May 7, 1963 H. A. ODLE 3,089,024

LUMINAIRE

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Fig. 1.

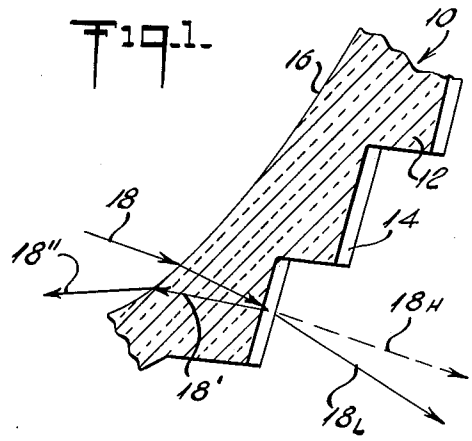

Fig. 2.

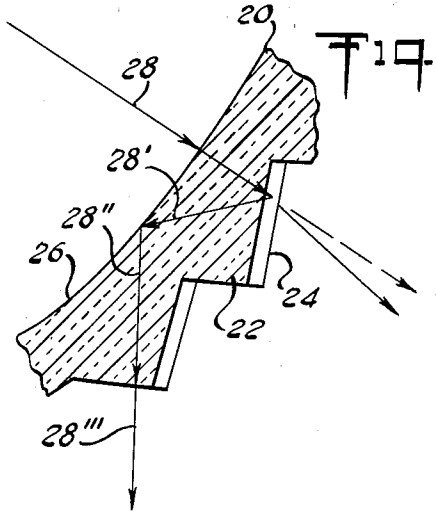

Fig. 5.

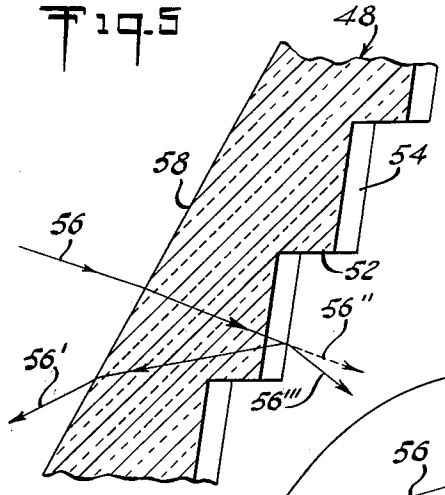

Fig. 3.

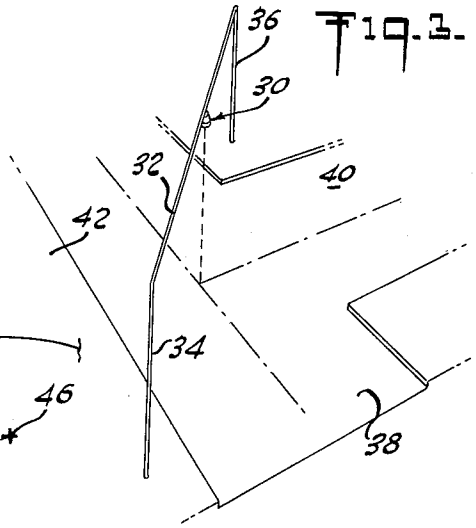

Fig. 4.

