

Aug. 20, 1957

E. F. GUTH

2,803,741

CEILING ILLUMINATION

Filed Oct. 1, 1953

2 Sheets-Sheet 1

FIG. 1.

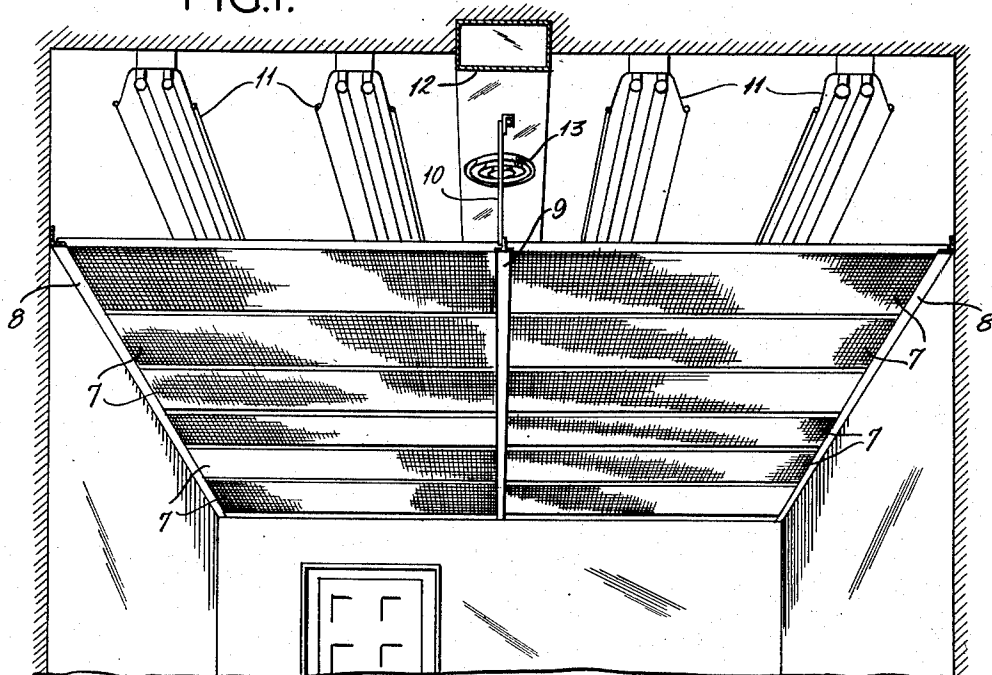


FIG. 2.

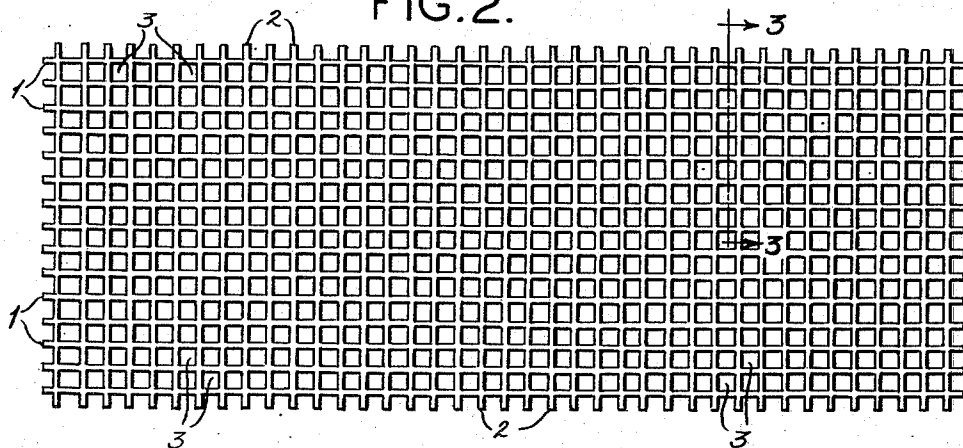
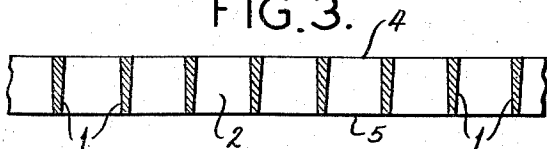


FIG. 3.



