May 10, 1966 D. E. WELTY 3,250,913

LUMINAIRE

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FIG. 1.

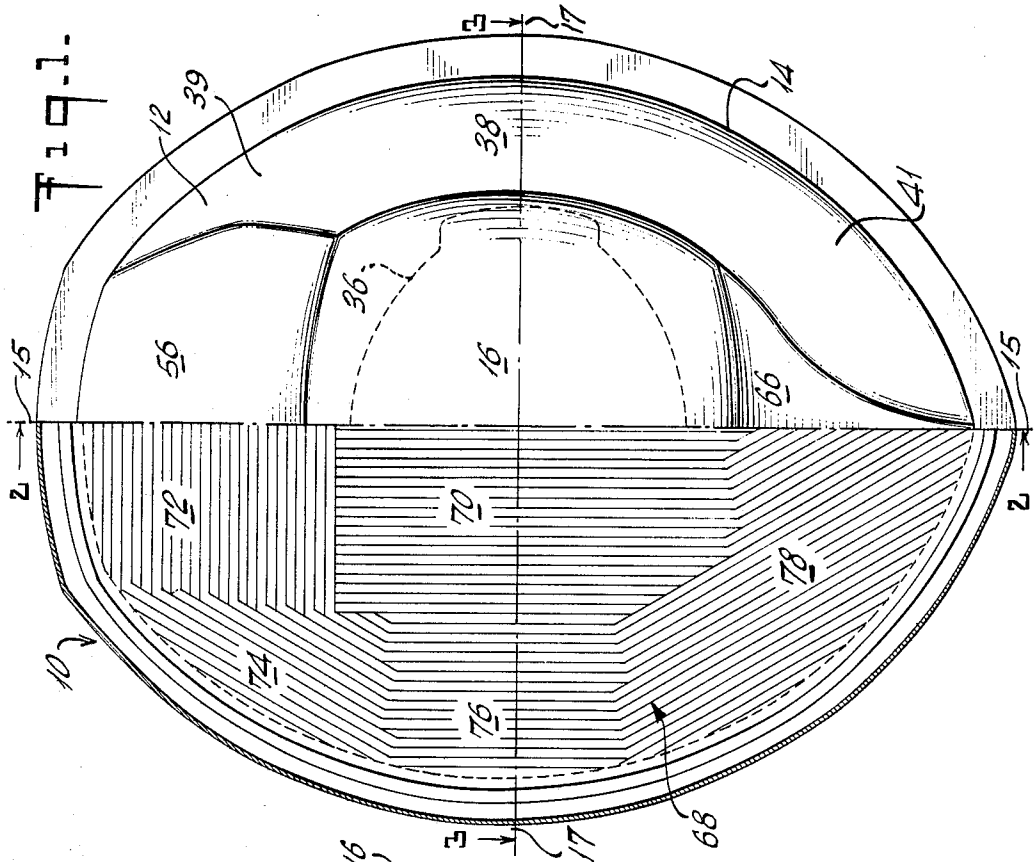
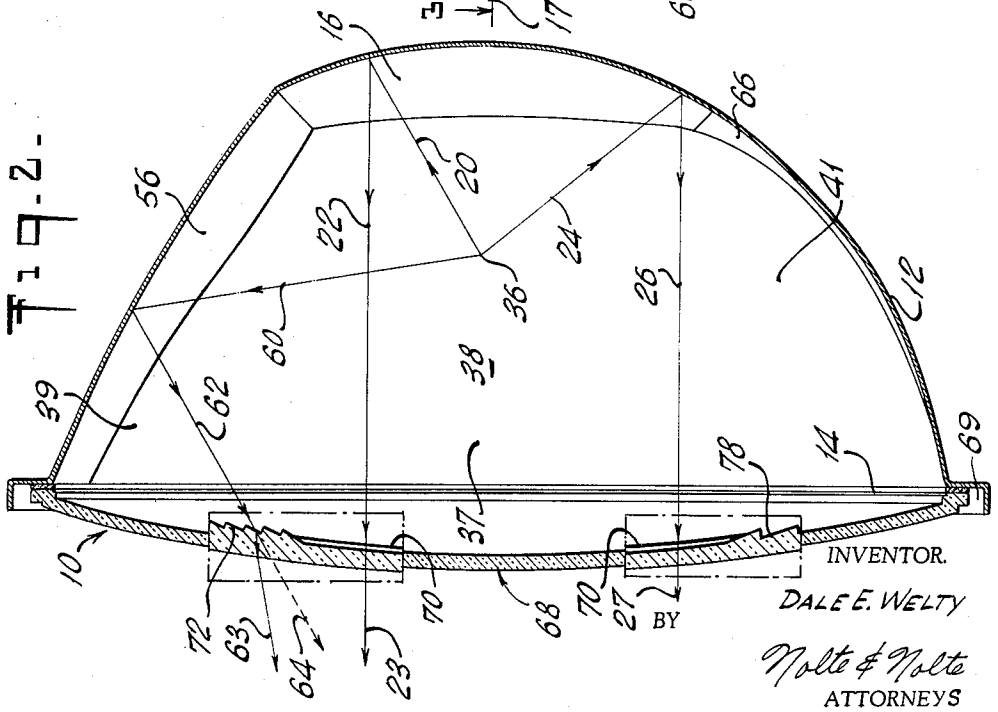


