

[54] **BI-DIRECTIONAL HIGHWAY LUMINAIRE**

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[52] U.S. Cl. ....240/25

[51] Int. Cl. ....F21s 1/10

[58] Field of Search.....240/25

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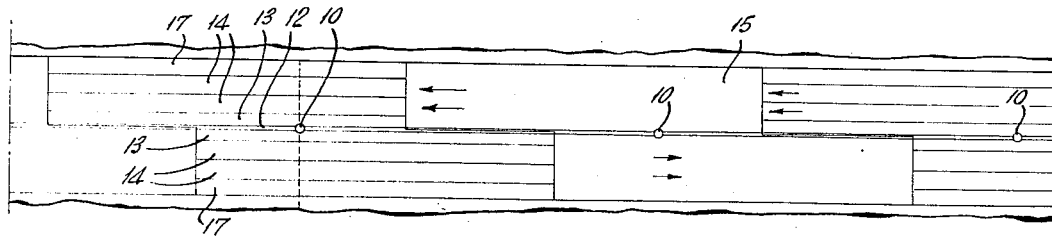
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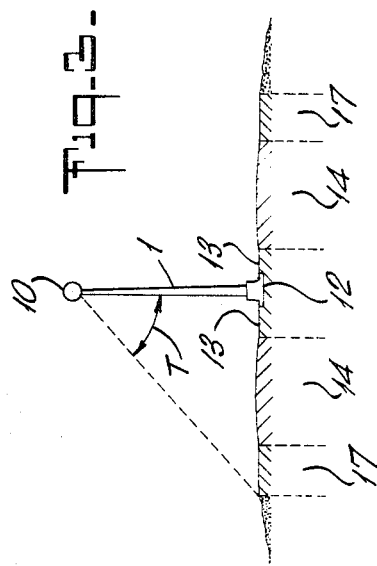
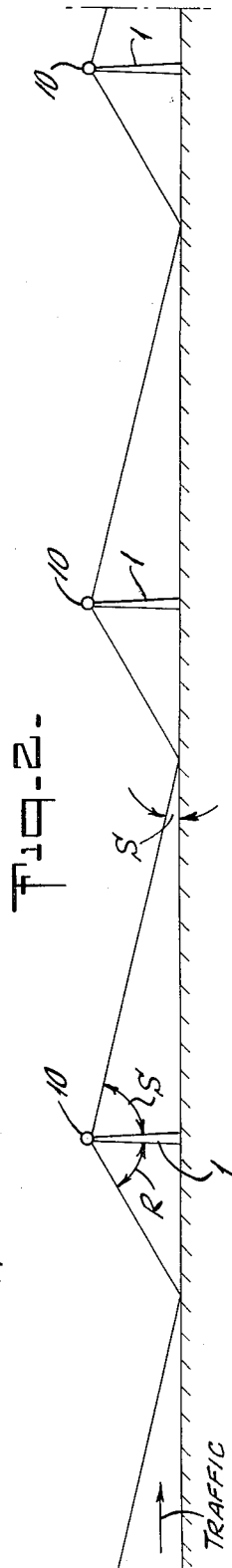
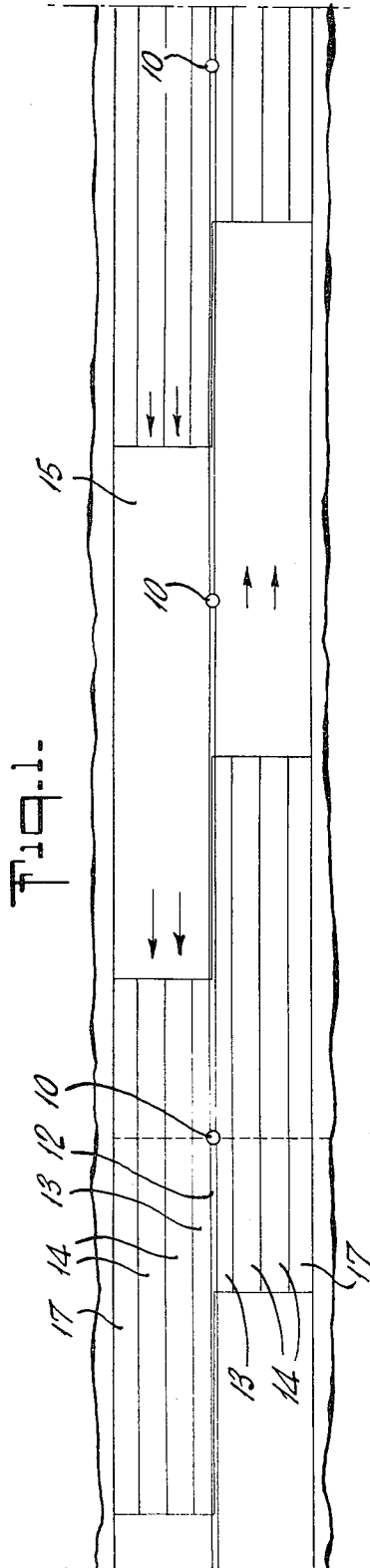
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[57] **ABSTRACT**

A luminaire provides a longitudinally asymmetrical light distribution on both sides of a bi-directional highway with low non-glare beams facing traffic on both sides of the highway and higher beams in the direction of traffic on both sides of the highway.

11 Claims, 19 Drawing Figures





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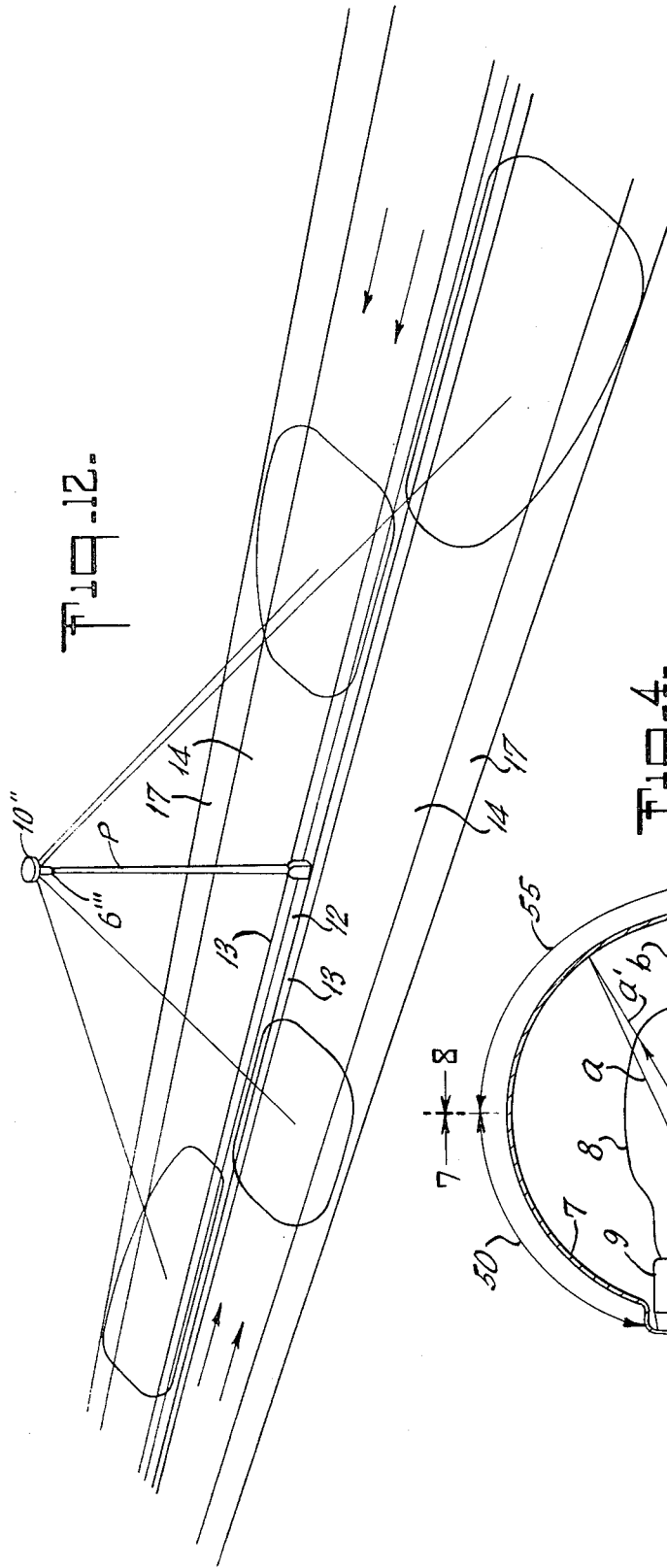


FIG. 12.

