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LUMINOUS CEILING PANEL

Filed June 1, 1960

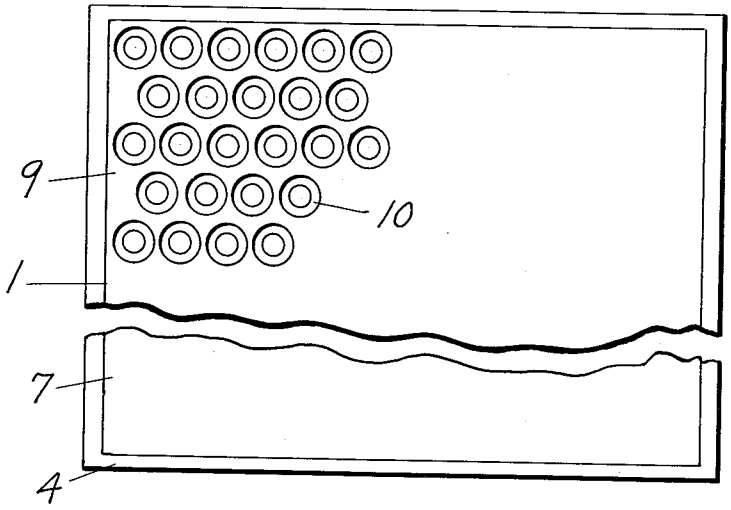


FIG. 1

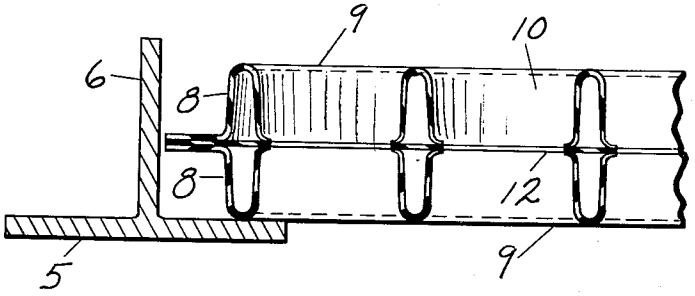


FIG. 2

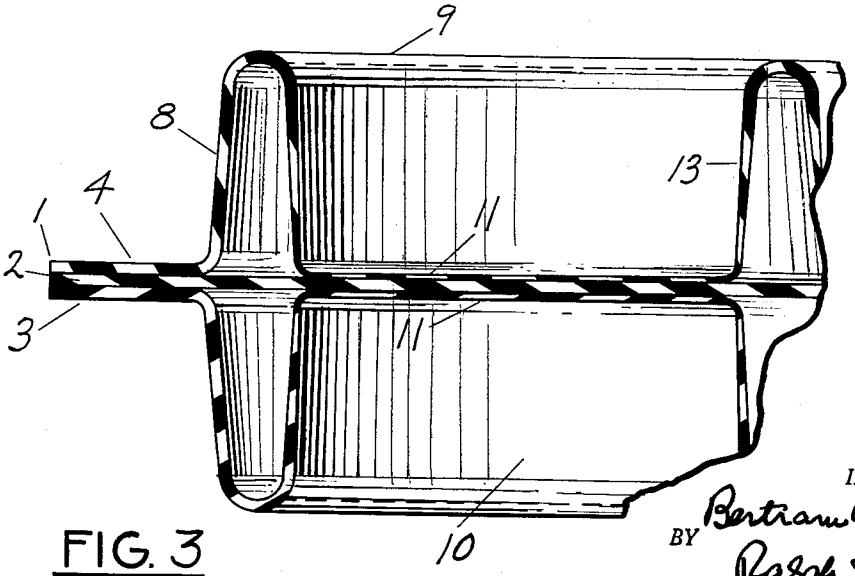


FIG. 3

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LUMINOUS CEILING PANEL

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This invention is a light transmitting ceiling panel of thermally formed sheet plastic having hollow light directing and diffusing ribs.

