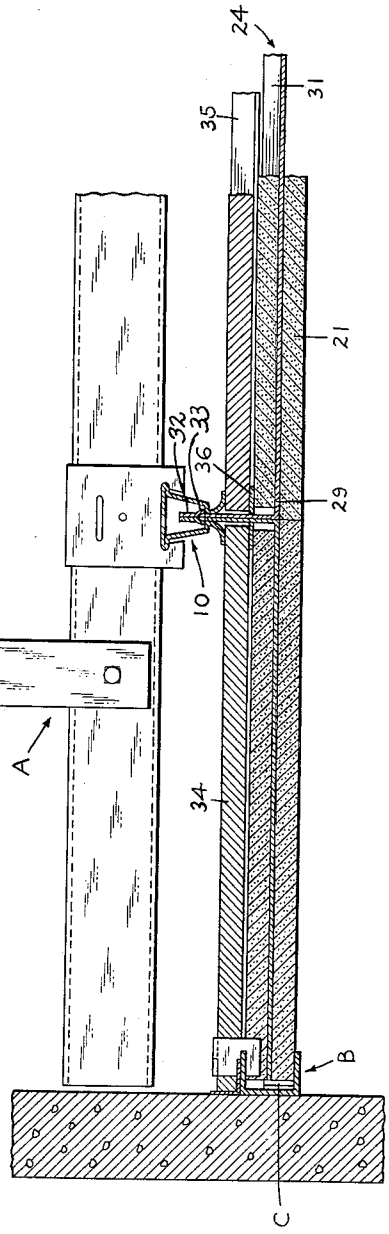


FIG. 2.

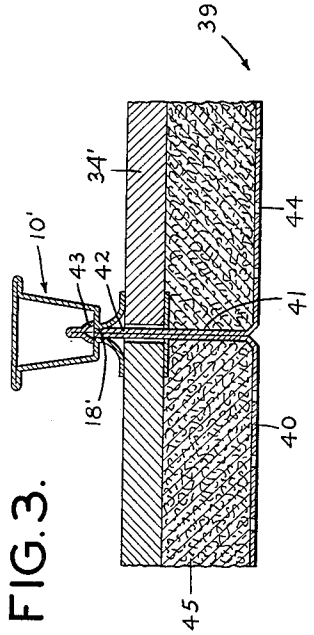


FIG. 3.

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SUPPORTING STRUCTURE FOR CEILINGS OF BUILDINGS

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This invention relates to building structures and it relates particularly to improvements in ceilings for buildings, houses and similar structures.

Acoustic insulating or decorative tiles and sheets are widely used as ceiling coverings in many types of buildings. It is common to mount on or affix to the real ceilings of the rooms of the buildings, furring strips or furring runners to which the tiles or sheets are secured by suitable clips, clip splines, staples or the like. Frequently such suspended ceilings are installed to form plenum chambers for receiving air-conditioning or heating ducts, wiring or the like. Where the suspended ceilings are formed of acoustic tile and extend from wall to wall of a room, they provide excellent acoustic insulation. However, when a room or space having such a suspended ceiling is divided into smaller compartments or cubicles by means of partitions that extend only from the floor to the suspended ceiling, a peculiar effect sometimes is observed. While the sound originating in a particular compartment or cubicle is appreciably deadened by the presence of the suspended ceiling, sounds which originate in other cubicles can be heard quite plainly. Investigation of this effect or phenomenon shows that the sound passes through the low density tile or sheet of the suspended ceiling, travels along the space between the suspended and the real ceilings and then enters other cubicles through the tile or sheet above such cubicles. Thus, instead of serving as a sound deadening or insulating medium, the sheets or tiles and the perforations or voids therein may actually form sound transmitting paths.

Prior suspended ceilings formed of decorative or acoustic tile or board are not very fire resistant and in the case of fire, the heat and flames may burn through the suspended ceiling or enter between the edges of the sheets or tiles thereby damaging or weakening the furring strips or runners so that the suspended ceiling falls.

