Oct. 6, 1964 C. M. CUTLER ET AL 3,152,277

FLUORESCENT PANEL LAMP LOUVER

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Fig. 1.

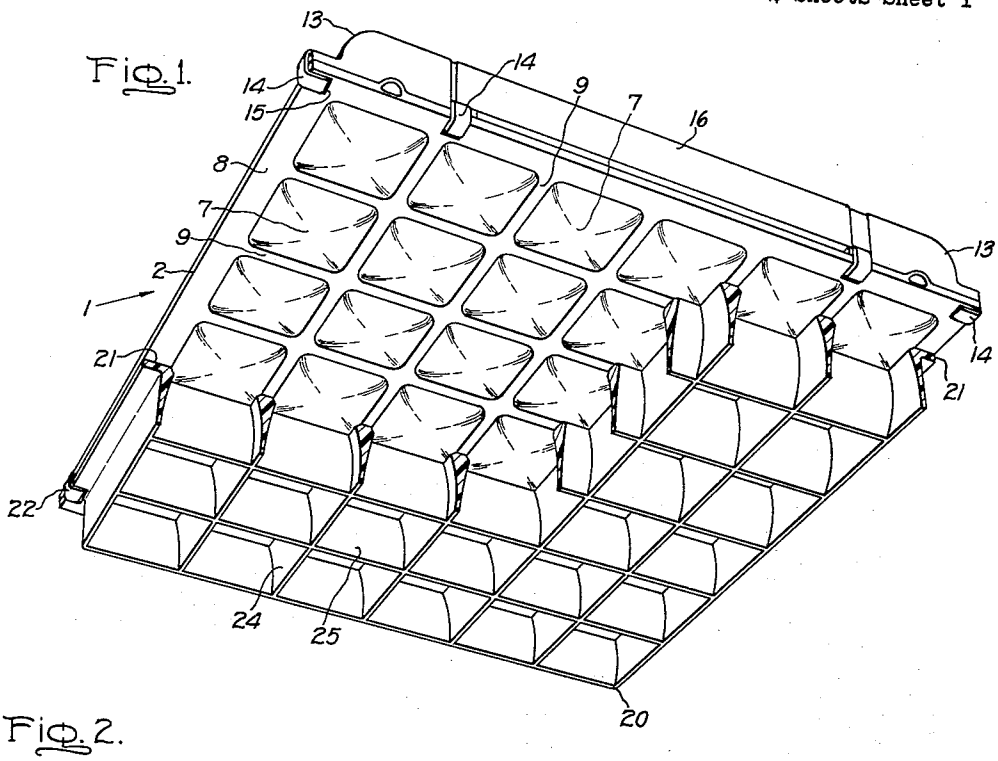


Fig. 2.

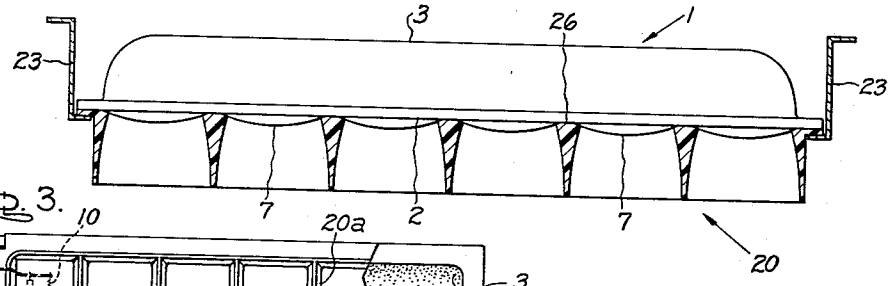
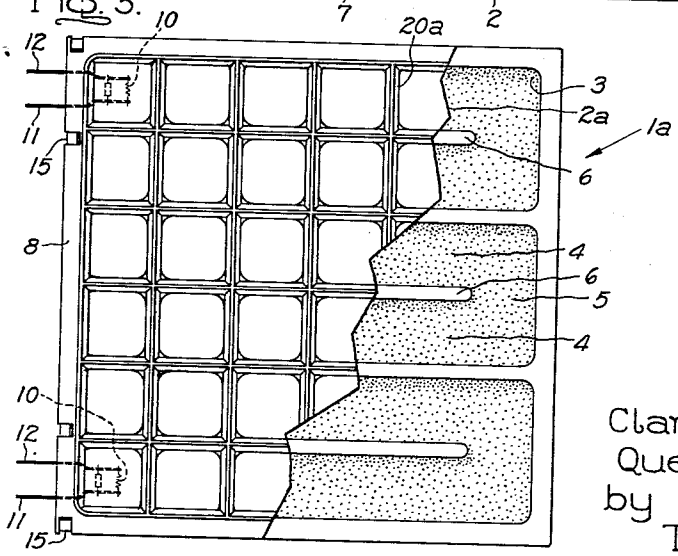


