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3,308,288

SUSPENDED CEILING CONSTRUCTION

Filed Oct. 29, 1964

2 Sheets-Sheet 1

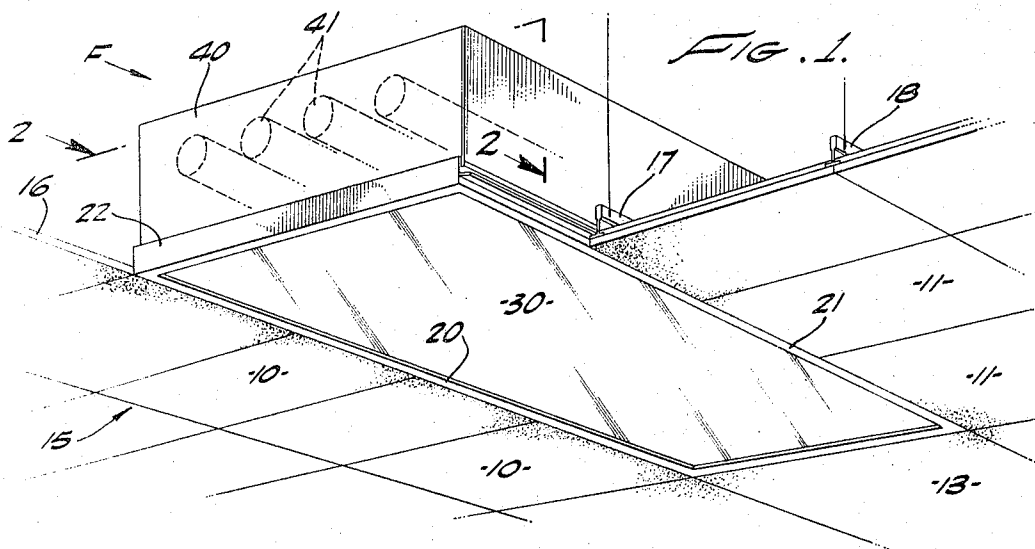


FIG. 2.

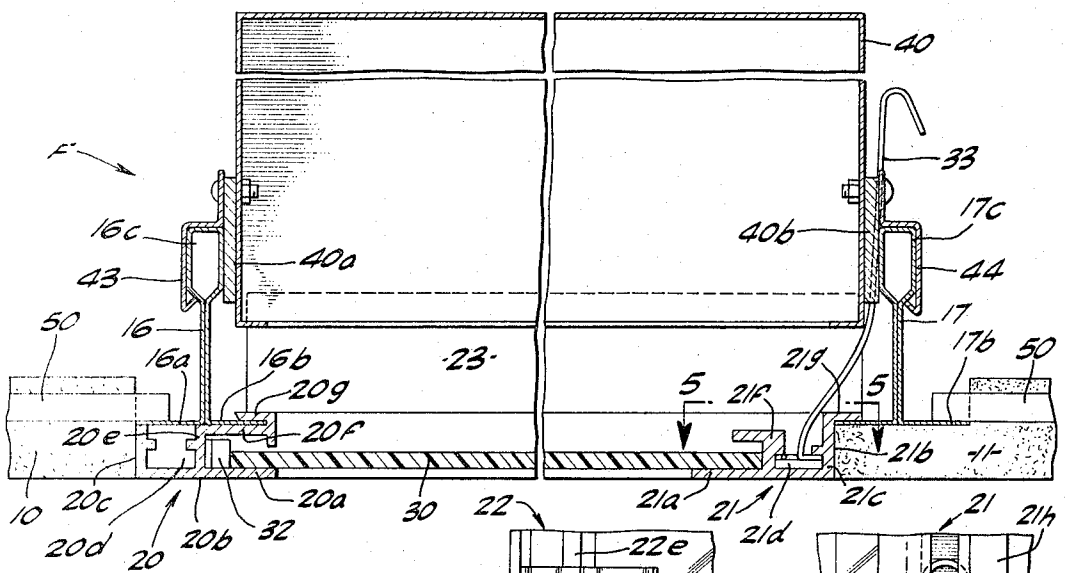


FIG. 3.