FIG. 2.



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FIG-3-

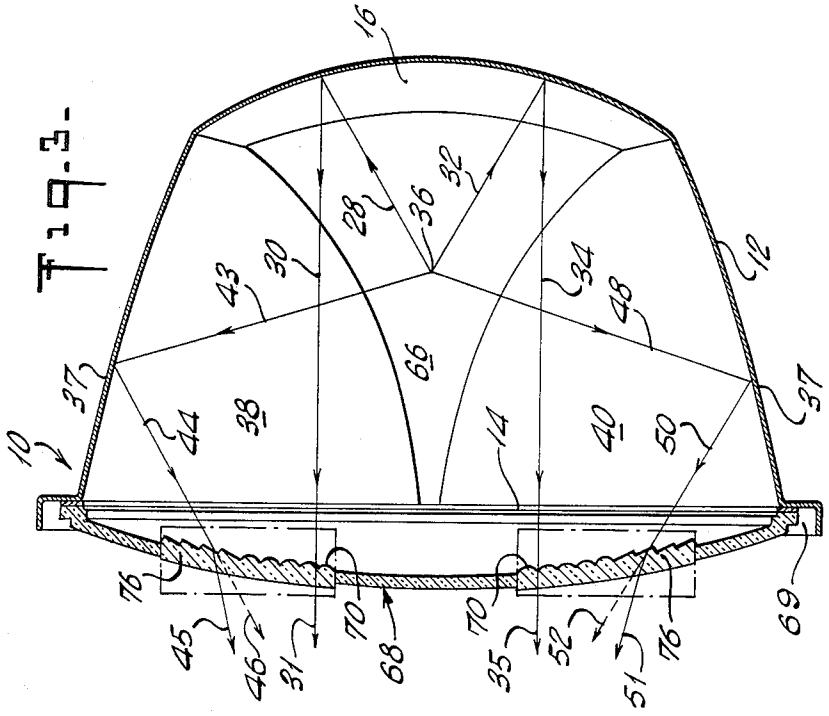


FIG-4-

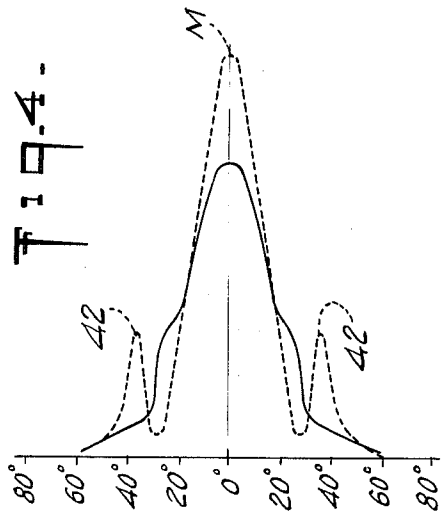
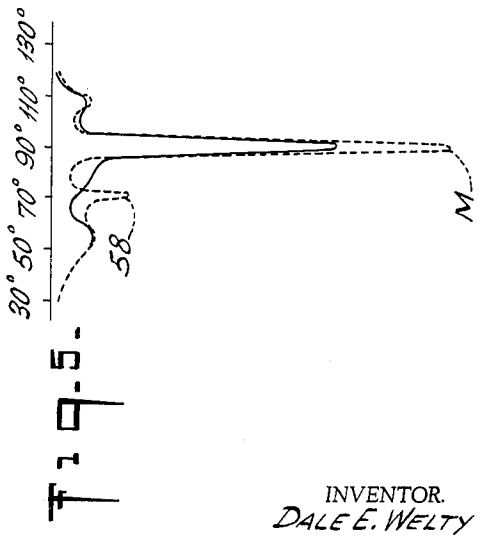


