United States Patent [19]
Pitkjaan

[11] **3,818,210**
[45] **June 18, 1974**

[54] **VEHICULAR ROAD-LIGHTING SYSTEM HAVING A HEADLAMP WITH A DUAL-SEGMENT REFLECTOR**

[75] Inventor: **Elam Pitkjaan,** Cedar Grove, N.J.

[73] Assignee: **Westinghouse Electric Corporation,** Pittsburg, Pa.

[22] Filed: **Jan. 17, 1973**

[21] Appl. No.: **324,474**

Related U.S. Application Data

[62] Division of Ser. No. 232,057, March 6, 1972, which is a division of Ser. No. 77,092, Oct. 1, 1970, Pat. No. 3,688,149.

[52] **U.S. Cl.**.......... **240/7.1 A,** 240/41.35 R, 315/82
[51] **Int. Cl.**.......................... **B60q 1/00,** B60q 3/00
[58] **Field of Search**.......... 240/7.1, 7.1 A, 41.35 R; 315/82, 83

[56] **References Cited**

UNITED STATES PATENTS

1,686,859	10/1928	Huntington	240/7.1 A
1,964,562	6/1934	Douglas	240/7.1 A
2,011,677	8/1935	Douglas	240/7.1 A
2,037,863	4/1936	Matha	240/7.1 A
2,556,052	6/1951	Adler, Jr.	240/7.1 A
3,553,520	1/1971	Hicks	240/41.35 R X

FOREIGN PATENTS OR APPLICATIONS

198,744	6/1923	Great Britain	240/41.35 R

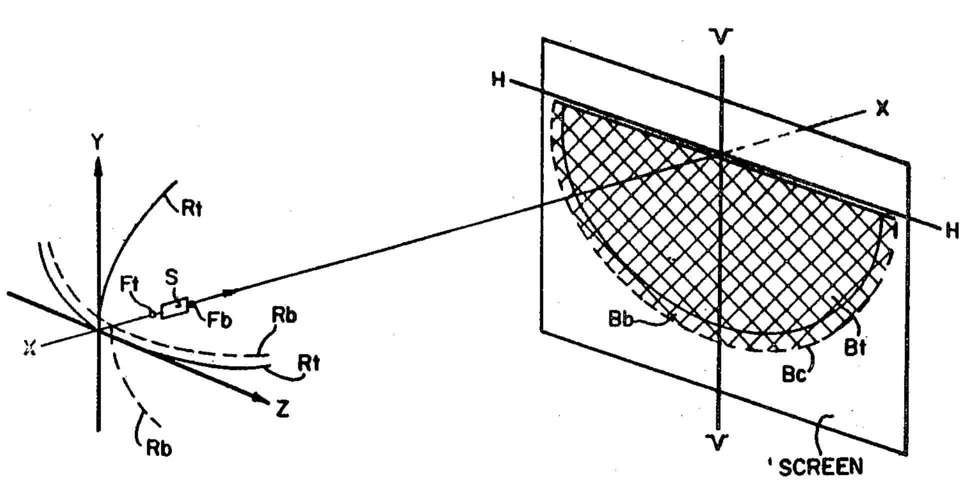
Primary Examiner—Richard M. Sheer
Attorney, Agent, or Firm—D. S. Buleza

[57] **ABSTRACT**

A vehicle headlamp having a single concentrated light source and a unitary concave reflector which is contoured to provide a pair of hemiparabolic reflector segments that have axially spaced focal points and merge with one another along a protruding step that extends horizontally along the inner surface of the reflector. The light source extends between and is so oriented relative to the focal points of the reflector segments that the light beams from the segments are superimposed and thus form a single composite beam of intense light that has a sharp horizontal cutoff. A shield mounted in front of the light source intercepts direct rays from the source and prevents glare. The lamp is preferably of "sealed beam" construction and contains a C6 or C8 type filament. Axially or transversely mounted halogen-incandescent lamps can also be employed as light sources. The lens component of the lamp is preferably provided with vertically extending flutes to provide additional control of the beam pattern or, alternatively, can be made of clear glass. In the case of a PAR 36 type lamp having a C8 filament or an axially-mounted halogen-incandescent lamp, a domed lens is used to accommodate the shield and mount structure.

Also disclosed are vehicular roadway-lighting systems wherein one of the aforesaid segmented reflector headlamps is combined with three conventional headlamps to provide low-beam, turnpike-beam, and high-beam modes of illumination — or a pair of segmented-reflector lamps are used as an auxiliary lighting system which supplements the illumination of a conventional headlamp system during passing or when driving in a fog or under similar hazardous driving conditions.

