

[54] **SUSPENDED CEILING SYSTEM**

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[51] Int. Cl. **E04b 5/52**

[58] Field of Search **52/83, 28, 484, 656, 645, 646, 52/144; 240/9; 108/125, 129, 131**

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[57] **ABSTRACT**

A suspended ceiling system having a repetitive modular appearance includes unique, removable, collapsible frame portions in which either finished panels or lighting fixtures can be centrally positioned away from the lower plane of the modules to form upwardly recessed coves.

9 Claims, 9 Drawing Figures

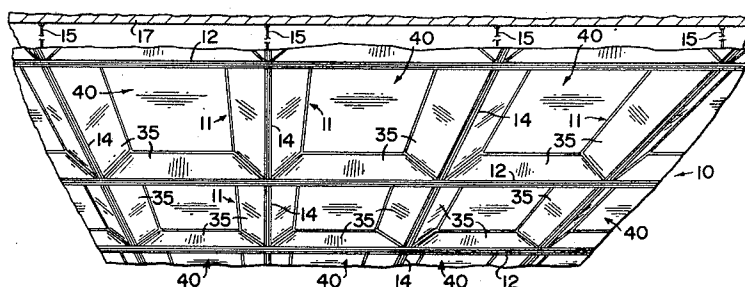


FIG. 3

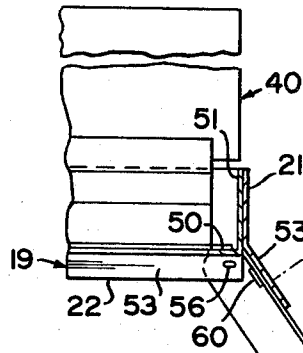


FIG. 5

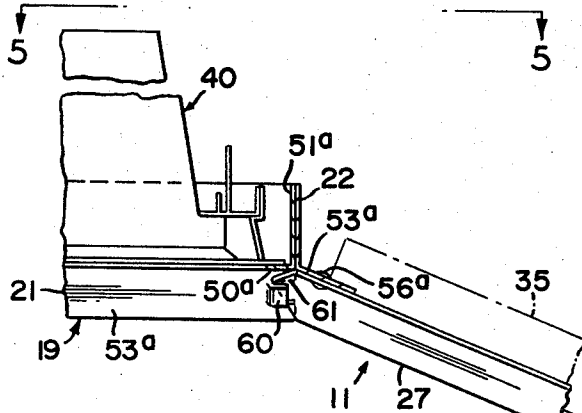
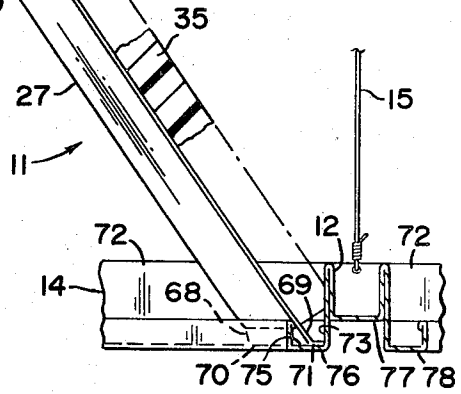
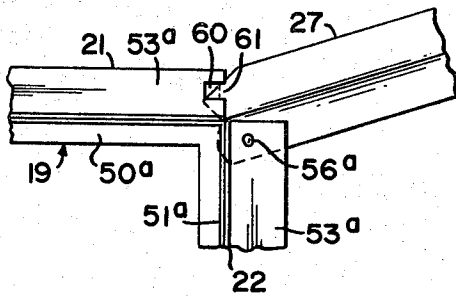


FIG. 4

FIG. 6

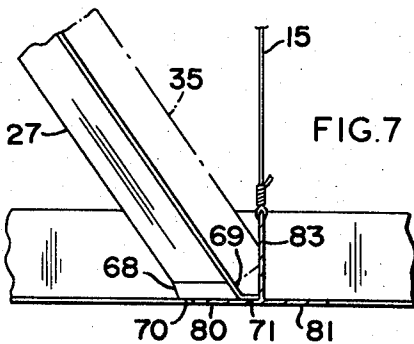
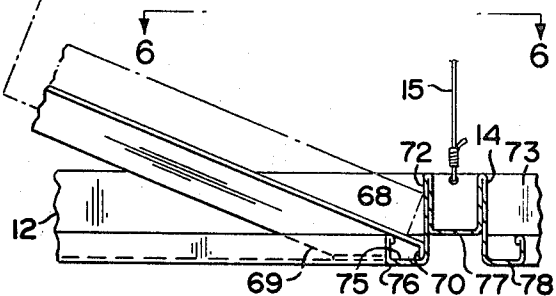