Fig. 3.



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Fig. 4.

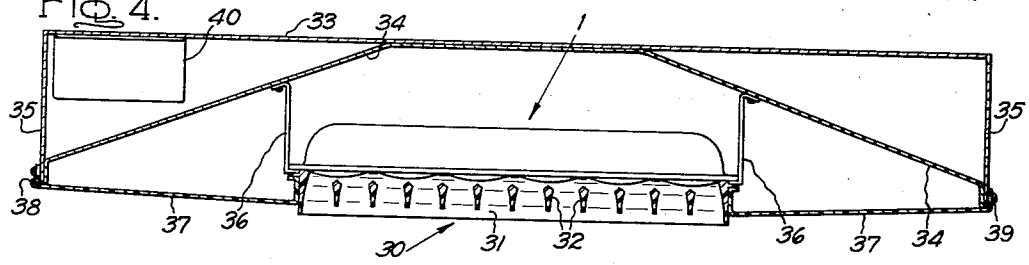
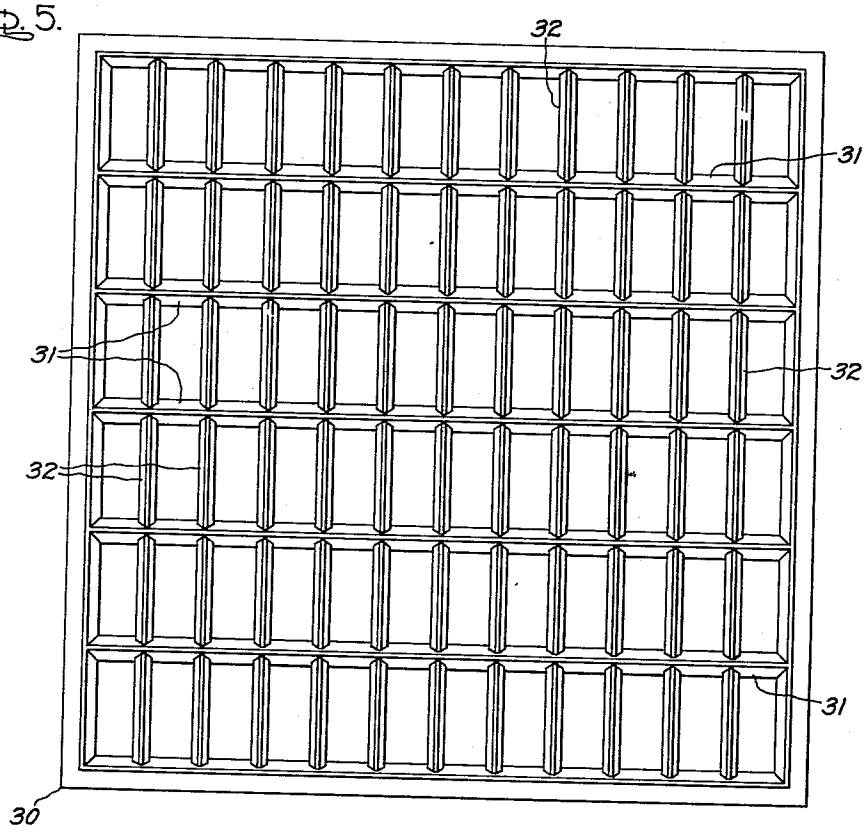


Fig. 5.



