

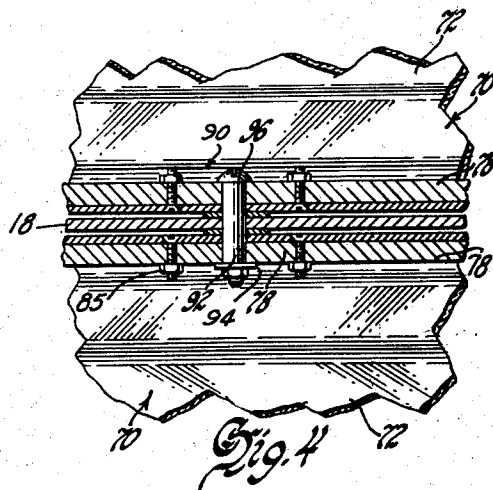
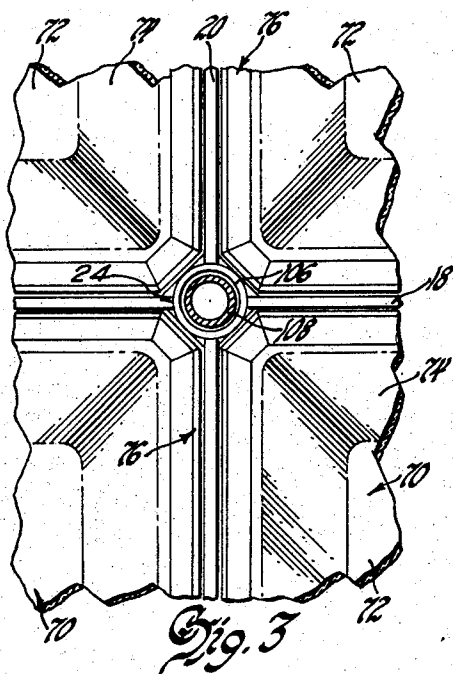
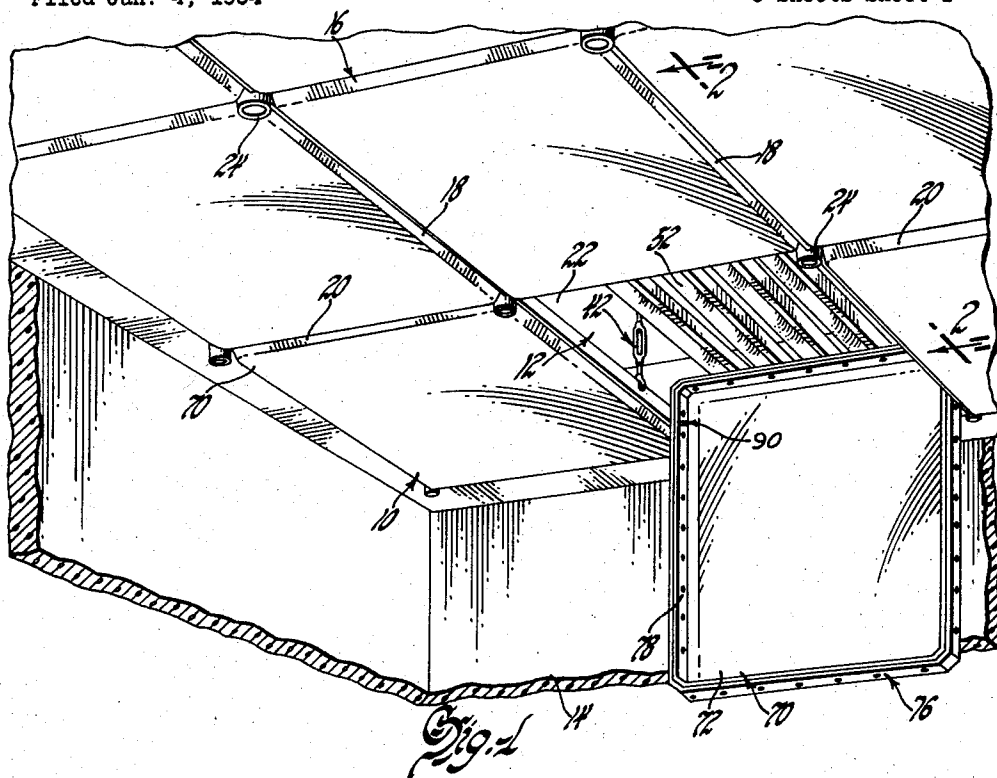
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LUMINOUS CEILING

