

March 29, 1966

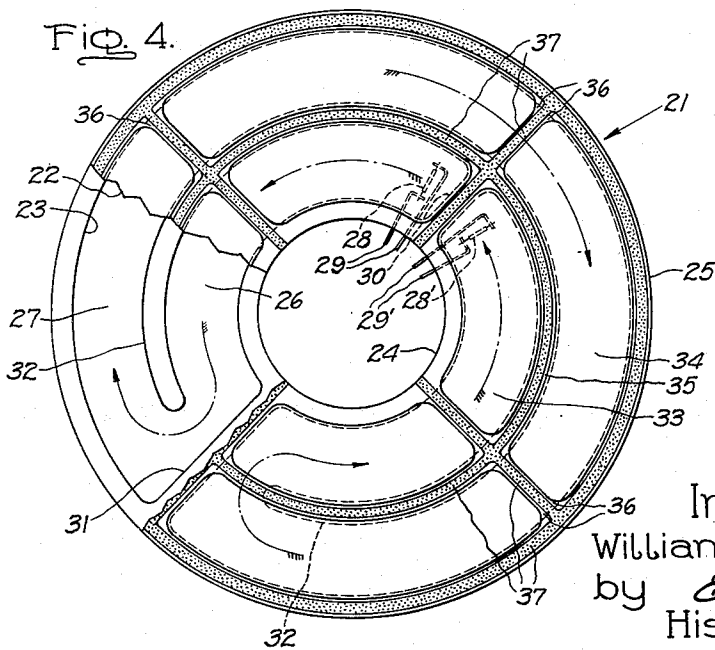
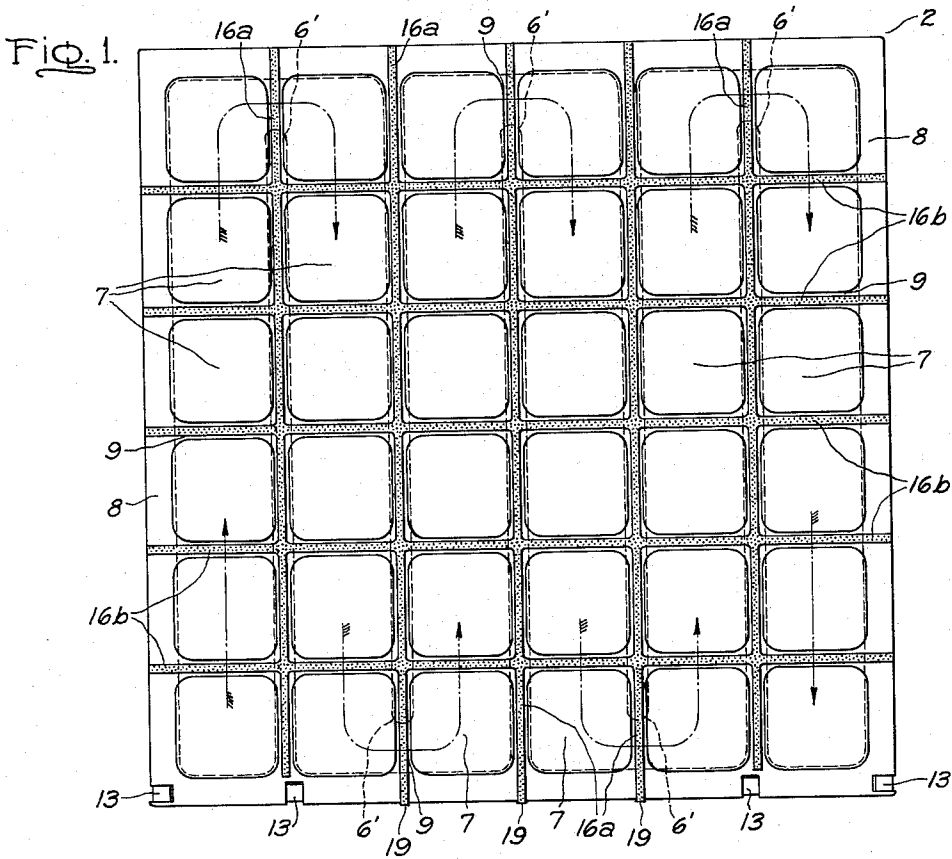
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FLUORESCENT PANEL LAMP FACEPLATE WITH OPAQUE STRIPING

Filed Jan. 2, 1962

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

FIG. 2.