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FLUORESCENT PANEL LAMP LOUVER

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1 Claim. (Cl. 313—109)

This invention relates to fluorescent panel lamps and more particularly to louvers or light control grids for use in combination therewith.

In fluorescent panel lamps, the discharge path is a labyrinthine channel formed between two vitreous components sealed together along their margins. Such lamps provide a relatively long discharge in a small area which is an advantage from the point of view of compactness of source and ease of handling. They offer what may be described as an area light source as against a line source as is the case with the usual elongated fluorescent lamp.

The very compactness of the fluorescent panel lamp entails that it is a relatively bright source. Furthermore, in many of the applications presently visualized for a panel lamp, it is intended that only one face of the lamp be exposed to view. For instance, it is contemplated that panel lamps be made in modular sizes corresponding to the dimensions of standard ceiling tile, that is one foot square. Alternatively, it is contemplated that panel lamps be used in shallow fixtures. In either case the greater part of the light emanates from the lower plate which is referred to as the faceplate of the lamp. It is therefore particularly desirable, in applications planned for high visual comfort, to shield the faceplate of the lamp from direct viewing or otherwise to prevent the rays from striking directly the eyes of the occupants in the illuminated space.

An object of the invention is to provide a novel fluorescent panel lamp and louver combination. More specifically, it is desired to provide a combination which is particularly effective in shielding the bright faceplate of the lamp from direct viewing and in controlling the light emanating therefrom with minimum absorption of light.

A further object of the invention is a matched fluorescent panel lamp and louver wherein the louver may be permanently attached to the lamp or form an integral part thereof.

The labyrinthine discharge channel of the fluorescent panel lamp is generally formed by grooved sections or channelways molded in the backplate. The partitions between channelways in the backplate seat on the faceplate and the brightness of the faceplate is substantially less along these partitions. In accordance with the invention, we provide a louver or light control grid juxtaposed to the faceplate of the panel lamp and so dimensioned that the partitions in the lamp overlie the cell-forming walls of the louver. The walls of the louver obstruct light from the faceplate and thereby cause some losses. By proportioning the louver such that the partitions within the lamp overlie the louver walls, the inevitable obstruction of light occurs where the brightness of the faceplate is least. As a result, light losses are kept to a minimum.

A preferred embodiment of the invention is designed to complement a fluorescent panel lamp having a faceplate provided with a plurality of shallow embossments of square outline giving it somewhat the appearance of a quilt or checkerboard. The flat areas or lands of glass between embossments in the faceplate seat on the partitions between channelways in the backplate. The louver is of a rectangular cell type with cells open at top and bottom; the cells are of a size matching the embossments in the faceplate. Preferably the louver is made of material treated to have a high reflectivity and is of the parabolic wedge type described and claimed in Patent 2,971,083—Phillips et al, Low Brightness Louver.

According to another feature of our invention, we provide a panel lamp having an integral louver, the entire structure being made of glass. In another variant of our invention, we provide a louver wherein the height and spacing of the louver walls is less in the direction transverse to the partitions in the backplate than in the direction parallel thereto.

For other features and for further objects and advantages of the invention, attention is now directed to the following detailed description of preferred embodiments to be taken in conjunction with the accompanying drawings. The features of the invention believed to be novel will be more particularly pointed out in the appended claim.

In the drawings:

FIG. 1 is a pictorial view looking up at the underside of a fluorescent panel lamp provided with a matching parabolic wedge louver in accordance with the invention, part of the louver being cut away to expose the faceplate of the lamp.

FIG. 2 is a side view of the lamp of FIG. 1 with a cross sectional view of the louver.

FIG. 3 is a plan view of a fluorescent panel lamp similar to that of FIG. 1 but having a louver integral with the faceplate which is partly cut away to reveal the backplate.

FIG. 4 is a cross sectional view through a shallow fixture having a fluorescent panel lamp mounted therein and equipped with a matching louver forming a variant of the invention.

FIG. 5 is a plan view looking at the underside of the louver of FIG. 4.