10 Claims, 23 Drawing Figures



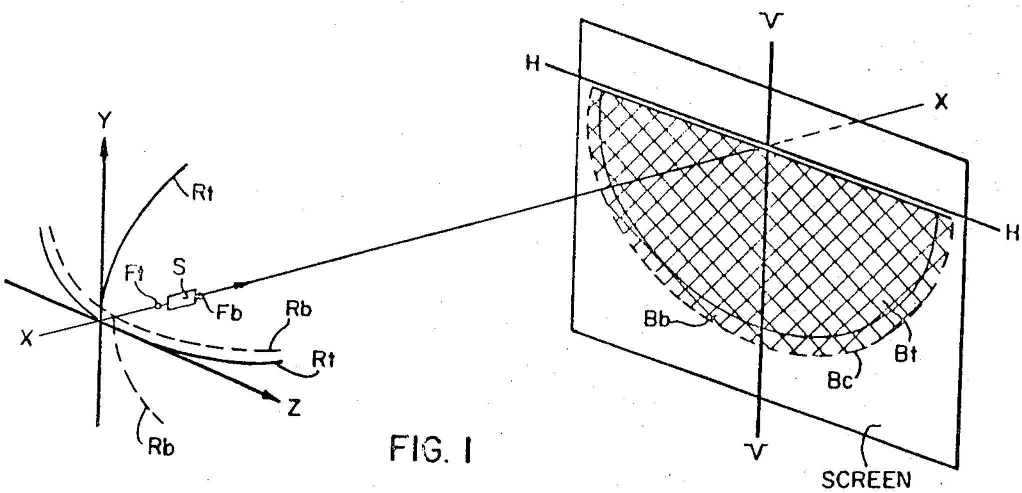

Y
Rt
S
Ft
Fb
Rb
X
Rt
Z
Rb
V
H
X
H
Bb
Bt
Bc
V
SCREEN

FIG. 1

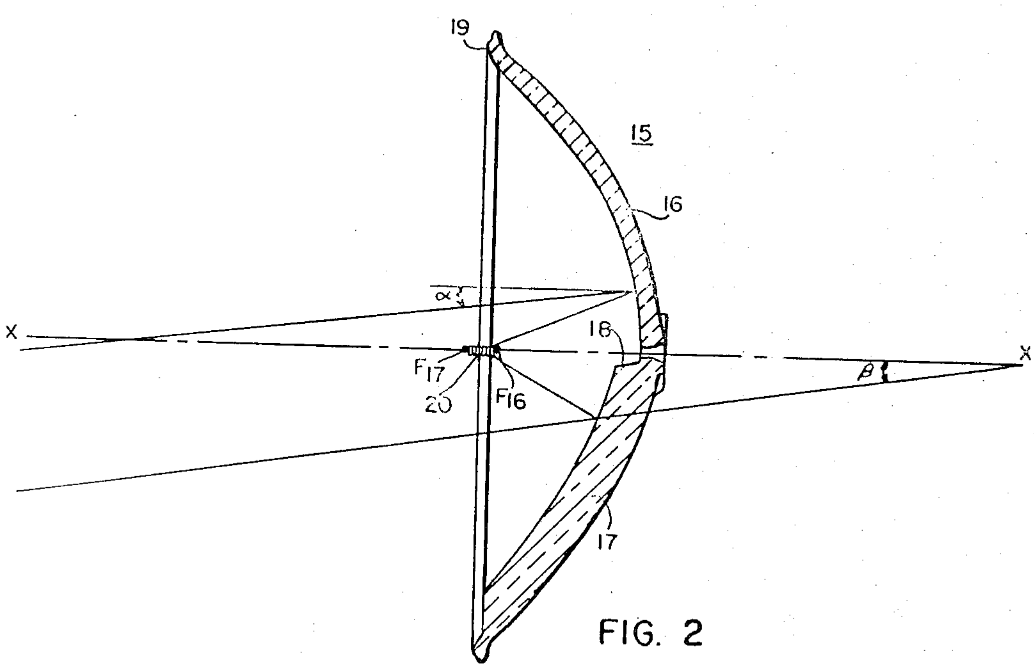

19
15
16
α
X
18
X
β
F17
20
F16
17

FIG. 2

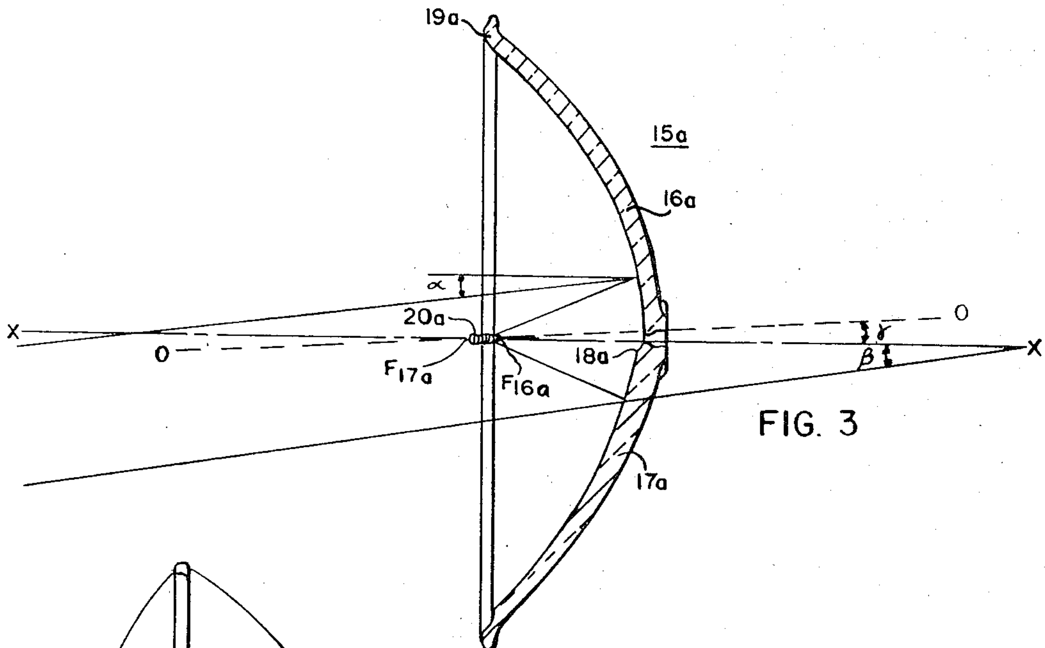


FIG. 3

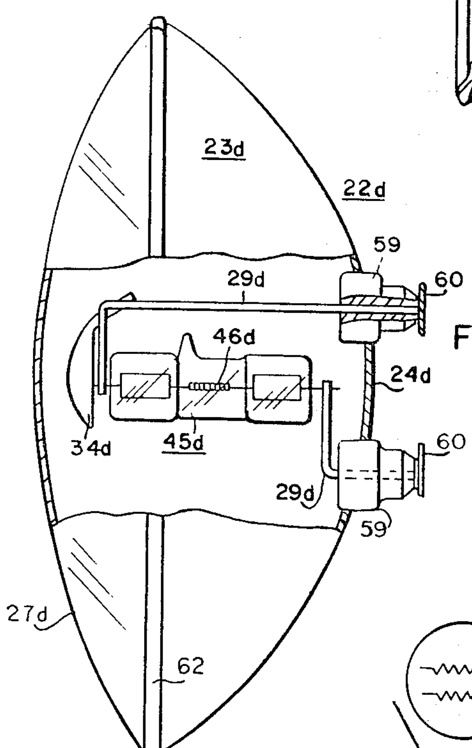