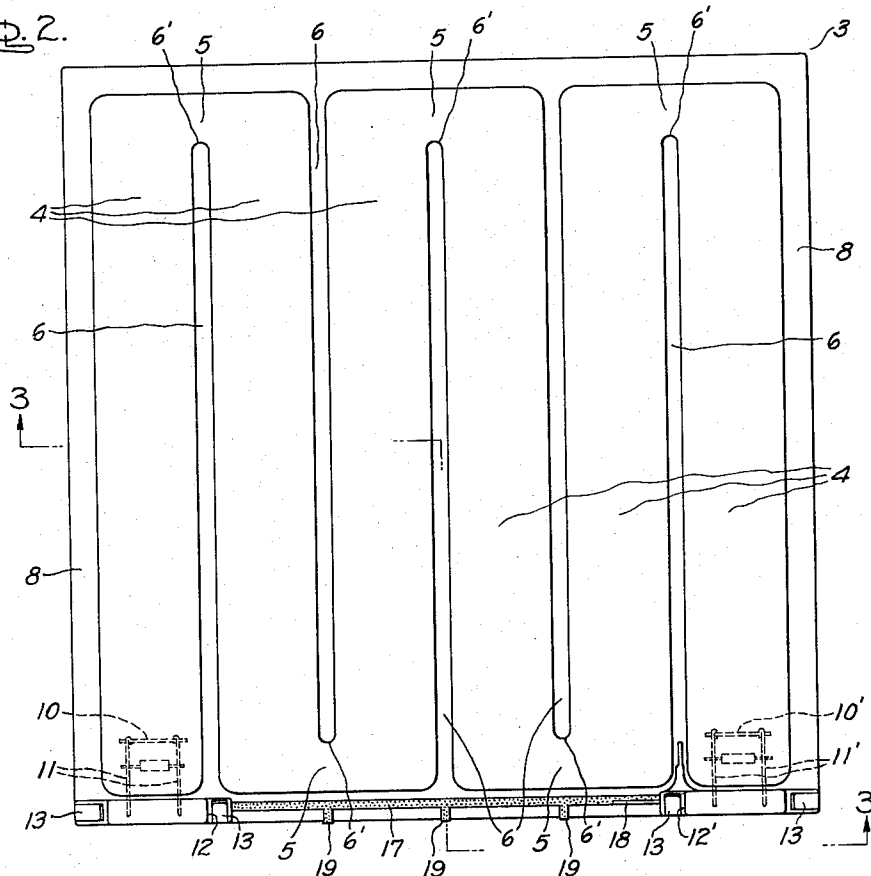
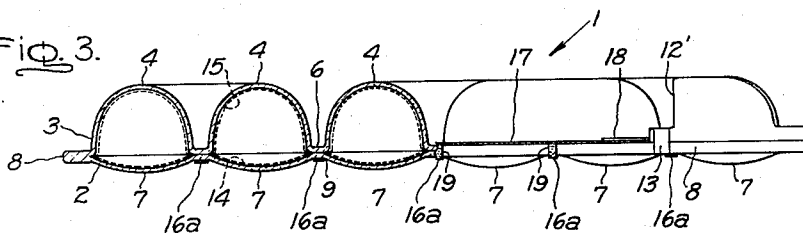


FIG. 3.



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FLUORESCENT PANEL LAMP FACEPLATE WITH OPAQUE STRIPING

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8 Claims. (Cl. 313-109)

This invention relates to fluorescent panel lamps and more particularly to features for improving the lighted uniformity and appearance of the faceplate.