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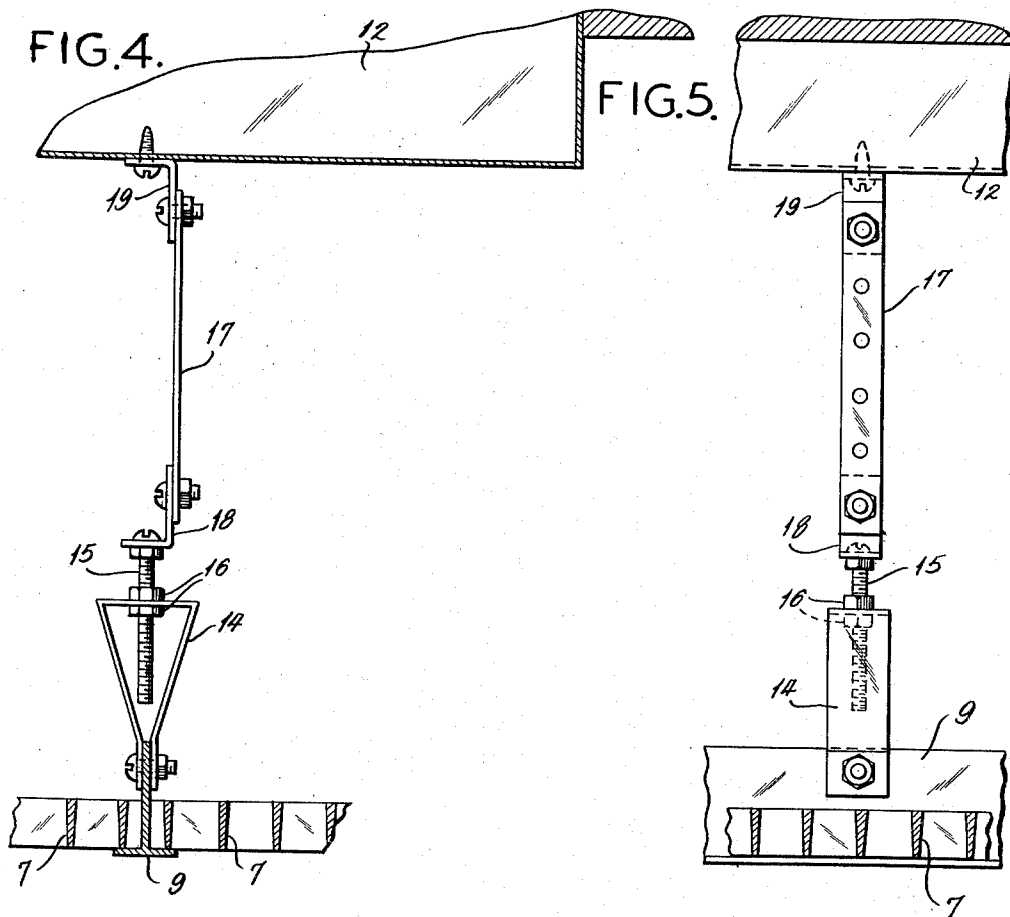
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2 Sheets-Sheet 2



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1

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CEILING ILLUMINATION

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1 Claim. (Cl. 240-9)

This invention relates generally to the control of light, and particularly to the control of light from fluorescent sources and other situations where it is desirable to shield the light source, reduce the glare, and otherwise improve the quality of the light reaching the illuminated area. This is a continuation-in-part application with respect to my copending application, Serial No. 261,780, filed December 15, 1951, now Patent No. 2,745,001.

The high intrinsic brightness of fluorescent sources and the "hard" quality of the light emitted thereby necessitates the provision of some control means in order to create a reasonable approach to comfortable seeing conditions in the area illuminated by such a fluorescent source. Heretofore, such control means have generally taken the form of louvers (made of metal or plastic) or imperforate diffusing panels (made of diffusing glass, or plastic sheets). By means of imperforate diffusing panels, the quality of the light has been improved at the expense of efficiency of the luminaire, but without substantially reducing the objectionable brightness and glare. Such imperforate diffusing panels also present an aggravating maintenance problem due to the proclivity of the luminaire to collect dust, dirt, and insects which, if not removed at frequent intervals, further reduces the efficiency of the luminaire. Louvers of the "egg crate" type greatly reduce the maintenance problem, as, being open in the vertical direction, foreign materials which would otherwise accumulate therein, fall through; but such louvers as have heretofore been provided fail to relieve the objectionable hard quality of the light emitted by fluorescent source and otherwise fail to equal the performance of imperforate diffusing panels toward the aim of comfortable seeing conditions. The quality of the light emitted by luminaires provided with such louvers is particularly tiring to the eyes of bespectacled persons who may be situated so that direct rays from the luminaire impinge upon the inside of their spectacle lenses. While such louvers made of metal, or plastic, quite adequately shield the source from direct view at normal viewing angles if the openings therein are properly proportioned, proper shielding in this respect requires that the louver be made at least as deep as the respective cross-sectional dimensions of the openings therein, and consequently when the openings are, as has heretofore been customary in the art, an inch or two in each cross-sectional dimension, the louvers themselves are quite space consuming. It has heretofore been indicated (see U. S. Pat. No. 2,258,354) that the use of narrower, more closely spaced elements in such louvers is "impractical," and as an alternative thereto, it was proposed to provide a two-ply imperforate diffusing panel in one ply of which transparent laminae were separated by translucent laminae running in the lengthwise direction, and in the other ply of which the translucent and transparent laminae ran in the transverse direction. Such two-ply laminated panels are not only extremely difficult and costly to manufacture, but present the same maintenance problem as other imperforate panels, and in addition, require to be twice as deep for any given angle of shielding as would be necessary if the translucent laminae, running at right angles to each other, were aligned in the same horizontal planes.