2,913,571

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5 Sheets-Sheet 1



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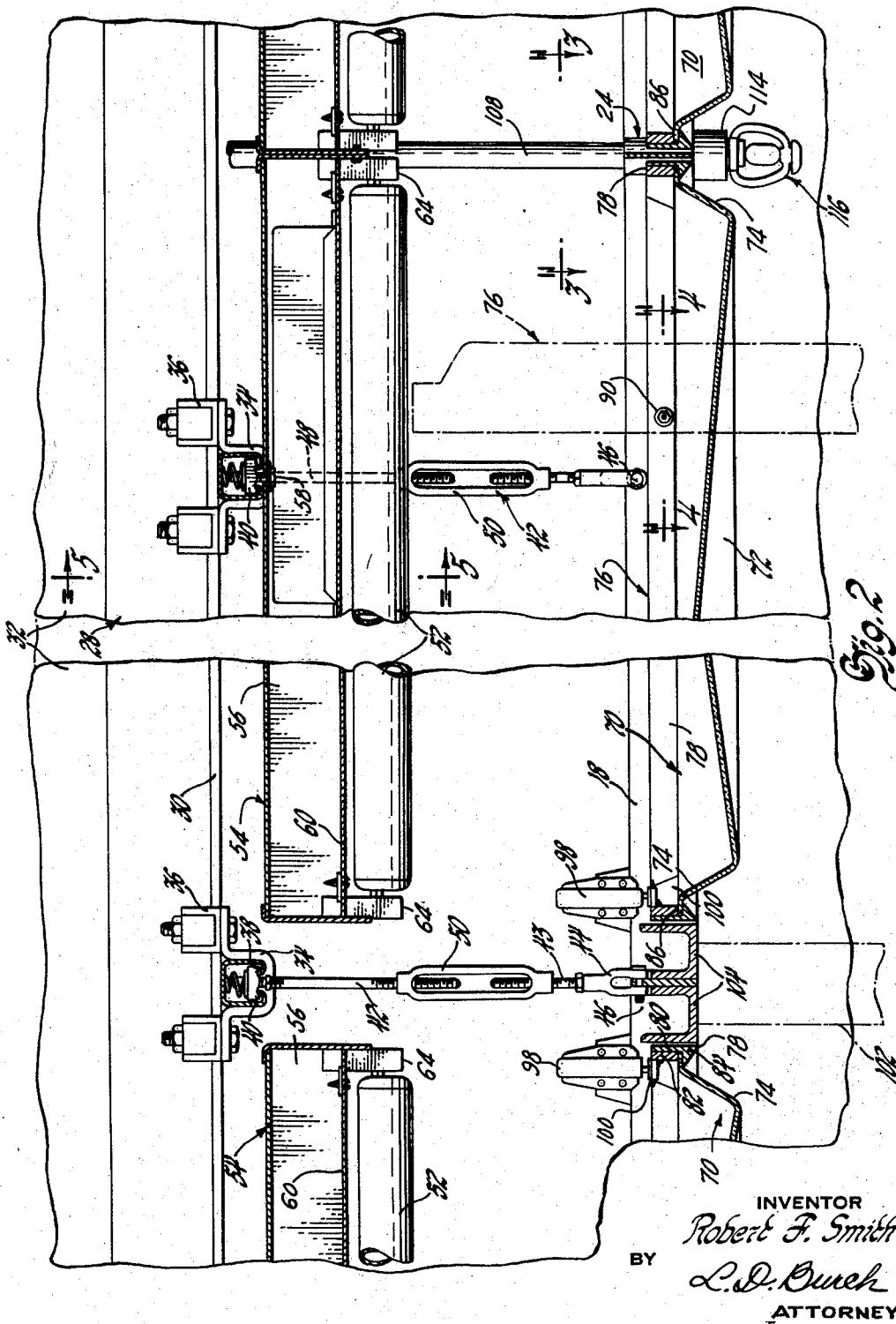
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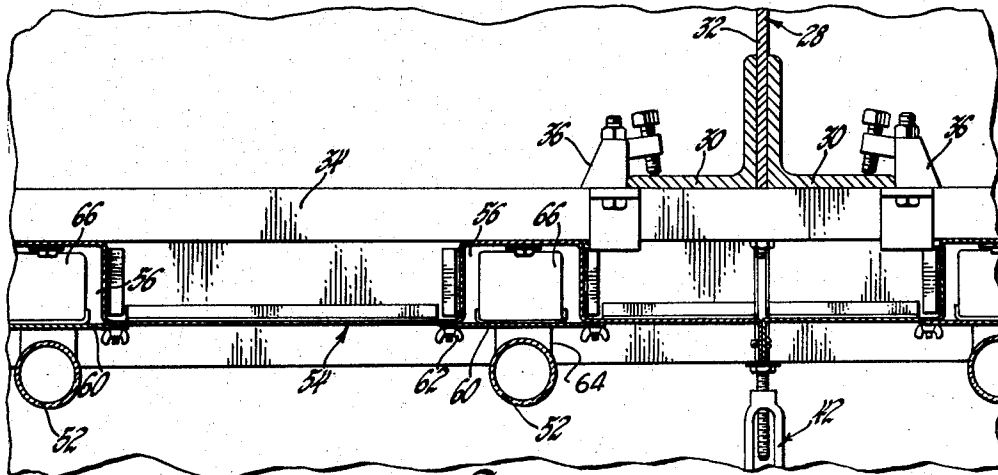


