United States Patent [19]

Miller

[11] **3,760,178**

[45] **Sept. 18, 1973**

[54] **VARIABLE DENSITY DIFFUSER FOR LIGHTING FIXTURES**

[75] Inventor: **Jack V. Miller,** Sierra Madre, Calif.

[73] Assignee: **Sunbeam Lighting,** Los Angeles, Calif.

[22] Filed: **Jan. 6, 1972**

[21] Appl. No.: **215,822**

[52] **U.S. Cl.** .... **240/106 R,** 240/51.11 R
[51] **Int. Cl.** **H05b 33/02,** F21v 5/00
[58] **Field of Search** .... 240/9 R, 11.4 R, 240/41.1, 46.01, 46.59, 51.11 R, 106 R, 9.5; 350/314

[56] **References Cited**

UNITED STATES PATENTS

3,294,964	12/1966	Schwartz	240/106 R
3,244,547	4/1966	Orr et al.	350/314
3,349,238	10/1967	Kruger	240/9.5

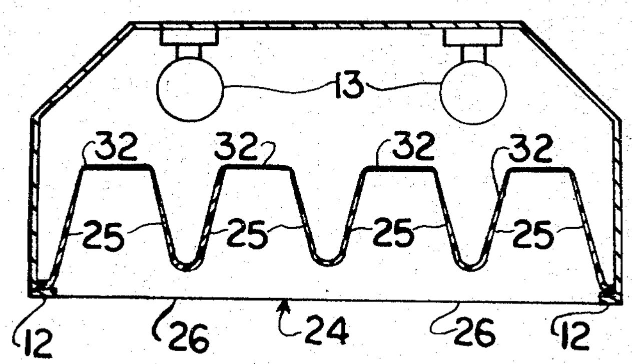
Primary Examiner—Samuel S. Matthews
Assistant Examiner—Russell E. Adams, Jr.
Attorney—John E. Wagner

[57] **ABSTRACT**

A new form of diffuser for fluorescent luminaires constituting a unitary sheet of translucent material formed with a number of deep recesses framed by planar edge portions. The material defining the recess is of variable thickness and at its greatest depth less than half of the material at the edge portions. In certain embodiments the edge regions are metallized.

In certain embodiments the recesses are asymmetrical longitudinally with respect to the lamp with a preferred direction of light radiation at an angle α.

21 Claims, 16 Drawing Figures



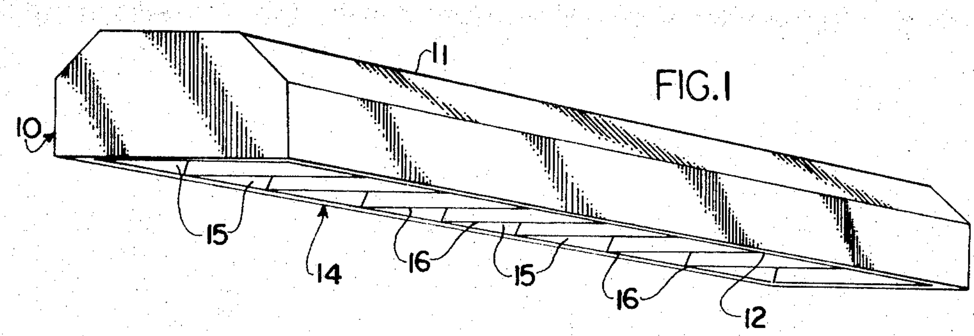


FIG.1

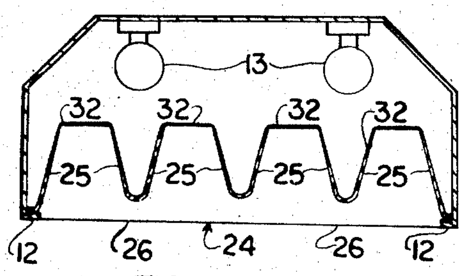
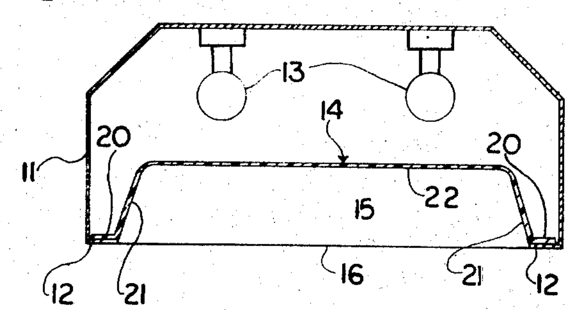