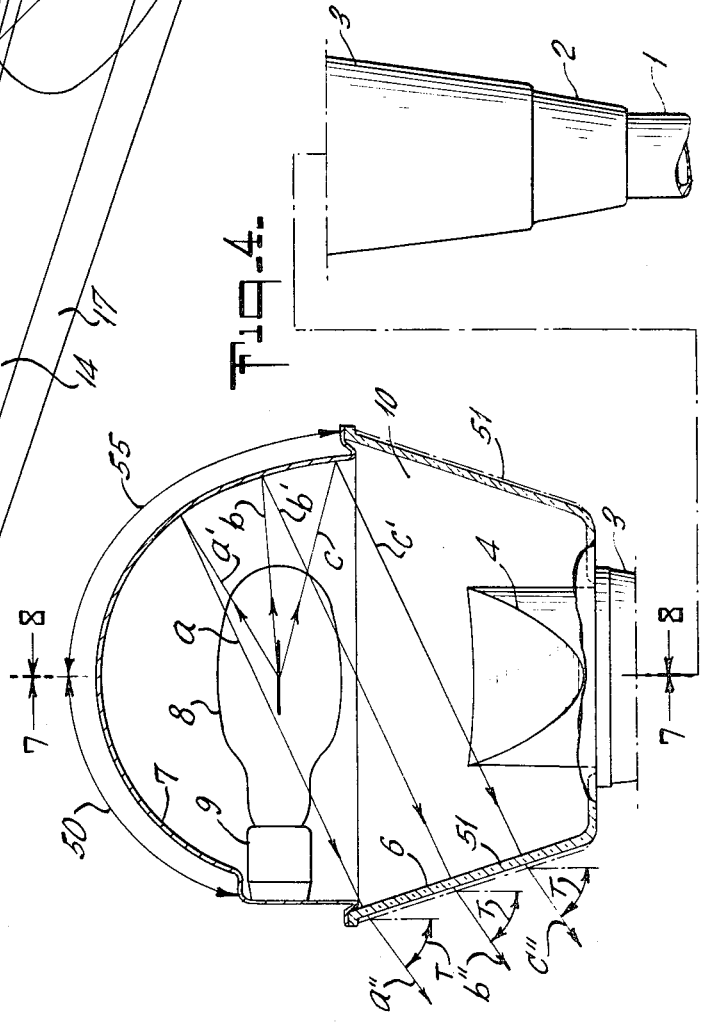
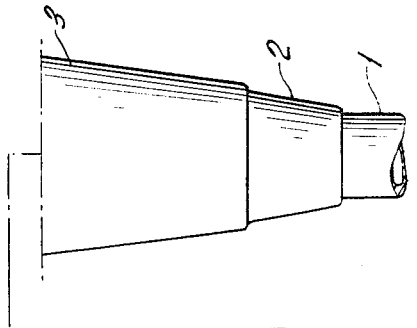


FIG. 4.



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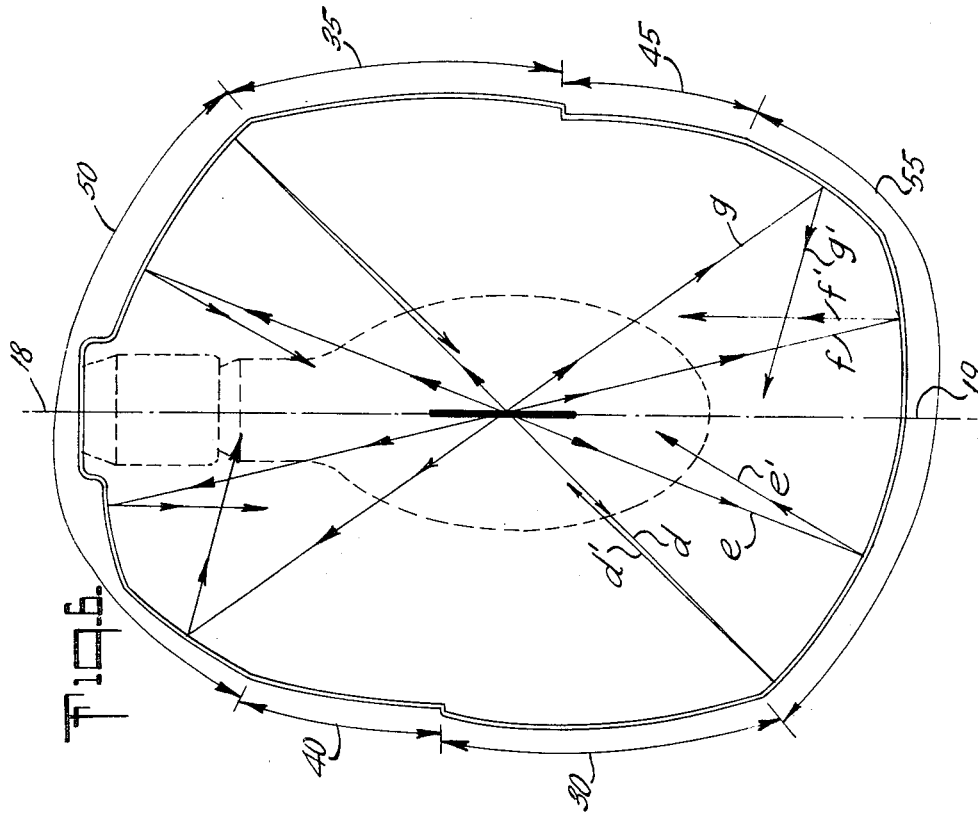


Fig. 6.

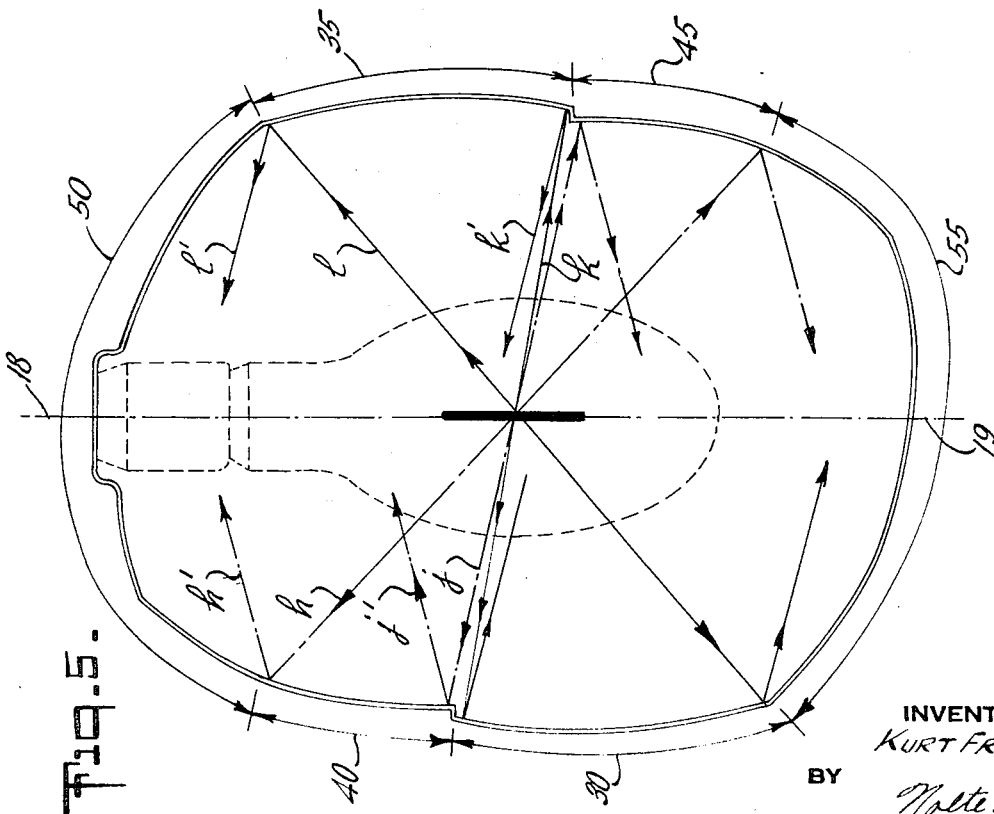


Fig. 5.