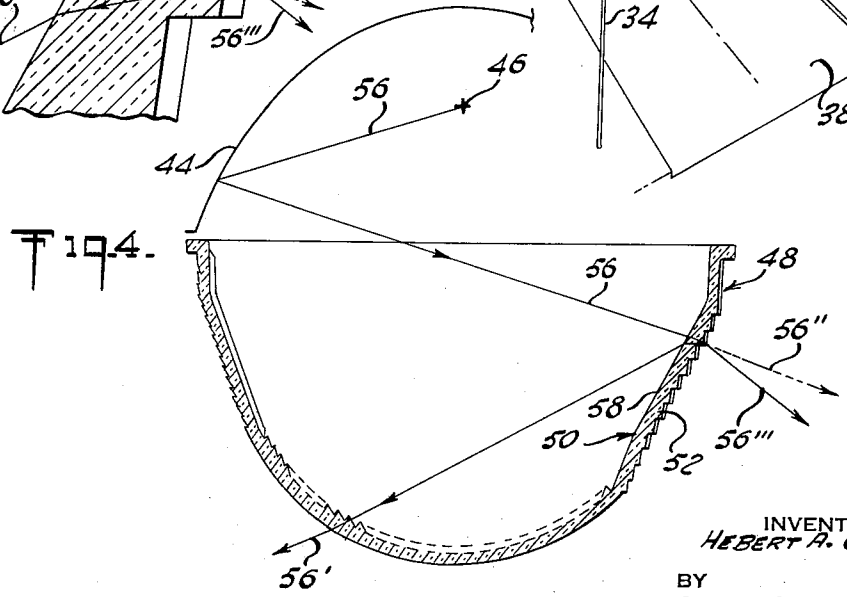

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FIG. 6.

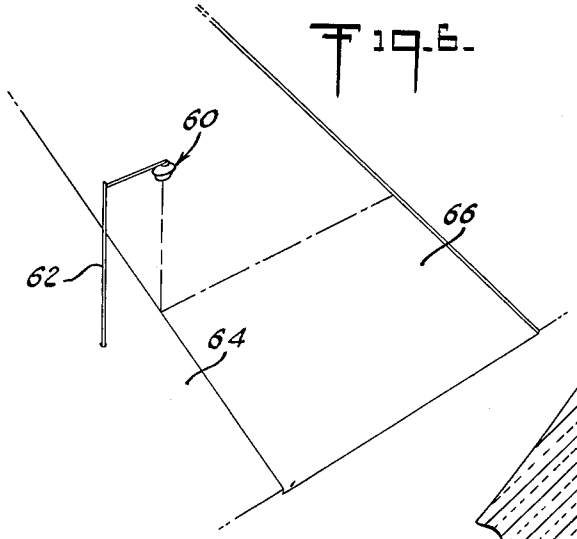
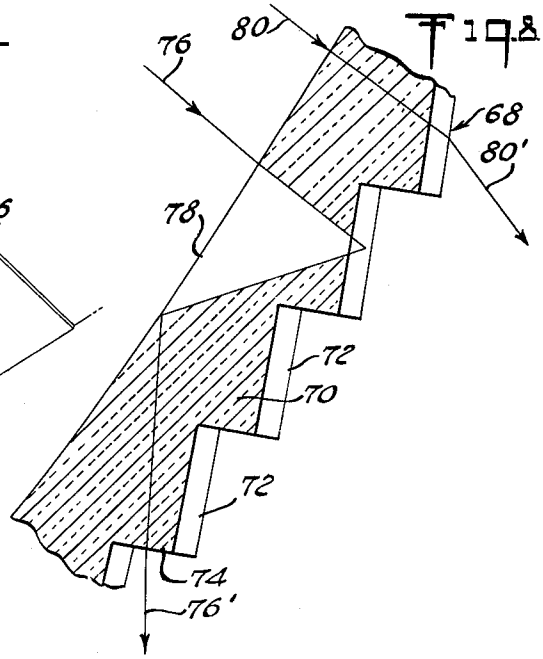


FIG. 8.



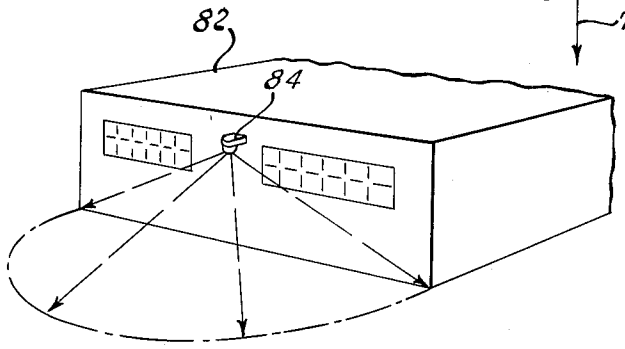
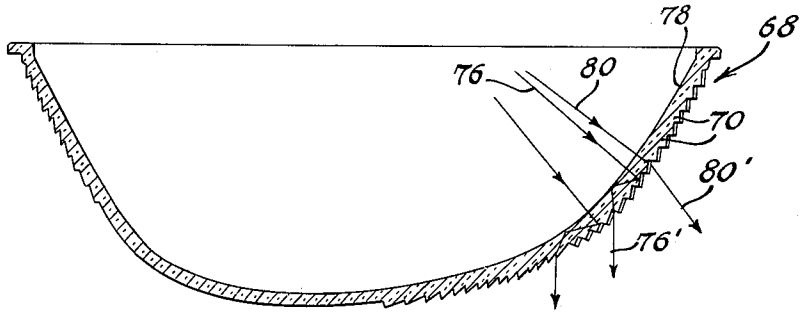