FIG. 15

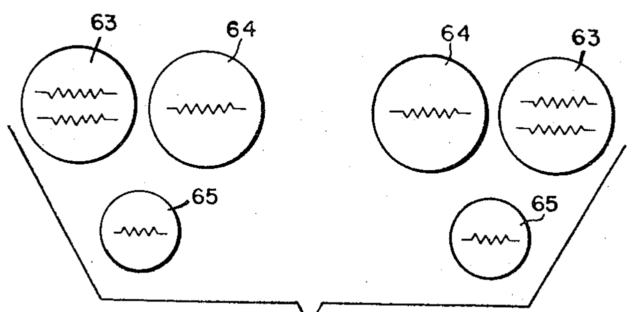


FIG. 16

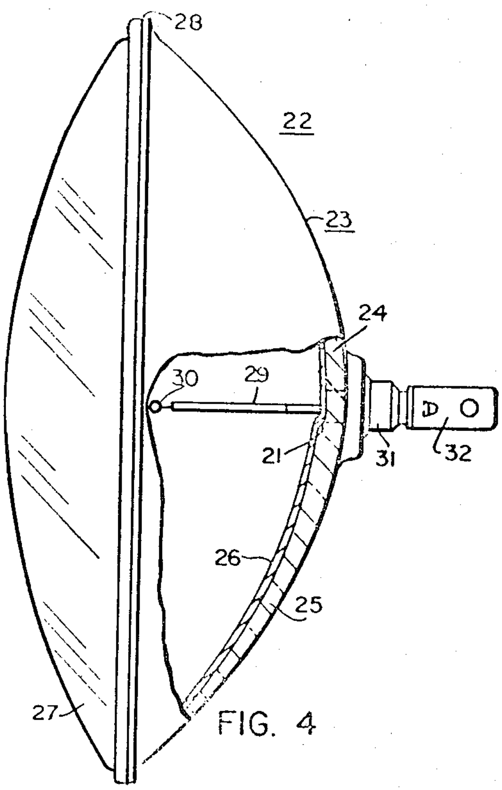


FIG. 4

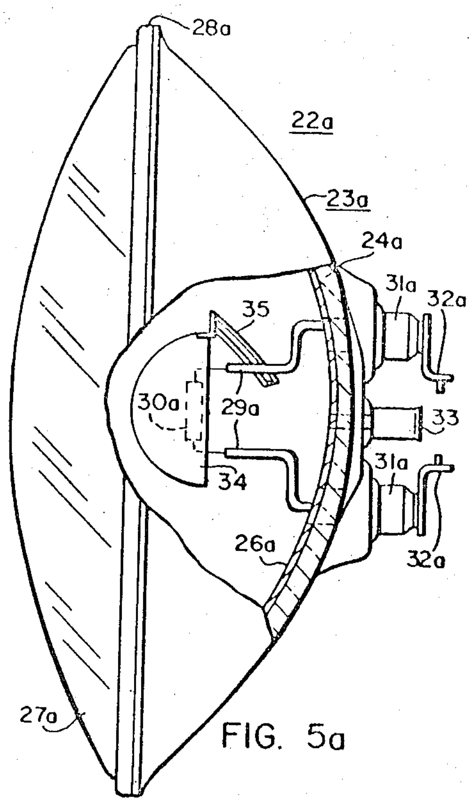


FIG. 5a

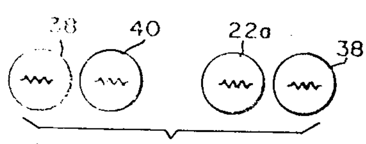


FIG. 7

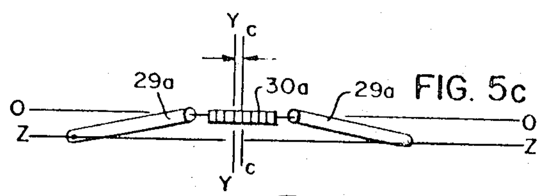
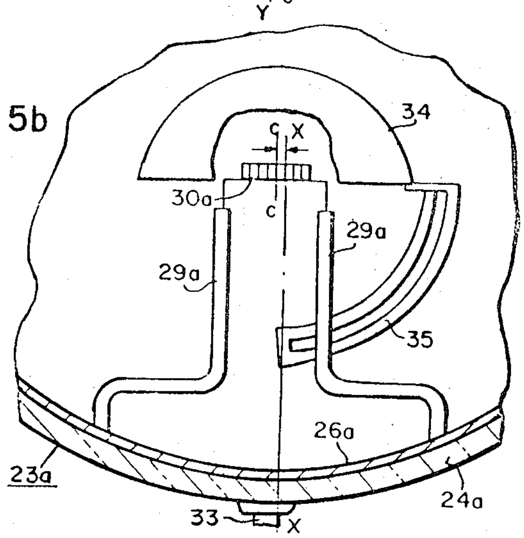