Referring to the drawings and more particularly to FIGS. 1 to 3, the illustrated six-channel lamp 1 is in the form of a generally flat square panel made up of a pair of complementary molded glass components or plates 2, 3. The lower component 2 forms the underside or faceplate of the lamp which is normally exposed to view. The upper component 3 which may be referred to as the backplate is molded or blown to define, in cooperation with the faceplate, a winding or labyrinthine discharge channel or passage by means of six parallel grooved sections or channelways 4 extending side by side and joined together at alternate ends, as at 5, where the lengthwise partitions 6 end, thereby forming a continuous grid-like channel. Both plates may be formed from flat sheets of glass by any suitable means, for instance by vacuum molding. The faceplate 2 is provided with a plurality of shallow embossments 7 which may be of square outline in plan view, giving it somewhat the appearance of a quilt or checkerboard. The quilting of the faceplate improves the appearance and increases the strength of the assembly.

The edges of the faceplate and backplate are hermetically sealed together along the outer periphery 8 which thus forms a marginal ledge running around the four sides of the lamp. This may be done following the teachings of copending application Serial No. 106,829, filed May 1, 1961, of Richard S. Christy, entitled Panel Lamp and Manufacture Thereof, and assigned to the same assignee as the present invention. According to the Christy process, the glass is heated above its strain point but not to conventional softening temperature, and a very high pressure is applied to the margins causing lateral flow of glass with formation of a rounded fillet at the internal juncture of the glass surfaces. Along the internal junctures between the partition 6 in the backplate and the flat areas or land 9 between embossments in the faceplate, the glass surfaces are pressed together into close conformance by the application of relatively low pressure but are not sealed or fused together. Provided there is close conformance

of the glass surfaces along the junctures, the electric discharge or arc will not leak through and short circuit at these partitions but will follow the labyrinthine channel through from end to end. Desirably a phosphor coating extends over the entire faceplate including the lands **9** which abut the partitions **6** in the backplate. The presence of phosphor between the glass surfaces at the junctures greatly improves the appearance of the faceplate and is also useful to prevent fusion and sticking of the glass surfaces at the junctures.

The lamp is provided with discharge supporting electrodes indicated generally at **10** at opposite ends of the channel. Each electrode comprises a tungsten filament coated with electron emitting alkaline earth oxides. The filament is supported across the inner projections of inleads **11, 12** which are sealed through the glass of the marginal ledge **8** and turned up through blind notches in the backplate for connection to the terminals of the bases **13**. The illustrated bases are of the kind described and claimed in copending application Serial No. 106,827, filed May 1, 1961, of Albert F. Pate et al., entitled Panel Lamp Base, and assigned to the same assignee as the present invention. They are placed near each end of the marginal ledge seal on one side of the lamp and overlie the blind notches through which the inleads **11, 12** are turned up. The inleads are taken directly up through the base structures and attached to their terminals or contact pins. The bases are attached to the lamp by means of spring metal clips **14** which engage the projecting feet of the bases and furrowed notches **15** on the faceplate side of the lamp. The bases are engaged by a telescoping bar-type connector **16**.

The lamp is provided with an ionizable filling consisting of a vaporizable metal such as mercury and an inert gas such as argon. In the usual fluorescent lamp combination, the filling is an excess of mercury to provide a partial pressure of 5 to 8 microns during normal operation, and argon at a pressure of 2 to 3 millimeters. Such a filling provides in general optimum generation of 2537 A. radiation for excitation of the phosphor coating applied to the inside surfaces of the plates. It is generally desirable to have the lamp emit a greater proportion of its light downwardly through the faceplate than through the backplate. This may be accomplished by applying a thinner phosphor coating to the faceplate than to the backplate, a thinner coating being readily obtained by using a less viscous binder during the coating process.

The very compactness of the fluorescent panel lamp results in a light source of unusually high brightness. Where a greater proportion of the light is caused to be emitted through the faceplate, the brightness of the faceplate is all the greater. For instance, in a fluorescent panel lamp of nominal 12" square size, the performance data for normal operation are as follows: lamp current, 600 milliamperes; lamp voltage, 145 volts; lamp input, 80 watts; light output, 4800 lumens. The average brightness of the faceplate under these conditions is about 3200 foot-lamberts and this is too bright for direct viewing in an installation where high visual comfort is desired.

