This invention relates to suspended ceilings.

The most common form of grid member has been the so-called T-rail. The T is inverted, the head serving to provide a shelf, and the stem, a means of connecting the rail to the wire or strap. The head of the T can also be used as a spline, extending into a kerf in the vertical edge of a ceiling tile. However, in this latter arrangement, it can be seen that the ceiling must be installed serially as a unit, i.e., with the first rail, then the first row of ceiling tile, then the second rail, and so on. It also precludes accessibility to the space between the suspended ceiling and the supporting structure except in those areas in which special provision is made by not using the T-rails as splines.

When ceiling tile is merely laid on the head of the T-rail, the tiles tend to vibrate. With the advent of extremely lightweight tile, the tiles may actually float from their shelf on the T-rail when a pressure differential is created between the room space below the suspended ceiling and the space above it.

Another problem in the use of the grid members known heretofore has been in the interlocking of cross members. This must now either be accomplished with the use of clips, or else the interlock is not positive.

One of the objects of this invention is to provide a suspended ceiling, the grid members of which are unobstructive in appearance, positive in their interlock, and which retain ceiling tiles against unwanted movement, but permit their release when their release is desired.

Another object of this invention is to provide a suspended ceiling with ceiling tiles peculiarly adapted to use with the grid members of this invention.

Still another object of this invention is to provide a suspended ceiling with hanger brackets peculiarly adapted to use with the grid members of this invention, which provide flexibility of use with relative rigidity in use as compared with hanger brackets known heretofore.

In the drawings,

FIGURE 1 is a fragmentary perspective view, partly in section, showing one embodiment of ceiling of this invention; FIGURE 2 is a sectional view taken along the line 2—2 of FIGURE 1; FIGURE 3 is a sectional view taken along the line 3—3 of FIGURE 1; FIGURE 4 is a sectional view taken along the line 4—4 of FIGURE 1; FIGURE 5 is a fragmentary perspective view, partly in section, showing what, in this embodiment, is a cross rail grid member; FIGURE 6 is a fragmentary view in perspective, partly in section, of what, in this embodiment, is a main rail grid member; FIGURE 7 is a view in side elevation of a cross rail grid member; FIGURE 8 is a view in side elevation of a main rail grid member; FIGURE 9 is a sectional view showing, in end elevation, a hanger bracket of this invention, mounted on a grid member; and FIGURE 10 is a sectional view taken along the line 10—10 of FIGURE 9, showing the hanger bracket of FIGURE 9 in side elevation.

In accordance with this invention, generally stated, a suspended ceiling is provided, made up with grid members which have a pair of transversely spaced vertical walls connected by and integral with a web. The walls have outboardly projecting, longitudinally extending tongues, preferably one on each wall, and preferably integral with the walls. Means are provided for connecting the members to the hanger. These means, between the vertical walls and below the top edge of the walls, define, with the web, a pair of channels opening transversely of the web.

In the preferred embodiment, these means take the form of a small T section, the stem of which is integral with the upper surface of the web. The head of the T defines, with the web, outwardly transversely opening channels, and with the adjacent walls, a pair of passages.

A hanger bracket is provided, which has transversely directed feet, located in the channels, and bearing against the underside of the channel-defining means. The hanger bracket also has a pair of ears, extending transversely closely adjacent the inner surfaces of the vertical walls, which inhibit transverse rocking of the hanger with respect to the grid member. The feet of the hanger bracket are preferably staggered longitudinally of the grid member and the hanger bracket is provided with bearing legs which are spaced close to the upper surface of the channel-defining means, so as to inhibit transverse rocking of the hanger bracket in a direction longitudinally of the grid member.