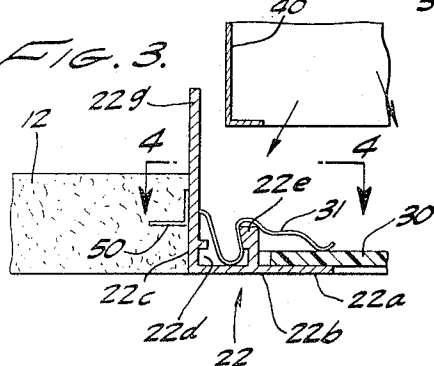


FIG. 4.

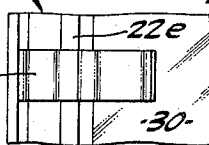
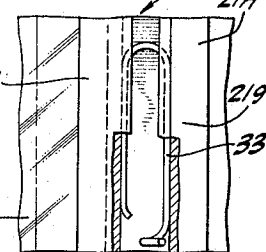


FIG. 5.



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FIG. 6.

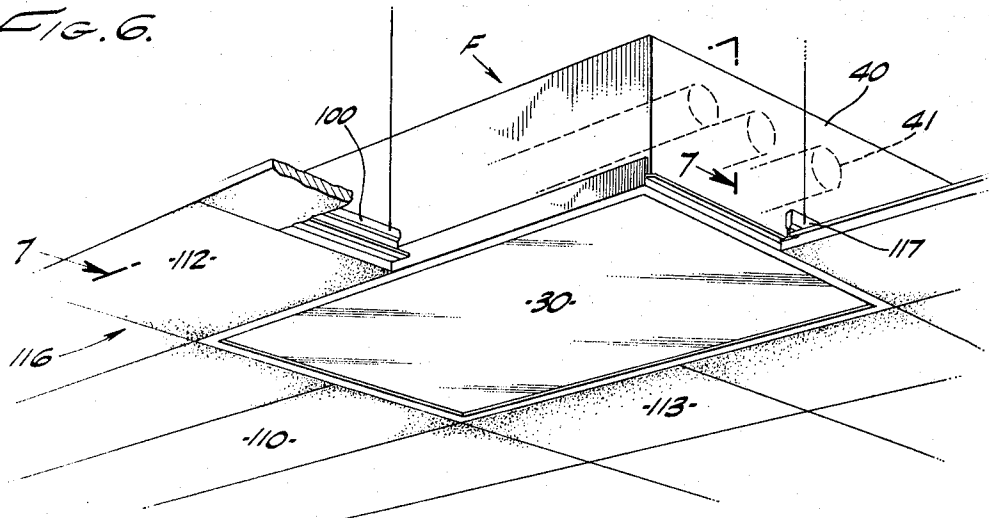


FIG. 7.

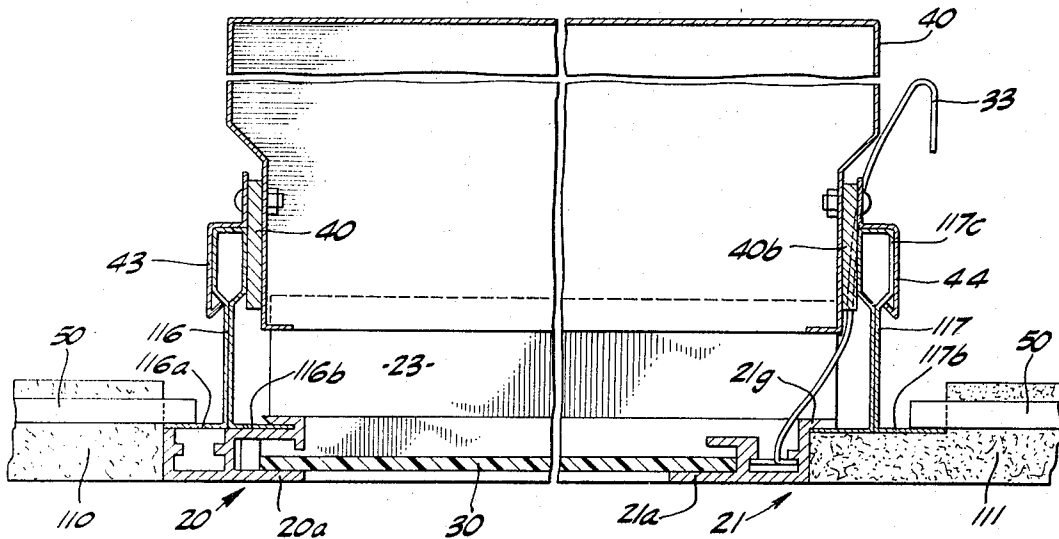


FIG. 8.