FIG. 3

FIG.2



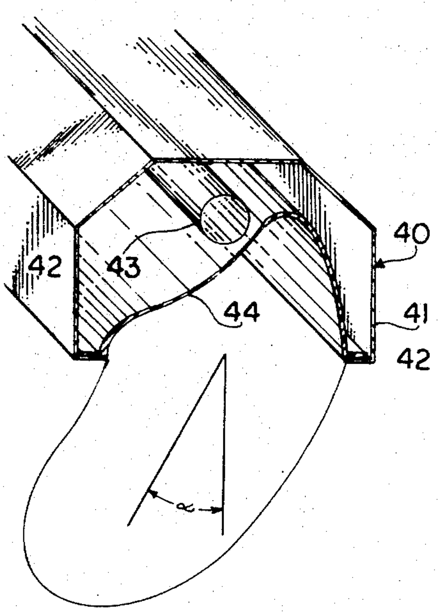


FIG.4

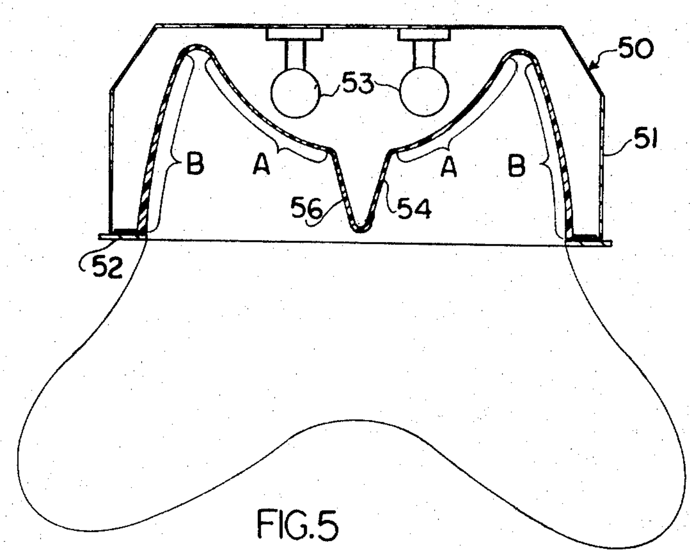


FIG.5

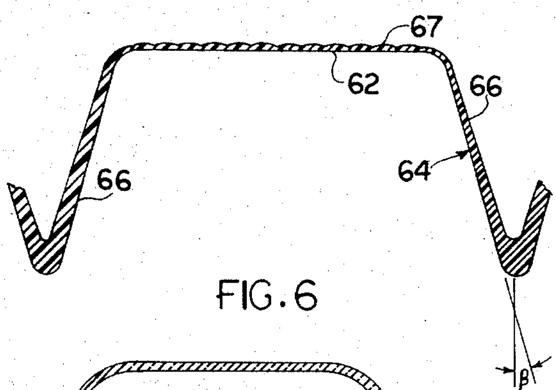


FIG. 6

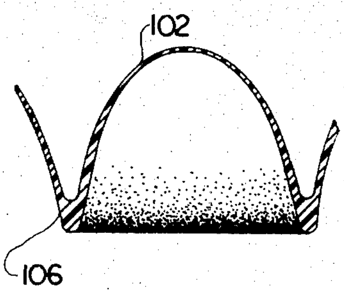


FIG. 10

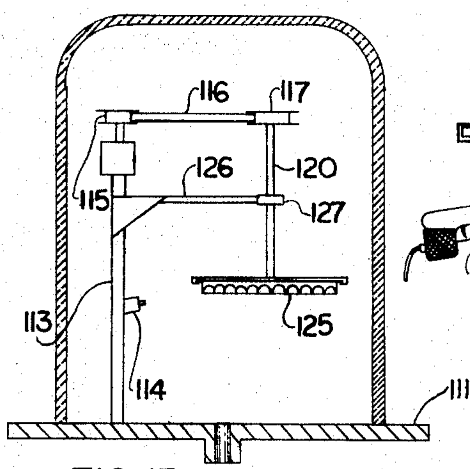


FIG. 15

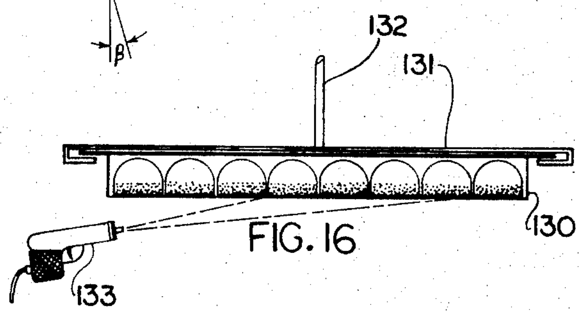
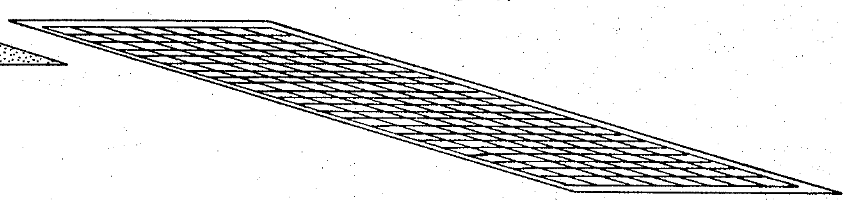