One of the objects of the present invention is to control light from a fluorescent source so as to achieve comfortable seeing conditions without sacrifice of efficiency, and without the maintenance problems of imperforate diffusing panels.

2

Another object of the invention is to provide a light-controlling louver which improves the quality of light delivered therethrough from a source of high intrinsic brightness.

Another object of the invention is to provide a louvered ceiling, or part-ceiling, of a character such as, at once, to control light and air currents traversing the same, and improve the acoustical qualities of the room provided therewith.

Other objects will become apparent to those skilled in the art when the following description is read in connection with the accompanying drawings in which:

Figure 1 is a perspective view of a room provided with a louvered ceiling constructed in accordance with the present invention;

Figure 2 is a plan view of a part of one of the louver elements embodied in the ceiling of the room shown in Figure 1;

Figure 3 is a sectional view taken along line 3-3 of Figure 2;

Figure 4 is an end view of a louver hanging element of the character utilized in the ceiling shown in Figure 1; and

Figure 5 is a side elevation of the hanger shown in Figure 4.

The present invention is predicated upon the discovery that louvers having substantially cubic apertures which are between a quarter and a half inch in each dimension improve the quality of light from fluorescent bulbs, or other sources of high intrinsic brightness, which traverse such louvers. When such louvers are made of translucent material, the strips which separate the cubic openings from each other may be made thick (as compared with prior louvers) relative to the dimensions of the openings, without impairing the efficiency of the luminaire, and consequently for the control of illumination from artificial sources, it is preferred that the louvers be made of translucent material. Optimum seeing conditions from a fluorescent source are created, for instance, by forming the louver of translucent thermoplastic materials which contain a small amount of white or gray pigment so as to give a gray-white appearance to the louver; and wherein the individual openings in the louver are spaced, center to center in both lengthwise and transverse dimensions, about 0.43 to 0.46 inch, with the translucent material which separates each opening from its neighbor having a dimension (in the direction of such center to center spacing) of between 0.060 and 0.090 inch. The openings need not be geometrically true cubes, in fact the technique of thermoplastic molding is facilitated if some draft be allowed and consequently, in one specific example, the thickness of the translucent material which separates the openings is 0.065 inch at one face of the louver and 0.085 inch at the opposite face.

Referring now to Figures 2 and 3 of the drawings for an illustration of a louver constructed in accordance with the present invention, it will be observed that the louver consists of a plurality of longitudinally extending strips 1 arranged in parallel equi-spaced relationship, and a plurality of transversely extending strips 2 arranged in parallel equi-spaced relationship. The center to center spacing between the strips 1 is the same as the center to center spacing between the strips 2, and the strips intersect each other substantially at right angles so that they collectively define a multiplicity of square openings 3. As clearly shown in Figure 3, the strips 1 and 2 are arranged so that their edges respectively define opposite faces 4 and 5 of the louver. In the embodiment shown, the several strips 1 and 2 are spaced apart, center to center, a distance of $\frac{3}{8}$ of an inch, and the thickness of the respective strips 1 and 2 (such thickness of strip 1 being measured in the lengthwise direction of strip 2, and

3

vice-versa) is between 0.065 and 0.085 inch. As clearly shown in Figure 3, the thickness of the strips, while substantially uniform as between strips, is not necessarily uniform from edge to edge of a given strip. Indeed, it facilitates the manufacture of the louver as a one-piece casting if some draft be allowed on the several strips in the manner indicated by Figure 3. While Figure 3 illustrates a cross-sectional view of the strips 1, it will be understood that a corresponding cross-sectional view of the strips 2 would be identical.

The louver shown in Figures 2 and 3 is an integral plastic casting which may be formed of such thermoplastic molding materials as polystyrene resin, known commercially as Lustrex, or one known as Lucite, a vinyl resin known commercially as Vinylite, an acrylic resin known commercially as Plexiglas, vinylidene resins, or other comparable plastic molding materials which are translucent, or may be made translucent, as distinguished from transparent. It is particularly advantageous, where the louver is to be used for the control of light from artificial sources, that the plastic material chosen have a whitish or frosty appearance identified in the illumination art as "diffusing white." The louver shown in Figure 2 may be conveniently molded as integral sections having a face dimension of 10½ inches x 48 inches. Such louvers may be applied for the control of light, heat and sound in various ways, some of which will now be described.