FIG. 7



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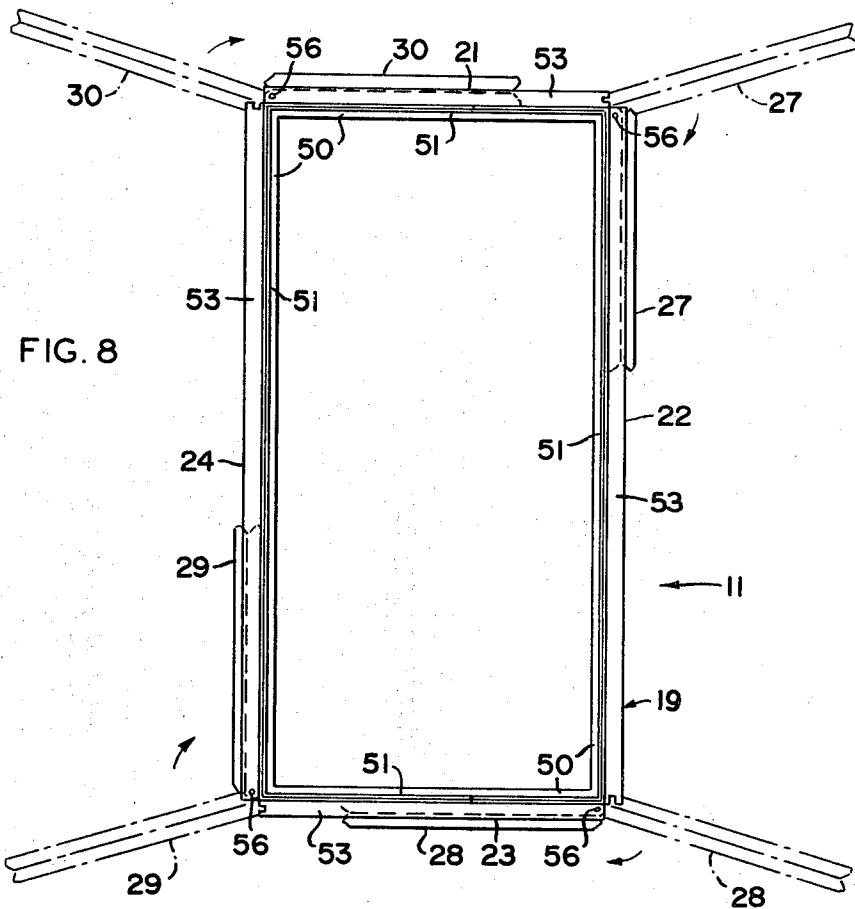


FIG. 8

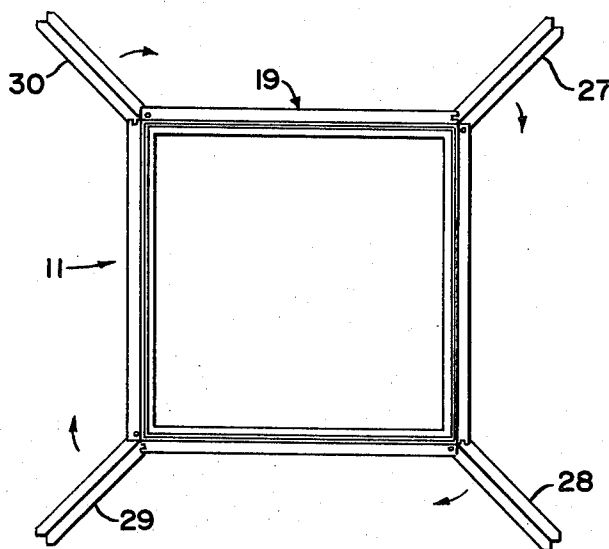


FIG. 9

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SUSPENDED CEILING SYSTEM

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention pertains to a ceiling system in which a predesigned ceiling is suspended from an overhead support. The ceiling system comprises a grid which forms a series of rectangular openings in the plane of the ceiling at least some of the openings being filled with a structure which forms a series of modular, upwardly recessed coves or hollow truncated pyramids. The sides of the recessed coves are formed of sound absorbing panels while the upper rectangular openings contain light fixtures or sound absorbing panels.

2. Description of the Prior Art

Until rather recently suspended ceiling systems have generally comprised a metal grid network which is suspended from an overhead building structure, usually the underside of the floor above the ceiling, and acoustical panels disposed in the general plane of the grid. If desired, certain of the acoustical panels may be replaced with lighting fixtures to provide illumination for the room below the ceiling.