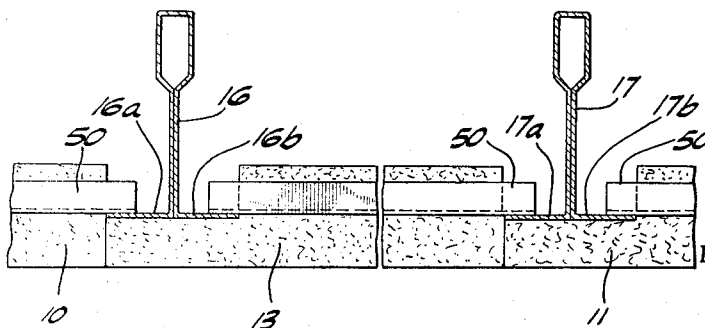
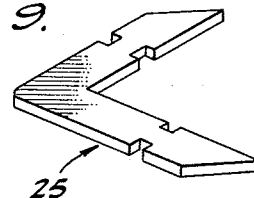


FIG. 9.



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SUSPENDED CEILING CONSTRUCTION
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8 Claims. (Cl. 240-9)

The present invention relates to a suspended ceiling construction, and more particularly to light fixture and air vent installations in suspended ceilings which are adapted to be quickly, conveniently, and economically moved from one location to another.

Suspended ceilings are now in widespread usage, particularly in multi-story office buildings. They involve, generally, a plurality of ceiling support beams which are suspended in a common horizontal plane, as for example by wires which are attached to the roof or to the next higher floor of the building, as the case may be. These ceiling support beams are generally provided, on each lower longitudinal edge, with an outwardly extending horizontal flange which is adapted to support ceiling tiles. A number of different designs of ceiling tiles are currently in usage, but they share the common characteristic of being adapted to be supported by the flanges of the ceiling support beams, either in a relatively permanent installation or in a removable installation.

Prior to the present invention the conventional practice has been to install light fixtures and air vents in suspended ceilings as permanent structures. Thus, the ceiling tiles can be easily removed either for replacement purposes or to obtain access to the plenum area above the suspended ceiling, but the light fixtures and air vents have not been thus easily removed.

At the time of construction of the building the locations of light fixtures and air vents are determined with reference to the locations of partitions in the structure. However, requirements for the usage of floor space change, particularly in large office buildings, and it frequently becomes necessary to relocate partitions. In conjunction with the relocation of partitions it also, very often, becomes necessary to relocate light fixtures and air vents.

The present invention is concerned, therefore, with light fixture and air vent installations in suspended ceilings, which are initially of a semi-permanent type, in the sense that they are constructed with a view toward being easily moved to a different location in these suspended ceilings whenever that may be required.

The primary object of the present invention, therefore, is to provide a utility device construction, for a light fixture or an air vent, which is adapted to be incorporated into a suspended ceiling construction, and when thus incorporated may thereafter be easily removed and replaced with tile, in order to relocate the utility device at a new position within the same suspended ceiling structure.

Another object of the invention is to provide a removable frame for housing a utility device, such as a light fixture lens or air vent, and which is adapted to be removably incorporated into a suspended ceiling construction in lieu of tile, and when thus incorporated to be suspended by substantially the same means that tile is suspended in the ceiling structure.

The foregoing and other objects and advantages of the invention will be more fully understood from the follow-

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ing description considered in conjunction with the accompanying drawings, wherein:

FIGURE 1 is a perspective view of a light fixture installation in accordance with the present invention;

FIGURE 2 is a vertical cross-sectional view taken on the line 2-2 of FIGURE 1;

FIGURE 3 is a fragmentary cross-sectional view of one portion of the light fixture installation;

FIGURE 4 is a plan view taken on the line 4-4 of FIGURE 3;

FIGURE 5 is a plan view taken on the line 5-5 of FIGURE 2;

FIGURE 6 is a perspective view of an alternate form of light fixture installation;

FIGURE 7 is a vertical cross-sectional view taken on the line 7-7 of FIGURE 6;

FIGURE 8 is a vertical cross-sectional view of a typical tile installation in the suspended ceiling structure; and

FIGURE 9 is a perspective view of a corner connector utilized in the invention.

