March 17, 1959 J. RIJNDERS 2,878,369

LIGHTING FIXTURE

Filed April 12, 1955

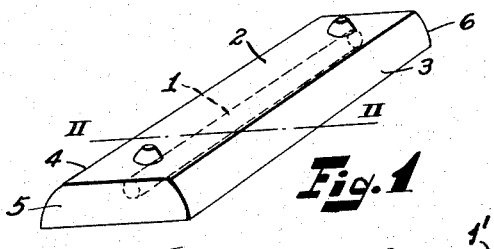

Fig. 1

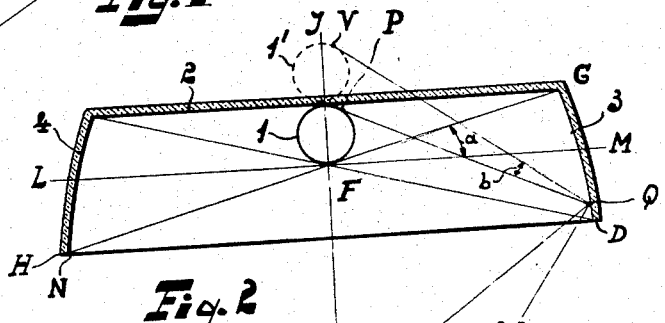

Fig. 2

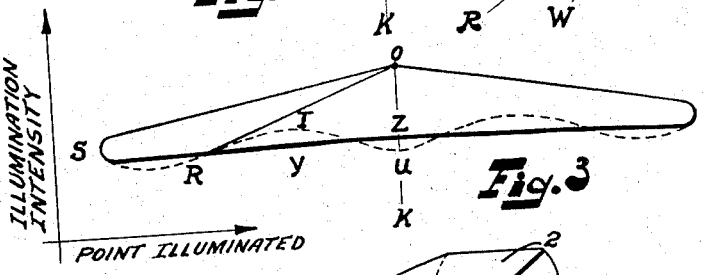

Fig. 3

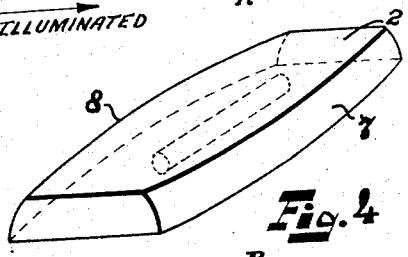

Fig. 4

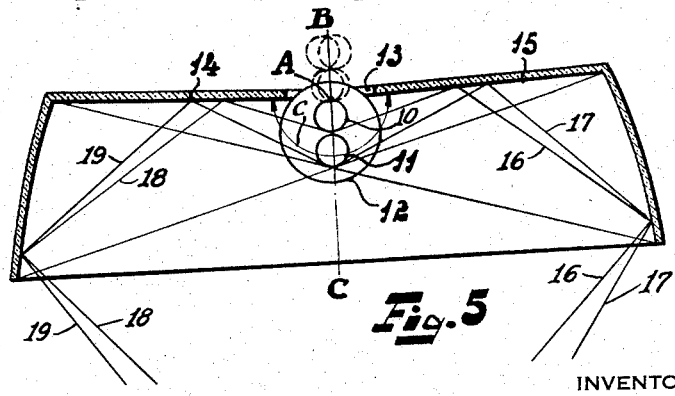

Fig. 5

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United States Patent Office 2,878,369 Patented Mar. 17, 1959

2,878,369

LIGHTING FIXTURE

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Application April 12, 1955, Serial No. 500,936

Claims priority, application Netherlands April 29, 1954

6 Claims. (Cl. 240—25)

The present invention relates to a light fixture or fitting.

Lighting fittings are known which comprise a tubular light source extending in the direction of length of the fitting. The fitting has on the top side a flat mirror and one on each side of the light source, the planes of these mirrors (which planes are, as the case may be, to be considered as being prolonged) joining, at least substantially, the light source. In this known construction the fitting is a so-called deep radiator, which means that the edges of the fitting extend so far downwardly that only reflected light rays, which are at an angle of about 35° or more to the horizontal line, can emerge from the fitting.