FIG-5-



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LUMINAIRE

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5 Claims. (Cl. 240—93)

The present invention relates to luminaires and is concerned with a refractor for use with a reflector element to provide improved distribution of reflected light. More particularly, the invention relates to a shallow refractor designed to modify the distribution from a light source, such as a one thousand watt mercury floodlighting reflector, to produce a narrow uniform light distribution pattern.

The invention results in improved light distribution by eliminating secondary peaks which, in prior art luminaires, are located approximately thirty to forty degrees laterally from the main beam axis and twenty degrees vertically below the main beam axis. By utilizing the refractor of the invention, which employs discrete prismatic panels corresponding to similarly discrete reflector panels, the light from the reflector is "uncrossed." The normally "crossed" light from the reflector, which would ordinarily produce secondary peaks of light adjacent the main beam, is utilized by blending it into the main beam, thereby presenting a more uniformly distributed beam of light emanating from the luminaire.

Accordingly, an object of the present invention is to provide an improved luminaire refractor.

Another object of the invention is to provide a novel combination of a floodlighting reflector and refractor for achieving uniform distribution of the transmitted light.

A further object of this invention is to provide a novel multi-panelled refractor, in combination with a multi-panelled reflector.

Further objects and advantages of the invention will become apparent and the invention will be fully understood from the following description and drawings in which:

FIG. 1 is an end view of a luminaire, with a portion of the refractor broken away;

FIG. 2 is a cross-section taken along line 2—2 of FIG. 1;

FIG. 3 is a cross-section taken along line 3—3 of FIG. 1;

FIG. 4 is a graph showing the lateral distribution through the plane of the main beam of the reflector alone (dotted lines) and the reflector-refractor combination (solid line); and

FIG. 5 is a graph showing the vertical distribution through the plane of the main beam of the reflector alone (dotted lines) and the reflector-refractor combination (solid line).

In the drawings, the luminaire is designated in general by the numeral 10. A reflector 12 is formed as a plurality of discrete parabolic panels, the outer sides and ends of which form a generally oval shaped flanged mouth 14. The reflector is illustrated having longitudinal and transverse axes 15 and 17, respectively. A light source 36, such as a one thousand watt mercury lamp, is mounted horizontally along transverse axis 17 of the reflector 12.

Rear panel 16 of the reflector is positioned behind the light source 36. This panel reflects light into a sharp main beam essentially perpendicular to the axes of the luminaire. This beam is shown graphically at M in FIGS. 4 and 5. Typical ray paths from panel 16 are illustrated diagrammatically at 20, 22, 24, and 26 of FIG. 2, and at 28, 30, 32 and 34 of FIG. 3.

Reflector panels 38 and 40 are relatively large parabolic sections comprising the two sides of reflector 12, and diverge outwardly from the edges of rear panel 16 to the flanged mouth 14 of the reflector. The light striking the central portions 37 of reflector panels 38 and 40 is reflected at approximately thirty to forty degrees laterally (see FIG. 3) across a center plane through the longitudinal axis of the reflector, i.e. across the axis of the main beam M, and provides the major portion of light which makes up the secondary peaks 42 as shown in FIG. 4. Reflected light from the upper and lower portions of panels 38 and 40 adds to the secondary peaks. Light striking the top portion 39 of panels 38 and 40 is also reflected at approximately thirty to forty degrees laterally across the axis of the main beam, and downwardly to approximately twenty-five degrees below a center plane through the horizontal or short axis of the luminaire. Light striking the bottom portion 41 of panels 38 and 40 is reflected at thirty to forth degrees laterally and upwardly to approximately twenty-five above the horizontal axis. The diagrammatical illustrations of the light rays emanating from source 36 and reflected by panels 38 and 40 are indicated by paths 43, 44, 46 and 48, 50, 52 in FIG. 3.