Fig. 5

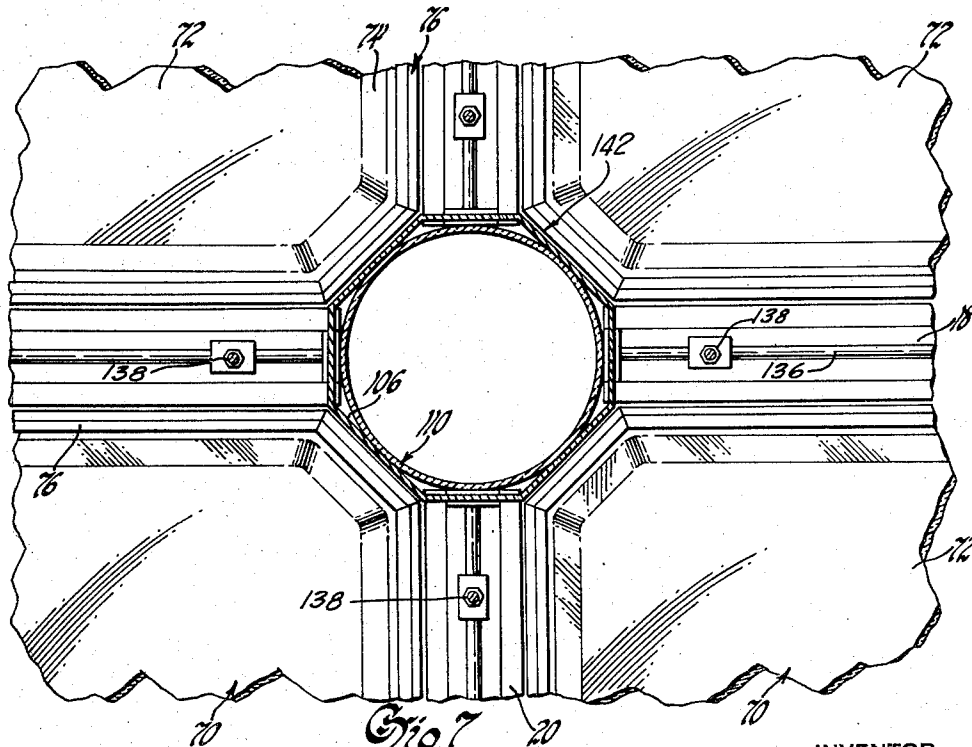


Fig. 7

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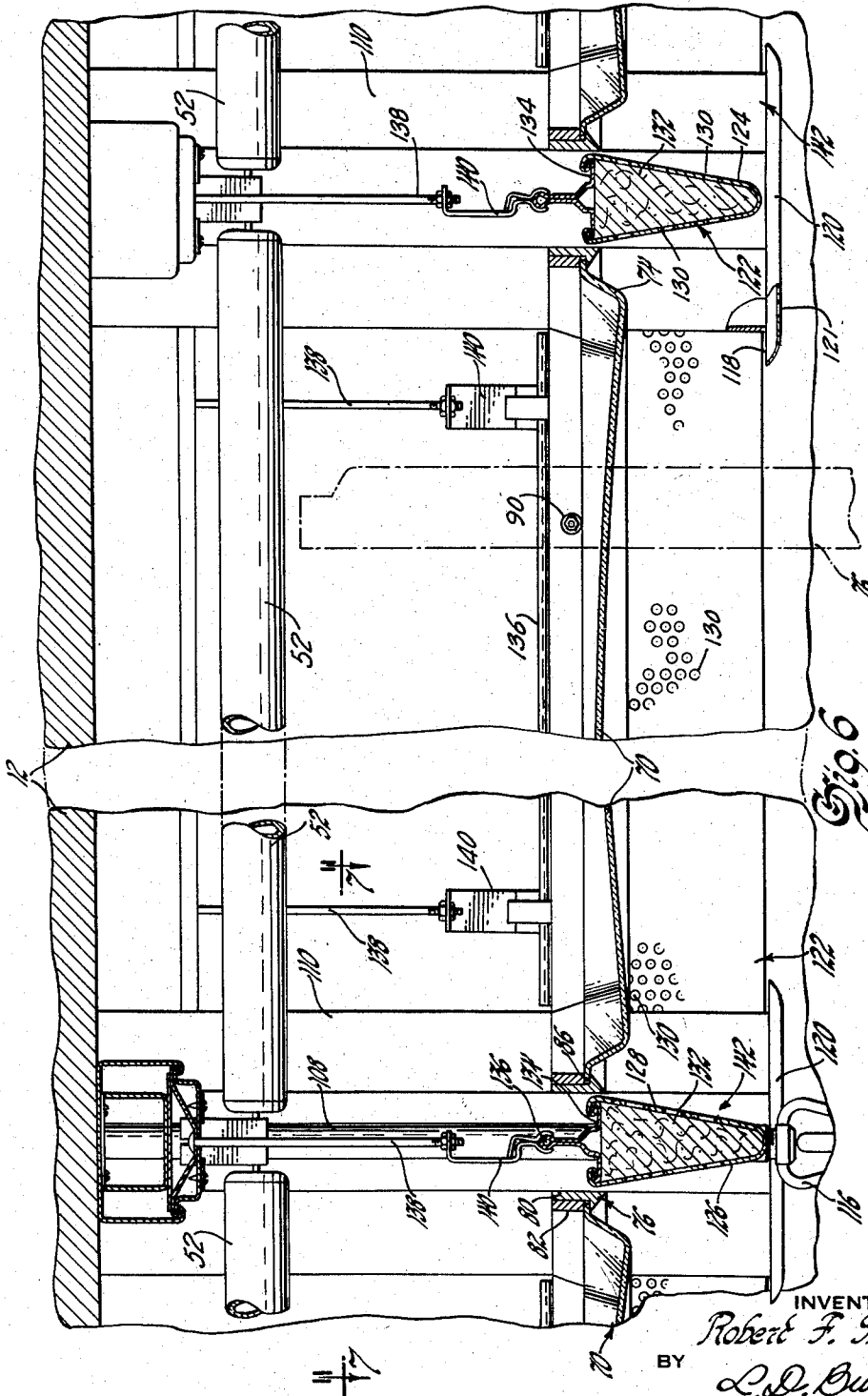
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