In fluorescent panel lamps, the discharge path is a labyrinthine channel formed between two vitreous components sealed together along their margins. By providing a relatively long discharge in a small area, they achieve compactness 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 panel lamp with which the present invention is particularly concerned is formed by sealing two molded plates, the faceplate and the backplate, together along their margins. In the usual application wherein the lamp is either suspended below or incorporated into a ceiling, it is intended that only the faceplate be exposed to view. The labyrinthine or grid-like channelway through which the arc extends is formed or molded in the backplate, while the faceplate is generally planar, that is it does not have any deeply grooved channels detracting from its appearance. The faceplate may however if desired, in order to improve both its strength and appearance, be provided with a pattern of shallow embossments corresponding in width to the channels or grooves in the backplate. In a square panel lamp for instance, the shallow embossments may be of square outline giving somewhat the appearance of a quilt or checkerboard. The flat areas or lands of glass at the base of the glass partitions between channels in the backplate seat on the corresponding lands between embossments in the faceplate.

The partitions between channels in the backplate do not of course extend across the entire width or dimension of the lamp but terminate short of the end wall in order to have sections joining adjacent channels together into one continuous discharge channelway from end to end. For instance in a square panel lamp, the partitions extend alternately from one end wall to a point short of the other end wall leaving gaps alternating on opposite sides of the lamp through which the discharge passes from one channel to the next. When the lamp is lit, the areas in the faceplate which are overlain by the partitions in the backplate are darker than the faceplate as a whole. The contrast is particularly noticeable at the gaps in the partitions which stand out brightly. This tends to make the sinuous course of the bright discharge visible through the faceplate and detracts from the appearance of the lamp. Even though configuration of the faceplate by shallow embossments camouflages appreciably the sinuous pattern of the discharge, further improvements are desirable.

The general object of the invention is to provide improvements to the faceplate of fluorescent panel lamps for better appearance and greater uniformity of lighting.

A more specific object of the invention is to provide an arrangement in the faceplate of a fluorescent panel lamp which will effectively camouflage the bright sinuous pattern of the discharge path resulting from the shape of the discharge channel molded in the backplate.

In accordance with the invention, the appearance and uniformity of lighting of the faceplate of a fluorescent panel lamp is greatly improved by providing opaque striping on the faceplate at least over the dark areas caused by the partitions and extending continuously at least over the adjacent bright areas of the faceplate to the extent

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required to camouflage the pattern of the discharge and achieve a pleasing appearance. Additional striping may be applied for more effective camouflage and for decorative effects. In the case of a square panel lamp with an embossed faceplate, the striping may be applied as a rectangular grid in the valleys between embossments. In the case of a round panel lamp having a pattern of embossment consisting of circular segments, the striping may suitably be applied in a pattern of concentric circles and radii.

The striping must be of such nature as to provide a decided contrast wherever it is applied when the lamp is lit. Therefore it should be opaque or quasi-opaque and may be reflecting or colored if desired. The preferred materials are a bright reflective metallic striping such as a silver stripe, or a white opaque paint.

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

In the drawings:

FIG. 1 is a plan view of the faceplate of a square fluorescent panel lamp embodying the invention.

FIG. 2 is a plan view of the backplate of the same lamp.

FIG. 3 is a side view partly sectioned through the same lamp.

FIG. 4 is a plan view of a round fluorescent panel lamp with the faceplate partly cut away to expose the backplate.

Referring to the drawings and more particularly to FIGS. 1 to 3, the illustrated fluorescent panel lamp corresponds to the square six-channel lamp, commonly designated FP12S. Its nominal dimensions are 12" square and it is rated at 80 watts for normal operation and 50 watts for reduced wattage operation. It is made up of a pair of molded glass plates, a faceplate 2 and a backplate 3 sealed together along their margins. The backplate is molded into six parallel grooved sections or channels 4 extending side by side and joined together by short sections 5 where the lengthwise partitions 6 end, thereby forming a continuous grid-like channelway. The faceplate is generally planar but configured into a pattern of shallow square outwardly convex embossments 7, giving it somewhat the appearance of a grid 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 which thus forms a marginal ledge 8 running around the four sides of the lamp. The sealing is preferably done by heating the glass above its strain point but not to softening temperature and applying a very high pressure to the margins to cause lateral flow of glass with formation of a rounded fillet at the internal juncture of the glass surfaces, as per 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. Along the internal junctures between the partitions 6 in the backplate and the flat areas or lands 9 between embossments in the faceplate, the glass surfaces are pressed together into close conformance but are not sealed or fused together. Provided there is close conformance of the glass surfaces along the junctures, the electric discharge will not leak through and short circuit but will follow the labyrinthine channel through from end to end. Discharge supporting electrodes 10, 10' are provided at opposite ends of the channelway consisting of a tungsten filament coated with activating material; they are supported on inleads 11, 11' sealed through the marginal ledge and