FIG. 16

FIG. 11



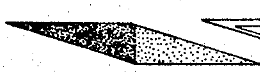


FIG. 12

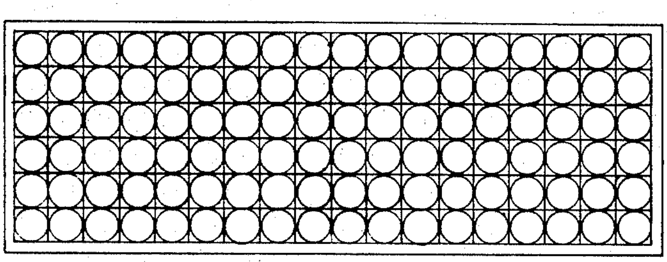


FIG. 13

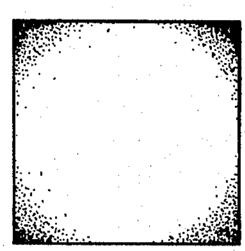


FIG. 14

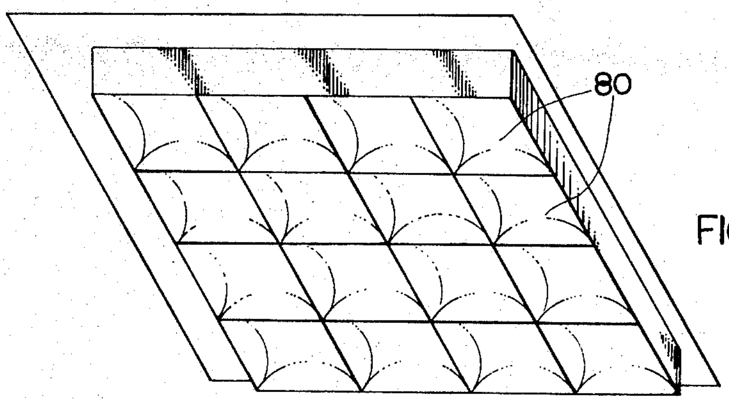


FIG.9

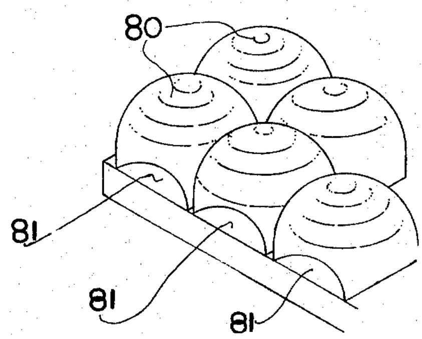


FIG. 8

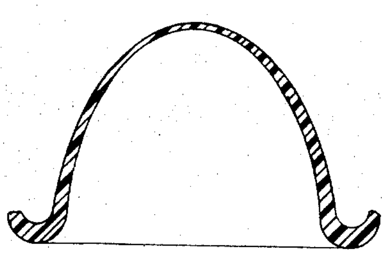


FIG.7

VARIABLE DENSITY DIFFUSER FOR LIGHTING FIXTURES

BACKGROUND OF THE INVENTION

Fluorescent luminaires designed for ceiling mounting, typically employ a housing or pan holding a number of longitudinally extending fluorescent lamps and a louver or lens of light transmitting material positioned below the lamps to diffuse light from the lamps and avoid direct view of the lamp image. Characteristically, these louvers are made of plastic or metal in a so-called egg crate shape similar to the classic egg divider with openings extending from inside to outside of the fixture. These louvers often consitute the most expensive components of the luminaire. This is understandable since the egg crate designed louvers often are of one foot by four foot dimension having as many as 2,000 discrete openings of uniform size and wall height. The tooling cost for injection molding such egg crate diffusers can often become prohibitive.

The egg crate louvers do not however prevent the direct view of the lamps when viewed near the nadir and, in general, the brightness varies abruptly with the viewing angle with a relative high brightness at angles where the viewer can see the lamp directly and significantly lower where the depth of the egg crate clock direct view of the lamp.

Another form of light controlling device for fluorescent luminaires is the lens diffuser which typically is a sheet of transparent or translucent material with an embossed or molded lens surface on at least one side. Often the lens surface is made up of a number of pyramidal or circular embossments of precise shape and angles for light control.