Ceiling tiles are provided which are particularly adapted for use with the grid of this invention. The ceiling tiles of this invention are light in weight, generally cellular, and of substantial thickness. They are formed with a central panel, and a rim. The rim extends upwardly beyond the plane of the central panel, and, in turn, is provided with outboardly projecting stop lugs. In the preferred embodiment shown, the stop lugs take the form of an overhanging lip, the lower surface of which defines one edge of a tongue-receiving groove. In one of the embodiments shown, the lip is downwardly outwardly sloped. The distance between the upper edge of a lip and the upper edge of the lip on the opposite, parallel side of a rectangular ceiling tile is less than the least distance between corresponding grid members upon which the ceiling tile is to be mounted. In this embodiment, then, the tile can be mounted from below the grid. In another embodiment, the stop lugs overhang vertical walls of the grid members to such an extent that they must be put in from above. In either event, the lip and grids are so proportioned as to ensure the engagement of the lip and the grids, when the ceiling tiles are mounted. In the preferred embodiments, the tongue of the vertical walls of the grid members projects into the tongue-receiving groove of the ceiling tile. In every case, the grid material must flex to permit the installation of the ceiling tile, and its resilience ensures a positive mounting of the ceiling tiles in the grid openings, whereby floating of the ceiling tiles is eliminated.

In the preferred form of ceiling tiles, the rim is tapered inboardly downwardly, in such a way as to leave a small space between the vertical walls of the grid members and the lower edge of the rim of the ceiling tile. This arrangement facilitates the installation, along grid members, of wall partition brackets, which can fit between the ceiling tile and the grid member.
Referring now to the drawing for one illustrative embodiment of ceiling of this invention, reference numeral 1 indicates an assembled ceiling, which includes grid members of two sorts, main rails 2 and cross rails 3, and one embodiment of ceiling tiles 4. Two types of ceiling tiles are shown in the drawings, one in FIGURES 1 and 2 and another (49) in FIGURE 9, differing only in the transverse width of stop lugs, as will be explained in detail hereinafter. In addition, the ceiling of this invention includes a hanger bracket 5, shown in FIGURES 9 and 10.

Referring now particularly to FIGURES 2 through 6, it will be seen that both the main and cross members 2 and 3 have transversely spaced vertical walls 12 and 13, connected by and integral with a web 14. In the embodiment shown, the web 14 connects the vertical spaced walls 12 and 13 along their lowermost edges. The channel-defining means between the vertical walls, in this embodiment, takes the form of a T section 15, with a stem 16 integral with the web 14, and a head 17 integral with the stem. Along the top edge of the walls 12 and 13, and projecting transversely outboardly are tongues 18, each with a downwardly outwardly sloped beveled face 19.

Referring now particularly to FIGURES 3, 5, and 7 for a position of the cross rails 3, normally the cross rail 3 is shorter than the main rail. For example, for a 2' by 4' module, the main rail may be 12 feet long, the cross rail 8 feet long. The main rail will then be notched to receive the cross rails on two foot centers. However, the members can be of different lengths and notched for different modules.

In the embodiment shown in FIGURES 3, 5, and 7, the cross rail is provided with a notch or opening 31, extending through the connecting web 14 and the T section 15. The side edges of the opening 31 are defined by walls 32 spaced apart only slightly farther than the distance between the outer surfaces of the walls 12 and 13. The upper boundary of the notch 31, at each of the walls 12 and 13 is defined by a downwardly projecting apron 33. Each of the walls 12 and 13, of the cross rail 3 is provided with a pair of keeper holes 35, near but below the tongue 18.

Referring now particularly to FIGURES 4, 6, and 8, for an embodiment of main rail, the main rail 2 has a main rail opening 21, extending through the tongues 18 downwardly into the walls 12 and 13. The sides of the opening 21 are defined by edges 22, spaced, in each wall, only slightly farther from one another than the distance between the outer surfaces of the walls 12 and 13. Near but below the tongues 18, the edges of the opening 21 are defined by pairs of inwardly projecting prongs 23. A bottom of the opening 21 in each wall is defined by an upwardly projecting saddle 25.

As is best shown in FIGURES 3 and 4, the main rail 2 and the cross rail 3 are assembled at right angles to one another, with the notch-defining walls 32 of the cross rail embracing the lower part of the walls 12 and 13 of the main rail, below the saddle 25, and with the opening-defining walls 23 of the main rail embracing the upper part of the walls 12 and 13 of the cross rail. The prongs 23 spring into the keeper holes 35 (see FIGURE 4). The aprons 33 fit snugly between the walls 12 and 13 of the main rail, while the saddles 25 fit snugly between the walls 12 and 13 of the cross rail.