According to the preferred embodiment of the invention illustrated in FIGS. 1 and 2, the bright faceplate of the lamp is shielded from direct viewing and the light emanating therefrom is controlled by attaching thereto a matching parabolic wedge louver **20**. It is of the kind sometimes referred to as an egg crate louver and consisting of a panel of rectangular cells open at the top and bottom. The cell dimensions are such that the top edges of the cell walls bear against the flat lands between embossments in the faceplate. The outwardly turned ledge or rim **21** of the louver is juxtaposed against the marginal ledge seal **8** of the lamp. The louver and lamp may be attached together to form a unitary structure by means of metal clips **22** as shown in FIG. 1 which engage the margins of both louver and lamp. It is also possible to cement the louver to the lamp by means of suitable adhesives. Alternatively, the louver need not be attached to the lamp and the two may be merely assembled together when the lamp is mounted in place for use. For instance, as illustrated in FIG. 2, the louver may be held in place, as in a false ceiling, by means of suspension bars or brackets **23** which engage its rim, and the lamp is merely seated in place thereover.

We prefer to use for our combination a parabolic wedge louver constructed according to the teachings of patent 2,971,083—Phillips et al., Low Brightness Louver. Such a louver achieves the desired light control by means of cell walls **24, 25** having contours which are portions of parabolas having their axes inclined in opposite directions at the cut-off angle and their focal points located at the upper edge of the next adjacent cell wall on either side. The louver is made of a material, for instance metal or plastic which may be hollow if desired rather than solid as indicated, provided with a finish which has substantial specular or mirror-like reflection at least over the parabolic wall surfaces. By reason of the optical relationships which are explained in the Phillips et al. patent, no light rays can pass through the louver at an angle less than the cut-off angle which, for the case illustrated in FIGS. 1 and 2, is 35° to the horizontal.

An important advantage which results from matching the louver to the faceplate of the panel lamp in accordance with our invention is a greater output of light and less absorption and losses than would otherwise be the case. The cell walls, and in particular the relatively wide top surfaces **26** which are in engagement with the faceplate, obstruct the light. Even though the surfaces are reflectively coated so that the light is reflected and may yet issue through the open cells after further reflection within the lamp, such multiple reflections inevitably entail losses and a reduction in the total output. However the top edges of the louver walls bear against the faceplate at the lands **9** between embossments, and those lands which underlie the partitions **6** in the backplate are not nearly as bright as the embossments or as the average of the faceplate. Actual measurements on an FP–12S–CW (fluorescent panel 12" square-cool white) operated at 80 watts show an average brightness for the faceplate of 3200 foot-lamberts. However the brightness measured at the center of one of the embossments is 4100 foot-lamberts. The brightness measured at a land underlying one of the partitions is only 1100 foot-lamberts. Thus the matching of the louver to the faceplate by having the dimensions of the louver cell correspond to the embossment in the faceplate results in less obstruction of light because the cell walls obstruct the faceplate where its brightness is least.

According to another feature of our invention, the faceplate and the louver may form a unitary molded structure of glass. Where production is sufficient in volume to absorb the cost of the molding dies, glass is a relatively inexpensive material. Such a louvered panel lamp is illustrated at *1a* in FIG. 3 wherein the parabolic wedge louver *20a* is made of glass and is integral with the faceplate *2a*. Of course in the final assembly, the entire lamp including the louver form a single unitary structure of glass. After assembly of the lamp, it may be completed by applying a reflective coating to the louver walls and the functional result is substantially the same as in the combination of FIG. 1.

With a unitary faceplate-louver structure molded of glass, the louver walls also serve as strengthening ribs for the faceplate. Therefore the shallow embossments in the faceplate may not be needed for strength and may be dispensed with, a flat faceplate being used instead. Of course in order to minimize the obstruction of light by the louver walls, it is yet desirable to have the cells of the louver so proportioned that the louver walls are aligned with the partitions in the backplate.