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Fig. 8.

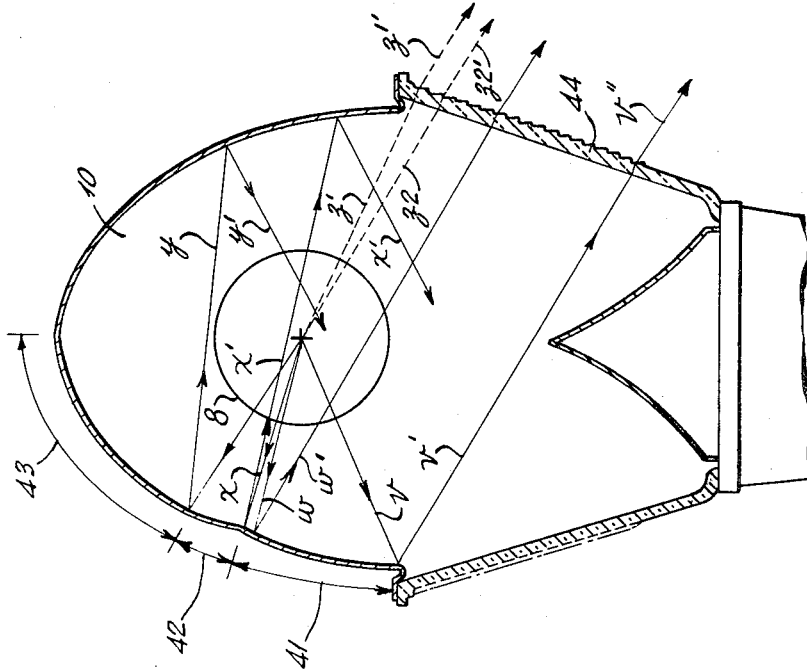
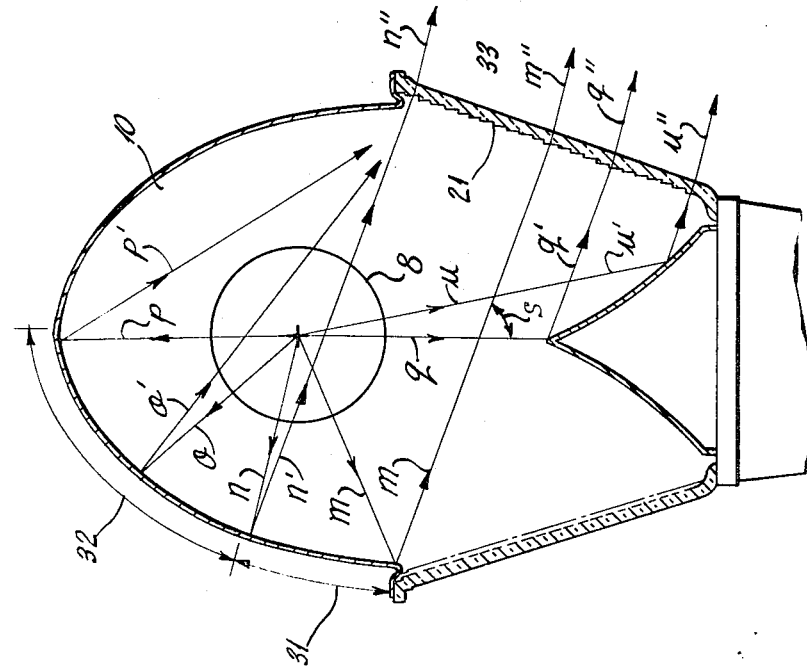


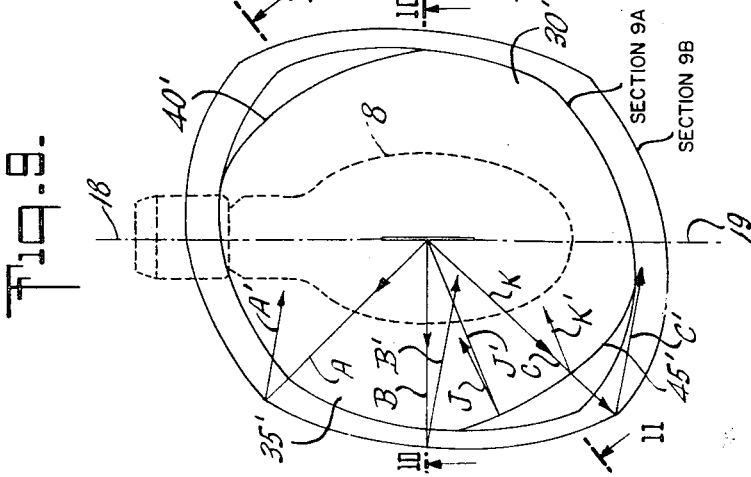
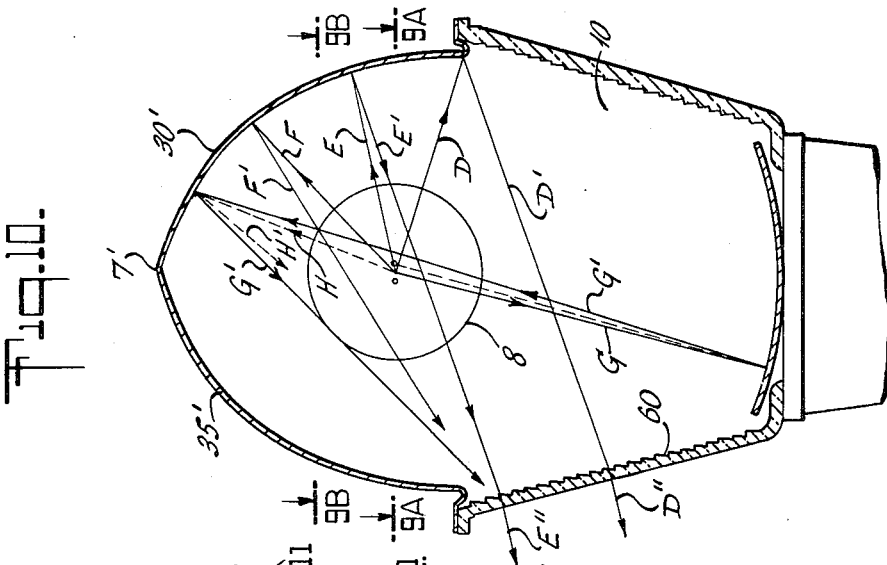
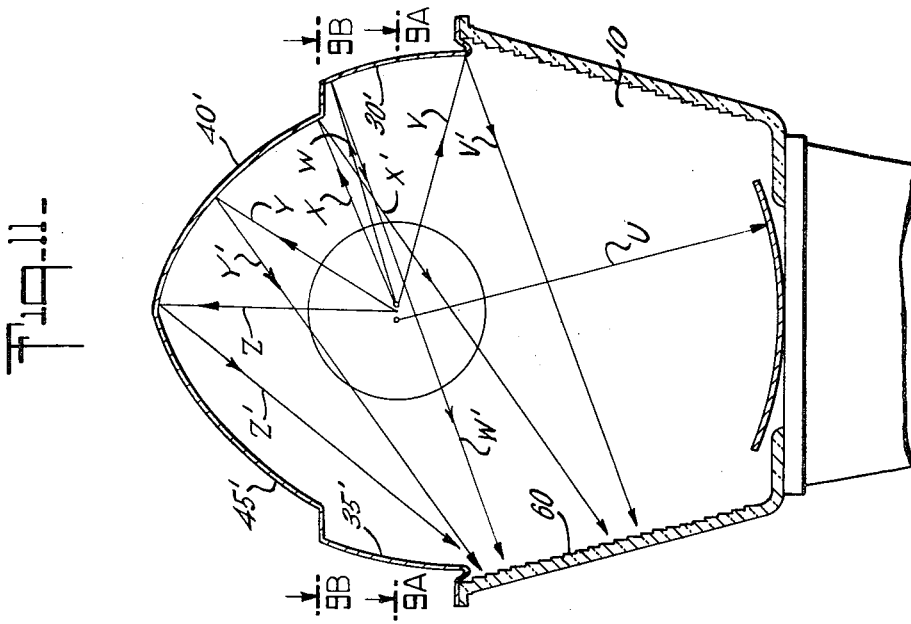
Fig. 7.