connected to the terminals of the bases 12, 12'. The bases may be of the kind described and claimed in co-pending 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. The bases are attached to the marginal ledge by means of metal clips 13, and in use of the lamp, they may be engaged by a telescoping bar type connector (not shown) which is placed to overlies the marginal ledge between them.

The lamp is provided with the usual ionizable filling consisting of mercury and an inert starting gas such as argon at a pressure of a few millimeters. An electric discharge through the lamp causes the generation of ultraviolet radiation which excites the phosphor coating applied to the inside surfaces of the plates and thus produces visible light. In order to have the lamp emit a greater proportion of its light downwardly through the faceplate than through the backplate, phosphor coating 14 applied to the faceplate may be thinner than coating 15 applied to the backplate. Desirably the phosphor coating covers the entire faceplate including the flat areas or lands 9 between embossments in order to provide a uniformly white appearance to the faceplate.

Even though the faceplate of the lamp is uniformly coated with phosphor, the sinuous course of the discharge through the lamp becomes quite discernible when the lamp is operated. The core or center of the discharge in each channel is naturally brightest and this can be observed through the faceplate, as indicated by the broken line arrows in FIG. 1. Those portions of the lands 9 in the faceplate which are overlain by partitions 6 in the backplate stand out in dark contrast because there is no ultraviolet radiation reaching the phosphor under the partitions to excite it. The dark lines in the intermeshing pattern corresponding to the partitions do not extend all the way across the face of the lamp but stop short of the far wall at 6' in alternating sequence on opposite sides of the lamp. In the gap between the end of the partition and the far wall, the faceplate is even more brightly lit than on the average due to the constriction of the arc as it makes a "U" turn around the end of the partition, as indicated by the curving arrows. These bright U turns accentuate the visibility of the sinuous pattern of the discharge.

In accordance with the invention, the sinuous pattern of the discharge may be effectively camouflaged by applying a pattern of striping 16 to the faceplate to form a grid extending over the lands 9, that is in the valleys between embossments 7. The striping 16a which extends parallel to the partitions and covers the areas where the backplate presses against the faceplate is of course the more important and may be used alone if desired. However for the sake of symmetry and improved appearance, I prefer to apply also striping 16b extending at right angles to the partitions. The striping should be sufficiently opaque to achieve a sharp contrast when the lamp is lit, the striping then appearing dark and the exposed portions of the faceplate appearing bright. This camouflages to a great extent the somewhat irregular light intensity distribution in the faceplate. In particular, the portion of the striping 16a which extend beyond the ends 6' of the partitions over to the proximate end wall or edge of the lamp is effective in breaking up the bright "U" turns which the arc makes in bending around the ends of the partitions. In observing the lamp, the eye notices the sharp constant between the striping which appears dark and the embossments on either side which appear bright, and fails to notice variations in brightness between embossments or lengthwise along the lands between embossments where the contrast is less. Also the eye follows the striping and is distracted from the sinuous or curving course of the arc, with the desired effect.

The main requirement for the striping is that it be sufficiently opaque to block, either by absorption or by re-

flexion, a sufficient proportion of the light to achieve a sharp contrast. Obviously a material which reflects light back into the envelope is preferable to one which absorbs it, since reflected light is at least to some extent re-radiated whereas absorbed light is completely wasted. As regards opacity, the striping need not be completely opaque; a quasi-opaque material which transmits some light may be used so long as a sufficiently high proportion is blocked to satisfy the requirement for contrast. Hereinafter and throughout the claims, the term "opaque" is used in the above sense to comprehend any material providing sharp contrast. Obviously there are many materials which meet these requirements and which can be applied in various ways. More or less conventional paints, provided they are able to withstand the temperature at the faceplate during operation, may of course be used; paints are best applied after the lamp is completely assembled and the application may be made by striping devices or by spraying coupled with the use of a suitable mask. By using a white paint, the striping is quite unnoticeable when the lamp is not lit and merges into the white background of the phosphor. However for decorative effects, colored striping may be used; the color is observable only when the lamp is not lit; when the lamp is lit, the striping provides the same dark grid-like effect irrespective of its color.