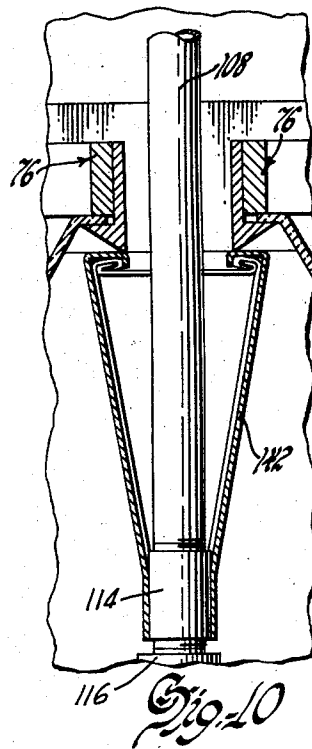
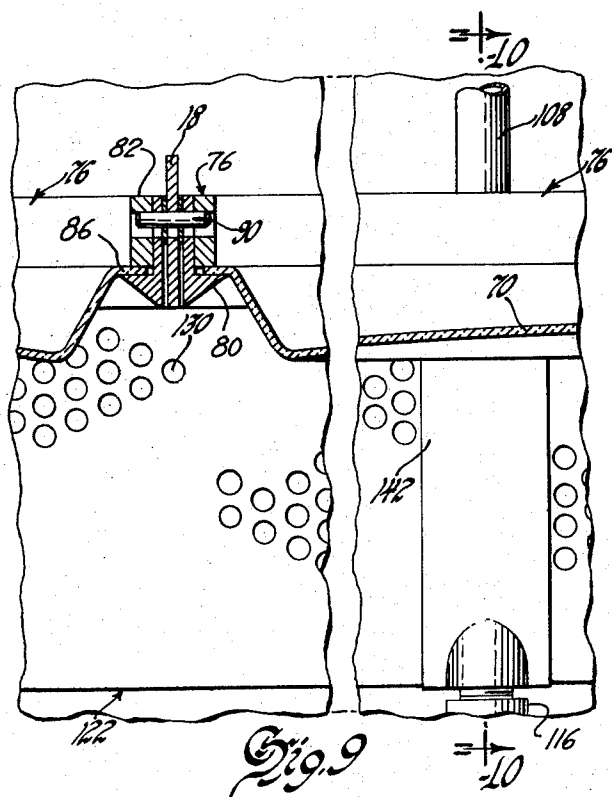
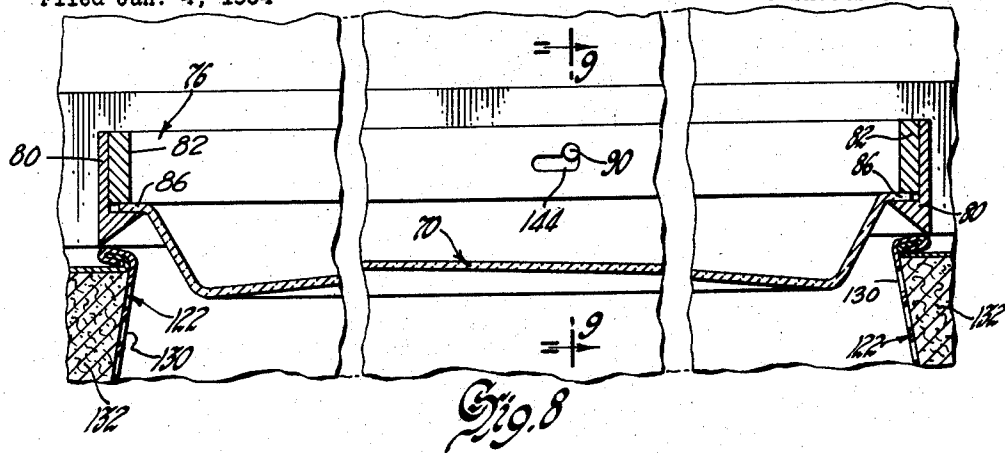
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LUMINOUS CEILING