FIG. 5c

FIG. 5b



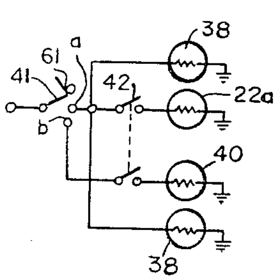


FIG. 8

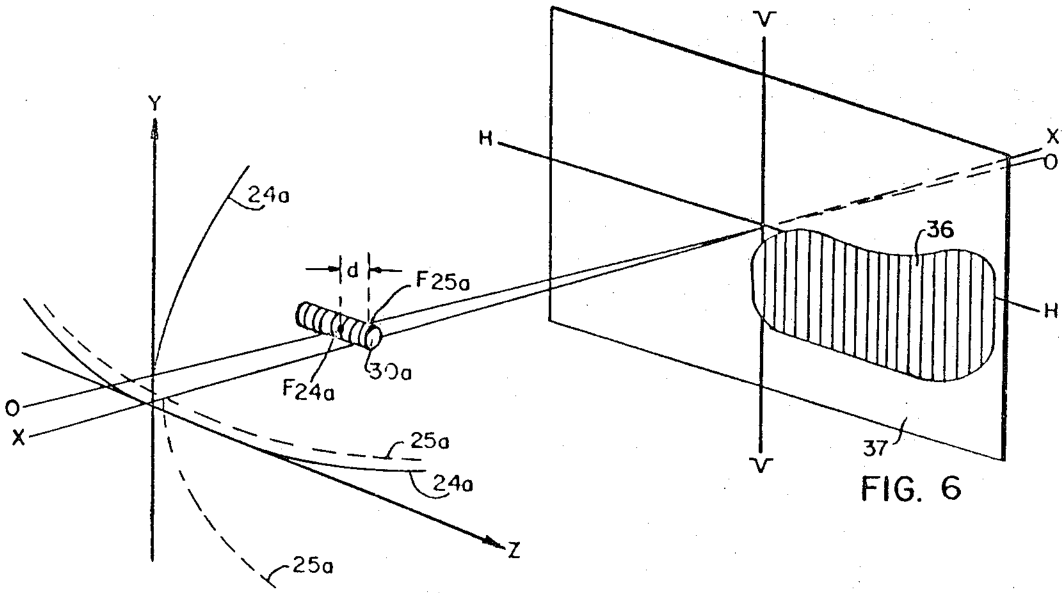


FIG. 6

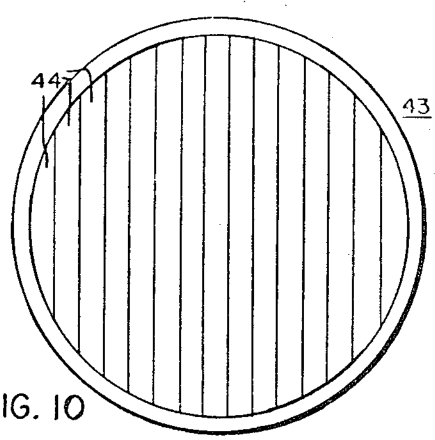


FIG. 10

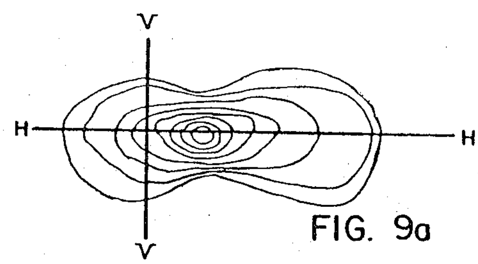


FIG. 9a

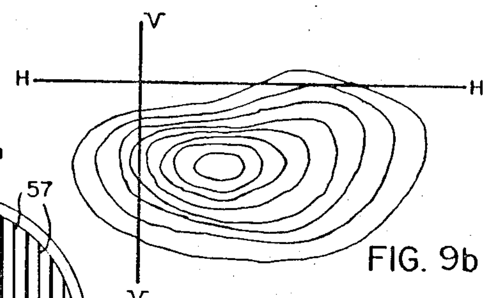


FIG. 9b

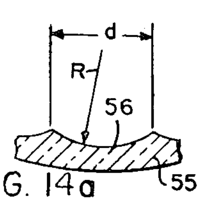


FIG. 14a

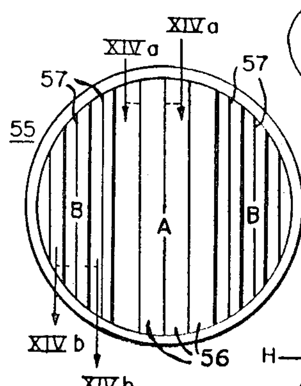


FIG. 14

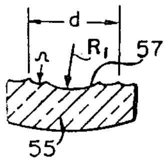


FIG. 14b

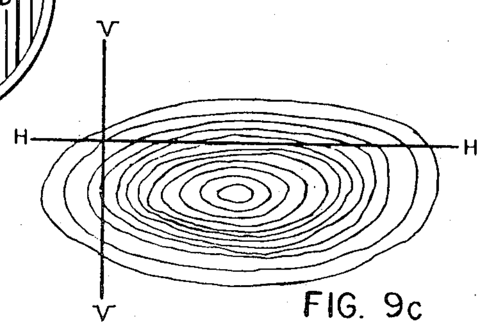


FIG. 9c

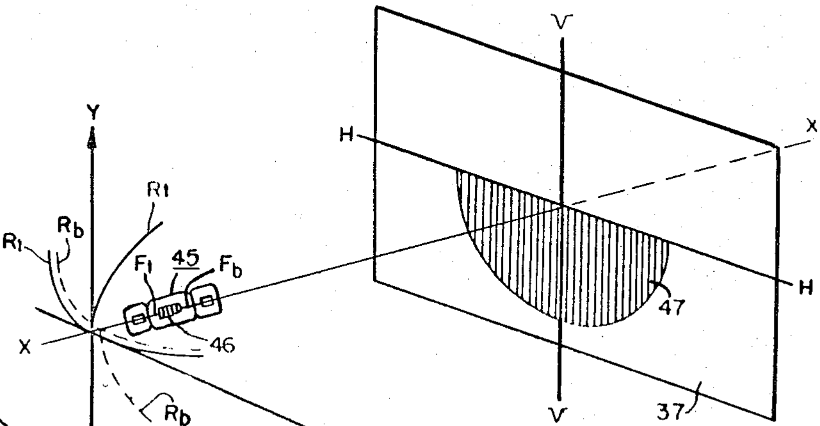


FIG. 11

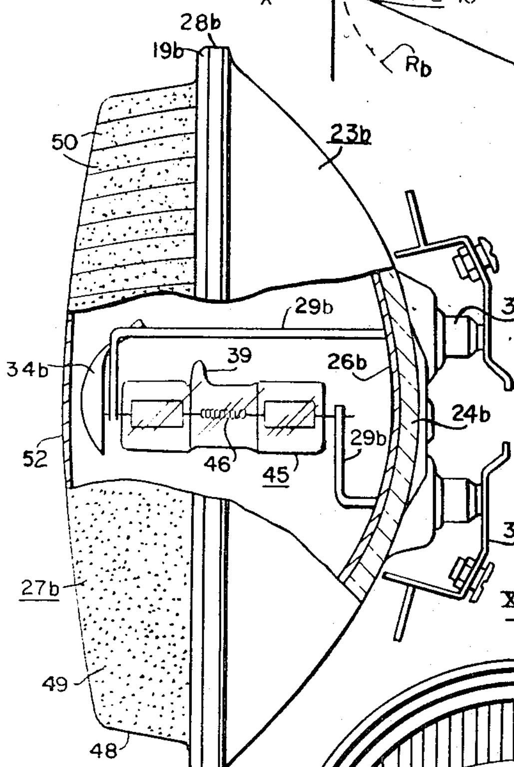


FIG. 12

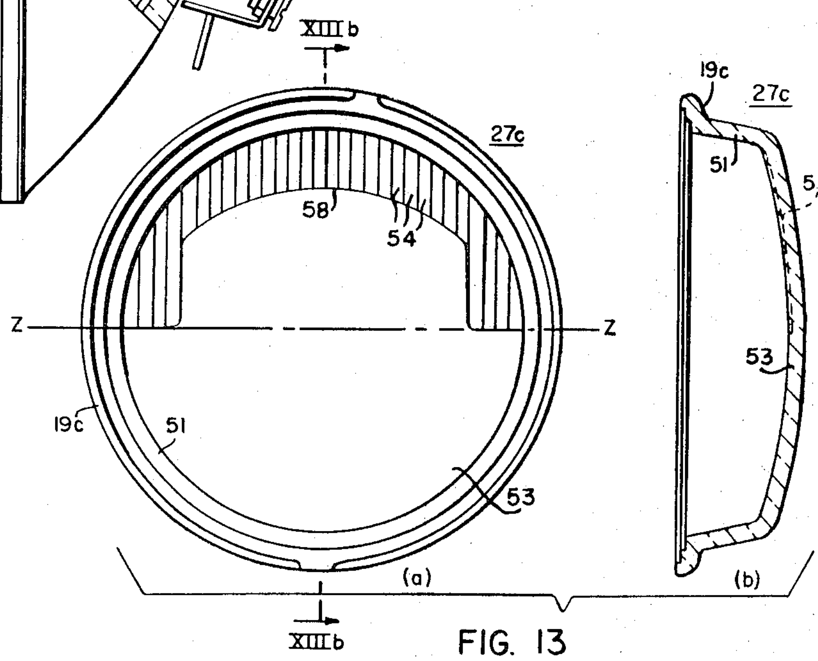


FIG. 13

VEHICULAR ROAD-LIGHTING SYSTEM HAVING A HEADLAMP WITH A DUAL-SEGMENT REFLECTOR

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a division of application Ser. No. 232,057 filed Mar. 6, 1972, which application, in turn, is a division of application Ser. No. 77,092 filed Oct. 1, 1970 (now U.S. Pat. No. 3,688,149).

BACKGROUND OF THE INVENTION

1. Field of the Invention:

This invention relates to the roadway illuminating art and has particular reference to an improved headlamp system for a motor vehicle.

2. Description of the Prior Art:

As is well known, the headlamp lighting systems now as used on motor vehicles frequently do not provide adequate illumination of the roadway under certain driving conditions, especially when passing or driving on a turnpike at high speeds. Driving through fog or in a rain or snow storm is especially hazardous due to the increased amount and intensity of the glare light which is inherently produced by conventional headlamp systems under such conditions.

The aforementioned problems have persisted down through the years despite strenuous efforts to solve them due to the fact that the affect on the drivers of oncoming vehicles must be taken into account. Thus, they cannot be corrected by simply increasing the beam intensity or brightness of conventional headlamps since this would merely tend to "blind" the other motorists on the road and further increase the glare intensity when driving under fog or adverse weather conditions. Basically, the solution lies in directing more light onto the roadway and concurrently controlling the light rays in such a manner that glare light is reduced for each mode of illumination provided by the headlamp system. In order to be practical from both a manufacturing and an economical standpoint, the headlamps must be such that they can be made on high-speed lamp-making machines now in use and the power requirements of the headlamp system must obviously be maintained within certain limits. Hence, a headlamp which can be mass-produced on such machines and a vehicle headlamp which will provide maximum illumination of the roadway with a minimum amount of electrical power and glare are required.