In the drawing, FIG. 1 is a plan view of a panel, FIG. 2 is a fragmentary section, and FIG. 3 is an enlarged view illustrating the manufacture.

The panel is made of thin sheets 1, 2 and 3 of transparent or translucent plastic, preferably of one of the plastics which will not support combustion, such as polyvinylchloride. The sheets are in face to face contact throughout the entire peripheral edges of the panel and are integrally united, for example by heat sealing, to form an outwardly projecting peripheral flange 4 by which the panel may be supported, for example by resting on one of the flanges 5 of a T-shaped joist 6. The flange 4 is convenient, but is not essential. The flange may be trimmed off and the panel supported by having its lower face rest on the supporting structure. Other forms of supporting structure may be used, for example those used for suspended, acoustical ceilings.

Each of the upper and lower sheets 1 and 3 has a section 7 dished away from the plane of the intermediate sheet 2, each dished section consisting of a side wall 8 adjacent the edge of the sheet and a bottom wall 9 lying in a plane parallel to the edge of the sheet. The bottom wall 9 has formed therein dimples 10 extending back toward the plane of the edge of the sheet. These dimples may be of any suitable shape such as round, as illustrated, square, hexagonal, etc. As shown in FIGS. 2 and 3, the dimples in the sheets 1 and 3 extend toward and are in register with each other so that when the sheets are aligned with their dished sections 7 registering and extending away from each other, the bottom walls 11 of the dimples are in contact with opposite surfaces of the intermediate sheet 2.

The sheets 1, 2 and 3 are united, preferably by heat sealing, at all areas of contact as illustrated in FIG. 3, thereby producing a panel which is completely sealed around its entire peripheral edge and also at the bottoms of the dimples. After sealing, the bottoms of the dimples are punched out within the sealed areas, thereby producing light transmitting holes 12 as illustrated in FIG. 2. The resultant panel is of light weight and yet has sufficient rigidity to permit edge support of the panels in the two foot by two foot and two foot by four foot sizes required by the lighting industry.

The sheets 1 and 3 are identical and are conveniently thermally formed in a single operation in which the sheet is heated until it becomes plastic and is sucked by vacuum against a mold of the desired contour. During the vacuum forming, there is a tapering of the side walls 8 and there is also a tapering of the side walls 13 and bottom walls 11 of the dimples as illustrated in FIG. 3. The vacuum forming stretches the sheet to the required shape and reduces the thickness in the regions in which the stretch is greatest. The reduction in thickness is greatest at the bottom walls 11 of the dimples. At the end of the vacuum forming operation, the individual sheets 1 and 3 are more rigid than before forming but the rigidity is nowhere near adequate for light transmitting ceiling panels unless the sheets are of a prohibitive thickness. If the sheets 1 and 3 were joined with the walls 9 in face to face contact and the dimples 10 extending away from each other, the increase in rigidity of the resultant panel would only be substantially twice

that of the individual sheets. When the sheets 1 and 3 are joined to opposite sides of the intermediate sheet 2 as shown in FIGS. 2 and 3, the rigidity of the resultant panel is increased at least tenfold over the rigidity of a single sheet.

The intermediate sheet 2 has several functions. First, it ties the peripheral walls 8 of the dished section 7 together. Second, the intermediate sheet 2 ties the side walls 13 of the dimples 10 together. Both of these have the effect of greatly increasing the rigidity of the resultant panel. Another advantage of the intermediate sheet 2 is that it provides additional material between the bottom walls 11 of the dimples which aids in the heat sealing. During heat sealing there is a flow of the plastic and with sections which are too thin, good joints cannot be obtained. By having an intermediate sheet 2, good joints are obtained even though the bottom walls 11 of the dimples are very thin. The addition of the intermediate sheet produces a marked improvement in crushing strength, i.e. the resistance to compressive forces applied to opposite faces of the panel. Compared to a panel having only the upper and lower sheets 1 and 3 with the dimples sealed directly to each other, the addition of the intermediate sheet 2 with the dimples sealed to opposite sides of the intermediate sheet increases the crushing strength by a factor of ten.

