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3,130,923

LIGHTING FIXTURE

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FIG. 1

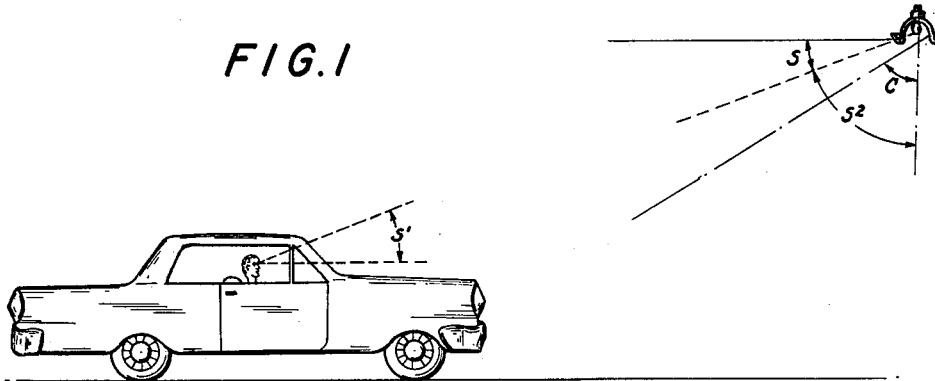


FIG. 2

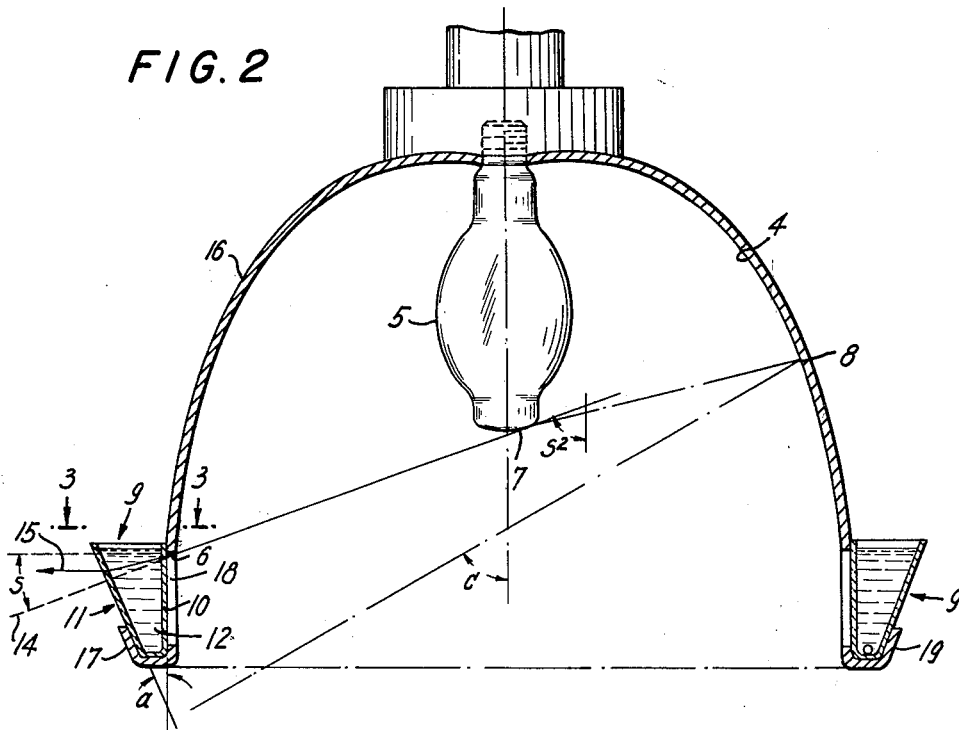
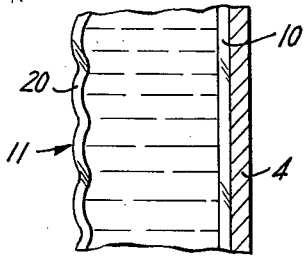


FIG. 3



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1

3,130,923

LIGHTING FIXTURE

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The invention relates to lighting fixtures for streets, thruways and other types of highways or roadways.