FIG. 9.

FIG. 7.



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United States Patent Office

3,089,024
Patented May 7, 1963

3,089,024

LUMINAIRE

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Filed Mar. 30, 1959, Ser. No. 802,825
4 Claims. (Cl. 240—25)

This invention relates in general to a luminaire and in particular to a new and useful luminaire including means for maintaining an area adjacent one side of the luminaire free of glare and for redirecting the light which would normally fall on such area outwardly therefrom into useful directions for illuminating an extended area such as a street.

In many instances luminaries are employed in locations where it is desirable to light one portion of an area adjacent the luminaire but to maintain an immediately adjacent area free of glare and excessive illumination. For example, with outdoor luminaires such as might be used on the side of a building, or at the edge of a street, it is desirable to illuminate the area extending outwardly from the building or wall into the street rather than the building itself or the areas immediately adjacent the side of the street. Where luminaires are placed on overhead poles in a residential area at one side of the street, it is necessary to provide some means to shield houses on this side of the street from excessive illumination and glare and to maintain a wide spread of illumination throughout the street area. Similarly on luminaires which are placed on one end of a large building, it is usually desirable to illuminate the area extending outwardly from the building rather than to illuminate a great wall area of the end of the building itself.

In order to direct as much light as possible into useful areas and to prevent excessive illumination and glare in areas which do not require lighting, such devices as metal reflecting shields or deflectors have been provided in the luminaires and are located on the side which is to be shielded from light in order to mechanically shield and re-direct this light forward by reflection from this metal shield. Such deflectors have the disadvantage that they provide an obstruction in the luminaire which frequently becomes disoriented and so effects an improper distribution of light. These deflectors have the further disadvantage in that they add expense to the construction of the luminaire and usually result in an undesirable visual appearance of the back side of the refractor in that they create a dark portion at this side.

In accordance with the present invention there is provided a luminaire including a novel refractor construction in which a portion of the refractor adjacent the area which does not require illumination is provided with means for redirecting the light incident thereon into useful directions and means for preventing this light from going into undesirable directions such as falling wasted on the side of a building or causing glare in houses adjacent the edge of a street. The luminaire constructed in accordance with the invention includes vertical reflecting prisms arranged on top of relatively large horizontal refracting prisms. The slope of the inner surface of the refractor is arranged to cooperate with the

slope of the outer refracting prism to redirect objectionable light incident thereon back into a forward, useful direction. Since such a prism construction includes some light leakage adjacent the peaks and valleys of the reflecting prisms, the construction also includes means for directing the light, which does escape, downwardly to an angle sufficiently low to reduce the back side glare.

Accordingly it is an object of this invention to provide a luminaire including means for cutting down light directed therefrom in a given direction and to redirect this light into useful areas.

A further object of the invention is to provide an improved luminaire refractor including means for reflecting light incident on a particular area thereof and for redirecting light leaking past the reflection portion at depressed elevations in order to reduce the glare.

A further object of the invention is to provide a refractor for a luminaire including substantially vertical reflecting prisms arranged to redirect light incident thereon and including means therein for depressing light which leaks therethrough.

The various features of novelty which characterize the invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of the invention, its operating advantages and specific objects attained by its use, reference should be had to the accompanying drawings and descriptive matter in which there are illustrated and described preferred embodiments of the invention.