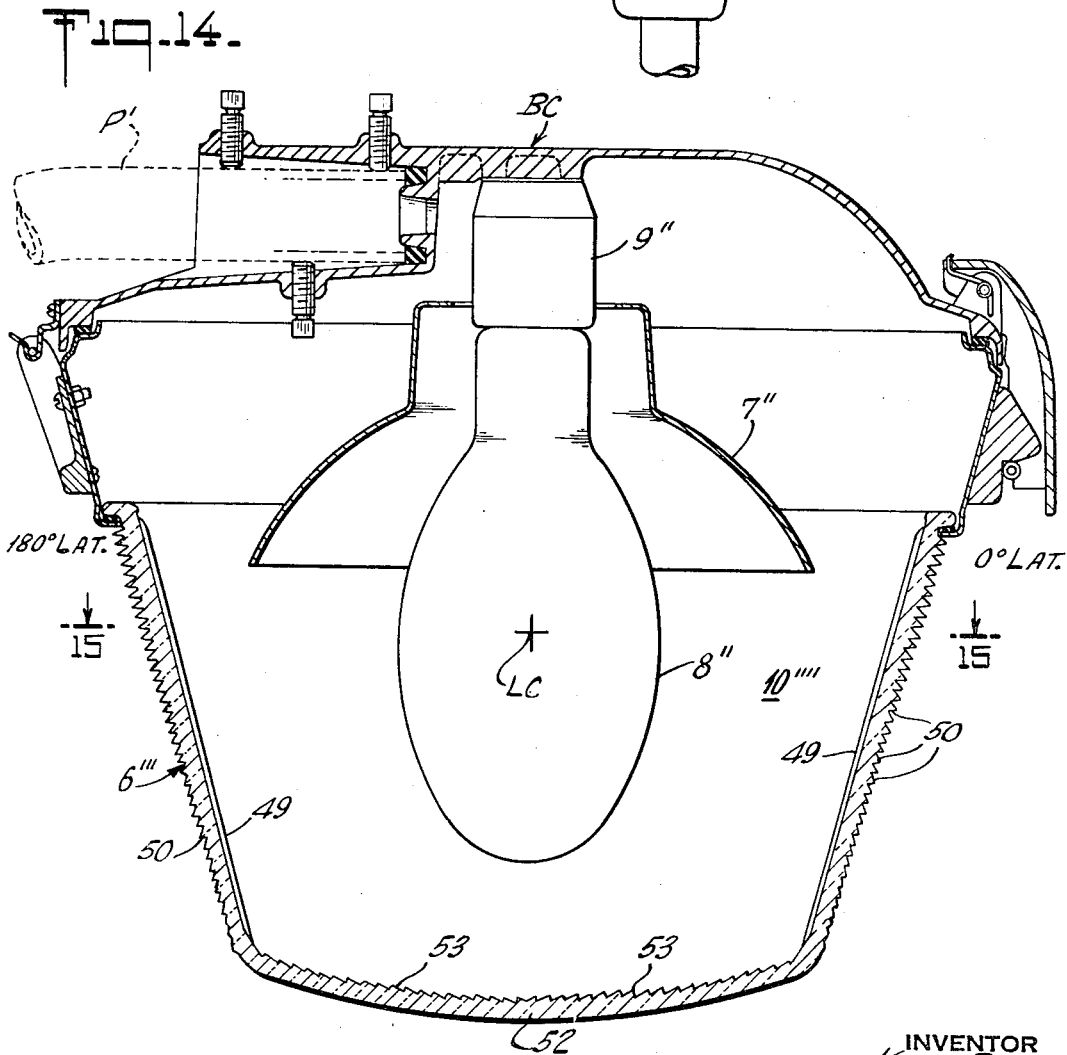
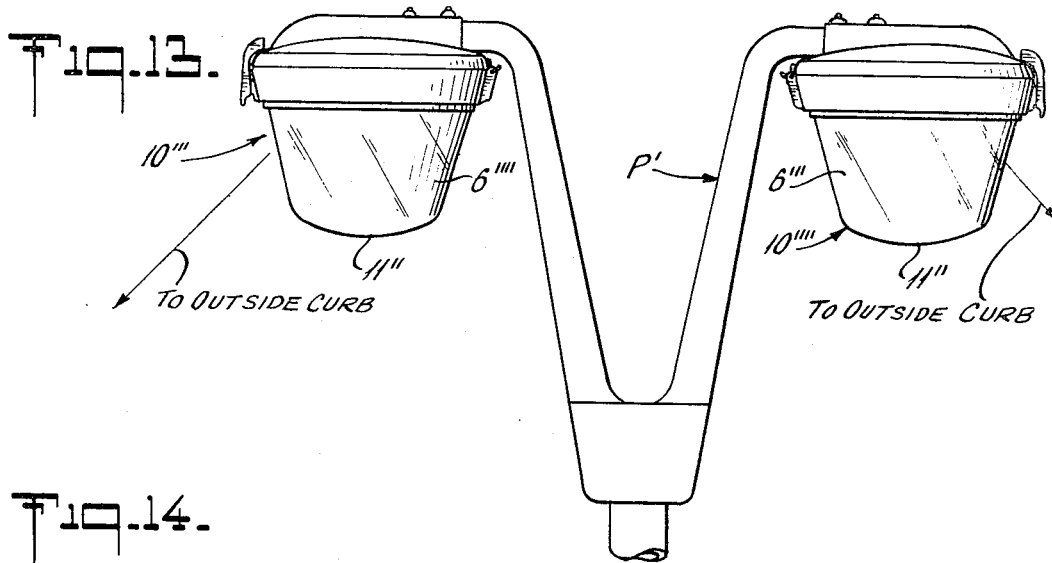
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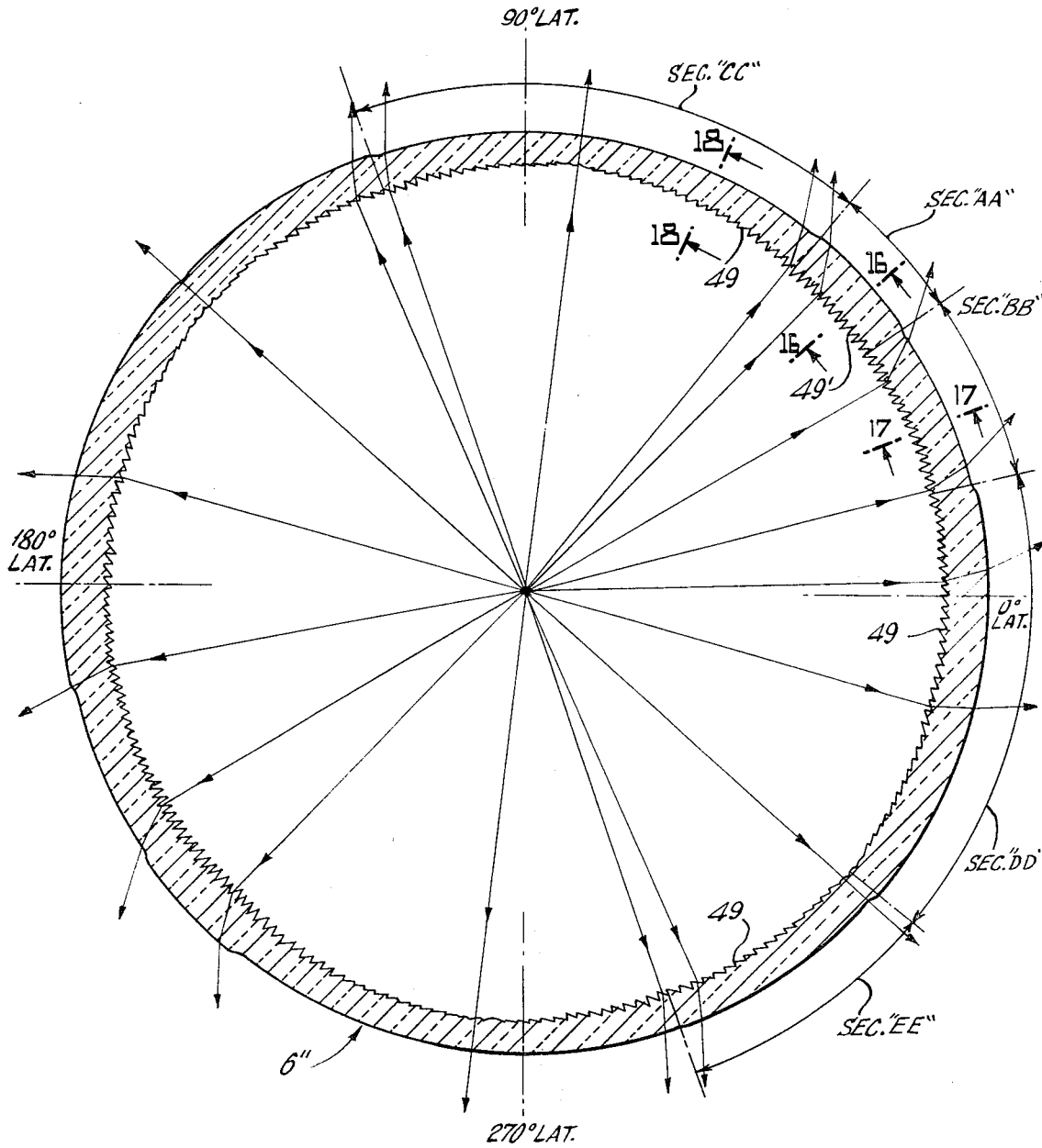