The reflecting characteristics from a dry pavement are very different from those of the same pavement when wet. When the pavement is dry, the best lighting fixture would be one in which the luminous source is shielded in such a way that drivers of approaching vehicles can see neither the luminous source itself nor any light rays reflected directly from the shield. However, when the pavement is wet, such a fixture would not be at all satisfactory. In this case pavement reflections become specular, and if the light emitted by the fixture is restricted as I have described, the light images reflected on the wet pavement would be seen only after approaching vehicles have come within the immediate environs of the lighting fixture. Hence obstacles on the road will be seen against a dark background and their visibility will then be very poor, with inadequate "discernment by silhouette." The importance of discernment by silhouette is well understood in the art to which the present invention appertains and is recognized, for example, in "Fundamentals of Rural Highway Lighting," Sweet, Transactions of the Illuminating Engineering Society, May, 1936. This problem of illumination of roadways in bad weather has led to the general adoption of fixtures emitting light up to and even above the horizontal. Such fixtures are seen reflected on the wet pavement and show the road brightly outlined for a great distance ahead of the driver. However it will be appreciated that such fixtures also shine directly into the eyes of drivers and, being angularly very near the lines of vision, produce undesirable glare.

Summary

The object of my invention is to provide an improved form of lighting fixture which will do a better job of meeting the requirements for proper lighting of both wet and dry pavements, and which therefore will be less of a compromise between fixtures which would be best just for one condition or the other.

According to my invention there is provided a lighting fixture comprising a shielding, or shielding and reflecting, element having an effective shielding angle which obscures the luminous source from the view of drivers of oncoming vehicles, and a receptacle or container for liquid extending below such shielding element and disposed to receive and accumulate rain water or other forms of precipitation. This receptacle has light-transmitting walls, e.g. walls made of transparent glass or plastic material, forming a reservoir for water so accumulated. These walls have portions disposed at an angle to the light rays from the luminous source whereby the water forms a temporary prism to refract the light rays upwardly above the range of the aforesaid effective shielding angle and thus to reveal the direct light from the luminous source at a greater distance when the roadway is wet. The receptacle may be constituted by a trough extending along the lower edge of the reflecting element to receive the run-off from the upper surfaces of the fixture for rapid build-up of the temporary water prism.

2

In this manner I provide what might be described as a weather-controlled lighting fixture having one kind of lighting characteristics when the pavement is dry and another kind of lighting characteristics when it is raining or snowing and the pavement is wet. This makes it possible to design the fixture to more nearly ideal performance under the different weather conditions.

Description

With reference to the accompanying drawing I shall now describe the best mode contemplated by me for carrying out my invention.

FIG. 1 is a schematic view to illustrate the relationship between the normal shielding angle of the top of an automobile and the effective shielding angle of a fixture embodying my invention.

FIG. 2 is a vertical transverse sectional view of my improved fixture.

FIG. 3 is an enlarged detail view taken as indicated at 3-3 in FIG. 2.

It is possible as described in the copending application of Edison Price and Isaac Goodbar, Serial No. 857,641, filed September 18, 1958, now U.S. Patent 3,098,612, to construct a light fixture which when viewed from positions exceeding a given angle to a vertical plane containing the luminous source will appear very low in the scale of brightness. When such a fixture is used for lighting roadways and the like, it is possible to select an effective shielding angle which when properly related to the shielding angle of the top of an automobile will have the result of obscuring the entire luminous source from the vision of the driver. Under these conditions direct glare from the luminous source and from its reflecting shield would be eliminated. This condition is illustrated in FIG. 1, wherein angle  $s$  represents the angle below the horizontal of the highest light rays projected from the luminous source below the nearest edge of the reflecting shield of the fixture, and  $s'$  is the angle above the horizontal of the highest line of vision of the driver below the shield afforded by the top of the automobile. When  $s$  equals  $s'$ , it will be impossible for the driver to see the luminous source at any time because at the very moment that the forward progress of his car would begin to reveal the luminous source to him, the shield afforded by the top of his car will cut off his view. By making  $s$  somewhat greater than  $s'$ , a similar result is achieved and the angle  $s$  preferably is selected so as to be accommodated to the minimum shielding afforded by any standard make automobile when driven from the lowest driver's seat position by a person of average height. Even in the absence of any shielding afforded by the top or visor of an automobile, my improved fixture will reduce glare and can entirely eliminate direct glare from all but the nearest fixture or fixtures, with reduced glare from the latter. Similarly, the fixture will be designed so that the farther portion of its reflecting shield will project no direct or indirect image of the luminous source at an angle  $c$  from the vertical plane containing the luminous source that is greater than  $90^\circ$  minus  $s$ . Otherwise stated, angle  $c$  will be no greater than angle  $s^2$ .