In FIGURE 1 the numeral 15 indicates a ceiling support beam which is located above the tiles 10 and hence is not visible. Second, third, and fourth ceiling support beams 16, 17, and 18, respectively, are located in the same horizontal plane as the beam 15.

A plurality of rectangular ceiling tiles 10 are located in end-to-end array, and are supported between a parallel beam pair consisting of the beams 15 and 16. A second plurality of tiles 11 are supported in similar fashion between the third beam pair 17, 18. A third plurality of tiles 12 (indicated only in FIGURE 3) are located at one end of lighting fixture F between the second beam pair 16, 17, and a fourth plurality of tiles 13 as indicated in FIGURE 1 are located at the other end of fixture F.

Reference is now made to FIGURE 2 where the structure of ceiling support beams 16 and 17 is shown in cross-section. The beam 16 on its lower extremity has a horizontal flange 16a extending to the left, and a horizontal flange 16b extending to the right. The upper extremity of the beam 16 is designated 16c, and in this particular instance is enlarged in the form of what is commonly referred to in the trade as a bulb. Beam 17 is constructed in an identical fashion.

Reference is now made to FIGURE 8 illustrating the manner in which the ceiling beams ordinarily support the ceiling tiles. It will be seen that the tiles illustrated in the present drawings are of the type known as shiplap tiles, although the invention is by no means limited to the use of such tiles. Each of the tiles has cut or kerfed ends so as to receive a spline 50, as best shown in FIGURE 3. As shown in FIGURE 8 the ends of the spline protrude beyond the sides of the tile, so that the spline can be used to provide vertical support for the tile. Specifically, the right-hand end of tile 10 abuts against the outer end of the left flange 16a of beam 16, and the spline 50 associated with the tile 10 extends over the beam flange 16a so as to support the tile 10 therefrom. Tile 13 on its left edge has a shallow portion which extends across the full width of the beam 16, including both the flange 16a and the flange 16b thereof, so that the left edge of tile 13 abuts against the right edge of tile 10, thus providing a continuous structure as viewed from below the suspended ceiling. The right-hand side of tile 13 abuts against the left edge of the left flange 17a of beam 17. The spline 50 associated with tile 13

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extends across the entire width of that portion of the tile which protrudes above the flanges 16b, 17a. It is of sufficient additional length so that it hooks over both of the flanges 16b and 17a, for providing vertical support to the tile. In similar fashion the left-hand edge of tile 11 extends beneath the flanges 17a and 17b of beam 17, while the spline 50 associated therewith hooks over the upper surface of flange 17b.

In accordance with the present invention, and as may best be seen by comparing FIGURES 2 and 8, the structure of the ceiling support beams remains unchanged, and the plurality of tiles 10 on the left side of beam 16 as well as the plurality of tiles 11 on the right side of the beam 17 also remain unchanged. The light fixture F, therefore, is supported between the beams 16 and 17, with the lower portion thereof being substituted in the exposed ceiling surface in lieu of tiles.

It may be noted that the light fixture F shown in FIGURE 1 is approximately 24 inches wide and 48 inches long, and the ceiling support beams 15, 16, 17, 18 shown in FIGURE 1 are arranged on approximately 24 inch centers. Thus the light fixture F, including a metal can 40 which houses a number of fluorescent light bulbs 41, is arranged in a direction such that its length is parallel to the beams 16, 17. That the invention is not thus limited will be apparent from the subsequent description of FIGURE 6.

As shown in FIGURE 2 the light fixture can 40 is provided on its two sides with spacers 40a and 40b, respectively, to which spring latches 43, 44, are respectively attached. In the installed position as shown in FIGURE 2 the catch on the lower end of spring latch 43 hooks beneath the outer and lower longitudinal edge of the bulb 16c of beam 16; and the catch on the lower end of latch 44 hooks beneath the lower and outer longitudinal edge of the bulb 17c of beam 17. The spring latches 43 and 44 are made of resilient material, however, and can be deflected outwardly, so as to lift the can from its engagement with the beams when so desired. An advantage of the spring latches is that labor time in the installation of the light fixture is saved, since no tools need to be manipulated by the workman in order to secure the can 40 in place. Likewise, when the light fixture is to be moved to a different location in the ceiling, no tools are required by the workmen to bend the latches 43 and 44 outward and lift the can from its position on the beams.