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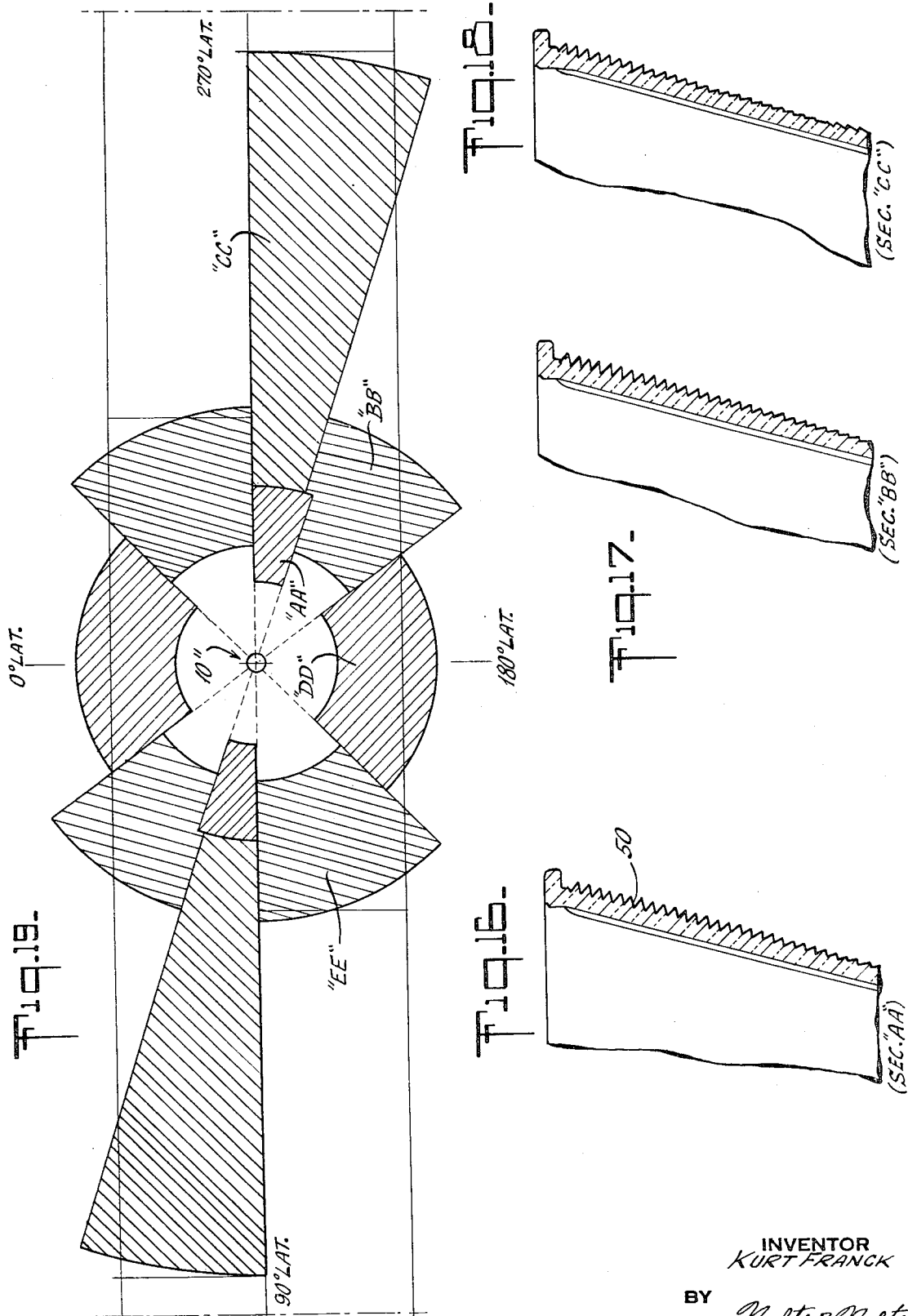
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Fig. 15.



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**BI-DIRECTIONAL HIGHWAY LUMINAIRE**

This invention relates to highway luminaires and more particularly to luminaires which illuminate bi-directional highways.

Previously, highways were illuminated by luminaires which directed high intensity light, in high beams, onto the highway surface. The high beams which were directed against oncoming motorists resulted in the production of glare. Safety considerations today dictate that this resultant glare be minimized.

Therefore, it is current practice to utilize luminaires which are asymmetric about their major axes and which direct light Against and in the direction of traffic flow at compromise angles whereby glare can be minimized and luminaire spacing can be maintained as far apart as possible. This type of luminaire is usually positioned along the outer edge of the highway and a separate luminaire system illuminates each side of a bi-directional highway. It has also been attempted to provide lower beams facing traffic and higher beams in the direction of traffic, again this type of luminaire being positioned along either side of the highway. In such a system, unless the highway has relatively large median sections, high beam light will cross over into the opposing highway lanes and, there, will produce glare to oncoming motorists. When either of the two types of luminaires first mentioned are utilized, two entire and completely similar lighting systems must be installed and this 100 percent duplication in installation and repair makes such a system very uneconomical.

Due to recent developments in highway design such as continuous median strips and breakaway poles, it is now becoming possible to install luminaire systems in the center of bi-directional highways on the median strip or divider. If the highway could be illuminated from this center isle this duplication of installation and repair would be minimized and therefore substantial savings would be achieved.

Accordingly, it is an object of the present invention to provide a luminaire which will individually illuminate both sides of a bi-directional highway system.

It is a further object to provide a luminaire which will illuminate a highway with conventional luminaire spacing.

It is also an object to provide a luminaire which directs low angle beams of light against traffic flow and directs high angle beams of light in the direction of traffic flow on a bi-directional highway.

It is a further object to provide a luminaire whereby the high angle beams will not cross over the highway median strip and will not therefore be directed against traffic flow in either direction, whether or not the luminaire is placed on the median or on the side of the roadway.

It is also an object to provide such luminaires in a system which will emit a maximum amount of light in those directions which can best be controlled to achieve maximum highway illumination with maximum uniformity.

It is a further object to provide a luminaire of the type defined which will effect a uniform highway illumination.

It is a further object to provide a luminaire which has sharp cut-off above beam direction for glare control.