Referring to Figure 1 of the drawings, a typical room is illustrated wherein a false ceiling is composed of a plurality of louver sections 7, each constructed as above described with respect to Figures 2 and 3. The several louver sections 7 are sustained at the side walls of the room by suitable supports 8 shown in the form of angle bars, one leg of which is secured to the side walls and the other leg of which provides a ledge upon which the ends of the louver sections 7 may rest. In the drawing, the lines of demarcation between the respective louver sections are exaggerated for clarity of illustration, but it should be understood that when the louver sections are constructed as shown in Figure 2 so that the transversely extending strips 2 project outwardly beyond the sidemost longitudinally extending strips 1 for a distance equal to one-half the spacing between the strips, the visual effect of the composite ceiling, as viewed from normal viewing distances, is one of continuity.

In the embodiment shown, the width of the room is such that two lengths of louver are required to fill the space, and consequently means is provided at the center of the room for supporting the adjacent ends of the lengthwise arranged louver sections 7. Such means, in the embodiment shown, consists of a T-bar 9 which is sustained by means of a hanger 10 from the ceiling, or other permanent part of the building which is capable of sustaining the load of the louvered ceiling.

Above the series of louvers 7, a plurality of luminaires 11 are suitably supported, as, for example, by mounting the same upon the ceiling. In the form shown, the luminaires are provided with fluorescent lighting units of standard type. The several luminaires 11 are preferably spaced, center to center, a distance about the same as the distance between the fluorescent units therein and the upper face of the louvers 7.

The room shown in Figure 1 is also provided in its ceiling with an air duct 12 for conveying the usual cooling or warming air. The duct 12 is provided with an outlet 13 which may be either a horizontal or a vertical opening, with or without controlling louvers of its own. Where the opening from the duct 12 is disposed as much as six inches away from the upper face of the louvers 7, the latter alone quite adequately perform the function of distributing the incoming air over a relatively wide area and with noticeable uniformity. Louvered ceilings of the character shown in Figure 1 serve therefore not only to control the light from the luminaires, but to control the air from the air conditioning source, and in addition, provide a substantial acoustical effect.

4

The details of the central hanger shown in Figure 1 are further illustrated in Figures 4 and 5 where it will be observed that the T-bar 9 is connected with a closed U-shaped clip 14 at the upper end of which an adjustable bolt 15 is secured by means of nuts 16. The head of the bolt 15 is sustained by a hanger strap 17 having angle members 18 and 19 at opposite ends thereof, the upper one of which is secured to the ceiling, or the duct 12, as circumstances may require. In the form shown, the hanger strap 17 may be made of the usual perforated strapping, and cut off to the desired length so that accurate adjustment as to height may be accomplished by properly manipulating screw 15.

With the translucent louver ceiling hereinbefore described, a decided softening effect is imparted to the light traversing the same, and comfortable seeing conditions are created without sacrifice of light transmitting efficiency and without objectionable brightness. In a louvered ceiling or part-ceiling application, such as that hereinbefore described, the uniformity of brightness throughout the entire louvered area is striking. That this is attributable to the relatively small magnitude of the cubic openings is demonstrated by the fact that louvers constructed of the same materials, but having openings which are ⅞ inch on a side (or roughly four times the open area of the individual openings in the louver herein described) are noticeably non-uniform in brightness. Hence, magnitude of the openings is an essential feature of the louver herein disclosed, and in order to achieve the results indicated, such openings must be not less than a quarter inch in each dimension, or more than a half inch in each dimension.

While several applications of the louver of the present invention have been described in detail, it is not intended that the invention be limited by its illustrative examples. On the contrary, it is realized that many adaptations and variations of the disclosed louver will present themselves to those skilled in the art without departing from the teaching of the invention or the scope of the appended claim.

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

In a room having a primary ceiling, the improvement comprising a false ceiling spaced substantially below said primary ceiling and extending substantially over the entire area thereof, said false ceiling being constituted by a plurality of egg-crate grids molded from light transmitting plastic with openings measuring no greater than a half inch center-to-center defined by walls which taper downwardly, a framework supporting said grids in substantially contiguous coplanar relationship with one another, said framework having narrow bottom flanges underlying the margins of adjacent grids, said flanges being substantially coplanar with the bottom surface of the grids and the framework otherwise being hidden by said grid so as to achieve the effect of a continuous ceiling, and a series of elongate light sources spaced vertically above said grids in horizontal parallel relationship to one another, said elongate light sources being transversely spaced from one another in the horizontal direction a distance approximating the vertical spacing of said light sources above said grids.

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