The foregoing problems and hazards have prompted various types of modified headlamps and roadway lighting systems. In U.S. Pat. No. 3,148,301 issued Sept. 8, 1964 to R. W. Johnson, for example, there is disclosed a vehicle headlight which provides both a driving beam and a passing beam by utilizing a unitary reflector having two parabolic-shaped reflecting portions that are offset vertically by a spacer portion. A filament is located at the focal point of each of the reflector portions and a shield is disposed between the vertically-spaced filaments so that the light from one of the filaments strikes only one of the reflector portions and the light from the other filaments strikes only the other reflector portion — thus providing either a driving beam or a low beam, depending upon which of the filaments is energized.

A similar result is achieved with a single filament in U.S. Pat. No. 3,191,024 issued June 22, 1965 to J. Bardin et al, by employing a pair of axially-spaced parabolic reflector segments, a single filament and a movable parabolic mirror which is rotated through the gap between the two reflector segments to produce a high beam or a low beam, depending upon the position of the movable mirror. A headlamp that has a more efficient reflector component is disclosed in U.S. Pat. No. 3,221,200 issued Nov. 30, 1965 to L. H. Verbeek. The reflector is of unitary construction and defines three parabolic segments that are radially spaced from one another and are each provided with its own light-emitting element, such as a coiled filament or a halogen-incandescent lamp. A vehicle headlamp comprising a segmented reflector which has two vertically and axially spaced focal points, a pair of light sources, and a specially contoured cover plate or lens to reduce glare is disclosed in U.S. Pat. No. 3,375,363 issued Mar. 26, 1968 to J. Rijnders et al.

A tri-beam headlamp system comprising four sealed-beam lamps having conventional parabolic reflectors and single "on-focus" light sources that are selectively energized to provide a low beam, a turnpike-driving beam and a high beam is disclosed in U.S. Pat. No. 3,373,311 issued Mar. 12, 1968 to K. H. Neulinger et al., A sealed-beam type headlamp having a conventional parabolic reflector and a dome-shaped lens is disclosed in U.S. Pat. No. 3,413,508 issued Nov. 26, 1968 to E. Pitkjaan, the author of the present invention.