With so-called broad-radiating fittings, employed for example for road illumination, attempts are made to obtain a light distribution curve such that, according as the vector indicating the light intensity in the light distribution curve is at a larger angle to the vertcal line, the magnitude of this vector increases. With most broad-radiating fittings it is now found that their light distribution curve exhibits, in the case of angles of about 30° to 60° to the perpendicular, a vector value for the light intensity, which is smaller than the vector value in those ranges of the curve in which the direction of these vectors is at a smaller or at a larger angle to the perpendicular. This does not improve the illumination obtained by means of such a fitting; the light intensity on the pavement illuminated by such a lighting fitting does not exhibit the desired uniformity.

An object of the present invention is the mitigation of the aforementioned disadvantage.

In accordance with the present invention, the lighting fixture or fitting comprises mirrors located one on each side of the light source and being at an angle of 180° to 200° to one another on the side of the light source. These mirrors each join, at their edges remote from the light source, a cylindrical mirror. The sectional curves of the cylindrical mirror at right angles to the direction of length of the light source are at least approximately parabolic with an axis which, in the sectional area under consideration, goes through the junction between the line of intersection of the flat mirror and the cylinder mirror and which passes, furthermore, through a part of the light source which lies on the side of the light source remote from the flat mirror(s). The parabolic line of intersection extends through an angle of not more than 30°, the corner of which lies at the point of intersection of the axis of the parabola with the axis of symmetry of the lighting fitting. The angle is divided into two parts of approximately equal values by the line going through the corner and is at right angles to the axis of symmetry of the lighting fitting.

In order that the invention may be readily carried into effect, it will now be described more fully with reference to the accompanying drawing, wherein:

Fig. 1 is a perspective view of an embodiment of a lighting fixture or fitting of the present invention;

Fig. 2 is a sectional view of the embodiment of Fig. 1, taken in the plane II of Fig. 1;

Fig. 3 is a graphical presentation of the light distribution of the embodiment of Fig. 1 in a plane at right angles to the axis of length of the light source;

Fig. 4 is a perspective view of another embodiment of the lighting fixture or fitting of the present invention; and

Fig. 5 is a diagrammatical cross-sectional view of still another embodiment of the lighting fixture or fitting of the present invention.

Referring to Figs. 1 and 2, reference numeral **1** designates the tubular source of light, which, in this case, is constituted by a fluorescent tube. It is known that in such a tube a discharge takes place during operation, so that the surface of the tubular bulb becomes fluorescent as a whole. Consequently, in the embodiment shown in Figs. 1 and 2, the bulb of the tube **1** is to be considered as a source of light.

The lighting fixture or fitting shown in Fig. 1 (of which Fig. 1 shows only the mirror surfaces and hence does not show a protective housing, if any) comprises mainly the flat mirror **2**, which closes the lighting fitting at the top, the bottom side of which mirror joins at least approximately the surface of the tubular light source **1**. The flat mirror **2** joins, at its outer edges, the two cylindrical mirrors **3** and **4**. The head surfaces of the lighting fitting are closed by the parts **5** and **6**, which are less important for the present case.

From a consideration of Fig. 2, it is evident that the line of intersection with the plane of the drawing of Fig. 2 is a parabola, the focus of which lies at point F, which is the point of intersection of the axis G—H of the parabola **3** and the axis of symmetry J—K of the lighting fitting. The focus point F lies in the immediate proximity of the lower part of the light source **1**. The axis G—H is in this case at an angle *a* of 15° to the horizontal axis L—M. The axis G—H touches the lower edge of the mirror **4** at point N. The mirror **4** will not be described further, since it is shaped in the same form as the mirror **3**.

From Fig. 2 it is evident that the light from the source, as far as it emanates from parts in or in the immediate proximity of the light source, is reflected by the mirror **3** into directions parallel to the parabola axis G—H. The light emanating from the side of the light source on the right-hand part of Fig. 2, from points lying higher than the focus point F, emerges at smaller angles to the axis J—K. A light ray emanating from the highest part P of the light source **1**, which ray falls on the mirror **3** at point Q on the lowest part of the said mirror is reflected by the said mirror in a ray of direction Q—R.