In the drawings:

FIG. 1 is an enlarged fragmentary transverse section of a refractor constructed in accordance with the invention;

FIG. 2 is a view similar to FIG. 1 of another embodiment of the invention;

FIG. 3 is a perspective view of a luminaire installed over a T-street intersection;

FIG. 4 is a fragmentary transverse section of the luminaire indicated in FIG. 3;

FIG. 5 is a fragmentary enlarged detail of the portion of the luminaire constructed to redirect light in accordance with the invention;

FIG. 6 is a perspective view of a luminaire mounted to illuminate an extended area of the street without causing glare on the houses adjacent the luminaire-pole mounting;

FIG. 7 is a transverse section of the luminaire indicated in FIG. 6;

FIG. 8 is an enlarged fragmentary section of a portion of the luminaire indicated in FIG. 7; and

FIG. 9 is a perspective view of a luminaire installed on the end wall or side wall of a building indicating the light pattern produced by a luminaire constructed in accordance with the invention.

Referring to the drawings in particular, the invention as embodied therein includes a refractor generally designated **10** including an area thereof formed of a plurality of large substantially horizontally disposed refracting prisms **12**, on top of each of which are superimposed a plurality of substantially vertical reflecting prisms **14**. In accordance with the invention, the slope of an inner surface **16** of the refractor and the rows of refracting prisms are arranged to redirect objectionable light back into a

forward useful direction. The refracting prism 12 and the reflecting prism 14 are arranged on the outside of the refractor to cut down on the amount of light which exits from the luminaire on this side and to lower any light which leaks past the prism combination to cause such leakage light to leave the luminaire at angles which will not result in glare.

A typical ray 18 which emanates from the light source and is reflected by the reflecting troughs of the luminaire strikes one of the refracting prisms 12 and reflecting prism 14 and is directed backwardly thereby as ray 18′ whereupon it is further bent by the inner surface 16 in direction indicated by 18″. A portion of this light leaks through the peaks and valleys of the associated prisms and would normally exit as ray 18_H. However, in accordance with the invention, the substantially horizontal refracting prisms 12 depress this leakage light through the peaks and valleys to an angle sufficiently low so as to reduce the back side glare, and the ray exits at a non-glare angle as indicated by the ray 18_L.

In accordance with another aspect of the invention, a refractor generally designated 20 is provided with a back side area which includes a plurality of substantially horizontal refracting prisms 22 on which small substantially vertical reflector prisms 24 are superimposed. In this embodiment, the angles of the refractor and reflector prisms 22 and 24 and the slope of an inner surface 26 of the refractor are so arranged to cause a typical light ray 28 to be directed backwardly as light ray 28′ where it is reflected by the surface 26 substantially downwardly as ray 28″. The ray 28″ is directed into the refractor prism 22 where it exits through a "window" lower surface of the refractor prism 22 as ray 28‴.

Each of the constructions described in FIGS. 1 and 2 are used in combination or alone to provide advantageous lighting conditions and the cutting down of back lighting and back glare for specific luminaire installation conditions. In FIG. 3, for example, a luminaire generally designated 30 is supported on an overhead wire 32 between spaced poles 34 and 36 at the intersection of the center lines of streets 38 and 40. In accordance with the invention the luminaire 30 is constructed to adequately light the complete intersection without causing glare along a house side 42 of the street 38.

In accordance with the invention, the luminaire includes a paraboloid reflecting trough 44 which directs light from a light source 46 over useful lighted areas of the intersections of the streets 38 and 40. The refractor generally designated 48 is specially constructed with an area 50 on a side which will be located adjacent the house side 42 including a plurality of rows of substantially horizontal refracting prisms 52 on top of which are superimposed a plurality of substantially vertical reflecting prisms 54. A typical light ray 56 emanating from a light source 46 strikes the reflector troughs 44 and is reflected into the refractor 48. A major portion of the light is reflected backwardly by the reflecting prisms 54 and then bent downwardly by an inner surface 58 of the refractor across the interior to the opposite side of the refractor where it exits at 56′ in the form of useful light which is directed over the street area. A small amount of light which leaks past the prisms 54 and 52, due to the peaks and valleys thereof is deviated from its normal course at 56″ to a lower angle 56‴ to achieve light which does not produce glare at the normal viewing angles.