I find that the most attractive effect is achieved by a metallic striping, either a silver or gold stripe. For this purpose, a self-adhesive plastic tape provided with a bright silver or gold colored metallic coating may be used. Such tape is commercially available; one such material sold by Minnesota Mining and Manufacturing Co. is designated Polyester Film Tape No. 850—Silver; I have found the 1/8 inch width suitable for the present purpose.

A more durable and more resistant striping may be achieved through the use of slips or metallic suspensions of the kind used for decorating ceramics such as china. The metallic suspension may be applied like an ink to the faceplate prior to its sealing to the backplate; the striping is then fired in during lamp processing when the faceplate is heated for sealing to the backplate. For this purpose I have used suspensions sold by E. I. du Pont de Nemours and Company and known as Du Pont Liquid Bright Platinum No. 7447, and Du Pont Liquid Bright Gold No. 5410. It is applied to the glass by striping equipment and fired on at about 1100° F. Other materials of the same nature may of course be used.

In order to facilitate starting of the lamp, it is desirable to have a conductive member, sometimes known as a starting aid, disposed in capacitive relationship to the discharge channel of the lamp. Heretofore conductive strips have been applied to the backplate in the valleys between the channelways and joined to a strip 17 which overlies the ledge seal between the bases 12. The strip 17 is shown in FIG. 2 on the back side of the ledge and electrical connection is made to it through contact member 18 attached to one of the bases 12. Where a striping is used on the faceplate of the lamp in accordance with my present invention, it may also serve the function of the starting aid by using a conductive material for the purpose. In such case, the striping 16 on the faceplate must of course be bridged over to the strip 17 on the back side of the ledge and this may be done by extending some of the strips around the edge of the ledge seal and into engagement with the strip 17; three such bridges 19 are shown in the drawings.

The invention may also be used with other arc path patterns, for instance that of the round panel lamp 21 illustrated in FIG. 4. That lamp is formed of a pair of circular or disk-like complementary molded glass plates, a faceplate 22 and a backplate 23, both having a circular hole in the center and being sealed together at their inner and outer peripheries 24, 25. The backplate is molded to define, in cooperation with the faceplate, a labyrinthine discharge channelway by means of two concentric grooved channels 26, 27. Electrodes 28, 28' on inleads 29, 29'

sealed through the inner rim are supported within the inner channel 26 on opposite sides of an internal partition 30 which extends across the inner channel only. On the diametrically opposite side of the lamp, an internal partition 31 extends across both channels and causes the arc or discharge to curve around the ends of the circular intermediate partition 32 between inner and outer channels. The course of the discharge proceeding from electrode 28 may be generally described as a half circle counterclockwise through the inner channel to radial partition 31, a full circle clockwise through the outer channel back to the other side of partition 31, and then a half circle counterclockwise through the inner channel to electrode 28', the course being indicated by the broken line arrows.

In the illustrated embodiment, the faceplate 22 is provided with a pattern of shallow embossments in order to improve the appearance and increase the strength of the plate. The embossments are in the form of inner and outer rings 33, 34 separated by a circular land 35 and divided into quadrants by radial lands 36 which extend from inner to outer peripheries. When the lamp is not lit, the faceplate has a balanced symmetrical appearance. However when the lamp is lit, the lands in the faceplate which are overlain by the half partition 30 between the electrodes and the full partition 31 diametrically opposite appear dark. Also the intermediate circular land which is overlain by the partition 32 between inner and outer channels likewise appears dark except for the gaps on either side of the full radial partition 31 where the arc passes from inner to outer channel. These effects detract from the balanced symmetry of the lamp and make the sinuous course of the bright discharge unduly noticeable. In accordance with the invention, such effects may be greatly reduced or substantially eliminated by applying striping 37 to the faceplate on the lands between circular segments. Preferably the striping is laid in a pattern of concentric circles and radii; the lamp is intended to be supported by a plate which engages the inner rim or periphery so there is no need to apply striping to the inner periphery. Striping camouflages to a substantial extent the somewhat irregular light intensity distribution in the faceplate and, by bridging over the gap in the intermediate circular partition 32, greatly reduces the extent to which the sinuous pattern of the discharge is noticeable.