The current fashion for ceilings has resulted in a ceiling designed on a modular basis with recessed areas in the form of coves or truncated pyramids rising above the plan of the grid system. In some designs a rectangular, modular grid system forms a base for splines extending upwardly to terminate in a smaller rectangular frame. Acoustical panels are supported on these splines and fill the area between the two levels of the system to form the sides of the hollow, truncated pyramid. The upper plane of the recess may contain an acoustical panel or a light fixture, as desired. For variation, only certain ones of the recesses may be closed with light fixtures and others with acoustical panels. Thus, a ceiling suspension system is provided which can lend itself to design flexibility.

The current ceiling systems, however, are costly to erect and require a significant amount of time to assemble the various components on the jobsite. In one such type the light fixture is held in place by spaced inverted U-shaped brackets which must be bolted both to the fixture and to the supporting grid. With this system splines are used to support the acoustical panels along contiguous edges.

Packaging and shipping of the modular units presents problems in requiring large packages and numerous individual components.

At times costly jurisdictional disputes arise between the various building trades, such as sheet metal works, carpenters and electricians as a result of unclear distinctions in the method of assembly of the ceilings. When the light fixtures can be dropped into a frame without further assembly, the jurisdictional disputes involving the electrical workers are minimized.

SUMMARY OF THE INVENTION

The present invention is directed to a novel modular ceiling system in which a collapsible, removable frame forms a supporting structure for a truncated pyramidal assembly. The assembly may incorporate decorative or acoustical panels as well as light fixtures. Design flexibility is provided in that a wide variety of ceiling styles can be installed.

It is, therefore, an object of the present invention to provide a novel suspended ceiling system which is easily assembled with a minimum of labor.

It is another object of the present invention to provide a novel suspended ceiling system which permits easy rearrangement and flexibility in design.

It is yet another object of the present invention to provide a novel suspended ceiling system which can be easily packed in an efficient manner with a minimum of parts.

BRIEF DESCRIPTION OF THE DRAWINGS

Other objects and advantages of the invention will become apparent when the detailed description is considered in conjunction with the accompanying drawings in which like elements are referred to by like numbers and in which

FIG. 1 is a perspective view of a portion of a suspended ceiling system of the invention;

FIG. 2 is an expanded elevational view of a portion of the ceiling of FIG. 1, viewed from above, with certain elements removed;

FIG. 3 is a cross-sectional view of a portion of the suspended ceiling of FIG. 2 taken along lines 3—3 thereof with an upper portion cut away;

FIG. 4 is a cross-sectional view of a portion of the ceiling of FIG. 2 taken along lines 4—4 thereof;

FIGS. 5 and 6 are detailed views of pertinent segments of top and bottom portions of the ceiling system of FIG. 4 taken along lines 5—5 and 6—6 respectively thereof;

FIG. 7 is a detailed view of an alternative suspension grid system of the ceiling system, and

FIGS. 8 and 9 are alternative elevational views of the frame portion of the ceiling of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to FIG. 1 of the drawings, there is shown an embodiment of the ceiling system of the invention, as viewed in perspective from below. In general, the ceiling system comprises a basic grid network 10 and cove-forming structure 11 supported by the grid network 10. Grid network 10 comprises main suspension grid members 12 in spaced parallel rows in the lower plane of the ceiling, and cross-suspension members 14 interconnected to and spanning main suspension grid members 12. For convenience, the spacing between members 12 is 60 inches on centers. Cross-members 14 are spaced in parallel rows on 60-inch centers and connected to the main suspension members 12. Thus, a basic modular effect is achieved with the modules being 60 inches on each side. If desired, modules of other dimensions may be selected.

To support the ceiling suspension system, wires 15 are connected from the main suspension members to an overhead supporting structure 17 which is usually the underside of the floor above the room containing the ceiling. In practice, the suspension grid system is installed and aligned in a predetermined horizontal plane by adjusting the lengths of wires 15.

The cove-forming structure 11 (shown in greater detail in FIG. 2) comprises a main rectangular frame 19 having four sides 21, 22, 23 and 24. Sides 21—24 are connected by bolts or welding or the like at their respective abutting ends to form a rigid frame. Legs 27, 28, 29 and 30 are pivotally attached to and depend from respective corners of frame 19 to hold the frame 19 in a plane away from and above the face plane of the main suspension system 10. Legs 27—30 are of equal length and may be cut from a long piece of right-angle channel iron or aluminum. As will be discussed in greater detail hereafter, legs 27—30 are pivotally mounted at their upper ends and also arranged to lock into place at their upper and lower ends so as to provide a strong support for the panels and light fixtures of the ceiling.

