United States Patent

Siegel

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[54] LUMINAIRE

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[52] **U.S. Cl.**.....**240/93**, 240/104, 240/106

[51] **Int. Cl.**.....**F21v 13/04**, F21v 5/00, F21v 7/10

[58] **Field of Search**.....240/25, 46.47, 78 CF, 78 G, 240/78 H, 78 LD, 83, 103, 104, 100, 92, 108, 1.4, 7.35, 7.4, 41.15, 41.35, 78 R, 78 HA

[56] **References Cited**

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[57] **ABSTRACT**

A luminaire is provided which achieves very low brightness of a ribbed prismatic reflector wall as seen at normal viewing angles by the utilization of a housing which is blackened for at least a portion thereof.

8 Claims, 3 Drawing Figures

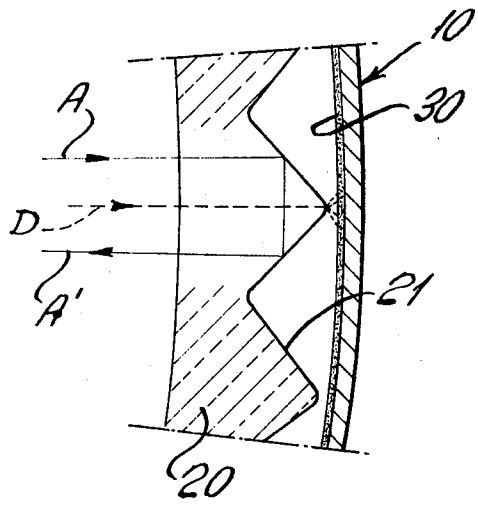


Fig. 1.

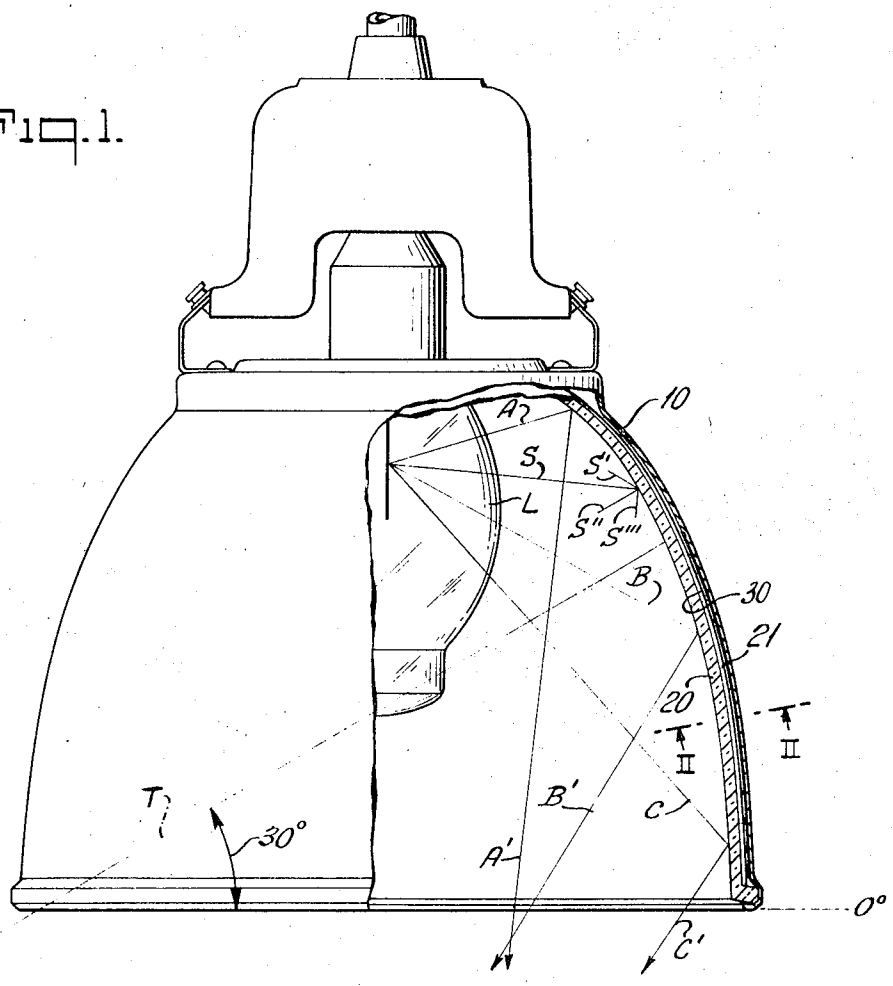


Fig. 2.