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

FIG. 1 is a diagrammatic plan view of the desired light distribution pattern for the new system on a typical bi-directional highway;

FIG. 2 is a diagrammatic elevational view, partially in vertical section along the highway illustrating the dual asymmetric high-low beam concept for one of the lanes of traffic in a bi-directional highway;

FIG. 3 is a diagrammatic elevational view partially in vertical section across the highway of the present luminaire system;

FIG. 4 is a vertical section through the light center transverse to the highway of the first preferred embodiment of the luminaire;

FIG. 5 is a plan view section of the main reflector of FIG. 4 showing the ray traces for the four beam panels;

FIG. 6 is the same plan view as FIG. 5 showing the ray traces from the ends of the reflector instead of from the beam panels;

FIG. 7 is a vertical section along the line 7—7 of FIG. 4, showing the reflector and refractor panels which form the high angle beams;

FIG. 8 is a vertical section along the line 8—8 of FIG. 4 showing the reflector and the refractor panels which form the low angle beams;

FIG. 9 shows plan view sections along the line 9A—9A and along the line 9B—9B of FIGs. 10 and 11, through the light center and through a plane 2 inches above the light center of a luminaire incorporating a second preferred embodiment of the invention;

FIG. 10 is a vertical section of the reflector-refractor combination of the second embodiment taken along line 10—10 of FIG. 9 showing ray traces for the high beam;

FIG. 11 is a vertical section taken along line 11—11 of FIG. 9;

FIG. 12 is a perspective view of a roadway and post mounted luminaire showing the distribution pattern from a single luminaire incorporating another embodiment of the invention;

FIG. 13 is an elevational view of another embodiment of the invention and showing a post top mounting for two luminaires;

FIG. 14 is a vertical sectional view of the luminaire on the right of FIG. 13 taken along a plane transverse to the highway (and parallel to the plane of the paper);

FIG. 15 is a sectional view taken along the line 15—15 of FIG. 14, eliminating the prisms on the bottom of the refractor and showing the discrete vertical prism panels comprising the refractor wall;

FIG. 16 is a sectional view partially broken away, taken along the line 16—16 of FIG. 15;

FIG. 17 is a sectional view, partially broken away taken along the line 17—17 of FIG. 15;

FIG. 18 is a sectional view, partially broken away, taken along the line 18—18 of FIG. 15; and

FIG. 19 is a diagrammatic representation of the basic light distribution pattern from a refractor incorporating the structures shown in FIGs. 12 through 18.

In the drawings the luminaire is designated generally by the numeral 10. The luminaire generally is comprised of the following major components as shown in FIG. 4; a fitter 2 for attaching the luminaire 10 to the top of the post 1, a ballast housing 3 positioned above the housing fitter 2, which will also contain a photo control device and a wiring chamber (not shown), a small bottom reflector 4 positioned above the ballast housing 3, a refractor 6, a main reflector 7 and a lamp 8 with a lamp socket 9.

FIG. 1 shows the desired light distribution pattern 15 for the new system on a typical bi-directional highway. The luminaire 10, according to the preferred embodiments is mounted as a post top unit, with the post 1 positioned on the median strip 12.

The basic light distribution is longitudinally asymmetrical on the highway. Low angle beams emanate from the luminaires of the present invention directed against the traffic flow, high angle beams emanate from the luminaire directed in the direction of traffic flow and transverse beams emanate from the luminaire in such a way as to illuminate the roadway surface in a direction transverse to the highway. With such a light distribution pattern, the problem of glare can be minimized while conventional luminaire spacing can be maintained.

FIG. 2 illustrates the dual asymmetric high beam-low concept which makes it possible to prevent high beam light from crossing over into the other side of the roadway and there producing glare. The low beams make an angle R with the vertical (approximately 60° in the preferred embodiments) and the high beams make a greater angle S with the vertical (approximately 77° in the preferred embodiments).

FIG. 3 shows the luminaire system as viewed from the center of the roadway. Angle T is normally set so that the

transverse beam will illuminate outwardly to the shoulder 17. Therefore, it can be seen that the transverse beam angle depends on the number of lanes constituting the bi-directional highway.

In the first and second preferred embodiments, illustrated in FIGS. 4 through 11, the light source 8 is linear in form and horizontally positioned with its axis 18-19 perpendicular to the direction of the roadway. Because of this horizontal orientation the maximum amount of light is sent down onto the roadway surface and because of being transversely positioned most of the light is sent in a direction parallel to the highway so that it can be readily shifted into highway beam directions. With the light source 8 lying horizontally it can easily be enclosed by a reflector 7, thus providing a sharp cut-off by the reflector 7 above the beam direction, thereby achieving a substantial degree of glare control.

In the first preferred embodiment, illustrated in FIGS. 4 through 8, the reflector 7 is formed as a plurality of discrete reflector panels, the outer sides and ends of which form a basically semi-elliptical shape. There are six panels which make up the reflector of this preferred embodiment; two high beam panels (30, 35), two low beam panels (40, 45), and two transverse beam panels (50, 55).

As can be seen from FIGS. 5 and 6, the reflector portion to the left of the axis 18-19 is not a mirror image of the reflector portion to the right side of the axis 18-19. To the contrary, it is an exact copy of the right side of the reflector having that portion rotated through an angle of 180° about an axis normal to the plane of the paper.

The refractor 6 has six discrete panels; two low beam panels 44, (FIG. 8), two high beam panels 33, (FIG. 7), and two transverse beam panels 51 (FIG. 4). The outer sides and ends of these refractor beam panels form an inverted frusto-elliptical section. When the refractor 6 is divided by a plane perpendicular to the highway surface into two equal portions, one of these portions, when rotated through an angle of 180° in a plane parallel to the roadway will be an exact copy of the other portion of the refractor.

Since the refractor 6 and reflector 7 are composed of two identical halves, discussion herein will be made with reference to only one of said reflector and refractor portions, with regard to rays of light incident thereon and passing therethrough.

This reflector and refractor shape makes it possible to have dual asymmetric light distribution, that is light distribution which is asymmetrical about both of the major and minor axes of the luminaire and to be able to effect a "Z" light distribution pattern with light emitted from one luminaire.

Typical ray traces for the first preferred embodiment are shown in FIGS. 4, 5 and 6. In FIG. 4, typical ray traces for the reflector panels (50, 55) and refractor panels (51) are illustrated diagrammatically at  $(a, a', a'')$   $(b, b', b'')$  and  $(c, c', c'')$ . Typical ray traces for these panels are also shown diagrammatically at  $(d, d')$ ,  $(e, e')$ ,  $(f, f')$  and  $(g, g')$  of FIG. 6. The end transverse reflector panels (50, 55) distribute light onto the highway out to the outer shoulders of the highway in a direction transverse to the highway, the light rays making on distribution an angle T with the vertical. The end reflector panels 50, 55 are designed so that they do not reflect any light onto the refractor high beam panels (33, 38) where the light would be refracted upward (for reasons to be subsequently discussed) out of the street area and would therefore be lost for purposes of street illumination. The two reflector transverse panels 50, 55 are identical as already defined herein, except for socket mounting provisions 9.

Typical ray traces for the high beam reflector (30, 35) and refractor panels (33) are illustrated diagrammatically at  $(l, l')$ ,  $(k, k')$ ,  $(m, m', m'')$ ,  $(n, n', n'')$ ,  $(o, o')$ ,  $(p, p')$ ,  $(q, q', q'')$  and  $(u, u', u'')$  in FIGS. 5 and 7.

In FIGS. 5 and 7, the high beam reflector panels (+35) are parabolic in form up to the top of the beam panel where rays  $(o, o')$  and  $(p, p')$  just miss the opposite edge of the reflector 7. The top portion of this reflector panel sends its light as high as

possible without sending any straight down so that light will not puddle beneath the luminaire in a bright spot.

The small bottom reflector 4 is parabolic in both horizontal and vertical sections and is utilized to concentrate the downward incident light into parallel beams to be distributed at high beam angles. The axis of symmetry of the small reflector 4 is rotated approximately 6° in plan view so that the beams  $(q, q', q'')$  and  $(u, u', u'')$  are swung laterally to the direction of high beam distribution.