Side panels 35 (shown in FIGS. 3 and 4), which may be decorative and acoustically absorbent, are removably supported at their top edges by sides 21—24, their side edges by legs 27—30 and their bottom edges by suspension members 12 and 14. As can be appreciated, the panels 35 may all be trapezoidal in shape, or for each modular opening or cove two panels may be trapezoidal and the other two can be rectangular. However, the appearance shown by each panel as viewed from below will be trapezoidal.

Frame 19 is arranged to support a light fixture 40 (shown in partial outline in FIGS. 3 and 4). If desired, light fixture 40 may be replaced by an acoustical or decorative panel depending upon the preference and wishes of the designer. The removable frame 19 is, thus, capable of providing a wide variety of design options.

Typical of the sides of frame 19 is side 21 (shown in greater detail in FIG. 3). Side 21 has a horizontal flange 50 extending inwardly from a vertical web 51. Vertical web 51 has a double thickness with an integral downwardly and outwardly extending flange 53. Side 21 can be made by roll-forming a single

wide sheet of steel or by welding two separately formed pieces together. A pivot hole is drilled into flange 53 at one end of side 21 to receive a rivet 56 or other pivot-providing connector for the upper end of leg 27. Because all four legs 21 - 24 are of similar construction it can be easily seen that frame 19 forms a horizontal bed with an inwardly facing rim formed by the horizontal flanges of the sides. The horizontal bed is surrounded by a vertical wall formed around the periphery of the bed by the vertical webs 51 of sides 21 - 24. In addition, an outwardly and downwardly flaring skirt is provided around frame 19 by the flanges 53 around the outside of the vertical webs of the sides 21 - 24.

The symmetry of the construction of frame 19 can be further realized by a consideration of FIG. 4 which is a view taken at right angles to FIG. 3. In FIG. 4, the flanges and web side 22 are referenced by like numbers, as in FIG. 3, but with a small "a" added as a suffix.

In order to lock the upper end of leg 27 (and in similar manner all of the legs 27 - 30 of frame 19) against pivoted rotation beyond a desired amount, a small piece 60 of the outwardly flaring flange 53a adjacent the pivotal flange is punched inwardly to form a finger which receives a portion of the upper end 61 of leg 27.

FIG. 5 shows a detailed view of the locking feature of the invention. End 61 of leg 27 engages piece 60 of the flange 53a.

It is thus seen that the upper area of the cove is formed by the upper pivoted ends of legs 27 - 30 engaging flaring skirts of frame 19. Frame 19 presents a bed to receive a light fixture or panel as desired.

Legs 21 - 24 extend outwardly and downwardly to span the area between frame 19 and grid network 10 and to support frame 19 in interlocking relation therewith.

FIGS. 3 and 6 illustrate the structural details of the interengagement of the suspension members 12 and 14 with the lower end of leg 27. Leg 27 is made of a piece of sheet metal with two sides at an angle with respect to each other. The lower end of leg 27 is bifurcated with two extending portions 68 and 69. The tip ends 70 and 71 of leg 27 have bent flange portions which are designed to fit snugly against web portions 72 of suspension member 14; while tip end 71 of side 66 engages the inside web portion 73 of suspension member 12.

While the tips 70 and 71 are shown in FIGS. 4 and 6 as being bent downwardly, if the angle of approach of leg 27 toward the grid members is steep enough as shown in FIG. 3, the tip ends 70 and 71 will be horizontal and rest upon the lower horizontal portion 75 of the suspension members.

The steepness of the angle made between the legs and the suspension members is determined by the relative size of frame 19 and the size of the module opening. In any event it can be seen that the weight of frame 19 causes a wedging action between the lower ends of the legs 27 - 30 and the suspension members 12 and 14. Because the lower ends of the legs are bifurcated, the legs engage the inner sides 72 and 73 of two perpendicularly related suspension members and are locked against rotation, giving rigidity to the entire assembly without requiring welds or bolts.

As can be seen from FIGS. 3 and 4, the cross-sectional configuration of suspension members 12 and 14 are similar and may be described as consisting of three parallel U-shaped sections 76, 77 and 78 with the central U-shaped portion 77 being raised with respect to the two outwardly flanking U-shaped sections 76 and 78. The suspension members can be made of a single sheet of metal formed by rolling into the desired shape. Obviously the cross-section of the suspension members can be varied and could be as simple as an inverted T-shaped one. Reference may be had to FIG. 7 as an illustration of this latter modification. Here two outwardly extending flanges 80 and 81 are integrally connected to a central upstanding web portion 83. The lower tip ends 70 of leg 27 engages the flange 80. Correspondingly the lower tip end 71 of leg 27 engages the other cross-member (not shown).