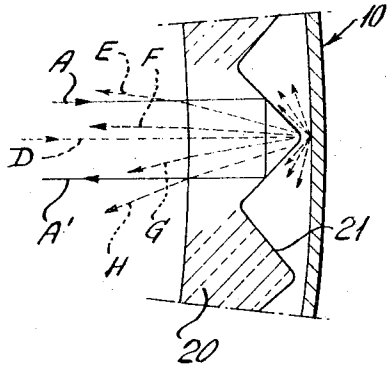
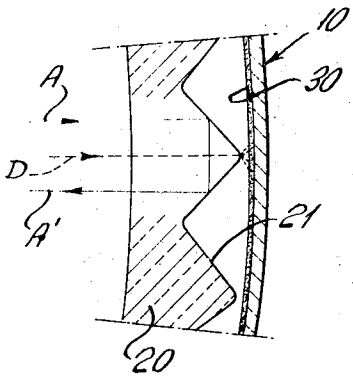


Fig. 3.



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LUMINAIRE

The present invention relates to luminaires which are utilized with high intensity light sources in low ceiling applications.

Glass reflectors are presently available which operate primarily upon the principal of total reflection at the prismatic surfaces of the reflector which extends around the luminaire light source. These prismatic glass reflectors are usually surrounded by a metallic cover which serves to protect the glass member against breakage.

These prismatic reflectors have general application in either surface mounted or built-in luminaires to be used in industrial buildings which have low ceilings. Since these luminaires are generally used in combination with high intensity light sources such as mercury, metallic additive, high pressure sodium or incandescent lamps in gymnasiums, supermarkets and the like, the problem of viewer glare is of prime importance.

Such a prismatic glass reflector is already superior in this respect to other reflectors on the market. Previously, this glare could not be minimized without a substantial lessening of the efficiency of the luminaire or a substantial changing of the distribution curve. This loss in efficiency was highly undesirable and the changing of the distribution curve often resulted in a significant reduction in luminaire spacing.

Accordingly, it is an object of the present invention to provide a luminaire in which a prismatic glass specular reflector is utilized in combination with a high intensity light source, which distributes almost no light in the direction of the eye of an observer in the form of light glare.

It is an additional object to provide luminaires which will function with a relatively small accompanying loss in efficiency while achieving a maximum reduction in viewer glare.

It is a further object to provide a luminaire which can be utilized at existing spacing relationships and which will distribute light in substantial conformity to the previously required lighting distribution.

It is also an object of the invention to provide a luminaire which will have a handsome appearance.

Further objects and advantageous features of the invention will become apparent from the following description and drawings wherein:

FIG. **1** is a partial cross-sectional elevational view of a luminaire according to the present invention;

FIG. **2** is a partial cross-sectional view of the glass reflector and metallic cover portion of the luminaire taken from axis II—II of FIG. **1** but without the housing surface being coated with light absorbent means.

FIG. **3** is a view similar to FIG. **2** with the luminaire housing being constructed in accordance with the present invention.

The structure of the presently preferred luminaire fixture is defined in U.S. Pat. No. 2,710,340. The luminaire is comprised of the following primary components: a light source indicated at L, a prismatic ribbed glass reflector **20** and an aluminum cover **10**. A socket and mounting bracket **11** retains the cover **10**, reflector **20** and light source **2** in assembly and provides support from the mounting surface, not shown.

The reflector **20** is provided with vertical light reflecting ribs **21** in the form of prisms. (FIGS. **1** and **2**). As can be seen from FIG. **1**, the prismatic reflecting ribs **21** are designed so that rays emitted by the light source L (A,B,C) will be reflected by these prisms in a downward direction to strike a horizontal surface such as a floor throughout a predetermined angular range. For low ceiling, industrial uses, this range is normally 0° to 60° from the vertical (A', B', C'). Since the normal viewing angular range of a person in a store or gymnasium is seldom beyond the angular range of from 0° to 30°, above the horizontal, theoretically no light would be distributed from the luminaire into the observer's eyes.

With the prior art luminaires, above referred to, some unwanted glare is produced which is undesirable for use wherever extra low brightness is required at normal viewing angles. This glare has been found to be the result of the inherent characteristics of the prismatic reflector when utilized in combination with the metallic cover, the internal surface of which

is advantageously used as an auxiliary reflector, as will be more fully explained. As can be seen from FIG. **2** a portion of the light emitted by the light source L and incident on the prismatic glass reflecting surface (ray D) is transmitted therethrough at the valleys and apices of prisms. These prism surfaces tend to be rounded at these points as a result of the limitations of the manufacturing process which make it impossible for these prismatic surfaces to be cut with mathematical precision. These curved surfaces do not reflect light incident thereon as desired but transmit the light which then becomes incident on the metallic cover **10**. Light incident on the internal surface of the cover is reflected diffusely back into the glass prismatic reflector **20** where it is dispersed in all directions (E, F, G, H). A portion of this diffusely scattered light is advantageously scattered throughout the desired angular range of from 0° to 60° from the vertical (rays G and H) and this light contributes to the illumination of the floor area. The remaining portion of this diffusely scattered light (rays E, F) is scattered beyond this desired angular range and is either cut off by the luminaire or is emitted from the luminaire as viewer glare. It is only the light which is scattered into this angular range of view of the observer that is desired to be eliminated through use of the present invention.