In the light distribution curve shown in Fig. 3, this vector is indicated by O—R. The part O—S—R of this curve indicates the vectors associated with the illumination of the road parts remotest from the lighting fitting.

With the conventional lighting fittings this light distribution curve exhibits the course R—T—U (indicated in broken lines) on the right-hand side of point R up to the perpendicular O—K, from which it is evident that immediately on the right-hand side of point R the luminous intensity in this direction decreases considerably. This does not favor suitable light distribution for a road.

The flat mirror **2**, which closes the lighting fitting at the top, obviates this disadvantage. This flat mirror which engages the light source **1**, produces the reflection **1'** of said source, the reflection **1'** serving as an apparent light source in conjunction with the light source **1** proper. Thus, adjacent the light ray P—Q from the upper part of the light source **1** the point Q receives additional light from the reflection **1'** through the angle *b*, so that point Q also reflects light in steeper directions. The extreme ray from the reflection **1'** of the light source **1** is indicated by V—Q; this light ray, subsequent to reflection at Q, has the direction Q—W. Since the reflection **1'** engages so to say the light source **1**, the light distribu-

tion curve shown in Fig. 3 exhibits the smooth course indicated O—S—R—Y—Z.

In the embodiment shown in Fig. 2 the angle *a* between the axis G—H of the parabolic directional curve **3** and the horizontal line L—M has a value of 15°. An equal angle of 15° is enclosed between the line F—D and the horizontal line L—M. If the screening angle of the lighting fitting is required to be smaller, the dimension of the mirror **2** is increased in the plane of the drawing of Fig. 2, since thus the angle *a* is decreased.

As is shown diagrammatically in Fig. 4 the cylindrical mirrors **7** and **8** may be curved in planes parallel to the plane of the flat mirror **2**, so that in this case the lines of intersection of the said flat mirror **2** with the side mirrors **7** and **8** exhibit a curved course. The embodiment of Fig. 4 may, for example, be used in conjunction with a shorter light source.

In the embodiment shown in Fig. 5, the light source is a folded sodium vapor discharge tube, the limbs of which are designated by **10** and **11**. With this type of light source it is common practice to surround the sodium tube by a vacuum bulb **12**. It is thus not possible to have the upper mirror surface of the lighting fitting itself engage the upper surface of the limb **10** of the discharge tube. Therefore, the flat mirror surface exhibits a recess at **13**, through which the vacuum bulb **12** projects from the lighting fitting at the top. However, the mirror surface has a position such that, if it is considered to be prolonged, it intersects the line of symmetry B—C of the fitting at A.

In the embodiment of Fig. 5, the mirror surfaces **14** and **15** are not located in the same plane; on the sides of the light source they are at an angle *c* to one another of 190°. Due to the mirror **15**, reflections **16** and **17** of the light source **10**, **11** are produced. The mirror **14** produces the reflections **18** and **19**. These reflections, in a manner similar to the reflection **1'** of Fig. 2, provide a more smooth course of the light distribution curve.

While the invention has been described by means of specific examples and in specific embodiments, I do not wish to be limited thereto, for obvious modifications will occur to those skilled in the art without departing from the spirit and scope of the invention.

What is claimed is:

1. A lighting fixture of relatively elongated shape, comprising a substantially elongated light source extending in the direction of the longitudinal dimension of said fixture, a relatively flat mirror located at the top of said fixture and in substantial contact with said light source in a longitudinal direction, and a pair of mirrors each joining said flat mirror along a longitudinal edge to form the sides of said fixture, each of said pair of mirrors being a lateral section of a substantially parabolic sheet formed by a substantial parabola moved normally along a line parallel to said longitudinal dimension and having a planar axis formed by the joining line of said flat mirror and the corresponding one of said pair of mirrors and the longitudinal surface line of said light source in a plane normal to the plane of said flat mirror through the longitudinal center of said light source and diametrically opposite said flat mirror.