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4 Claims. (Cl. 240—9)

The present invention relates to ceilings and more particularly to a luminous false ceiling that may be suspended from an overhead supporting structure.

Under certain conditions it is desirable to employ high intensity-low brightness illumination. This may be accomplished by employing light diffusing means that are mounted below a source of illumination so as to diffuse the light throughout the space around the source of illumination. Although there are numerous systems that are adapted to be built into an overhead ceiling so as to produce such illumination, they generally employ numerous luminous units that are positioned at various spaced positions around the ceiling. These arrangements produce satisfactory illumination for some purposes, however, the amount of light in some locations is greater than in others.

It is now proposed to employ a false ceiling in which substantially the entire surface of the ceiling comprises light diffusing means that are uniformly illuminated from above by a plurality of lights. Thus the entire surface of the ceiling will be luminous and all of the space below the ceiling will be substantially uniformly illuminated.

Under certain circumstances, it is desirable to construct buildings having one or more large rooms that may be subdivided into numerous smaller rooms by a plurality of vertical partitions. In order to facilitate altering the floor plan by periodically resubdividing the larger rooms, the partitions may be constructed so that they can be readily moved from one position to another. Heretofore, when the partition extends all the way from the floor to the ceiling, movement of the partition from one position to another has not only necessitated numerous alterations in the ceiling structure but has also resulted in extensive changes in the lighting and ventilating systems.

It is now proposed to provide a ceiling that will permit a partition which extends all the way from the floor to the ceiling to be moved from one position to another without necessitating any additional changes. The ceiling preferably includes a grid that is suspended from an overhead supporting structure in spaced relation therebelow. The grid may include rigid members which are spaced at predetermined intervals to form openings therebetween. These members may be adapted to receive the upper end of a vertical partition without requiring any alterations in the appearance of the ceiling. Since the ceiling is spaced below the overhead supporting structure, the ventilating, light system and similar equipment may be mounted on the supporting structure so that they will not be disturbed by the movement of the partitions from one position to another.

In the drawings:

Fig. 1 is a fragmentary view in perspective of a portion of a building structure embodying the present invention.

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Fig. 2 is a cross sectional view taken substantially along the plane of line 2—2 in Fig. 1.