At the lands between embossments running transversely to the partitions in the backplate the brightness is just as high and in fact may be higher than at the center of

the embossments. For instance at the midpoint between partitions in a land extending at right angles to the direction of the partitions, the measured brightness is 4600 foot-lamberts. Therefore there is no advantage, from the point of view of reducing obstruction of light, in having the cell walls of the louver engage the lands in the faceplate extending transversely to the partitions in the backplate. According to another feature of our invention, we use a smaller cell wall spacing in the louver for the cell walls extending transversely to the partitions in the backplate, as illustrated in FIGS. 4 and 5. In louver **30**, the spacing between cell walls **31** extending parallel to the partitions in the backplate corresponds to that existing between embossments in the faceplate and the top surfaces of walls **31** engage the lands between embossments. However the cell walls **32** extending at right angles have been doubled in number and the cell dimensions reduced in half. The transverse cell walls do not contact the faceplate of the lamp but have their top surfaces dropped below the faceplate so that they are spaced intermediately between the upper and lower surfaces of the louver. By using cell walls of half the height where the wall spacing is likewise reduced by half, the cut-off angle remains unchanged. Therefore louver **30** illustrated in FIGS. 4 and 5 achieves substantially the same light control as louver **20** illustrated in FIGS. 1 and 2, but has the additional advantage of not directly obstructing the light at the relatively bright lands extending transversely to the partitions in the backplates.

A matched louver and panel lamp combination in accordance with our invention is ideally suited for use in a shallow rectangular fixture such as is illustrated somewhat diagrammatically in FIG. 4. The fixture comprises an enclosure having a top wall **33** and an internal reflectively coated wall **34** which slopes down towards the vertical end walls **35**. Brackets **36** depending from the internal wall **34** supports the lamp horizontally in the center of the fixture. A diffuser and louver assembly, comprising a diffuser panel **37** provided with a square aperture in which louver **30** is mounted, closes the underside of the fixture. The diffuser panel may suitably consist of a translucent plastic and is hinged to one end wall at **38** and fastened to the other at **39**. The housing **40** for the ballast or current regulator may be mounted in the space between top wall **33** of the enclosure and internal wall **34**.

The fixture illustrated in FIG. 4 permits the rather unusual effect wherein the apparent brightness of the diffusing panel **37** is higher than that of the louver **30** in its center for normal viewing angles less than the 35° cut-off angle. This is so because the light emanating from

the faceplate of the lamp is confined to the 55° cone below the 35° cut-off angle. At the same time the light issuing from the backplate of the lamp is reflected by the internal wall **34** and brightens the diffuser panel **37** which surrounds the louver. For decorative effects, a colored diffuser panel may be used or a colored film may be applied over the reflecting surface of the internal wall **34**. The brightness of the surround relative to the louver may be controlled by varying the relative thickness of the phosphor coating applied to the backplate of the lamp relative to that applied to the faceplate, or the effectiveness of a reflective coating on the backplate. It is also possible to produce colored decorative effects by the use of a color phosphor on the backplate or alternatively by applying a die or colored glaze to the backplate.

While certain specific embodiments of the invention have been illustrated and described in detail, they are intended by way of example only. Modifications will readily occur to those skilled in the art and it is intended by the appended claim to cover any such as fall within the true spirit and scope of the invention.

What we claim as new and desire to secure by Letters Patent of the United States is:

In combination, a fluorescent panel lamp comprising an envelope formed of a backplate and a faceplate, said plates together defining a labyrinthine discharge channel by means of internal partitions, said faceplate having a plurality of embossments therein of generally rectangular outline underlying the discharge channel with flat lands between said embossments underlying said internal partitions, and a louver juxtaposed to said faceplate comprising a grid of cells formed by vertical walls open at the top and bottom, the spacing between walls in said louver extending parallel to said partitions corresponding to the width between partitions whereby said parallel extending walls engage said lands between embossments, and the height of and spacing between walls extending in a direction transverse to said partitions being less than in said walls extending parallel to said partitions whereby to obstruct a minimum of light from said faceplate, the walls of said louver being generally wedge-shaped in cross section and thicker at the top than at the bottom and having a substantial degree of specular reflection.

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