In accordance with the present invention, a ceiling structure is provided which overcomes the above noted disadvantages of the prior suspended ceilings. More particularly, in accordance with the present invention, sheets of dense materal are affixed to the building structure to form a suspended ceiling defining a plenum chamber between the real ceiling and the suspended ceiling. Acuostic and/or decorative tiles or boards are affixed to the building structure and disposed against the under surface or surfaces of suspended ceiling. The sheets of dense material may be wallboard of the asbestos or fiber type which is of such dimensions that it abuts tightly against the suspension structure supporting the sheets and forms a heat resistant and sound retarding cover for it. Inasmuch as the shielding is of dense material, any sounds which might tend to pass through the openings or voids in the less dense acoustic or decorative tiles or sheets are effectively blocked by the overlying cover sheets. Likewise passage of flames or heat through or between the edges of the less dense tiles or sheets also is blocked by the denser cover sheets so that the suspension structure for the sheets and the real ceiling of the room or building are protected.

The invention is adaptable to use with either the conventional non-metallic decorative or acoustic tile or board or with metallic acoustic tiles of the type in which the base or major portion thereof is formed of perforated metal and is adapted to receive a layer of a sound insulating fibrous material. The use of a protective upper imperforate sheet with such a metallic tile aids in retaining the sound insulating material in the tile and thereby assures sound and heat insulation throughout the entire extent of the ceiling.

For a better understanding of the present invention:

FIGURE 1 is a perspective view of a section of a typical suspended ceiling structure with a C-clip for use therewith shown detached from the furring runner;

FIGURE 2 is a view in cross-section taken on line 2—2 of FIGURE 1 and;

FIGURE 3 is a sectional view of a modified type of acoustic ceiling embodying the invention and utilizing metallic acoustic tiles.

The invention will be described with reference to its use with metallic furring runners and other conventional elements for supporting acoustic tiles or sheets on the building. As illustrated in FIGURE 1, a typical furring runner **10** includes a base having edge flanges **12** and **13** which may be secured to conventional structural elements A supported from the ceiling of a building. Spaced sidewalls **14** and **15** converge downwardly from the flanges **12** and **13** and are bent inwardly and then outwardly to form inwardly extending flanges **16** and **17** which define a slot **18** between them and outwardly extending bottom flanges **19** and **20**.

The acoustic or decorative tiles or sheets referred to generically hereinafter as "tiles" may be formed of a vegetable or mineral fiber and provided with a multiplicity of voids, holes or perforations extending through or partially through the tiles which impart sound deadening properties to the tiles. The edges of the tiles **21** illustrated in the drawings arep rovided with grooves **22** to receive C-clips **23** or clip splines **24**. As shown in FIGURES 1 and 2, a C-clip **23** may consist of a sheet of metal which is bent along its center line to form the upright **25** of the T and then bent at right angles to form flanges **26**, **27** which are adapted to engage in the slots **22** in the tiles. The opposite sides of the upright **25** are provided with struck out tongues **28** which anchor the C-clip **23** in the furring runner **10** when the upright **25** is forced into the slot **18**.

A typical clip spline **24** which is adapted to extend at right angles to the furring runner **10** includes a pair of laterally directed edge flanges **29**, **30**, upright rib **31** and end flanges **32** at opposite ends which are also provided with struck out tongues **33** to engage in the slots **18** of adjacent furring runners and thereby lock the clip spline in position. It will be understood that the clip splines **24** span the space between adjacent parallel furring runners **10** with their edge flanges **29**, **30** engaging the slots **22** of adjacent tiles **21**.

The provision of slots **22** in the edges of the tiles **21** enables them to be mounted in spaced relation to the undersurfaces of the flanges **18** and **19** of the furring runners **10**.