Fig. 3 is a plan view of the ceiling of Fig. 1 taken substantially along the plane of line 3—3 in Fig. 2.

Fig. 4 is a cross sectional plan view taken substantially along the plane of line 4—4 in Fig. 2.

Fig. 5 is a cross sectional view taken substantially along the plane of line 5—5 in Fig. 2.

Fig. 6 is a cross sectional view similar to Fig. 2 but showing a modification of the ceiling.

Fig. 7 is a plan view taken substantially along the plane indicated by line 7—7 in Fig. 6 showing an additional modification.

Fig. 8 is a cross sectional view similar to Fig. 6 but taken on an enlarged scale and showing a slight modification thereof.

Fig. 9 is a cross sectional view taken substantially along the plane of line 9—9 in Fig. 8.

Fig. 10 is a cross sectional view taken substantially along the plane of line 10—10 in Fig. 9.

Referring to the drawings in more detail the present invention may be embodied in a ceiling 10 suspended from an overhead supporting structure 12 in a building having a plurality of vertical walls 14. The ceiling 10 may have a grid 16 which contains one or more sets of rigid members 18 and 20. In the present instance the grid contains a set of transverse members 18 and a set of longitudinal members 20 that are disposed at right angles to each other so as to form an orthogonal structure having a plurality of rectangular openings 22 therethrough. Although these members 18 and 20 may be of any desired shape, it has been found desirable to employ a relatively thin member having its greatest dimension in the vertical direction. This will provide an inconspicuous grid 16 by presenting the minimum amount of material to be viewed from below and at the same time it will provide the maximum strength. In order to increase the rigidity of the ceiling 10 the ends of the members 18 and 20 may be secured together by any suitable means or they may be secured together by means of a suitable fitting 24. This fitting 24 may have a cylindrical outer surface that is adapted to have the ends of the members 18 and 20 secured directly thereto or it may have means adapted to receive and support the ends of the members 18 and 20.

In order to facilitate suspending the ceiling 10 from the supporting structure 12, the overhead structure may be provided with a beam 28 which has a pair of flanges 30 that project horizontally outwardly from the bottom of the web 32. An inverted channel 34 may be secured to the underside of the beam 28 by means of a plurality of clamps 36 which grip the edges of the flanges 30. The channels 34 extend horizontally below the beams 28 and have an open bottom that forms a runway 38 for slide fasteners 40. The grid 16 is suspended from the overhead supporting structure 12 by some suitable means such as a plurality of hangers 42. The lower end 43 of each hanger 42 may be secured to the grid 16 by means of a clevis 44 that straddles a member 18 or 20 so that a pin 46 may extend through aligned openings in the clevis 44 and members 18 or 20. The upper end 48 of the hangers 42 may be threaded into the slide fasteners 40 accessible through the bottoms of the channels 34. It has been found desirable to provide each hanger 42 with a turnbuckle 50 or other suitable adjusting means for individually controlling the length of the hangers 42. This will greatly facilitate adjusting the position of the grid 16 until the ceiling 10 is disposed in a substantially horizontal plane.

In order to properly illuminate the space below the ceiling 10, suitable lighting means may be mounted

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between the ceiling 10 and the supporting structure 12. Although any form of light may be employed it has been found that tubular fluorescent lights 52 of substantially the same length as the rectangular openings 22 through the grid 16 are preferable. In order to facilitate mounting of the lights 52 a sheet metal structure 54 may be secured to the under side of the channels 34. The sheet metal structure 54 has a plurality of parallel recesses 56 formed therein so as to be substantially uniformly spaced and positioned to register with the openings 22 through the grid 16. The sheet metal structure 54 may be secured to the channels 34 by bolts 58 that project upwardly from the top of the recesses 56 into the slide fasteners 40 accessible through the bottom of the channels 34. A plurality of plates 60 may be secured to the sheet metal 54 so as to register with the mouth of the recess 56 and close the same. The plates 60 may be secured in position by wing nuts 62 so as to facilitate removal thereof. A plurality of light sockets 64 may be secured to the plates 60 so as to depend downwardly therefrom. The opposite ends of the fluorescent lights 52 may be disposed in adjacent pairs of these sockets 64. The wiring and accessories 66 such as ballasts and starters may be mounted on the back sides of the plates 60 so that they will project upwardly into the recess 56. In order to service these accessories the plates 60 may be removed from the recess 56 in the sheet metal 54 by means of the wing nuts 62.