Referring now to FIG. 2, I shall describe the preferred construction of my arrangement for altering the optical distribution of the light according to the condition of the weather. In dry weather all of the light will be confined below angle  $s$  so that all glare will be avoided.

When it is raining, or when it is snowing under temperature conditions which result in the accumulation of water in certain parts of the fixture the light distribution will change so that light will be emitted up to the horizontal or even higher. This will make the road well visible for a requisite distance ahead and make possible a satisfactory discernment by silhouette of obstacles in the driver's path.

Still referring to FIG. 2, my lighting fixture comprises a reflecting element or shield 4 having an effective shielding angle which obscures the luminous source 5 from the view of drivers of oncoming vehicles. By "effective shielding angle" I refer to the angle  $s$ , this angle being determined by a line drawn through the lowest point 6 of the nearest edge of shield 4 to a point of tangency 7 at the lower end of the luminous source 5, angle  $s$  then being the angle which such line makes with the horizontal. The defined expression also implies that angle  $c$  will not be greater than  $90^\circ$  minus  $s$ , so that direct reflections of the luminous source from a point such as 8 in the reflecting shield will not be visible above the line 6, 7. My fixture comprises further a receptacle, or receptacles, 9 extending below reflecting shield element 4 disposed to receive and accumulate precipitation and having light-transmitting walls 10, 11 forming a reservoir for water so accumulated. These walls may be of transparent glass or plastic and include portions disposed at an angle to light rays from the luminous source whereby the water forms a temporary prism 12 to refract the light rays upwardly above the range of shielding angle  $s$  and thus reveal the luminous source at a greater distance from the light source than when there is no water in the trough. Thus light rays projected along the line 6, 7 are projected as shown by the dotted line 14 when reservoir 9 is empty but are refracted for projection along line 15 when the reservoir is filled with water.

Receptacle 9 preferably is constituted by a trough extending along the lower edge 6 of the reflecting element to receive the run-off from the upper surfaces 16 of the fixture for rapid build-up of the temporary water prism. The light-transmitting walls include the wall 10 extending vertically below the lower edge 6 of the reflecting element and the wall 11 extending outwardly and upwardly from the bottom of the reservoir to form a trough which widens toward the top. The wide top of the trough permits evaporation of the accumulated water in dry weather to thereby destroy the temporary water prism and restore the shielding action of the reflecting element when the roadway is dry.

In my preferred construction the reservoir is held in position in the reflecting shield 4 by providing the latter with an extended lower edge or edges which are flanged outwardly and upwardly as at 17 to provide a pocket for receiving the trough 9. Openings 18 in the extended portion of the reflecting shield permit passage of the direct and/or reflected rays of light from the luminous source. The trough 9 being in contact with the reflecting shield 16 which extends into close proximity with the luminous source 5 transfers a certain amount of heat from the luminous source to the reservoir and the water contained therein, aiding in evaporation of the water after precipitation has stopped.

If desired the reservoir 9 may be provided with means such as apertures 19 in the ends of the trough for draining off the accumulated water at a predetermined rate to the end that the water prism will disappear by the time the roadway dries.