It has long been desired to produce a diffuser for fluorescent luminaires of greater effectiveness than the foregoing diffusers and louvers and one which exhibits a continuously variable light transmission characteristic with viewing angle rather than abrupt change as encountered with the egg crate louver. It is further desirable that a louver be produced which is low in cost and one which can be made to be selectively directional particularly transverse to the axis of fluorescent lamps to provide a preferred bat wing or semi-bat wing distribution.

Heretofore vacuum forming is a technique which is in use for lighting components and novelty fields. One of the banes of the vacuum forming industry has been the so-called blue corner effect which in actuality is the variable transmission characteristic of vacuum formed products due to the difference in thickness of various sections of the vacuum formed product with the thinner section being that where the greatest depth of vacuum forming has occured. The blue corner is the unwanted transparency characteristic of the areas of greatest material displacement.

BRIEF STATEMENT OF INVENTION

Given the foregoing state of the art, I have invented an improved optical property, lower cost, diffuser for lighting fixtures particularly for fluorescent luminaires. My invention involves basically a diffuser comprising a single continuous sheet of thermoplastic material and having a plurality of deep vacuum formed portions each surrounded by a region having little or no displacement.

In one embodiment the diffuser constitutes a sheet of translucent material having longitudinal and transverse ribs defining discrete areas such as ½ or 1 inch squares each with a vacuum formed continuous variable density bubble in each discrete area. The opaque or semi-opaque area is at the perimeter of each discrete region and the centermost portion of each region is a blue corner area constituting the bubble which is semi or actually transparent.

In another embodiment the extremity of the vacuum formed region is made lens-like by being vacuum formed against a textured surface.

In another embodiment the vacuum formed regions constitute rectangular recesses extending transverse to the length of the fluorescent lamp thereby providing a different degree of illumination control along the axis of the lamp and transverse thereto.

In another embodiment of the louver in accordance with this invention when viewed along the axis of the lamp exhibits a skewed appearance with the point of greatest vacuum form depth and greatest transmission of one side and actually above the lamp. One region of the diffuser constitutes a light transmitter and a second region constitutes a reflector.

In another embodiment designed for use with dual lamp installations, the louver includes double skew portions, one to the outside of each lamp with the central rib of non vacuum formed region extending parallel to and between the two lamps.

In each of the embodimetns of this invention, the material adjacent to the edge or central ribs having the least light transmission and extending towards the bubble of area of greatest vacuum deformation has an angle of approximately 15% with the nadir when in position and extending upwards from the edges far enough to provide an effective cut-off angle for direct glare control. In carrying out this invention vacuum forming occurs to the extent that the thickness ratio or light transmission ratio of the diffuser in accordance with this invention are at least 2 to 1.

As the light transmission ratio is increased there is a decrease in the light diffusion properites of the material, whereby the pattern of combined direct lamp illumination and internally reflected radiation from the luminaire is least modified by the diffuser in areas of greatest displacement from the original plane of the material.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view as seen from slightly below of a fluorescent luminaire employing the one embodiment of this invention;

FIG. 2 is a transverse section through the luminaire along lines 2—2 of FIG. 1 showing the relative position of the lamps and diffuser;

FIG. 3 is a transverse section through an alternate embodiment of this invention employing four recesses or cavities across the width of the fixture;

FIG. 4 is a transverse section through an alternate embodiment of this invention showing a skewed louver;

FIG. 5 is a transverse sectional view through a double skewed embodiment of this invention;

FIG. 6 is a sectional view of a fragmentary portion of an "embossed" lens embodiment of this invention;

FIG. 7 is an enlarged sectional view of a bubble lens embodiment of this invention illustrating the variable thickness and transmissibility;

FIG. 8 is a perspective view of a fragment of the embodiment of FIG. 7 viewed from above.

FIG. 9 is a perspective view of the bubble lens embodiment of this invention viewed from below;

FIG. 10 is a sectional view of a metallized bubble lens diffuser in accordance with this invention;

FIG. 11 is a perspective view of a metallized bubble lens diffuser as viewed from a high angle;

FIG. 12 is an enlarged perspective view of one lens of FIG. 11;

FIG. 13 is a front view of metallized bubble lens diffuser viewed from directly beneath the luminaire;

FIG. 14 is an enlarged fragmentary view of one single metallized bubble lens section of the diffuser of FIG. 13; and

FIGS. 15 and 16 are alternate forms of apparatus for metallizing the bubble lens diffuser of FIG. 14.