In order to provide high intensity-low brightness illumination, it may be desirable to place translucent panels 70 in the openings 22 through the grid 16 so as to diffuse the light passing therethrough. In the present instance these panels 70 are shaped like a tray having a bottom 72 and four sides 74 angularly disposed with respect thereto. Each tray 70 is of the same size and shape as the opening 22 it is in so as to substantially fill the entire opening. If the sides 74 are high enough the bottom 72 of the tray 70 may be disposed far enough below the grid members 18 and 20 as to make them inconspicuous. Thus the ceiling 10 will appear to be fabricated entirely from a plurality of luminous panels 70. When the trays 70 are large and are fabricated from a material such as plastic that may soften as a result of heat from the lights 52, it is advantageous to dish the bottom 72 of the tray upwardly. Thus if there is any tendency for the bottom of the tray 70 to sag from expanding, contracting or other causes the effects thereof will be minimized and less noticeable.

In order to facilitate servicing of the fluorescent lights 52 and their accessories, it has been found advantageous to make the panels 70 easily removable from the openings 22. In the present instance this has been accomplished by mounting the panels 70 on a frame 76 that is hinged to the grid members 16 or 18 so as to be able to swing into and out of the openings 22. The frames 76 include four sides 78 that have their ends secured together to form a rectangle shaped to correspond to the openings 22 in the grid 16. Each side 78 may be made from two members 80 and 82 in which the outer members 80 are disposed adjacent and parallel to the grid members 20 and 18. The inside of each outer member 80 may have a shoulder 84 that projects towards the center of the frame 76 so as to receive a lip 86 that extends outwardly from the walls 74 of the tray 70. To insure that the tray 70 remains on the frame 76 an inside member 82 may be secured to the outside member 80 by means of nuts and bolts 85. When fastened together the side members 80 and 82 are positioned so as to compress the lip 86 on the tray 70 therebetween. This prevents the tray 70 falling from the frame 76 when it swings into its vertical position.

In the present instance this diffusing means includes outlet 118 and apertures 121. The frame 76 may be pivoted on the grid members 20 and 18 by means of

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hinges 90 that are positioned adjacent one end thereof. It should be noted that by placing the hinges 90 close to the end of the frame 76, the clearance between the grid 16 and lights 52 may be kept to a minimum and a larger unobstructed opening will be available when the panels are opened. In the present instance the hinge means 90 include a bushing 92 which extends through a grid member 20 or 18, spacer washers 94, and the sides 78 of the adjacent frames 76. A nut and a bolt 96 that extends through the center of the bushing 92 may be employed to retain the hinge assembly 90 in position.

In order to retain the panels 70 in a horizontal position in the grid openings 22, a latch 98 may be provided. This latch 98 may engage a suitable hook 100 on one end of the frame 76 to hold it in position. It is desirable to employ a suitable concealed latch 98. In the present instance this latch 98 is spring loaded so that if a small lifting force is applied to the frame 76, the resultant raising of the frame 76 will allow the latch 98 to open. It is thus apparent that when the latch 98 is released, the frame 76 and translucent tray 70 will swing down into a substantially vertical position so as to provide access to the lights 52.

Although the ceiling 10 may be used in a small room it has been found particularly well adapted for use in a large room that is to be subdivided into a group of smaller rooms by means of one or more vertical partitions 102. In order to facilitate rearranging the floor plan of the large room, it may be desirable to employ suitable movable partitions 102 such as a Houserman partition which extends from the floor to the ceiling 10. It has been found that if the partition 102 is disposed between the panels 70, it still permits swinging the panels 70 into the open position nor will it in any other way interfere with the use of the ceiling 10. To prevent interference between the frames 76 and partition 102, the grid members 18 and 20 are preferably made at least as wide as the partition 102. This may be accomplished by having a channel 104 secured to form the opposite sides of the member 18 or 20. This will increase the width of the member to approximately that of the panel 102 so as to facilitate placing of the partition.

The fittings 24 may be provided with a passage 106 therethrough that will allow a conduit 108 or 110 to extend through the ceiling 10 without interfering with the illumination from the ceiling 10 or movement of the translucent panels 70. In the present instance some of the fittings 24 have an opening large enough for a water pipe 108 to extend therethrough as seen in Figures 2 and 3. The discharge end 114 of this pipe 108 is provided with a thermal responsive sprinkler nozzle 116 suitable for automatically spraying a fire extinguishing fluid into the rooms in the event the room temperature is raised as a result of a fire. Some of the remaining fittings 24 may have an opening 106 large enough to allow a ventilating duct 110 to extend therethrough as seen in Figures 6 and 7. The outlet end of this duct 110 may be provided with any suitable diffusing means 120. Thus, the air from an air conditioning unit or other suitable source may be discharged into the rooms.