SUMMARY OF THE INVENTION

Briefly, the foregoing problems and deficiencies associated with the headlights and road-lighting systems now in use, as well as the higher cost and complicated manufacturing operations entailed in the lamp structures proposed by the prior art, are avoided in accordance with the present invention by combining a single concentrated light source and a shield with a unitary reflector member that is divided by a protruding step along its horizontal axis into two hemiparabolic reflector segments that are optically oriented relative to one another and to the light source in such a manner that they provide two glare-free light beams of substantially equal intensity that are superimposed and form a single composite beam which has a sharp horizontal cut-off. The configuration of the hemiparabolic segments is such that their focal points are spaced from one another along the mechanical axis of the reflector and the light source is so positioned that it extends horizontally between the focal points in substantial alignment with the step. The geometrical and optical relationships of the light source and the focal points are such that the upper reflector segment provides a convergent beam of light and the lower reflector segment provides a divergent beam of light. The beam angles are so correlated that the two beams overlap one another at a predetermined distance in front of the lamp and form a composite beam of light having a controlled beam pattern.

Tests have shown that the composite beam pattern formed on a screen positioned in front of the improved lamp and normal to its mechanical axis does not exhibit the characteristic "bow-tie" beam configuration with a diamond-shaped hot spot in the middle which is produced by conventional headlamps having a single parabolic surface and on-focus light source. The composite beam has a sharp horizontal cut-off equivalent to that which would be obtained if the lower half of the reflector were shielded. However, the light flux emanating from the lower reflector segment is not wasted but is utilized to increase the intensity of the beam and project more usable light onto the roadway. The composite beam is preferably spread laterally by vertically extending flutes on the lamp lens which provide a generally rectangular beam pattern. Due to its sharp horizontal cut-off, the beam, despite its intensity, drastically reduces the amount of glare light both with respect to oncoming traffic and preceding vehicles compared to conventional headlamps having a single parabolic reflector surface.

Since the reflector is of unitary construction, it can be readily manufactured by glass molding techniques or stamped from sheet metal. The light source, shield, reflector and lens can be assembled in accordance with standard lampmaking procedures on conventional machines thus eliminating the need for special equipment and tedious or expensive manufacturing operations.

Either a conventional coiled refractory wire filament (**C6** or **C8**) or a halogen-incandescent lamp is used as the light source and a dome shaped lens or cover is employed to provide sufficient space to accommodate the shield and light source structure in the case of small size lamps, such as the PAR **36** type.

The sharp horizontal cut-off and higher intensity of the composite beam produced by the improved lamp is used in accordance with the present invention to enhance the turn-pike-driving beam and high-beam illumination provided by the headlamp system disclosed in the aforementioned Neulinger et al patent by substituting the improved lamp for their "turn-pike" lamp (lamps **6** and **16** in the patent drawing). In another embodiment, a pair of segmented reflector lamps are employed in combination with a conventional headlamp system to supplement the low-beam illumination during passing and when driving in fog or similar "glare-producing" weather conditions.

BRIEF DESCRIPTION OF THE DRAWINGS

A better understanding of the invention will be obtained from the exemplary embodiments shown in the accompanying drawings, wherein:

FIG. **1** is a schematic representation of the composite "non-glare" light beam which is obtained with an axially-mounted light source and a dual-segment reflector and is employed in the improved roadway lighting system of the present invention;

FIG. **2** is a cross-sectional view of a unitary dual-segment reflector which embodies the features shown schematically in FIG. **1**;

FIG. **3** is a similar view of a modified molded glass reflector and an axially-extending light source in accordance with an alternative headlamp embodiment;

FIG. **4** is a side elevational view, partly in section, of a PAR **46** type sealed-beam lamp which has a reflector of the type shown in FIG. **3** but utilizes a transversely extending (**C6**) filament coil as a light source;

FIG. **5**(*a*) is a plan view of another PAR **46** type sealed-beam lamp which includes a shield and is adapted for use as a vehicle headlamp, a portion of the lamp envelope being removed to show the structure of the shield and filament mount assembly;

FIG. **5**(*b*) is an enlarged plan view of the filament-shield assembly and associated reflector portion of the lamp shown in FIG. **5**(*a*);

FIG. **5**(*c*) is a front view of the **C6** filament and associated portion of the mount structure showing the spatial relationship of the filmament and the vertical and horizontal centerlines of the reflector;

FIG. **6** is a schematic representation of the reflector and horizontally-oriented **C6** filament combination shown in FIGS. **5**(*a*) to **5**(*c*) and the resulting composite beam pattern;

FIG. **7** is a schematic illustration of an improved "tri-beam" automobile headlighting system utilizing three headlamps which have conventional parabolic reflectors and one lamp which has a dual-segment reflector according to the invention;

FIG. **8** is a circuit diagram of the energizing and switching circuit used in the "tri-beam" headlighting system shown in FIG. **7**;

FIGS. **9***a* to **9***c* are isocandle diagrams illustrating the beam patterns produced by a conventional single-filament headlamp and segmented reflector headlamps having a clear lens and a fluted lens, respectively;

FIG. **10** is a front elevational view of a fluted lens used in the lamp which provided the beam pattern shown in FIG. **9**(*c*);

FIG. **11** is a schematic representation of an alternative road-lighting embodiment wherein a tubular halogen-incandescent lamp is utilized with a dual-segment reflector;

FIG. **12** is a plan view of a PAR **36** sealed-beam reflector lamp having the segmented reflector and halogen lamp combination shown in FIG. **11** as well as a light shield and a specially conformed dome-shaped lens, a protion of the envelope being removed to show the shield and lamp mount assembly;

FIGS. **13**(*a*) and **13**(*b*) are front elevational views and cross-sectional views, respectively, of an alternative dome-shaped lens for a PAR **36** type lamp;

FIG. **14** is a front elevational view of an alternative fluted lens embodiment;

FIGS. **14**(*a*) and **14**(*b*) are enlarged fragmentary cross-sectional views of different portions of the fluted lens shown in FIG. **14**;

FIG. **15** is a plan view of a PAR **46** type headlamp having a shielded halogen-incandescent lamp and a dual-segeent metal reflector that is fitted with a removable glass lens; and

FIG. **16** is a schematic representation of an alternative roadway-lighting means for a vehicle wherein a conventional headlamp system having four lamps is employed and is supplemented by an auxiliary headlamp system consisting of two smaller headlamps that are mounted below the main headlamps and have segmented type reflectors.