The other component parts of the fixture F include a light lens frame which has frame members 20, 21, 22, and 23, fastened together by four fasteners 25; and a rectangular light lens 30. The light lens frame is supported from the beam flanges 16b and 17a in the same manner that a string of tiles would be supported from those beam flanges, if the light fixture were not being used in this particular location in the ceiling. The light lens 30 is supported by the frame members 20-23; and it is significant to note that there is no mechanical coupling between the light lens and the metal can 40 of the fixture.

According to techniques of the prior art a light fixture has been permitted to preserve its integrity as an independent unit, and the light lens has been an integral part of the fixture including the metal can 40 or its equivalent. Thus according to the prior art technique the complete fixture as a unit has been attached to and supported from the beams. According to the present invention, as most clearly shown in FIGURE 2, the lighting fixture F is separated into two distinct assemblies, not physically connected to each other. One assembly is the can 40 containing the fluorescent bulbs 41 and having the spacers 40a, 40b, and the spring latches 43, 44 attached thereto. This entire assembly is attached to the upper extremities of the ceiling support beams 16 and 17. The other assembly includes the frame members 20-23 and the lens 30, and is attached to the lower extremities of the beams 16, 17. Thus according to the

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present invention the can 40 and the lens frame are installed as separate items, each being removably attached to the ceiling support beams, and when the entire fixture is to be moved to a different location they are separately detached from the ceiling support beams in order to move them to their new desired location.

It therefore follows that the ceiling beams 16, 17 are actually a part of the light fixture. As can readily be seen from FIGURE 2, the inner walls of the ceiling beams 16 and 17 cooperate with the metal can 40 in directing light from the light bulbs 41 downward through the light lens 30. Of course, the beams 16 and 17 are permanent parts of the suspended ceiling installation, hence when the lighting fixture is moved to a different ceiling location a different pair of ceiling beams will necessarily become an integral part of the fixture.

In the embodiment of FIGURE 1 the lens frame includes frame side members 20 and 21, and frame end members 22 and 23. The ends of each of the frame members are cut at a 45 degree angle, not specifically shown, so that the four frame members may be attached together to form a rectangular frame. The end frame members 22 and 23 are of identical cross-section, namely that shown in FIGURE 3, but the side frame members 20 and 21 are of differing cross-sections as shown in FIGURE 2. Each of the frame members is of constant cross-section throughout its length and is preferably formed as an aluminum extrusion.

Referring to FIGURE 2, the frame member 20 has an inwardly extending horizontal flange 20a adapted to support one edge of the light lens plate 30. Member 20 has a flat under surface 20b which extends from the edge of tile 10 across the entire width of flanges 16a and 16b of the beam 16, and somewhat beyond the edge of flange 16b. The flat under surface 20b provides a decorative appearance, as is conventional. The outer edge of frame member 20 has a vertical wall forming an exterior wall surface 20c which engages the vertical edge of the tile 10. Formed inside the external wall of the member 20 is a channel 20d, which is adapted to receive one end of the corner fastener 25. Member 20 has a central section 20e which extends vertically upward in parallel relationship to the outer wall, and whose lower portion in conjunction with the lower portion of the outer wall forms the channel 20d. At its upper extremity the portion 20e is turned over into a horizontally extending portion 20f which is parallel to the flange 20a, and coextensive therewith. Portion 20f engages the under surface of beam flange 16b. The right-hand edge of 20f extends up and into the portion 20g which extends leftward and hence hooks over a portion of the upper surface of the beam flange 16b. Thus in the installed position as shown the frame member portion 20g provides vertical support for the frame from the beam flange 16b, in substantially the same manner as the tile 13 would be supported by the beam flange if the tile 13 were occupying the space rather than the light lens frame.

Frame member 21 has a horizontal flange portion 21a on its left edge, which is adapted to support the light lens 30. On its right-hand side frame member 21 includes a vertical wall 21c, whose outer wall surface 21b is adapted to engage the vertical edge of the tile 11. The upper part of wall 21b also engages the left edge of beam flange 17a. Frame member portion 21c at its upper extremity is turned over to form portion 21g, which extends horizontally to the right and rests on a portion of the upper surface of beam flange 17a.

Frame member 21 also includes a vertical center portion 21f, which together with the vertical portion 21b forms a channel 21d which is identical to the channel 20d of frame member 20.