Reflector panel 56 is a parabolic section comprising the top of reflector 12. Light striking panel 56 is reflected downwardly at approximately twenty degrees below the main beam. Light from this reflected beam is shown as creating the secondary peak 58 in FIG. 5. In FIG. 2 there is shown diagrammatically, ray paths of light which originate from source 36 and are reflected by panel 36. The rays are numbered 60, 62 and 64.

Reflector panel 66 is a comparatively small V-shaped parabolic section comprising the bottom of the reflector. The light reflected by this panel is directed generally into the main beam of light.

Thus it can be understood that reflector panel 16 forms the main beam of light transmitted by the reflector and the side panels 38 and 40 and the top panel 56 reflect their incident light across the main beam axis to form what is essentially a hollow cone of light around the beam. This hollow cone of light is utilized by the refractor of the invention by bringing it into the main beam.

A refractor 68 in accordance with the invention is designed to "uncross" the hollow cone of light from reflector panels 38, 40 and 56 in amounts just sufficient to bring the light distribution of each of these panels adjacent the edge of the main beam distribution. Consequently, the secondary peaks in the distribution curves produced by the reflector panels 38, 40 and 56 are effectively blended into the main beam as shown in FIGS. 4 and 5 in the solid line light distribution curves.

The refractor 68 is fitted into the flanged opening of the reflector and is conventionally seated upon a ring 69 for cushioning the reflector and refractor elements. Refractor 68 comprises a plurality of discrete prismatic panels 72, 74, 76 and 78 surrounding a central diffuser panel 70.

Panel 70 contains a plurality of shallow diffusing flutes which receive the main beam of reflected light from reflector panel 16. Panel 70 does not change the distribution of the reflected main beam, as shown by the diagrammatical illustration of the paths of rays emanating from source 36 and reflected by panel 16 outwardly to panel 70. Thus, ray paths 20, 22, 23 and 24, 26, 27 of FIG. 2 and paths 28, 30, 31 and 32, 34, 35 of FIG. 3 show the light beams emerging from the luminaire in a straight course to comprise the main beam of light.

Refractor panel 72 is positioned between panels 74 and adjacent panel 70 at the flattened top end of the

refractor. Panel 72 includes a plurality of elevating prisms which refract the light reflected from panel 56 upwardly to the bottom edge of the main beam of light. The alteration of the vertical distribution due to the refraction of the light reflecting from panel 56 is shown on the curve in FIG. 5, where the dotted lines indicate the light pattern without the refractor and the solid lines with the refractor. Typical ray paths for the refracted light are shown in FIG. 2 as 60, 62 and 63. It will be noted that the beam of light represented by 60, 62 and 64 has been refracted outwardly to a path which now approximately parallels the main beam of light. Were it not for refractor panel 72 the portion of light reflected from panel 56 would cross the main beam and result in a secondary peak 58.

Panels 74 consisting of two similar sections are located adjacent panel 72, one section on each side thereof, and having a side adjacent panels 76. Panels 74 receive the light that is reflected from the top portion 39 of panels 38 and 40. Panels 74 serve to refract the light laterally and upwardly toward the luminaire axes to the edge of the main beam. The prisms comprising panels 74 are set on diagonal paths to thereby provide both lateral and vertical prismatic action.

Refractor panels 76 receive the light reflected from the central portion 37 of reflector panels 38 and 40 and refract the light laterally toward the main beam axis to the edge of the main beam. Panels 76 consist of two similar sections positioned one on each side of panel 70 and adjacent a section of panels 74 and 78. The change resulting from the aforesaid lateral distribution of that portion of the light entering panels 76 is shown in FIG. 4. FIG. 3 depicts the ray paths of the light refracted through panel 76, designated as 43, 44, 45 and 48, 50, 51. Thus, the rays have been refracted from their original paths by an amount equal to the angle between 45 and 46 or 51 and 52.

Refractor panels 78 include two similar sections positioned adjacent each other at the pointed end of refractor 68. Panel 78 receives the light from the lower portion of reflector panels 38 and 40 and refract this light laterally and downwardly toward the beam axes to the edge of the main beam. The prisms in panels 78 are set on diagonal paths to provide both lateral and vertical prismatic action.