This provides a very substantial joint. The rails can move relatively with respect to one another, except to the extent permitted by the tolerances of the walls and openings and, the "give" of the materials. As can be seen from FIGURES 7 and 8, the ends of the grid members are provided with half an opening. That is to say, the main rails are cut off through the center line of the two saddles 25; the cross rails are cut off through the center lines of the aprons 33. In making a ceiling installation, the main and cross rail joints are staggered, so that the ends of both main and cross rails never coincide. It can be seen, that in such a staggered arrangement, the joints provided are still substantial and rigid, since the interlocking of the saddles and aprons, and the engagement of the prongs in the keeper holes provides a substantial rigidity in every case.

Referring now to FIGURES 9 and 10, the hanger bracket 5 is a plate 51, generally rectangular in outline, with a hanger-receiving hole 52 near its upper edge. In the center part of its lower edge, the plate 51 has a number of feet 55, turned inward toward one another and spread so as to straddle the head 17 of the T-section 15, and project beneath the head. At the two outer parts of the lower edge of the plate 51, are bearing legs 56, which fit closely the top surface of the bend 17 of the T-section 15. Thus, between the feet 55 and the bearing legs 56, rocking in the plane of the plate 51 is largely impaired. Ears 53, projecting in opposite directions from the plane of the plate 51, are struck from the plate at such a distance from the bottom as to be within the compass of the walls 12 and 13 when the hanger bracket is mounted on a grid member. The ears 53 extend sufficiently closely adjacent the inner surfaces of the walls 12 and 13 to inhibit rocking of the plate at right angles to the plane of the plate. The hanger bracket 5 is merely slid onto the T-section from below.

The suspension of the grid members, by means of hanger straps 6, is conventional, except for the greater flexibility provided by the free adjustability of the hanger brackets 5.

When the grid members have been assembled and suspended, the ceiling panels 4 may be installed. The type of ceiling tile 4 shown in FIGURE 2 may be installed from the underside of the grid. The ceiling tiles are made of material of substantial thickness and resilience. Each of them has a central panel 41, a rim 42 integral with the central panel and extending above the central panel, and stop lugs 43 extending outboardly from and integral with the rim. In the complete ceiling tile, the outer margins of opposite stop lugs are spaced a greater distance than the space between opposite grid members, so that the stop lugs must be flexed inboardly to install the tile. Reinforcing ribs 46 are provided on the upper surface of the central panel, integrally therewith.

In the ceiling tile 49 shown in FIGURE 9, stop lugs 58 extend so far over the top edge of the grid member on which it is notched as to make it necessary to insert the tile from the top.

Numerous variations in the construction of various elements of this invention, within the scope of the appended claims will occur to those skilled in the art in the light of the foregoing disclosure. Merely by way of example, the channel-defining means in the grid members may take the form of facing shelves integral with an projecting from the side walls, and terminating short of meeting to define a central passage. The hanger bracket feet can then be bent outwardly to fit into the channels beneath the shelves.

The web joining the spaced vertical walls of the grid members may be positioned above the very bottom edges of the walls, to form a decorative effect or to admit partition openings. The stop lugs on the ceiling tile can be continuous or intermittent, and if communication between the spaces along and below the ceiling is desired, the edge of the tiles between interrupted stop lugs can be serrated or recessed. These are merely illustrative.

Hanging this described the invention, what is claimed and desired to be secured by Letters Patent is:

1. Grid members for a suspended ceiling comprising a main rail and a cross rail, both of said rails comprising a pair of transversely spaced vertical walls connected at their lower edges by and integral with a web, and an outboardly projecting, longitudinally extending tongue on and integral with each of said respective walls, said main rail having one of said tongue openings each extending from the upper edge of the vertical wall, each of said openings having its side and lower boundaries respectively defined by a pair of facing inwardly projecting prongs and a
having a beveled outer edge, and a T-rail with its stem integral with the upper surface of said web and its head between, but below the upper edge of the said vertical walls, said head defining with said web a pair of channels and with said walls a pair of passages.

A. A grid member for a suspended ceiling comprising a pair of transversely spaced vertical walls connected at their lower edges by and integral with a web, an outboardly projecting, longitudinally extending tongue on and integral with each of said respective walls, and a T-rail on and the stem of which is integral with the upper surface of the web, between said vertical walls, below the top edge thereof, the head of the T defining, with the web and stem, a pair of channels opening toward their adjacent walls.

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