The invention is applicable to fixtures of differing shapes, elongated, circular and other forms, the form chosen for illustration being one which has a reflecting shield of inverted channel form with troughs extending along the lower edges of such shield, the troughs having light-transmitting walls angularly disposed to one another as has been described. The outer light-transmit-

ting walls 11 may be flat or may have vertical convolutions as shown at 20 in FIG. 3 to spread the light rays transversely of the roadway.

For simplicity the fixture selected to illustrate the invention in its preferred form is designed to control the shielding angle only lengthwise along the roadway. Similar shielding surfaces and troughs may be arranged at the ends of the fixture to control the shielding angle transversely of the roadway. However, since the distribution of light across the roadway does not need to change in accordance with the weather, I consider that the particular form I have described represents the best mode known to me for carrying out my invention.

The light distribution in rainy weather being modified by the refracting characteristics of the water prism 12, it will be understood that these characteristics can be controlled in accordance with the respective angular disposition of the faces of the prism, i.e. the angle  $a$  between the faces of the transparent walls 10, 11, the inner and outer faces of wall 10 being parallel to one another and this being true also with respect to the faces of wall 11. Angle  $a$  may be determined by simple experiment or it can be computed, taking into account the index of refraction of water, so that a ray 6, 7 coming from the lamp is refracted into a ray 15 at or above the horizontal as desired. When the outer wall 11 of the trough is formed with convolutions such as shown at 20 in FIG. 3, the entire trough element 9 will be visible with controlled brightness. These elements when seen along the lower edges of the elongated fixture shown will be reflected on the wet pavement so as to appear in the form of wide streaks which will be particularly effective in delineating the pavement and in making any obstacle visible by a silhouette. When the rain is over, and the water in the troughs evaporates or runs out through the metering apertures 19, the illumination again becomes glareless.

Other dispositions of the water prism receptacles may be possible without departing from the concepts of my invention.

The terms and expressions which I have employed are used in a descriptive and not a limiting sense, and I have no intention of excluding such equivalents of the invention described as fall within the scope of the claims.

I claim:

1. A lighting fixture for roadways and the like comprising a shielding element open at the bottom thereof to project light downwardly, a lamp, means for mounting said lamp within said element in a position located above a lower edge of said shielding element to produce an effective shielding angle which in clear weather normally obscures the lamp from the view of drivers of oncoming vehicles, and a receptacle supported by said element extending along and below said lower edge of the shielding element, said receptacle having light transmitting walls disposed to receive and accumulate precipitation, said walls having portions disposed at an angle to each other and to light rays from said lamp to form a temporary water-filled prism during inclement weather to refract the light rays upwardly above the said shielding angle and thus reveal the lamp when the roadway is wet.

2. A lighting fixture according to claim 1 in which said receptacle is constituted by a trough extending along the lower edge of said shielding element to receive the run-off from the upper surfaces of the fixture for rapid build-up of the temporary water prism.

3. A lighting fixture according to claim 1 in which said light-transmitting walls of the reservoir include a wall extending vertically below the lower edge of said shielding element and another wall extending outwardly and upwardly from the bottom of the reservoir to form a trough which widens toward the top.

4. A lighting fixture according to claim 1 in which said reservoir is provided with means for draining off the accumulated water at a predetermined rate whereby the water prism will disappear by the time the roadway dries.

5

5. A lighting fixture according to claim 1 in which the outer light-transmitting wall includes vertical convolutions to spread the light rays transversely of the roadway.

References Cited in the file of this patent

1,948,555  
2,448,318  
2,572,379  
2,702,850  
5 2,886,698

UNITED STATES PATENTS

1,174,930 Frey ----- Mar. 7, 1916  
1,584,369 Graham ----- May 11, 1926

6

Wood ----- Feb. 27, 1934  
Lowry ----- Aug. 31, 1948  
Pearse ----- Oct. 23, 1951  
Harling ----- Feb. 22, 1955  
Dorman ----- May 12, 1959

FOREIGN PATENTS

3,392 Great Britain ----- Nov. 7, 1868