DESCRIPTION OF THE PREFERRED EMBODIMENTS (FIGS. 1 and 2)

In FIG. **1** there is shown a schematic representation of the basic concepts embodied in the electric lamps employed in the vehicular lighting systems of the present invention. As illustrated, a concave reflector having a top segment R_t and a bottom segment R_b (shown in dashed outline) of hemiparaboloidal configuration is combined with a concentrated elongated light source S that extends along the mechanical axis x—X of the reflector between the focal point F_t of the top segment and the focal point F_b of the lower segment to form two beams of light B_t and B_b that are substantially superimposed and provide a composite beam of light B_c on a screen located a predetermined distance in front of the light source and placed at right angles to the axis X—X. In this particular embodiment the optical axes of the top reflector segment R_t and the bottom reflector segment R_b are both coincident with the mechanical axis X—X of the dual-surface reflector member so that the respective focal points F_t and F_b both lie on axis X—X. The bottom reflector segment R_b is offset in a forward direction from the top reflector segment R_t and the focal lengths of the segments are substantially equal. Hence, the focal points are spaced a predetermined distance from one another along the longitudinal mechanical axis X—X of the reflector with focal point F_t being located closer to the apex of the reflector than focal point F_b.

Since the light source S is located inside focal point F_b, the beam formed by light rays reflected from the bottom reflector segment R_b is slightly divergent and forms a generally hemispherical light beam B_b on the screen that is centered on the vertical axis V—V and is generally aligned with and extends below the horizontal axis H—H. The screen is located approximately **25** feet in front of the reflector light source combination as is customary when evaluating the beam patterns of vehicle headlamps. In contrast, since the light source S is located slightly beyond or outside of focal point F_t, the beam formed by the light rays reflected from the top reflector segment R_t is convergent and forms a hemispherical beam of light B_t that substantially overlaps and is slightly smaller than the hemispherical beam B_b formed by the bottom segment.

The resulting composite beam B_c is centered on the screen, has a sharp horizontal cut-off that is generally aligned with the horizontal axis H—H, and does not exhibit the "bowtie" beam configuration or diamond-shaped hot spot characteristic of conventional headlamps having a single parabolic reflecting surface. The sharp horizontal cut-off obtained is equivalent to that which would be derived by shielding the lower half of a conventional parabolic reflector. However, the dual-segment reflector of the present invention achieves this desirable horizontal cut-off without shielding (and thus without wasting the light from) the lower half of the reflector but adds this light flux to the projected light beam. Composite beam B_c thus has approximately twice the brightness or intensity of a beam generated by an identical light source and a conventional parabolic reflector with a shielded lower half and, by virtue of the more uniformly controlled distribution of the light flux and absence of a centralized hot spot, produces less glare to on-coming traffic as well as preceding vehicles as compared to a standard parabolic headlamp.

While the elongated light source S is disposed between the foci F_t and F_b in the embodiment shown in FIG. **1**, a controlled composite light beam of suitable intensity and configuration will also be obtained if the light source extends slightly beyond F_b and at least three-fourths of the source is located between F_t and F_b. Roadway-lighting systems employing lamps made in this manner are thus within the scope of the present invention.

In accordance with the invention, the two hemiparabolic reflector segments constitute parts of a unitary reflector member **15** of the type shown in FIG. **2.** The reflector member **15** is concave configuration and can be molded from a suitable vitreous material such as glass, as illustrated, or can be stamped from suitable sheet metal. In this particular embodiment, the hemiparabolic top segment **16** has the same shape and focal length as the bottom segment **17** but the latter has a thicker wall dimension and is thus offset in a forward direction relative to the top segment a distance such that a protruding step **18** is formed along the horizontal centerline of the reflector **15** where the two segments merge with one another. The axial dimension of this step **18,** at the apex of the reflector **15,** is substantially equal to the distance between focal point F_{16} of the top reflector segment **16** and focal point F_{17} of the bottom reflector segment **17.** The step dimension in this case is substantially the same across the entire diameter of the reflector **15.** The rim **19** of the reflector **15** is, however, circular and identical to that of a conventional reflector.

The light source comprises a coiled filament **20** of refractory wire, such as a C8 tungsten filament, that extends between the two focal points along the mechanical axis X—X of the reflector **15.** Filament **20** is thus disposed in the focal plane of the reflector **15** and is substantially aligned with and extends in the same general direction as the step **18.** The reflector segments **16** and **17** have a common optical axis which coincides with the mechanical axis X—X and the orientation of the filament **20** and the respective reflector segments is such that the angle of beam convergence (angle α) produced by the top segment **16** is approximately equal to the angle of beam divergence (angle β) provided by the bottom segment **17.**

As will be noted in FIG. **2,** the top reflector segment **16** merges with the trailing edge of step **18** and the bottom offset segment **17** merges with the leading edge of the step.

FIG. 3 EMBODIMENT

The optical axes of the top and bottom segments of the unitary reflector do not have to be coincident with one another or with the mechanical axis of the reflector to achieve a composite beam having the desired features. Moreover, the focal lengths of the reflector segments need not be equal. This facet of the invention is illustrated in FIG. **3** wherein a modified reflector 15_a of molded glass or the like is formed in such a manner that the optical axis O—O of the bottom reflector segment ***17a*** is tilted downwardly relative to the mechanical axis X—X through a predetermined tilt angle γ. In addition, the focal length of the bottom segment ***17a*** is greater than that of the top segment ***16a*** so that the spacing between the foci F_{16a} and F_{17a} is substantially the same as that in the FIG. **2** embodiment. This permits both the wall thickness of the bottom segment ***17a*** and the dimension of the step ***18a*** to be reduced by an amount such that the wall thickness of the bottom segment ***17a*** is approximately the same as that of the top segment ***16a***. The axial dimension of step ***18a***, at the reflector apex, is thus less than the spacing between the foci.