DETAILED DESCRIPTION OF THE INVENTION

Now refer to FIG. 1 in conjunction with FIG. 2 which illustrate this invention in a simple form. FIG. 1 illustrates a fluorescent luminaire 10 including a housing or pan 11 of generally rectangular side dimensions and tapered upper walls. The luminaire 10 of FIG. 1 is designed particularly for ceiling mounting preferably recessed into the position with the lower edge or frame 12 of luminaire 10 flush with the ceiling surface. Contained within the luminaire are one or more fluoresent lamps best seen in FIG. 2 which extend along the length of the pan or housing. The frame 12 supports the unitary formed plastic diffuser 14 constituting this invention. In the embodiment as shown in FIG. 1 the diffuser 14 includes a plurality of transversely extending generally rectangular cavities 15 each separated by a transverse rib 16. The cavity portion 15 is clearly visible in FIG. 2 and the rib 16 is further distinguishable in FIG. 2. The ribs 16 each separate adjacent recessed cavities and tend to stiffen the diffuser 14. It is apparent in FIG. 2 that the diffuser 14 is supported around its periphery by means of the continuous lip 20 which rests on the frame 12. The rib 16 and the edges 21 of each recess 15 as well as the portion of the diffuser 14 constituting the top of the cavity 15 are each of different thicknesses. This difference in thickness is accomplished by reason of the stretching of the diffuser by vacuum forming technique with the depth of formation of the recess 15 great in comparison with the thickness of the material drawn. In other words, a deep draw vacuum formed diffuser is produced whereby the portion 22 at the deepest point of draw is extremely thin as compared to that of the undrawn rib portion 16. Also the side wall 21 of the cavity 15 is of variable thickness extending from the unformed portion adjacent to the edge of rib 16 to the top of the cavity. The continuous variable thickness resulting from the vacuum drawing process produces a variable light transmission and diffusion through the side walls 21 and the rib 16 and a uniform maximum light transmission and minimum light diffusion characteristics through the top 22. Typically the thickness ratio between the edge of the rib 16 and the top portion 22 is in the order of 2 to 1 to 10 to 1 and the light transmission which goes through primarily through the surface 22 is maximum particularly when viewed at angles close to the nadir. Also the light diffusion is at a minimum near nadir, as the diffuser least affects the direct and internally reflected light from the luminaire. The rib 16 running transverse to the length of fluorescent lamps 13 provides longitudinal illumination control. The illumination control is continuously variable because of the continuously variable thickness and, therefore, variable transmission properties of the rib 16. The upper edges of the rib 16 and horizontal portion 22 constitute the "blue corner," heretofore the bane of vacuum formers but employed in accordance with this invention to provide wanted light control.

Now refer to FIG. 3 wherein a similar pan 11 with its frame 12 and lamps 13 may be seen. In this case the diffuser 24 includes longitudinal cavities 25. A plurality of ribs 26 extend longitudinally the length of the luminaire. The ribs vary in maximum thickness adjacent to the level of the frame 12 to the top 32 of each cavity 25 of minimum thickness. Similar to FIGS. 1 and 2 the ratio of maximum thickness area to minimum thickness is in the order of 2 to 1 to 10 to 1 with a preferred ratio of 5 or 6 to 1. This preferred diffuser is 0.060 inch to 0.10 inch of thickness before vacuum forming and with a depth of draw D in the order of the width of each cell. In addition to the ribs 26, FIG. 3, transverse ribs similar to ribs 16 of FIGS. 1 and 2 may be present in the diffuser of FIG. 3 for transverse light control.

Now referring to FIG. 4, an asymmetrical embodiment of the vacuum formed diffuser may be seen. In FIG. 4 the luminaire 40 is designed to provide asymmetrical lighting with a beam distribution as represented by the dashed line constituting a semi-bat wing with the greatest intensity illumination at an angle alpha with respect to the nadir. Alpha preferrably ranges 15° to 45° with an optimum angle being 35°. The luminaire accomplishing this distribution employed in this invention includes the conventional housing 41 and frame 42 with a single lamp 43. Secured within the housing by the frame 42 is a longitudinally extending diffuser 44 having a skewed shape as illustrated in the drawings.

Preferably the diffuser 44 is formed by vacuum forming with the continuous gradation of thickness, diffusion and light transmission characteristic. The region A is largely transparent while the region B by reason of its position and having its variable thickness and greater opacity acts principally as a reflector of light passing through the region A. The combined direct radiation in the direction of the semi-bat wing plus the reflected light from the outer surface of region B produces the sem-bat wing characteristic shown in FIG. 4.

A more common requirement than the semi-bat wing of FIG. 4 is that the luminaire employ a plurality of lamps, usually two, and a full bat wing light distribution be provided. This is accomplished in the embodiment of FIG. 5 by the luminaire 50 of FIG. 5. It includes a housing 51, frame 52, fluorescnet lamps 53 and diffuser 54. In this case the diffuser is virtually the double or mirror image version of the embodiment of FIG. 4 with the exception that the central region constitutes a rib 56 similar to the ribs 16 and 26 of FIGS. 1–3.