In FIGURES 6 to 8 inclusive there is illustrated another application for a luminaire constructed in accordance with the invention. In this embodiment, a luminaire generally designated 60 is mounted on a pole 62 located on a house side 64 of a street 66. The luminaire 60 is arranged to direct a maximum amount of light outwardly over the street area and to prevent any glare on the housing side 64. The luminaire 60 includes a refractor generally designated 68 having a plurality of substantially horizontally arranged refracting prisms 70 and a plurality of substantially vertically disposed small reflecting prisms 72 arranged thereon on the outer surface thereof. A portion of the refracting prisms 70 between adjacent vertically spaced rows of reflecting prisms as at 74 provide a window through which light is directed downwardly through the refractor to light the area of the street 66 immediately below the luminaire 60. A typical light ray 76 is directed backwardly by the reflecting prisms 72 against an inner surface 78 of the refractor 68 which in turn directs the light ray downwardly through the window portion 74 of the refracting prisms 70. The ray is emitted at 76′ in a substantially downward direction. Leakage light is indicated by the rays 80, and this is bent downwardly to exit at 80′ in a direction which will not cause glare when viewed from the normal angles on the street 66.

Another application of the principles of this invention would be to illuminate the walls and adjacent area of a building 82 by means of a luminaire 84 centrally positioned on a wall at one end or a side of the building. In FIG. 9, the light ray pattern produced by a luminaire constructed in accordance with the invention and positioned on the end wall of the building 82 is indicated.

Thus the invention provides a novel luminaire construction in which the light can be properly directed to avoid back lighting and glare without incorporating the expensive and difficult to maintain devices such as deflectors.

While specific embodiments of the invention have been shown and described in detail to illustrate the application of the invention principles, it will be understood that the invention may be embodied otherwise without departing from such principles.

What is claimed is:

1. A luminaire comprising a light source, a reflector above said light source and a refractor having sides located in the path of light from said reflector and said light source, horizontally extending prisms disposed on one side of said refractor on the outer surface thereof, each said horizontally extending prism including an upper substantially vertical side and a lower substantially horizontal side, a plurality of vertically extending reflecting prisms disposed in horizontal side-by-side relationship on the substantially vertical side of each said horizontal prism, each horizontally extending prism lying inwardly of its next adjacent upper horizontally extending prism, the inner surface of said side of said refractor sloping downwardly and inwardly relative to said light source in a curved path, both of said prisms and said inner surface of said side of said refractor being disposed at such angles relative to said light source and the path of light from said reflector, that light rays striking said curved surface pass to the surfaces of said vertical reflecting prisms and are reflected inwardly back to said curved surface and reflected again by said curved surface in a substantially downward direction through the substantially horizontal sides of said horizontally extending prisms.

2. The luminaire of claim 1, wherein said substantially vertical sides of said horizontally extending prisms are disposed at such an angle relative to said light source that leakage light along the peaks and valleys of said vertical reflecting prisms is refracted downwardly.

3. In a luminaire having a light source and a reflector positioned above said light source, a refractor comprising sides located in the path of light from said reflector and said light source, one of said sides having an inner surface and an outer surface, a plurality of substantially horizontal rows of refracting prisms on said outer surface, each said refractor prism being disposed inwardly of its next adjacent upper horizontally extending prism and having a substantially vertical upper side and a substantially horizontal lower side, said inner surface of said side of said refractor sloping downwardly and inwardly, vertically extending reflecting prisms disposed in horizontal side-by-side relationship along the substantially vertical sides of said refracting prisms, said inner surface of said one side

of said refractor and both of said prisms being disposed relative to the light from said light source and from said reflector that light incident on said inner surface of said one side of said refractor passes to the surfaces of said reflecting prisms and are reflected inwardly back to said inner surface of said one side of said refractor and transmitted thereby into a substantialy downward direction.

4. In the luminaire of claim 3, wherein said substantially vertical sides of said horizontally extending prisms are disposed at such an angle relative to the light from the light source and from the reflector that leakage light along

the peaks and valleys of said vertical reflecting prisms is refracted downwardly.

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