The specific embodiments of the invention which have been illustrated and described in detail are intended by way of example only. Obviously many modifications are possible within the spirit of the invention to obtain a variety of decorative effects or to apply the principles to other configurations of panel lamps. The scope of the invention is accordingly to be determined by the appended claims which are intended to cover any such modifications.

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

1. A fluorescent panel lamp comprising a backplate and a vitreous faceplate sealed together along their margins, said faceplate being generally planar and said backplate having a labyrinthine discharge channelway formed therein by means of partitions which seat against the faceplate, at least said faceplate being coated internally with a phosphor, the regions where said partitions underlie the faceplate appearing dark by contrast when the lamp is lit, and opaque striping applied to the faceplate over the dark areas overlying the partitions and extending continuously over adjacent bright areas in order to camouflage the pattern of the discharge through said labyrinthine channelway.

2. A fluorescent panel lamp comprising a vitreous envelope formed by a backplate and a faceplate sealed together along their margins, said backplate having a labyrinthine discharge channelway defined by vitreous partitions which engage the faceplate, said faceplate having relatively shallow outwardly convex embossments

formed therein of width corresponding to the channelway and disposed to overlie the channelway, an internal phosphor coating on said faceplate, and a pattern of opaque striping on said faceplate extending between the embossments therein and serving to camouflage the channelway in the backplate.

3. A lamp as in claim 2 wherein said striping is in the form of a reflective metallic coating.

4. A lamp as in claim 2 wherein said striping is a white coating.

5. A fluorescent panel lamp comprising a vitreous envelope formed by a backplate and a faceplate sealed together along their margins, said backplate having a labyrinthine discharge channelway extending throughout its area and defined by vitreous partitions which engage the faceplate, said faceplate having a pattern of relatively shallow outwardly convex embossments formed therein throughout its area of width corresponding to the channelway and disposed to overlie the channelway, electrodes sealed into the ends of said channelway and in ionizable medium therein, an internal phosphor coating on said faceplate, and a pattern of opaque striping on said faceplate extending between the embossments therein and serving to camouflage the dark areas where the partitions defining the channelway in the backplate engage the faceplate.

6. A rectangular fluorescent panel lamp comprising a vitreous envelope formed by a backplate and a cooperating faceplate sealed together along their margins, said backplate being divided by partition walls into a plurality of parallel channels joined at alternate ends to provide a continuous discharge channelway, said faceplate having shallow outwardly convex rectangular embossments formed therein and disposed to overlie the channels in the backplate with flat lands between said embossments overlying said partition walls and also extending from edge to edge of said faceplate in a rectangular grid, electrodes sealed into opposite ends of said channelway and an ionizable medium therein, said faceplate having an internal phosphor coating thereon, and opaque striping applied to said flat lands on the faceplate and creating a sharp contrast with the bright embossments when the lamp is lit in order to camouflage the pattern of the discharge and improve the lighted uniformity of said faceplate.

7. A lamp as in claim 6 wherein said striping is conductive and electrical connections thereto are provided to permit use as a starting aid.

8. A round fluorescent panel lamp comprising a vitreous envelope formed by a disc like backplate and a cooperating faceplate sealed together along their margins, said backplate being formed with concentric grooves joined together to provide a reverting channelway defined by circular and radial partitions, electrodes sealed into the ends of said channelway and an ionizable medium therein, said faceplate having a pattern of shallow outwardly convex embossments in the form of circular segments with circular and radial lands therebetween, an internal phosphor coating on said faceplate, and a pattern of opaque striping on the faceplate applied to the lands between said embossments in a pattern including a circle and radii extending over the dark areas in the faceplate corresponding to the partitions in the backplate and serving to camouflage the tortuous pattern of the bright discharge when the lamp is lit.

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