2. A lighting fixture of relatively elongated shape, comprising a substantially elongated light source extending in the direction of the longitudinal dimension of said fixture, a relatively flat mirror located at the top of said fixture and in substantial contact with said light source in a longitudinal direction, and a pair of mirrors each joining said flat mirror along a longitudinal edge to form the sides of said fixture, each of said pair of mirrors being a lateral section of a substantially parabolic sheet formed by a substantial parabola moved normally along a line parallel to said longitudinal dimension and having a planar axis formed by the joining line of said flat mirror and the corresponding one of said pair of mirrors and the longitudinal surface line of said light source

in a plane normal to the plane of said flat mirror through the longitudinal center of said light source and diametrically opposite said flat mirror, said planar axes of said substantially parabolic sheets intersecting along said longitudinal surface line to form a side angle which is not more than 30 degrees in magnitude.

3. A lighting fixture of relatively elongated shape, comprising a substantially elongated light source extending in the direction of the longitudinal dimension of said fixture, a relatively flat mirror located at the top of said fixture and in substantial contact with said light source along a longitudinal surface line of the said light source, and a pair of mirrors each joining said flat mirror along a longitudinal edge to form the sides of said fixture, each of said pair of mirrors being a lateral section of a substantially parabolic sheet formed by a substantial parabola moved normally along a line parallel to said longitudinal dimension and having a planar axis formed by the joining line of said flat mirror and the corresponding one of said pair of mirrors and the longitudinal surface line of said light source diametrically opposite said first-mentioned longitudinal surface line.

4. A lighting fixture of relatively elongated shape, comprising a substantially elongated light source extending in the direction of the longitudinal dimension of said fixture, a relatively flat mirror located at the top of said fixture and in substantial contact with said light source along a longitudinal surface line of the said light source, and a pair of mirrors each joining said flat mirror along a longitudinal edge to form the sides of said fixture, each of said pair of mirrors being a lateral section of a substantially parabolic sheet formed by a substantial parabola moved normally along a line parallel to said longitudinal dimension and having a planar axis formed by the joining line of said flat mirror and the corresponding one of said pair of mirrors and the longitudinal surface line of said light source diametrically opposite said first-mentioned longitudinal surface line, said planar axes of said substantially parabolic sheets intersecting along said last-mentioned longitudinal surface line to form a side angle which is not more than 30 degrees in magnitude.

5. A lighting fixture of relatively elongated shape, comprising a substantially elongated light source extending in the direction of the longitudinal dimension of said fixture, a relatively flat mirror located at the top of said fixture and in substantial contact with said light source in a longitudinal direction, and a pair of mirrors each joining said flat mirror along a longitudinal edge to form the sides of said fixture, said longitudinal edges being curvilinear in planes parallel to the plane of said flat mirror opening inward and substantially symmetrical about a plane normal to the plane of said flat mirror through the longitudinal center of said light source, each of said pairs of mirrors being a lateral section of a substantially parabolic sheet formed by a substantial parabola moved normally along a line parallel to said longitudinal dimension and having a planar axis formed by a line through the end points of jointure of said flat mirror and the corresponding one of said pair of mirrors and the longitudinal surface line of said light source in said normal plane and diametrically opposite said flat mirror.

6. A lighting fixture of relatively elongated shape, comprising a substantially elongated light source extending in the direction of the longitudinal dimension of said fixture, a pair of relatively flat mirrors located at the top of said fixture and in substantial contact with said light source in a longitudinal direction, said flat mirrors being at an angle to each other at their surfaces adjacent said light source of from 180 to 200 degrees in magnitude, and a pair of mirrors joining said flat mirrors along their outer longitudinal edges to form the sides of said fixture, each of said pair of mirrors being a lateral section of a substantially parabolic sheet formed by a substantial parabola moved normally along a line parallel to said

longitudinal dimension and having a planar axis formed by the joining line of one of said pair of flat mirrors and the corresponding one of said pair of mirrors and the longitudinal surface line of said light source in a plane normal to a plane through said joining lines through the longitudinal center of said light source and diametrically opposite the line of intersection of said flat mirrors.

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