The light distribution of the luminaire FIG. 5 appears in the form of dashed lines which may be clearly seen to be a bat wing configuration resulting from the asymmetrical form of the two longitudinal sections of the diffuser 54. Similar to the embodiment of FIG. 4 the two regions A adjacent to the fluorescent lamps 53 have the greatest light transmission characteristic while the sections B are largely reflective because of their angular orientation with respect to the lamps 53 and their greater thickness and reduced light transmission. In each of the embodiments described so far the interior of the housings are preferably white or highly reflective for optimum energy output from the luminaire as a whole.

Now referring to FIG. 6. Another embodiment of the diffuser is shown in greatly enlarged detail illustrating the variable thickness of the vacuum formed structure additionally providing a lenticular surface. Specifically the diffuser **64** is produced by vacuum forming from acrylic or other vacuum formable material to a thickness which is in the order of 1/6th the original thickness — a deep draw. The diffuser **64** includes a plurality of ribs **66** defining an angle beta with the nadir of approximately 15°. The diffuser has a generally flat top **62**. The extreme thinning of flat top **62** provides very little change in the optical properties of the lamp and luminaire geometry at angles near nadir. In order to increase lamp hiding properties, the upper surface **67** of the top **62** is formed in lenticular or other non planar surface by the vacuum form process in which the vacuum die has the corresponding shape to the shape of surface **67**. As shown in FIG. **6** the surface of the diffuser is lenticular, however pyramidal, concentric circular ribs or other forms of diffuser surface are also desirable. The purpose of this surface treatment is to minimize the direct lamp view in the area close to the lamp with the thinnest section. This is in contrast with the prior art where diffusers often are planar surfaces of uniform thickness with uniform pattern throughout. In other words, employing the embodiment of FIG. **6**, the continuously variable light transmission characteristic of the earlier embodiments is achieved along with the minimization of direct lamp view attained through a lenticular or non planar surface adjacent to the lamps. This one surface tends to act as a diffuser while the side wall **66** forming the ribs tend to act both as light transmitters from the upper or back side of the diffuser and reflectors of energy passing through the top surface **67**. In FIG. **6** which is the first detailed enlargement of the diffuser according to this invention the variable thickness of the side wall **66** is apparent and in particular is exaggerated for clarity sake.

This invention in its simplest form is illustrated in FIGS. **7**, **8** and **9** and which can be produced with the simplest form of vacuum form tooling. This embodiment termed "bubble lens diffuser" appears in sectional view in FIG. **7** and in perspective view from the lamp side in FIG. **8** and in fragmentary perspective view from the room side FIG. **9**. The bubble lens is produced by vacuum forming onto an open grid, in this case square grids like the conventional egg crate diffuser which it will replace. It is produced by taking a flat sheet of vacuum formable plastic material in the order of thickness and of length and width corresponding to the approximate dimension of the finished diffuser, for example, 2 feet by 4 feet. Using an egg crate form of ⅝ inch squares, the bubbles are vacuum formed to a depth of approximately ⅝ inch for a 1 to 1 depth of draw to diameter ratio. The bubble is of variable thickness and variable light transmission where a translucent material is used.

In FIG. **8** the details of each bubble lens **80** are more clearly visible. Each is largely hemispherical except for flat regions **81** at the edges where they contacted the vacuum form die. These edges constitute areas of minimum light transmission and do not affect the optical properties of the bubble lens. Inasmuch as the lenses are spherical shaped and discrete as compared with a continuous surface and variable thickness, they tend to break up and prevent any definite lamp image from being seen when viewed from below.

In FIG. **9** the diffuser is shown in the condition as it is produced after vacuum forming against an egg crate die before it is trimmed. Both the spherical configuration of each bubble lens **80** and the interface with adjacent flat portions **81** are clearly visible.

In certain applications a lower overall level of illumination with virtually no high angle brightness is required. Often this can be obtained by using a colored vacuum formable plastic rather than translucent one which the non formed or rib portions are virtually opaque and when drawn to significantly lesser thickness they are light transmitting. Another way of keeping this high ratio of variable light transmission is achieved when a translucent or transparent sheet is vacuum formed in a manner described heretofore and then metallized from a high angle. The end result is shown in sectional view in FIG. **10** which is a bubble lens made up of formed acrylic plastic with a variable density metallized coating on the underside. The metallized coating is of sufficient thickness to be opaque in the rib regions **106** and of variable density until the top portion **102** which is metal free. This provides the greater ratio transmission and also presents to the viewer the same appearance as the metal louver. This appearance is particularly apparent in FIGS. **11** and **12**. FIG. **11** shows a normal high angle view of the louver of FIG. **10** in accordance with this invention giving the general appearance of a metal louver. FIG. **12** shows one individual bubble. The edges appear as solid metal which gradually become less dense but from the angle viewed in FIGS. **11** and **12** the definite metallic appearance is presented by the louver.