The right-hand side of lens 30, as seen in FIGURE 2, is flush against the vertical central portion 21f of frame member 21. The left side of lens 30 is retained by a leaf spring 32, which lies on its side upon the upper surface of

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horizontal flange 20a of frame member 20, and abuts against the vertical center section 20e of frame member 20.

Reference is now made to FIGURE 3 showing a cross-sectional view of frame member 22. Frame member 22 includes a horizontal inwardly extending flange 22a, upon which an end of the light lens 30 rests. Frame member 22 has an outer wall forming a vertical outer surface 22c which engages the vertical edge of tile 12. Furthermore, the outer wall extends a considerable distance above the top of the tile, the upper extremity of this wall being labeled 22g and extending above the lower edge of the fixture can 40. Wall 22g forms a light trap, which prevents light from the fixture can from escaping into the room below, between any crack which might exist between the tile 12 and the frame member 22. Frame member 22 also has a vertical center section 22e, which together with the outer wall forms a channel 22d for receiving one end of a corner fastener 25.

FIGURE 3 is also illustrates a retaining spring 31 which is retained in the channel 22d and is held by a sloped inner surface of the upper portion of the frame portion 22e. The outer end of spring 31, extending to the right in FIGURE 3, engages the upper surface of light lens 30.

FIGURE 4 shows the frame member 22, light lens 30, and retaining spring 31, as seen from above.

The invention embodiment of FIGURE 1 is assembled and installed as follows. First, the spacers 40a and 40b, and spring latches 43 and 44, are attached to the metal can 40. Then the metal can 40 is placed in position by raising it above the beams 16 and 17 and lowering it until the spring latches catch.

Before the lens frame is assembled a plurality of lens retainer springs 32 are inserted in position, by sliding them into frame member 20. Then the four frame members are assembled by placing their mitered ends, not shown, together and inserting one of the corner fasteners 25 at each corner of the frame. Each corner fastener is then staked at the notched portions shown in FIGURE 9. Next the lens 30 is inserted into the open edge of the frame member 20. When lens 30 is pressed tightly against the leaf springs 32, the other side edge of lens 30 is able to drop below the laterally protruding portion of the central part 21f of frame member 21, and then becomes hooked in place by both of the frame members 21 and 20. The ends of the light lens 30 then rest upon the flanges 22a and 23a, as seen in FIGURE 3, and since the light lens 30 is generally of resilient material, these ends would be subject to rattling and vibration if they were not held in place. Consequently the retaining springs 31 are used in order to hold the ends of lens 30 tightly against the flanges 22a, 23a.

Spring 31 has a peculiar configuration which is deliberately designed for the purpose at hand. The spring consists of a flat strip of metal as seen in FIGURE 4, which is bent in the configuration as seen in the side view of FIGURE 3. At its extreme right end as shown in FIGURE 3 the spring 31 is twisted up so as to provide a rounded under surface for smoothly engaging the light lens 30. Between its right or outer end and the frame member portion 22e, the spring member is bowed upwardly in order to insure the resiliency of its outer end. Frame member portion 22e on its left side is not vertical, but inclines downwardly and inwardly of the frame at an angle of approximately 10 degrees. Spring 31 at that point is formed in approximately the shape of a dipper with the handle being at an angle of somewhat less than 90 degrees relative to the bowl portion of the dipper. The bowl portion of the dipper engages the left side wall of portion 22e, the bottom of fastener channel 22d, and the inner vertical surface of wall 22g, being therefore securely locked into place because of the inclined wall surface previously described of the frame member portion 22e. The left end of spring 31 does not rise in line with the left side of the bowl, but is twisted over into an

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approximately horizontal alignment so as to engage the inner surface of wall 22g with a substantially horizontal force. Furthermore, when the spring 31 is to be removed or detached from the frame member 22, a thin member such as a knife blade is inserted under the left end of spring 31 and is raised vertically upward so as to release the otherwise locked bowl portion of the spring from its retained position.

When the lens frame has been assembled and the lens inserted therein, the frame member 21 is then pushed upward between tiles 12 and 13 and is caused to pass up above the flange 17a of beams 17. Then the frame member 20 is raised to a nearly level position of the frame, so that the frame portion 20g is able to hook over the right-hand edge of beam flange 16b. The entire frame is then moved to the left so as to permit the frame member 21 to drop down beside the tile 11, in the position shown in FIGURE 2. This entire manipulation occurs in the two-dimensional plane shown in FIGURE 2, and does not involve any endwise movement, since the end frame members 22 and 23 simply engage vertical tile edges, as shown in FIGURE 3.