By the foregoing structure, light transmitting panels have been built with adequate rigidity for edged support in two foot square and two foot by four foot sizes from sheet polyvinylchloride having a thickness of 15 mils. The finished panel is of light weight due to the hollow rib construction. The hollow rib construction also increases the fire resistance of the panels. These are important factors in luminous ceiling constructions. Increased weight of the panels requires sturdier suspension systems. Without adequate fire resistance, the panels will not pass the underwriters requirements for multistory buildings.

Because the sheets are hermetically sealed throughout, cleaning is as simple as in the heavier, solid constructions.

In addition to improving the rigidity of the panel, the intermediate sheet 2 also assists in providing better diffusion of the light. This is of particular advantage in luminous ceilings because it reduces the intrinsic brightness of the panel.

Commercial constructions in two foot by two foot and two foot by four foot sizes have been made with the dimples 10 approximately ½ inch in diameter on 9/16 inch centers with the depth of the side walls 13 being approximately ¼ inch and the holes 12 substantially ⅜ inch in diameter. This results in a ceiling panel which cuts off direct view of the light source at all angles up to 45 degrees from the horizontal. Above 45 degrees, direct view of the light is possible but the brightness is cut down because the open area provided by the holes 12 is less than half of the panel area and the unperforated panel area has its light diffusing properties increased by the intermediate sheet 2.

What is claimed as new is:

1. A light transmitting ceiling panel comprising spaced upper, lower and intermediate sheets of light transmitting plastic, said upper and lower sheets each having a plurality of dimples therein with side walls extending transversely from the respective sheets toward the intermediate sheet and of depth equal to the spacing from the intermediate sheet, the dimples in the upper and lower sheets being opposite each other and the bottoms of the dimples being united to opposed areas on opposite sides of the intermediate sheet, the side walls and bottoms of the dimples being of lesser thickness than the sheets from

which the dimples extend, and the bottoms of the opposite dimples and the intermediate sheet having an opening therein within said areas.

2. A light transmitting ceiling panel comprising upper, lower and intermediate sheets of light transmitting plastic sealed in contact with each other around the peripheral edges of the panel, said upper and lower sheets each having a section dished away from the intermediate sheet within the peripheral edges of the panel consisting of a transverse side wall adjacent the edge of the panel and a bottom wall spaced from the intermediate sheet, the bottom walls of the dished sections having a plurality of dimples therein extending transversely therefrom toward the intermediate sheet and of depth equal to the spacing from the intermediate sheet, the dimples in the bottom walls of the dished sections in the upper and lower sheets being opposite each other and the bottoms of the dimples being united to opposed areas on opposite sides of the intermediate sheet, the side walls and bottoms of the opposite dimples being of lesser thickness than the sheets from which the dimples extend, and the bottoms of the dimples and the intermediate sheet having an opening therein within said areas.

3. A light transmitting ceiling panel comprising spaced upper, lower and intermediate sheets of light transmitting plastic, said upper and lower sheets each having a plurality of dimples therein with side walls extending transversely from the respective sheets toward the intermediate sheet and of depth equal to the spacing from the intermediate sheet, the dimples in the upper and lower sheets being opposite each other and the bottoms of the dimples being united to opposed areas on opposite sides of the intermediate sheet, the side walls and bottoms of the dimples being of lesser thickness than the sheets from which the dimples extend.

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Disclaimer

2,996,417.—*Bertram Arnold Wilson*, Erie, Pa. LUMINOUS CEILING PANEL. Patent dated Aug. 15, 1961. Disclaimer filed Feb. 19, 1963, by the assignee, *Wilson Research Corporation.*

Hereby enters this disclaimer to claims 1, 2 and 3 of said patent.

[*Official Gazette April 9, 1963.*]