FIGS. **13** and **14** show the same embodiment of FIG. **10** viewed from directly below. In this case a bubble like appearance within the grid is apparent but no significant lamp image is visible. In FIG. **14** the one individual bubble is shown with its variable density and clear central region.

Two well known processes for producing the variable density metallized coating are illustrated in FIGS. **15** and **16**. Referring now to FIG. **15**, a metallizing chamber **110** is shown mounted on a base **111** designed to be evacuated through orifice **112**. Positioned within the chamber is a support **113** carrying a metallizing source **114** and motor **115**. The motor **115** drives a pulley **117** via belt **116**. The pulley **117** is connected by shaft **120** to holder **121** for the vacuum formed lens **125** to be metallized. The holder **121** is mounted on shaft **120** and the two are held by support **126** and bearing **127** so that the diffuser **125** may be rotated during the metallizing process. Note that the metallizing source is located almost at the same level as the diffuser so that direct line migration of metal from the source **114** to the diffuser **125** results in a variable density. Recommended metals for metallizing are aluminum and silver and the optimal thickness for the rib portions is approximately five millionths of an inch (0.005 mils) thick, sufficient to be substantially opaque.

FIG. **6** shows a simplified version of an alternate method of metallizing the diffusers. A vacuum formed diffuser **130** is supported by frame **131** for rotation on shaft **132** while a metallizing gun **133** is positioned or held to one side of the rotating diffuser **130** with metallizing spray directed at a high angle to produce a heavy coat of metallizing at the base or ribs and continuously variable metallizing up to metallization free bubble portions. Spray metallization or spray painting with metallizing paint is well known in the art and has an advantage of eliminating the need for evacuating chambers used in the vacuum metallizing.

The foregoing description is a number of embodiments of this invention, all of which achieve a continuously variable density transmission of illumination from a fluorescent luminaire to a room below keeping high angle brightness at a minimum with virtually no light lamp image visible. The diffusers according to this invention also provide attractive appearance and low cost.

What is claimed is:

1. A diffuser for fluorescent luminaires comprising a unitary sheet of translucent material having upper and lower surfaces and including an edge region defining a plane of radiating surface of the luminaire,

said diffuser including a plurality of discrete areas with the upper and lower surfaces displaced at continuously varying distances from the plane defined by said edge region and having a thickness which varies inversely with the displacement distance from the said plane whereby each of said discrete areas has a continuously variable light transmission property ranging from minimum transmissivity on the region of said plane and maximum transmissivity in the region of greater displacement of said surfaces from said plane.

2. The combination according to claim **1** where in, the ratio of the displacement distance of said discrete areas from said plane compared with the distances across said discrete area has a ratio greater than of **1:1.**

3. The combination in accordance with claim **1** wherein each of said discrete areas is bounded by rib portions, said rib portions constitute an equilateral grid and said discrete area therebetween comprises a substantially semi spherical bubble.

4. The combination in accordance with claim **3** wherein one side of said diffuser is coated with opaque material to a thickness in the rib regions which is sufficient to render said rib regions opaque and of continuously varying thickness in the region displaced from the plane of said ribs wherein the central most portion of each discrete area is free of opaque material coating and constitutes a light transmitting region.

5. The combination in accordance with claim **4** wherein said opaque material is metal and said diffuser presents a metallic grid appearance when viewed at or near the plane of said ribs and the appearance of light transmitting regions surrounded by metallic boundary regions with continuously variable light transmission transition therebetween.

6. The combination in accordance with claim **5** wherein said opaque metal materail is the product of metal deposition from a source of metal particles directed at said diffuser substantially parallel to the plane defined by said edge regions.

7. A diffuser for fluorescent luminaires comrising a unitary sheet of formed plastic material including an edge region defining a plane constituting the radiating surface of said luminaire,

said diffuser having edge region for mounting said diffuser in a luminaire and at least one truncated recess having a substantially planar end region displaced from said edge region and angular side walls, said angular side walls being of continuously variable thickness ranging from the thickest portion adjacent to said edge region and a thinnest region adjacent to said end region, said end region having a thickness in the order of less than one half the thickness of said edge region,

said diffuser being of translucent material whereby the light transmission property of said diffuser varies continuously from said edge region to said end region.

8. The combination in accordance with claim **7** wherein said diffuser includes a plurality of truncated pyramidal recesses extending transverse to the direction elongated lamps associated with said diffuser, said recesses separated by integral ribs extending substantially to the said plane of radiating surface at said diffuser.