A feature of the apparatus which, for the sake of simplicity, was omitted from the foregoing description, is the safety hook 33. FIGURE 5 shows the configuration of the lower end of safety hook 33, which is securely anchored in the channel 21d of frame member 21. The upper portion of safety hook 33 passes upward, beside the can 40, and between the can 40 and the bulb 17c of beam 17. In FIGURE 2 it appears that safety hook 33 occupies the same space as is occupied by spacer 40b. However, ordinarily there are two of the spacers 40b and two respectively associated spring latches 44 along the entire 48 inch length of the metal can 40. Consequently, a great deal of space is left between the spacers 40b, and on the ends of the can beyond the spacers 40b, in which two or more of the safety hooks 33 may be disposed, in suitably spaced relationship along the length of the lens frame. As shown in FIGURE 2 the upper end of safety hook 33 is bent over, so that upon a lowering of the hook it will engage the upper extremity or bulb of the beam 17.

Thus, at least two of the safety hooks 33 are attached to the frame member 21 before the insertion of the frame into its installed position. If for any reason it is desired to remove the frame, as for example, to replace light bulbs 41, the frame does not drop to the floor but hangs down on one side, with the frame member 21 being uppermost and being held in place by the two or more safety hooks 33 whose upper ends then engage the bulb 17c of beam 17.

In FIGURES 2 and 5 the safety hook 33 is shown as being formed of a stiff metal wire. It is in fact preferred, however, to utilize a plastic member of slightly different configuration, because of its greatly reduced cost.

Referring now to the embodiment of FIGURES 6 and 7, it will be seen that the length of the light fixture can 40 runs perpendicular to the length of the beams 116, 117. Beam 116 is not specifically shown in FIGURE 6 but its position is indicated. It will also be noted that another beam, designated 100, is located intermediate to the beams 116 and 117, and a portion of the beam 100 is either cut out or else initially omitted in order to permit the installation of the light fixture in the position shown.

In the embodiment of FIGURES 6 and 7 the configuration of frame members 20, 21, 22, 23 is exactly the same as in the embodiment of FIGURES 1 to 3. However, in FIGURES 6 and 7 the "end frame members" 22 and 23 are four feet long, while the "side frame members" 20 and 21 are only two feet long. It is therefore apparent that the words "end" and "side", as applied to the frame members of the present invention are arbitrarily selected and have no particular significance, but are in fact interchangeable under the circumstances illustrated.

In the embodiment of FIGURES 6 and 7 the end portion of the metal can 40, as shown in FIGURE 7, is slightly curved immediately above the beam locations. This detail differs from FIGURE 2, but does not represent any change in the configuration of the can 40, but rather simply illustrates the end of the can whereas in FIGURE 2 the side of the can is shown. It will be seen that safety hooks 33 are incorporated into the embodiment of FIGURES 6 and 7 in the same manner as in the previous embodiment of the invention.

While not specifically illustrated in the drawings, it is apparent that the frame including the side and end frame members and corner fasteners may be used for other purposes, independently of the light fixture can 40 and its associated assembly. Specifically, the frame may also be used in conjunction with an air vent. When thus used the front plate of the air vent is substituted in the position of the light lens 30. In both instances the easily movable frame of the present invention incorporates a utility device, where the operative portion of the utility device is a flat plate disposed within the frame, and where the central portion of the flat plate is of an energy transmissive nature. That is, the light lens 30 transmits light in the case of a light fixture as illustrated, while the baffle of an air vent transmits flowing air, which is energy of another form. In accordance with the present invention the ceiling tiles may be removed at any desired location, the removable frame inserted in that location, and the removable frame may then be used either in conjunction with the light lens associated with a light fixture, or in conjunction with the cover plate of an air vent, as may be desired.

The invention has been described in considerable detail in order to comply with the patent laws by providing a full public disclosure of at least one of its forms. However, such detailed description is not intended in any way to limit the broad features or principles of the invention, or the scope of patent monopoly to be granted.