In accordance with the present invention, sheets of imperforate wall or insulating board **34** are secured to the furring runners **10** prior to installation of the ceiling tiles **21**. The insulating board **34** is formed of much denser and sturdier material than the tiles **21** and is secured to the furring runners **10** by means of clip splines **35** and C-clips (not shown) similar to the clip splines **24** and C-clips **23**. The dimensions of the clip splines **35** and associated C-clips are such as to hold the sheets **34** against the undersurface of the furring runners **10** and thereby form, in effect, a continuous suspended ceiling independently of the tiles **21**. The joints between the edges of the sheets **34** may be covered with tape **36** to render the ceiling formed of the sheets **34** substantially continuous. After installation of the dense sheets **34**, the tiles **21** can be installed. The upper ends of the

T splines **24** and C-clips **23** are pushed through the tapes **36** to engage in the furring runners **10**, the lengths of the uprights **25** and **32** being appropriate to bring the tiles **21** against the undersurfaces of the sheets **34**. Inasmuch as the flanges **26**, **27** on the C-clip and the flanges **29** and **30** on the T splines **24** are covered by the tiles **21**, no gaps remain through which sound can enter the space between the true ceiling and the suspended ceiling. Moreover, almost complete shielding of the C-clip, T splines and the furring runners is achieved by the denser sheets so that the fire resistance of the ceiling is greatly prolonged as compared with prior structures.

It will be understood that the edges of the suspended ceiling can be finished off in any conventional way, for example, by means of the wall channels B slidably receiving the edges of the outermost sheets **34** and tiles **21** and containing springs C urging the channels against the walls of the room. Such channels and springs are conventional.

Advantages other than those described above also are derived from ceiling constructions of the type described. Inasmuch as the sheets **34** provide a strong continuous ceiling structure, the weaker and less dense ceiling tiles are reinforced thereby and rendered less susceptible to damage by impact. Moreover, the sheets **34** afford a backing which enables the tiles **21** to be removed and replaced readily if required.

The invention is also applicable to use with metallic tiles **39** of the type shown in FIGURE 3. These tiles include a pan or tray-like structure **40** formed of sheet metal having a peripheral rim **41** and upwardly extending tongues **42** spaced around their peripheries and having struck out tongues **43** for engagement in the slots **18'** of the furring runners **10'**. The bottoms of the tiles **39** are provided with sound dampening perforations **44** and they are also filled with a layer or pad of fibrous material **45** which enhances the sound deadening effect of the tiles. Sheets of insulating board **34'** corresponding to the sheets **34** shown in FIGURES 1 and 2 are secured to the runners **10'** and are engaged by the peripheral rim **41** of the tiles **39**. The sheets **34'** block the passage of sound waves as well as heat waves to thereby improve the acoustic and the thermal insulating properties of the suspended ceiling.

It will be understood that the invention is applicable to suspended ceilings formed of decorative sheets and tiles as well as the acoustic tiles and sheets and accordingly, it will be appreciated that the invention is

susceptible to other uses and to other structural modifications than those described herein. Accordingly, the forms of the invention described herein should be considered as illustrative.

I claim:

1. An acoustic ceiling comprising a building ceiling, a plurality of metallic furring runners suspended from said ceiling and having under surfaces spaced from said ceiling, each runner having substantially horizontal flanges thereon and a downwardly opening slot between said flanges, supporting elements having edge flanges and portions extending upwardly into said slots and connected thereby to said runners, imperforate sheets mounted on said edge flanges of said supporting elements and held thereby against said flanges of said runners, other supporting elements extending upwardly between said sheets and connected to said runners and acoustic tiles attached to said other supporting elements and held thereby adjacent to and covering the under surfaces of said imperforate sheets.

2. The ceiling set forth in claim 1 in which said tiles are formed of perforated sheet metal and said other supporting elements are integral with said tiles.

3. The ceiling set forth in claim 1 in which said tiles have slots in their edges and said other supporting elements comprise clips having lateral projections engaging in said edge slots and shanks engaging in runner slots.

4. The ceiling set forth in claim 1 in which said tiles are pan-like members having said holes in their bottoms and said other supporting elements around their edges, and fire-resistant and sound-retarding material between said pan-like member and said imperforate sheet.

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