9. A fluorescent luminaire comprising an elongated housing having an open face for the radiation of light from a fluorescent lamp therein,

means mounting a fluorescent lamp in said housing,

a diffuser secured to said housing substantially closing said face of said housing, said diffuser comprising a single sheet of translucent material having a planar edge portion for mounting to said housing and at least one portion displaced from the plane of said edge portion extending into said housing,

said at least one displaced portion is of variable thickness with the greatest thickness in the region of the edge portion and constitutes an elongated recess paralleling the axis of a fluorescent lamp in said housing and asymmetrical with respect to a plane transverse to the axis of such fluorescent lamp.

10. The combination in accordance with claim **9** wherein said at least one displaced portion is of continuous variable thickness and light transmissibility with the thinnest region and greatest transmissibility in the region closest to the axis of the fluorescent lamp.

11. The combination in accordance with claim **9** wherein said at least one displaced portion has a continuous curve cross-section.

12. The combination in accordance with claim **11** wherein said at least one displaced portion includes a convex curved portion and a concave curved portion to one side of the fluorescent lamp.

13. The combination in accordance with claim **12** wherein said convex portion constitutes a light transmitting region from the fluorescent lamp to the exterior of said housing and said concave portion constitutes primarily a reflective region for light emanating from said convex portion.

14. The combination in accordance with claim **9** wherein said housing includes means for mounting a plurality of fluorescent lamps in generally parallel relationship and said diffuser includes a plurality of displaced portions one for each fluorescent lamp and asymmetrical with respect to a plane passing through the axis of each respective fluorescent lamp, said displaced portions each including a first portion adjacent to its respective lamp constituting primarily a light transmitting region and a second portion to one side of said first portion constituting primarily a reflector for light emitted from said first portion.

15. The combination in accordance with claim **14** wherein said first portion associated with each respective fluorescent lamp includes a generally convex curved region adjacent to its respective fluorescent lamp and said second portion includes a generally concave region each when viewed from the exterior of said housing.

16. A diffuser for fluorescent luminaires comprising a unitary sheet of translucent material including an edge region defining a plane of radiating surface of the luminaire,

said diffuser including a plurality of discrete areas displaced at continuously varying distances from the plane defined by said edge region and having a thickness which varies inversely with the distance from the said plane whereby each of said descrete areas has a continuously variable light transmission property ranging from minimum transmissivity on the region of said plane and maximum transmissivity in the region of greater displacement from said plane,

said diffuser being elongated to approximate the length of a fluorescent lamp to be used therewith,

said displace discrete areas extending transverse to the length of said sheet thereby defining a plurality of displaced recessed areas separated by ribs of undisplaced material.

17. The combination in accordance with claim **16** wherein said ribs extend transverse to the length of said diffuser constituting primarily reflectors for light transmitted through said displaced areas and diffusers of light transmitted through said ribs.

18. The combination in accordance with claim **16** wherein said ribs extend longitudinally with respect to length of said diffuser.

19. A diffuser for fluorescent luminaires comprising a single sheet of translucent plastic material including an edge region generally defining a plane and a plurality descrete areas having the body of the material displaced from said plane in a direction toward its associated fluorescent lamp,

said discrete areas separated by virtually undisplaced boundary regions constituting ribs,

said translucent plastic material having a variable thickness ranging from a maximum in said ribs and a minimum at the greatest displacement from said plane,

whereby each of said discrete areas has continuously variable light transmission efficiency and continuously variable light diffusion properties, ranging from a maximum of diffusion with a minimum of transmission of light, both from the lamps and the interior reflecting surfaces of the luminaire, in the regions at or near the plane of radiating of the luminaire, to a minimum of diffusion with a maximum of transmission in the regions of greatest displacement from said plane, the diffuser thereby providing most control over the direct and internally reflected light from the luminaire at high angles from nadir, and the least control near nadir.

20. A diffuser for fluorescent luminaires comprising a unitary sheet of translucent material including an edge region defining a plane of radiating surface of the luminaire,

said diffuser including a plurality of discrete areas stretched and displaced from the plane defined by said edge region and having a thickness which varies inversely with the distance from the said plane whereby each of said discrete areas has a continuously variable light transmission property ranging from minimum transmissivity on the region of said plane and maximum transmissivity in the region of greater displacement from said plane.

21. A diffuser for fluorescent luminaires comprising a unitary sheet of translucent material including an edge region defining a plane of radiating surface of the luminaire,

said diffuser including a plurality of discrete vacuum formed areas displaced from the plane defined by said edge region and having a thickness which varies inversely with the distance from the said plane whereby each of said discrete areas has a continuously variable light transmission property ranging from minimum transmissivity on the region of said plane and maximum transmissivity in the region of greater displacement from said plane.

* * * * *