To illustrate the versatility of the cove-forming structure of the invention reference may be had to FIG. 8 which shows the

frame 19 and the legs 27 - 30 in retracted position for shipping. The legs 27 - 30 are also shown in phantom lines, as if extended. When arranged for shipping the legs 27 - 30 are rotated around their pivotal rivets 56 and nest against their respective sides 21 - 24 of frame 19. As alternative structures, the legs 27 - 30 may lie above or below the flanges 53 of sides 21 - 24. Furthermore, the legs 27 - 30 may be pivoted so that two legs may nest against the same side of the frame 19.

FIG. 9 shows a frame 19 which is of square configuration, rather than being merely rectangular in shape.

In summary, the present invention is directed toward a novel ceiling suspension system is versatile and flexible in use and packaging and which comprises a minimum of components for easy assembly.

We claim:

1. A ceiling suspension system comprising:

A rectangular structural member having four corners; and further having an outwardly and downwardly flaring skirt forming a lower peripheral extension of said structural member; a plurality of legs of V-shaped cross-section, each leg having one end pivotally attached at a corresponding corner of said skirt so that each of the said legs can be moved from a nesting position with respect to said structural member to an outwardly and downwardly extending position;

a grid system having suspension members connected together and arranged to form a repeatable modular configuration;

said suspension members having coplanar horizontal flanges and vertical web portions integral with and spaced from the free edges of said horizontal flanges, said horizontal flanges and vertical web portion of one of said suspension members meeting with a horizontal flange and vertical web portion of an adjacent suspension member at a right angle

means on said skirt to limit pivotal movement of each of said legs, and

means on each of said legs remote from said pivotally attached ends engaging corresponding ones of said horizontal flanges and said vertical web portions of said abutting suspension members.

2. A ceiling suspension system as recited in claim 1 in which said rectangular structural member comprises four sides, each of said sides having a vertical flange forming an outer edge for the reception of a ceiling enclosing member;

a horizontal flange integral with said vertical flange extending inwardly from said vertical flange for supporting a ceiling enclosing member,

and an outwardly and downwardly extending skirt connected to said vertical flange for connection to said legs.

3. A ceiling suspension system as recited in claim 2 in which each of said outwardly and downwardly extending skirts has a pivot means securing said legs to each of said outwardly and downwardly extending skirts.

4. A ceiling suspension system as recited in claim 1 in which each end of each of said legs remote from said structural member has a V-shaped cut-out portion to form a bifurcated end and each bifurcated end has bent flange portions interlockingly engageable with said grid suspension members.

5. A ceiling suspension system as recited in claim 2 in which ceiling completing units are mounted on said structural member.

6. A ceiling suspension system as recited in claim 5 in which at least one of said ceiling completing units is a light fixture.

7. A rectangular structural member and leg assembly having four corners for supporting ceiling panels in a suspended ceiling system to form a modular ceiling of adjacent hollow truncated pyramids, and further having an outwardly and downwardly flaring skirt forming a lower peripheral extension of said structural member; adjacent sides of said skirt forming an inverted V-angle; a plurality of legs of V-shaped cross-section complementary to said V-angle; each leg having one end pivotally attached at a corresponding corner of said skirt, each

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of said legs being folded in nesting relationship with a corresponding side of said skirt and being adapted to being extended outwardly and downwardly in divergent relationship with respect to said structural member and to each other when in their extended positions, each leg having a cut-out section in its end remote from said pivotally attached end, said remote end being adapted to engage a grid structure, and locking means punched out of each side of said skirt spaced from said pivotally attached ends of each of said legs for limiting the extent of pivoted motion of each of said legs; whereby the legs can be moved from a nesting position with respect to said structural member to and locked in an outwardly and downwardly extending relationship with respect to said structural member and to each other when in their extended positions.

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8. A rectangular structured member and leg assembly as recited in claim 7 in which said frame has four sides each of said sides having a vertical flange forming an outer edge for the reception of a frame-closing member, a horizontal flange integral with said vertical flange extending inwardly from said vertical flange for supporting said frame-closing member, and an outwardly extending flange connected to said vertical flange for pivotal connection of said legs.
9. A rectangular structural member and leg assembly as recited in claim 7 in which each of said outwardly and downwardly extendible legs has a V-shaped cut-out portion to form a bifurcated end remote from said pivoted end.

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