What is claimed is:

1. A concealed-grid suspended ceiling construction comprising, in combination:

a parallel pair of beams supported in a common horizontal plane, and adapted to removably support a plurality of ceiling tiles therebetween, each of said beams having a pair of outwardly extending horizontal flanges formed on its lower longitudinal edges;

a metal can adapted to contain and support at least one fluorescent light bulb;

latch means releasably coupling said can to the upper extremities of said beams, the lower extremity of said can being spaced above said beam flanges, whereby said can and light bulb may be conveniently relocated at any desired location in the suspended ceiling construction;

a rigid rectangular frame, which includes a pair of side members and a pair of end members, disposed between said parallel pair of beams, each of said frame side members having support means associated therewith which extends upwardly above the corresponding beam flange and laterally outward over the upper surface thereof to retentively engage the same;

one of said frame side members and its associated support means being adapted for vertical movement to disengage it from its associated beam flange prior to moving the other of said side members horizontally for purpose of disengagement;

a light lens disposed in said frame;

said metal can and the inner walls of said beams cooperatively directing light from said light bulb through said light lens;

and holding means securing one of said frame members to one of said beams, to prevent inadvertently

dropping said frame during installation or removal thereof;

whereby said frame may be conveniently removed and replaced with ceiling tiles when it is desired to relocate said metal can and fluorescent light bulb in a different ceiling location.

2. In a suspended ceiling construction which includes a parallel pair of beams supported in a common horizontal plane, each of said beams having a pair of outwardly extending horizontal flanges formed on its lower longitudinal edge, and which further includes first and second pluralities of rectangular ceiling tiles disposed in end-to-end array between said beams so as to leave a space between said first and second pluralities of tiles, and supported from and in removable engagement with the immediately adjacent flange of each of said beams, and easily movable light fixture arrangement occupying said space, comprising, in combination:

a metal can adapted to contain and support at least one fluorescent light bulb;

spring latch means releasably coupling said can to the upper extremities of said beams;

a rigid rectangular frame including a pair of side members and a pair of end members, the members of one of said pairs engaging the immediately adjacent flanges of said beams and being removably attached thereto, the members of the other of said pairs engaging the end tile of said first and second pluralities of tiles, respectively;

a substantially rectangular light-transmissive plate disposed within said frame;

and spring means releasably retaining said plate within said frame.

3. Apparatus as claimed in claim 2 which further includes a pair of safety hooks attached to one of said frame members, extending upwardly therefrom, and having hooked upper ends adapted to hook over one of said beams so as to prevent said frame from falling when said frame is removed and lowered from said space.

4. Apparatus as claimed in claim 2 wherein each of said frame members is an aluminum extrusion and has an inwardly extending horizontal flange formed thereon.

5. Apparatus as claimed in claim 2 wherein said members engaging said tiles each includes a solid upper portion which extends vertically upward to a point outside of, and above, the lowermost extremity of said can.

6. An easily movable light lens frame adapted for mounting in a suspended ceiling in lieu of tile, comprising:

a pair of end frame members and a pair of side members, each being an aluminum extrusion and having a smooth undersurface adapted to provide an ornamental appearance, each having an external wall surface adapted to engage the vertical edge of an adjacent tile, and each being cut at 45° angles on its ends and having near its external wall surface on each of its ends means for receiving a fastening device;

four fastening devices holding associated ends of said frame members together so as to form a rectangular frame;

each of said frame members having on its lower inner longitudinal edge an inwardly extending horizontal flange adapted to support a light lens;

means for attaching one pair of said frame members to the inwardly extending horizontal flanges of respectively associated ceiling support beams so as to be supported thereby;

and a plurality of spring members for retaining the light lens in place;

the upper portions of at least two of said frame members being adapted to retain said spring members, and said spring members being so formed as to hold the light lens in place while being retained by said frame member upper portions.

7. An easily movable light lens arrangement adapted for mounting in a suspended ceiling in lieu of ship-lap tile, comprising:

- a pair of frame end members, one abutting flush against the outer edge of a horizontal flange of a supporting beam and simultaneously hooking over said flange, the other extending beneath the full width of a supporting beam and at the same time hooking over a horizontal flange thereof;
- a pair of frame side members, engaging the vertical edge of an adjacent tile and having a light-trap portion extending vertically thereabove;
- four separate fastening devices fastened to the ends of said frame members to form a rectangular frame, each of said frame members having a horizontal flange formed thereon which extends inwardly of said frame and;
- a substantially rectangular light-transmissive plate disposed within said frame upon said inwardly extending flange thereof.

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8. A light lens arrangement as claimed in claim 7 wherein each of said frame members is an aluminum extrusion.

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