The high beam refractor panels (33) have elevating prisms on the inner surface thereof, the prisms on the top half (21) being straight-faced for the achievement of a sharp beam, while those on the bottom half are curved to provide vertical diffusion for the light incident directly thereon which emerges at relatively low angles. This achieves a relatively uniform light distribution beneath the luminaire.

Typical ray traces from the low beam reflector and refractor panels are illustrated diagrammatically at  $(h, h')$ ,  $(j, j')$ ,  $(v, v', v'')$ ,  $(w, w', w'')$ ,  $(x, x', x'')$ ,  $(y, y')$ ,  $(z1, z1')$  and  $(z2, z2')$  in FIGS. 6 and 9. The low beam reflector panels are basically parabolic in form.

As can be seen in FIG. 6, a radical departure over the prior art has herein been disclosed. In prior art reflectors, the high beam and low beam reflector panel contours have been identical in form. As can be seen in FIG. 6 the contour of the high beam reflector panel (30, 35) and the low beam panel (40, 45), have a contour which is dissimilar. In previous reflector design, there was an inherent inability to direct sufficient light in the high beam direction where it was needed to effect a long light distribution, so that luminaire spacing would not have to be decreased. In the present invention, the low beam reflector panel (40, 45), is pinched inwardly creating three panel sections. The lower sections (41) shown in FIG. 6 direct light to the low beam refractor panels (44) where it is distributed as low angle beam light; the middle section panels (42) formed immediately above the pinched sections are designed to reflect light incident thereon to the opposite side high beam refractor panels (30, 35) where it is again reflected into the high beam lateral direction but at a lower vertical angle than the high beam angle. As can be seen in FIG. 8, the upper low beam panels (43) are designed to be similar to the upper portions of the high beam panels (32).

As shown in FIG. 8, the low beam (rays  $v, v', v''$ , to  $w, w', w''$ ) does not extend to the top of the low beam refractor panel. Each low beam refractor panel (44) has prisms thereon, calculated in the top region, to limit direct light to beam direction or lower. The refractor prisms on the lower portion have curved faces to provide vertical diffusion.

Some lateral control may be required depending upon the details of the desired distribution. This control can be accomplished by vertical outside prisms in the refractor high beam panels and by vertical inside prisms in the refractor low beam panels.

In a situation where luminaire spacing is sought to be increased, it is necessary to send a greater percent of the light emitted into the high beam direction. This requires a larger reflector area sending its light into the high beam direction.

For these situations there is a second preferred embodiment illustrated in FIGS. 9-11. As can be seen from these diagrams, the high beam reflector 30', 35'' extends completely across the side of the reflector 7' from the bottom of the reflector upward to a plane (section B) where the reflected light just misses the bottom edge of the reflector. Above this, the side panels on both ends are turned laterally inwardly to form the low beam panels (40', 45'). Both panels are substantially parabolic so that beams of parallel light will be formed. The proportions of the high and low beam panels are determined by the relative amount of light desired in the two beams. Since portions of the two beams reflect light to the same area on the refractor, the vertical angles of the refractors must be matched to work with common prisms.

The ends of the reflector spread light along the outer edges of the roadway. As shown in FIG. 9 the end panels are canted

to the high beam direction to provide the desired unbalance. Again, the two ends are identical except for socket mounting provisions.

In order to flash a larger reflector area, so that more light can be distributed in the high angle beam, the reflected light is sent lower and then elevated with refractor prisms (60).

Typical ray traces from this preferred embodiment for the reflector 7' at a vertical section where the reflector is entirely utilized to reflect light into the high beam direction are illustrated diagrammatically at (D, D', D''), (E, E', E''), (F, F'), (G, G', G''), and (H, H'').

Typical ray traces from the lower reflector portion where the high beam reflector extends completely around the reflector are illustrated diagrammatically at (A, A'), (B, B') and (C, C') and typical ray traces from the low beam reflector panel are illustrated diagrammatically at (J, J') and (K, K') of FIG. 9.

Typical high beam traces (V, V') and (W, W') and typical low beam traces (X, X'), (Y, Y') and (Z, Z') in a vertical plane cutting through the high and low beam panels is illustrated diagrammatically at FIG. 11.

Further preferred embodiments for achieving the desired distribution for a center of the roadway mounted luminaire are illustrated in FIGS. 12 through 19. In both these embodiments, all of the light control for the distribution is done prismatically with a novel refractor 6'', 6'''. The refractor is comprised of two portions which are not mirror images of each other, but are exactly identical copies rotated 180° in a plane parallel to the surface of the highway.

FIG. 12 shows the distribution pattern from a single such luminaire 10'' and a possible method of mounting it upon a post P, similar to the mounting shown in FIG. 4 for luminaire 10.

FIGS. 13 and 14 show two such luminaires 10''', 10'''' mounted on a post P' and which yields double the illumination of luminaire 10''.

Beside the post P' and bracket cover BC assembly of luminaires 10'''' and 10''''', and beside the refractor bottoms, which in the FIG. 12 embodiment would provide a post mounting, the luminaires of FIGS. 12-19 are the same, with the cover (not shown) for luminaire 10'' being devoid of post mounting means.

Each of such luminaires comprises basically a refractor element 6'''' (and 6'''' in FIG. 13), a spherical reflector element 7'', a lamp 8'' and a lamp socket 9''.

The reflector 7'' acts to redirect light downwardly and does not contribute to the "Z" distribution.

For the purposes of this application, the 0° axis of the luminaire will be on the latch side of the luminaire 10'''' and the 180° axis will be on the hinged side of the luminaire with 90° and 270° axis parallel to the median strip and transverse to the 0° and 180° axis.

The light source is a 400 watt mercury lamp positioned vertically. This positioning is desirable in this particular embodiment where all of the light control for the "Z" distribution is done prismatically with the refractor element 6''.

FIG. 15 is a plan view section of the refractor 6'' to illustrate the lateral control which is achieved by the inside vertical prisms 49. Each individual vertical prism 49 is of the same form from the top of the refractor 6'' to the bottom, so as to vary the lateral spread of light decreasingly from the outer reaches of the distribution from the panels on the road to the inner portion thereof. (See FIG. 19 to be discussed.) The prism sides have some curvature (see prism 49' for example) to provide lateral diffusion which is desirable. Approximately plus or minus 15 percent change in slope for each prism side has been selected as the best range for this application.

FIG. 15 illustrates one half of the refractor element 6 having five discrete vertical refractor panels AA, BB, CC, DD and EE and FIG. 19 illustrates the basic distribution of the light into areas marked AA, BB, CC, DD and EE to correspond with the panels of the refractor 6'' from which the light is directed. The vertical control of the light incident on these refractor internal prism portions as shown in FIG. 19 is achieved by use of

horizontal transverse outside prisms 50. As can be seen in FIG. 14 these outside prisms vary in depth from the top to the bottom of the refractor to thereby provide a uniform distribution of parallel beams.

Care should be taken to observe that the half portion of the refractor illustrated in FIG. 15 does not correspond to a half as defined by the 0°, 180° axis or the 90°, 270° axis, but is "shifted" so that panel 66 can be utilized for distributing high beam light along the street and the other panels can be utilized to form low beam and transverse beam light distribution.

In this last respect, the surfaces of external horizontal prisms 50 of sections DD and AA are identical in shape as are those of sections BB and EE, resulting in the interrupted circular distribution disclosed in FIG. 19, into areas AA, DD on the one hand and BB and EE on the other.

FIGS. 16, 17 and 18 are scale drawings of the horizontal outside prisms showing variations in prism depth in sections AA, BB and CC add therefore, also in DD and EE as just explained. The bottom portions of the side wall of the refractor (not shown in FIGS. 16-18) vary in depth in different lateral orientations, i.e., deepest at 0° and 180° as shown in FIG. 14, for better lifting action (see the inner arc of area BB in FIG. 19) and shallowest at 90° and 270° to assist in filling in the distribution on the "house" side of the road.

By the combination of rounded internal vertical prisms 49 and external horizontal prisms 50, a light distribution pattern as illustrated in FIG. 19 is achieved and as a result of the diffusion of the rounded internal vertical prisms these light areas blend together to establish a substantially uniformly illuminated highway surface.

The bottom 52 of the refractor 6''', shown in FIG. 14 provides prisms 53 for distributing light from the source and from the refractor to illuminate the area directly beneath and closely surrounding the luminaire.