Thus the design of the refractor of this invention provides for a realignment of certain portions of the light emanating from the light source and reflected from the reflector panel to thereby present a beam or cone of light from the luminaire which has a relatively smooth distribution. The results are achieved by eliminating the secondary peaks located approximately thirty to forty degrees laterally from the main beam axis and twenty degrees vertically below the main beam axis. The refractor 68 passes a main beam of light along a path consistent with its original direction and refracts the portions of the light incident upon the reflector side and top panels 38, 40 and 56. The refracted portions of the light are so directed as to fall along the edges of the main beam to thereby provide the relatively smooth total light distribution achieved in this invention.

It will be understood that the reflector-refractor panel arrangement disclosed herein may be adjusted to provide for any light distribution pattern which may be desired. Many variations and modifications of the particular arrangement herein illustrated will be apparent to those skilled in the art, and therefore, the invention is not to be construed as limited except as defined in the following claims.

What is claimed is:

1. In a luminaire having a generally hemispherical multi-panelled reflector, said reflector having an oval shaped opening extending along a longitudinal axis from one end of the luminaire to the other, and a light source positioned within said reflector, said reflector and light source combining to produce a main beam of reflected light outwardly along an extended center line and a substantially hollow cone of reflected light around the main beam, the improvement comprising a multipanelled shallow glass refractor connected to the reflector adjacent the oval shaped opening thereof, said multi-panelled shallow glass refractor including a centrally positioned first panel having a plurality of shallow diffusing flutes, a second panel positioned adjacent said first panel and toward said one end of said luminaire and having a plurality of prism means for directing reflected light incident thereon away from said center line toward said one end of the luminaire, third and fourth similarly shaped panels positioned one on each side of said second panel and having prism means set on diagonal paths, for directing reflected light incident thereon laterally away from said longitudinal axis and from said center line toward said one end of the luminaire, fifth and sixth similarly shaped laterally directing light panels positioned one on each side of said first panel and adjacent said third and fourth panels respectively, and seventh and eighth similarly shaped panels positioned adjacent each other and said first panel each having a side positioned adjacent said fifth and sixth panels respectively and having prism means for redirecting reflected light incident thereon laterally away from said longitudinal axis and from said center line toward said other end of said luminaire whereby said refractor passes the main beam of reflected light in its original direction from said reflector and refracts the remaining light forming the cone of reflected light in such directions that said cone of light falls along the edges of the beam to provide a relatively smooth distribution of the total light emanating from the light source.

2. A luminaire, comprising a generally hemispherical reflector having an open end therein, a light source positioned within said reflector, said reflector including a plurality of reflector panels which redirect light emanating from said light source into a main beam of light and a substantially hollow cone of light around the main beam, a refractor connected to the reflector across the open end thereof, said refractor including a plurality of refractor panels and a diffuser panel, said diffuser panel including means for transmitting the main beam without changing the distribution thereof, and said refractor panels including means for redistributing the cone of light reflected from said reflector panels into the main beam of light and thereby provide a more uniformly distributed luminaire light output.

3. A luminaire comprising a reflector, a light source positioned within the reflector, said reflector including means for intercepting light from the source and for directing the same into a main beam, said reflector further including means for directing some of said light into a hollow cone surrounding said main beam, a refractor positioned forwardly of said light source and said reflector and including means for transmitting substantially unaltered the light from the reflector which is directed into the main beam, said refractor additionally including means for redirecting the light from the reflector which is directed into the hollow cone surrounding the main beam into the main beam.

4. The luminaire of claim 3, wherein said means included in said reflector for directing some of the light into a hollow cone comprises reflector surfaces constituting means for directing said some of the light inwardly across the axis of the main beam and outwardly of the luminaire for forming the hollow cone of light surrounding said main beam, and said means for redirecting light comprise prisms, the surfaces of which constitute means for receiving said some of said light before it crosses the main beam axis, and for directing the same laterally away from the main beam axis.

5. A refractor comprising means for receiving and transmitting a main beam of reflected light generally centrally of the refractor along an extended center line and for simultaneously receiving and refracting a cone of reflected light extending substantially along the center line of the main beam and around the main beam, said means including a plurality of sections of light transmitting elements, said sections including a centermost section, said elements of which centermost section include means for diffusing the main beam of light without affecting the general direction thereof, said sections including sections surrounding said centermost of said sections, said surrounding sections including means for redirecting the reflected hollow cone of light incident thereon laterally of the center line into and in the direction of the main beam.

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