In order to reduce the noise level in the room, the embodiment shown in Figures 6 through 10 may be employed. This embodiment employs some form of sound deadening in order to prevent excessive noises in the rooms. Accordingly, some of the members forming the grid may comprise an acoustical baffle 122. These baffles 122 include a V-shaped trough 124. The walls 126 and 128 of the trough 124 are provided with a large number of perforations 130 for permitting sound to pass therethrough. The interior of the trough may be filled with a suitable sound absorbent material 132 which will absorb any sounds passing through the perforations 130 into the trough 124. The upper end of the trough 124 may be closed with a top 134 which has a bead 136 that

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projects upwardly from the top 134 of the baffle 122. A hanger 138 may depend from the supporting structure 12 so that a spring clip 140 may engage the beading 136 and hold the baffles 122 between the panels 70 so as to extend therebelow. If it is desired these baffles 122 may be easily withdrawn from the clips 140 so that a partition 102 may be positioned to extend up into the place they (122) formerly occupied.

If desired fitting 142, as seen in Figures 6 and 10, may be provided for securing the baffles 122 of the grid 16 together. These fittings 142 may be cylindrical members that will receive the ends of the grid members 18, 20 or 122. In addition the fittings 142 may have a passage therethrough suitable for permitting a ventilating duct 110 or fire extinguishing pipe 108 to extend there-through.

When the baffles 122 are employed, as a modification it may be desirable to allow the end of the frame 76 to rest on one of the baffles 122 as best seen in Figure 8. To open the panel 70 the tray 76 is moved so that hinge 90 slides in the slot 144 until the frame 76 is clear of the baffle 122 and free to swing down. To close the panel 70 the process is reversed.

While but two embodiments of the invention have been shown and described, it will be apparent that other changes and modifications may be made therein. It is, therefore, to be understood that it is not intended to limit the invention to the embodiment shown, but only by the scope of the claims which follow.

What is claimed is:

1. In combination, an overhead lighting system, a sub-ceiling framework underneath said system, said framework comprising crisscross rails defining openings, of length and width determined by the spaces therebetween, light-diffusing panels of approximately the same size and shape as such openings removably carried by said framework so as to substantially close such openings, said panels being effective, when in such openings, to screen said lighting system from view from below and to provide overall, diffused illumination of the room area below said panels, couplings joining said rails together at their intersections, at least one coupling having an opening therethrough, of relatively small size as compared with the openings defined between said rails and a room-conditioning element extending downwardly through the opening in said one coupling.

2. In combination, an overhead lighting system, a sub-ceiling framework underneath said system, said framework comprising a plurality of elongated members defining openings, light-diffusing panels removably supported by said framework so as to substantially close said openings, said panels being effective, when in such openings, to screen said lighting system from view from below and to provide overall, diffused illumination of the room area below said panels, said members being secured together by at least one coupling with an opening therethrough, of relatively small size as compared with the openings defined between said members and fluid discharge means extending downwardly through the opening in said coupling.

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3. In combination, an overhead lighting system, a sub-ceiling framework beneath said system, said framework comprising a group of transverse members and a group of longitudinal members defining openings of length and width determined by the space between said members, light diffusing panels of approximately the same size and shape as said openings removably supported by the members in one of said groups so as to substantially close said openings, said panels being effective when in such openings to screen said lighting system from view from below and to provide overall, diffused illumination of the room area below said panels, couplings joining the members in said groups together at their intersections, at least one of said couplings having an opening therethrough of relatively small size as compared with the openings defined between said members and fluid discharge means extending downwardly through the opening in said coupling.

4. In combination, an overhead lighting system, a sub-ceiling framework beneath said system, said framework comprising a group of transverse members and a group of longitudinal members defining openings of length and width determined by the space between said members, light diffusing panels of approximately the same size and shape as said openings removably supported by the members in one of said groups so as to substantially close said openings, said panels being effective when in such openings to screen said lighting system from view from below and to provide overall, diffused illumination of the room area below said panels, at least a portion of the members in the other of said group comprises acoustical dampening means extending downwardly below said panels, couplings joining the members in said groups together at their intersections, at least one of said couplings having an opening therethrough of relatively small size as compared with the openings defined between said members and room conditioning means extending downwardly through the openings in said couplings to terminate below said panels.

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