Ray S in FIG. **1** which is incident on the prism peak or valley of the prismatic reflector **20** is scattered into rays S', S'' and S''' (shown diagrammatically), by the metallic cover **10**. Since none of these scattered rays can be emitted from the luminaire within the viewing range, these rays either being again reflected by the opposite side of the reflector or passing beneath the opposite edge thereof, this scattered light cannot result in viewer glare since in either instance it will be emitted from the luminaire within the desired angular range. It can be, therefore, appreciated that light leakage incident on the aluminum cover and its subsequent diffuse reflection will not produce glare from the top of the reflector **20** down to a horizontal plane where a light ray (T) being directed from the reflector in a downward direction so as to establish an angle of approximately 30° with the horizontal (30° being the upper limit of the observer's angular range of view), will just pass the opposite lowermost portion of the luminaire. A portion of the light leakage incident above this plane will contribute to the illumination of the desired area and by allowing this light from the upper portion of the housing to be so reflected, luminaire efficiency can be substantially maintained.

Based upon the previous discussion, it can be understood that as a light ray which is emitted from the light source strikes a prism apex or valley below this plane, the greater the distance below this plane the greater will be the light scattered at that point into the glare zone.

To substantially eliminate this light which causes glare, the aluminum cover according to the present invention is dipped in caustic soda to clean the surface by removing foreign material and the aluminum oxide film and then the lower portion thereof (below this horizontal plane) is blackened with black paint **30** to thereby provide an area of light absorption to substantially reduce reflection of light at glare angles. For maximum reduction of glare, the entire lower portion below this horizontal plane will be blackened.

The present invention has achieved a substantial refinement in comfort control by producing prismatic reflectors that reduce brightness in the glare zone as much as 75 percent while reducing the efficiency of the fixture by less than 10 percent.

The following chart illustrates this optical refinement by comparing a standard luminaire and the same luminaire made in accordance with the present invention.

AVERAGE LUMINANCE AND OUTPUT COMPARISON

LAMP A vs. Lamp A with extra low brightness coating

250W.,H37-5KC/C Improved Color Mercury Lamp

11,500 Lumens

Average Luminance in Footlamberts

Vertical Angles	Lamp A Luminance	Lamp A with extra Low brightness coating	% Reduction
65	1,245	295	76%
70	835	200	76%
75	645	205	68%
80	540	190	65%
85	575	155	73%

Output Comparison

Zone Degrees	Lamp A % Output	Lamp A with extra low brightness coating % output	% Reduction
0-45	15.2	46.6	9%
0-60	63.6	56.4	11%

What is claimed is:

1. In combination with a luminaire comprising a light source and a reflector, said reflector including a plurality of elongated prisms for reflecting light incident thereon outwardly from said luminaire within a predetermined angular range, said prisms having peaks and valleys, a portion of the light incident on said peaks and valleys being transmitted therethrough as light leakage, a housing surrounding said reflector, said housing reflecting a portion of said light leakage, at least a portion of the surface of said housing adjacent said reflector including means for absorbing light incident thereon.

2. A combination as defined in claim 1, wherein said absorbing means are included on that portion of the surface of said housing adjacent said reflector from which light leakage incident thereon could be reflected therefrom to pass through said reflector and be distributed from said luminaire beyond said predetermined angular range.

3. In combination with a luminaire comprising a light source and a reflector, said reflector including a plurality of elongated prisms for reflecting light incident thereon outwardly from said luminaire within a predetermined angular range, said prisms having peaks and valleys, a portion of the light incident on said peaks and valleys being transmitted therethrough as light leakage, a housing surrounding said reflector said housing reflecting a portion of said light leakage within said predetermined range and having light absorbing means over a portion of it from which a part of the light leakage would be reflected outside said predetermined angular range.

4. A combination as defined in claim 3 wherein said absorbing means includes a black film on said housing.

5. The combination as defined in claim 4 wherein said film is paint.

6. A combination as defined in claim 5 wherein said housing is comprised of aluminum and wherein said adjacent surface has been treated with caustic soda prior to painting said surface with said film.

7. A combination as defined in claim 3 wherein said portion of said surface of said housing is the lower portion thereof.

8. A luminaire comprising a light source and a downwardly open, bowl shaped reflector, the reflector including a plurality of elongated prisms on its surface remote from the light source, said prisms reflecting light incident thereon outwardly from the luminaire through the open bottom of the reflector and within a predetermined low angular range, said prisms having peaks and valleys, a portion of the light incident on said peaks and valleys being transmitted therethrough as light leakage, a housing surrounding said reflector, said housing being reflective over an upper portion of it from which said light leakage is reflected through the open bottom of the reflector and within said predetermined angular range and having light absorbing means over a lower annular portion of its interior surface from which said light leakage would be, but for said light absorbing means, reflected through said open bottom of the reflector and above said predetermined angular range.

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