What I claim is:

1. A highway lighting luminaire for illuminating both sides of a bi-directional highway on one side of which traffic flows in one direction and on the other, approximately adjacent side of which traffic flows in a second and opposite direction, said luminaire comprising a reflector for use with a light source, the light source being disposed within said reflector above the rim thereof said reflector having first panel means for reflecting light from the light source into a low, parallel beam of light of predetermined vertical angle in the direction against the traffic flow of the highway first side, said reflector having second panel means for reflecting light from the light source into a high angle parallel beam of light of predetermined vertical angle in the direction of traffic flow of the first highway side, said reflector having third panel means for reflecting light from the source into a second, low, parallel beam of light of predetermined vertical angle, in the direction against traffic flow of the second highway side and said reflector having fourth panel means for reflecting light from the light source into a second high, parallel beam of light of predetermined vertical angle in the direction of traffic flow of the second highway side said panel means being disposed on either side of a vertical median plane bisecting said luminaire whereby to constitute means for reflecting light from the source into beams which cross below the rim of said reflector.

2. A luminaire as defined in claim 1, wherein said high beam panels have a contour dissimilar to the contour of said low beam panels.

3. A luminaire according to claim 1, wherein said luminaire further comprises a second reflector positioned beneath the light source and comprising means for redirecting down light into said high beams of light.

4. A luminaire comprising light directing means, for use with a light source the light source being disposed within said light directing means and for illuminating both sides of a bi-directional highway having one side in which traffic flows in one direction and having a second, approximately adjacent side in which traffic flows in a second and opposite direction, said light directing means comprising a refractor for trans-

mitting lateral light over a 360° arc and having first panel means for refracting light from the source into a low beam of light directed against the traffic flow of the first highway side, said refractor having second panel means for refracting light from the light source into a high beam of light directed in the direction of the traffic flow of the first highway side, said refractor having third panel means for refracting light from the light source into a low beam of light directed against the traffic flow of the second highway side and said refractor having fourth panel means for refracting light from said light source into a high beam of light directed in the direction of traffic flow of the second highway side said panel means being disposed on either side of a vertical median plane bisecting said refractor whereby to constitute means for refracting light from the source into a high and a low beam on either side of the plane.

5. A luminaire for illuminating both sides of a bi-directional highway having one side in which traffic flows in one direction and having a second approximately adjacent side in which traffic flows in a second and opposite direction, comprising light directing means for use with a light source disposed therein, said light directing means having a reflector with a refractor disposed at its lower edges, said reflector and said refractor having first panels, said reflector first panel comprising means for reflecting light from the light source onto said refractor first panel, said refractor panel comprising means for refracting said light from said first reflector panel into a low beam of light in the direction against the traffic flow of the first highway side, said reflector and said refractor each having second panels, said second reflector panel comprising means for reflecting light from the source onto said second refractor panel, said refractor panel, comprising means for refracting said light from said second reflector panel into a high beam of light in the direction of traffic flow of the first highway side, said reflector and said refractor having third panels, said third reflector panel comprising means for reflecting light from the source to said third refractor panel, said third refractor panel comprising means for refracting said light into a low beam of light in the direction against traffic flow of the second highway side, and said reflector and said refractor each having at least fourth panels, said fourth reflector panel comprising means for reflecting light from the source to said fourth refractor panel, said refractor panel comprising means for refracting the light from the source into a high beam of light in the direction of traffic flow of the second highway side, wherein said first, second, third and fourth reflector panels are disposed on opposite sides of a vertical median plane of the luminaire with respect to the corresponding ones of those refractor panels to which they reflect light.

6. A luminaire as defined in claim 5 wherein said high beam panels have a contour dissimilar to the contour of said low beam panels.

7. A luminaire as defined in claim 5, wherein said reflector further comprises transverse reflecting panels and wherein said refractor further comprises transverse refracting panels, the said transverse reflecting panels comprising means for reflecting light incident thereon to said transverse refracting panels, said transverse refractor panels comprising means for redirecting said reflected light into transverse beams of light directed transverse to said highway whereby said highway is illuminated transverse to said highway.

8. A highway lighting luminaire for illuminating both sides of a bi-directional highway having one side in which traffic flows in one direction and having a second approximately adjacent side in which traffic flows in a second and opposite direction, comprising a light source and light directing means said light directing means comprising a reflector having two discrete continuous surfaces extending completely around said light source, said surfaces meeting in an approximately horizontal plane, the reflector surface portion having the closest proximity to the highway having a first panel comprising means for reflecting light from the light source into a high beam of light in the direction of traffic flow of the first

highway side and having a second panel comprising means for reflecting light from the light source into a high beam of light directed in the direction of traffic flow of the second side, said reflector portion having the furthest proximity from the highway surface having a first panel comprising means for reflecting light from the light source into a low beam of light directed against traffic flow of the first side, said reflector portion having a second panel comprising means for reflecting light from the light source into a high beam of light directed in the direction of traffic flow of said first side, said reflector portion having a third panel comprising means for reflecting light from the light source into a low beam of light directed against traffic flow of the second side and said reflector portion having a fourth panel comprising means for reflecting light from the light source into a high beam of light directed in the direction of traffic flow of the second side of the highway.

9. A luminaire according to claim 8, wherein said luminaire further comprises a second reflector positioned beneath the light source and comprising means for redirecting down light into said high beams of light.

10. A highway lighting luminaire for illuminating both sides of a bi-directional highway on one side of which traffic flows in one direction and on the other, approximately adjacent side of which traffic flows in a second and opposite direction, said luminaire comprising a reflector for use with a light source, the light source being disposed within said reflector above the rim thereof said reflector having first panel means for reflecting light from the light source into a low, parallel beam of light of predetermined vertical angle in the direction against the traffic flow of the highway first side, said reflector having second panel means for reflecting light from the light source into a high angle parallel beam of light of predetermined vertical angle in the direction of traffic flow of the first highway side, said reflector having third panel means for reflecting light from the source into a second, discretely, low, parallel beam of light of predetermined vertical angle, in the direction against traffic flow of the second highway side and said reflector having fourth panel means for reflecting light from the light source into a second high, parallel beam of light of predetermined vertical angle in the direction of traffic flow of the second highway side said panel means being disposed on either side of a vertical median plane bisecting said luminaire whereby to constitute means for reflecting light from the light source into beams which cross below the rim of said reflector, wherein each of said low beam reflector panels' contour comprises a single smoothly continuous curvilinear line and wherein said high beam reflector panels' contour is comprised of two curvilinear portions intersecting angularly forming a continuous contour.

11. A highway lighting luminaire for illuminating both sides of a bi-directional highway on one side of which traffic flows in one direction and on the other, approximately adjacent side of which traffic flows in a second and opposite direction, said luminaire comprising a reflector for use with a light source, the light source being disposed within said reflector above the rim thereof said reflector having first panel means for reflecting light from the light source into a low, parallel beam of light of predetermined vertical angle in the direction against the traffic flow of the highway first side, said reflector having second panel means for reflecting light from the light source into a high angle parallel beam of light of predetermined vertical angle in the direction of traffic flow of the first highway side, said reflector having third panel means for reflecting light from the source into a second, discretely, low, parallel beam of light of predetermined vertical angle, in the direction against traffic flow of the second highway side and said reflector having fourth panel means for reflecting light from the light source into a second high, parallel beam of light of predetermined vertical angle in the direction of traffic flow of the second highway side said panel means being disposed on either side of a vertical median plane bisecting said luminaire whereby to constitute means for reflecting light from the source into beams which cross below the rim of said reflector,

wherein each of said low beam reflector panels further comprises a lower portion, a middle portion, and an upper portion, said lower portion comprising means for reflecting light incident thereon into low beam light, said middle portion comprising means for reflecting light from the source to the opposite high beam reflector panel, said opposite high beam reflector panel comprising means for reflecting the light onto said high beam reflector panel, the said high beam refractor

panel comprising means for refracting said doubly reflected light into light beams having high beam direction but having a predetermined vertical angle less than said high beam angle, and said upper portion comprising means for reflecting light from said light source, to said opposite low beam refractor panel where said reflected rays just miss the opposite edge of said reflector panel.

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