The optical axis of the top segment ***16a*** is coincident with the mechanical axis X—X of the reflector ***15a*** and thus produces a beam having a convergence angle α equivalent to that in the FIG. **2** embodiment. However, due to the downward tilt of the bottom segment ***17a***, the beam divergence (angle β) effected by this segment is less than that which would be achieved with a nontilted lower segment. The tilt angle γ and the beam divergence angle β are such that their combined effect is sufficient to produce a downward "throw" or depression of the light rays reflected by the lower segment **17***a* which is generally equivalent to the downward "throw" of light produced by the convergence angle α of the top segment **16***a*. The contour of the two segments **16***a* and **17***a* is such that the axial spacing between the respective focal points F_{16a} and F_{17a} is the same as in the FIG. **2** embodiment and the C**8** filament **20***a* is located in the plane that passes through the two focal points. The reduction of the thickness of the bottom segment **17***a* achieved by the controlled tilting of its optical axis not only reduces the amount of glass required to mold the reflector but prevents strains from occurring in the glass during annealing and thus makes it much easier to make the reflector.

The same advantages can also be obtained without tilting the reflector segments and simply modifying the configuration of the lower reflector segment **17***a* so that its focal length is greater than that of the upper segment **16***a*. By properly correlating these parameters the desired spacing between focal points and reduction in the step dimension can be obtained without tilting the lower segment, in which case the optical axes of both segments would be coincident with the mechanical axis of the reflector member. Optimum optical efficiency and step reduction is achieved by employing reflector segments that have a common optical axis which is tilted and a bottom segment whose focal length is greater than that of the top segment and this combination of features is preferred in the turnpike-beam lamp application described below.

While a specular coating of aluminum or the like on he concave inner surfaces of the integral vitreous reflectors **15** and **15***a* has not been shown, it will be understood that such a coating is deposited on such surfaces before the reflectors are manufactured into headlamps.

FIG. 4 LAMP EMBODIMENT

A sealed-beam reflector lamp **22** having a unitary reflector **23** that is molded from glass and has a horizontal step **21**, a top hemiparabolic reflector segment **24** and a bottom hemiparabolic segment **25** which have a common optical axis which is tilted downwardly through a predetermined angle and have different focal lengths as in the above-described preferred embodiment is shown in FIG. **4**. The inner surfaces of the reflector segments **24** and **25** are coated with a layer **26** of suitable specular material such as aluminum that is vapor deposited in the usual fashion. The mouth of the reflector **23** is closed by a light-transmitting cover such as a lens **27** of clear glass that is slightly convex outwardly and has its periphery fused and hermetically sealed to the matching rim of the reflector **23** in accordance with standard lamp-making practice to form an annular bead **28**. A pair of rigid lead wires **29** (only one of which is visible in FIG. **4**) extend through spaced openings in the back of the reflector **23** and are electrically joined, as by brazing, to a pair of metal ferrules **31** that are hermetically sealed to bosses molded into the exterior surface of the reflector. L-shaped metal terminals **32** are fastened to the respective ferrules **31** to provide a blade-like connector adapted to be inserted into a suitable socket.

The envelope formed by the reflector **23** and lens **27** is evacuated and filled with suitable inert gases, such as a mixture of argon and nitrogen, through a tubulation (not shown) in the usual fashion and the tubulation is then tipped off.

In contrast to the FIGS. **1–3** embodiments, a horizontally-extending coiled filament **30** is attached to the inner ends of the lead wires to provide a so-called "C6" mount. The filament **30** is located in the horizontal plane that passes through the spaced focal points of the reflector segments **24, 25**. The filament **30** thus extends across the mechanical axis of the reflector **23** in substantially the same direction as the step **21** and a medial part of the filament is located between the focal points of the reflector segments.

FIGS. 5–6 LAMP EMBODIMENT

In FIG. **5**(*a*) there is shown a lamp **22***a* that is of the same basic construction as lamp **22** except that lamp **22***a* is specifically designed for use as a headlamp. Lamp **22***a* is thus provided with a concave shield **34** that is mounted in front of and in masking relationship with the C**6** filament **30***a* to intercept direct light rays from the filament that would otherwise pass through the clear glass lens **27***a* and blind the drivers of oncoming vehicles and those immediately in front of the car being driven. The shield **34** is fabricated from a suitable metal such as nickel-plated iron and is suspended in its filament-masking position by a strap **35** that extends from the shield and is fastened as by spot welding to one of the lead wires **29***a*.

The envelope formed by the reflector **23***a* and lens **27***a* is evacuated and gas-filled through a metal tube **33** that is sealed into the back of the vitreous reflector **23***a* and communicates with an opening in the reflector. The filament **30***a* is connected electrically to lug terminals **32***a* by the lead wires **29***a* and sealed-in ferrules **31***a* in the customary fashion. A specular coating **26***a* is also provided on the inner surface of the dual-segment reflector **23***a* (only the top segment **24***a* of which is shown in FIG. **5**(*a*)).

The spatial relationship of the filament **30***a* and the reflector **23***a* is shown in the enlarged plan view of the filament mount assembly shown in FIG. **5**(*b*). As will be noted, the centerline C—C of the C**6** filament **30***a*, as viewed in FIG. **5**(*b*), is offset a predetermined distance to the left of the mechanical axis X—X of the reflector **23***a* so as to deflect the reflected light rays to the right of axis X—X and, hence, to the right of the roadway. In addition, as shown in the front view of the mount assembly depicted in FIG. **5**(*c*), the inner ends of the lead wires **29***a* are slanted upwardly to position the filament **30***a* in plane O—O that is generally parallel to and spaced a predetermined distance above the horizontal axis Z—Z of the reflector **23***a* and passes through the focal points of the two reflector segments **24***a* and **25***a* (not shown). As shown in this view, the centerline C—C of the filament **30***a* is offset to the right of the vertical axis Y—Y of the reflector **23***a*.

The beam pattern produced by the headlamp **22***a* is illustrated schematically in FIG. **6**. As shown, the offset of the C**6** filament **30***a* to the left of the longitudinal mechanical axis X—X and upwardly from the horizontal axis Z—Z of the reflector **23***a* into focal plane O—O produces a generally rectangular beam **36** on a screen **37** that is positioned approximately 25 feet in front of the headlamp and at right angles to the mechanical axis

X—X of the reflector. The composite beam **36** formed by the reflected light rays is of uniform intensity and, as will be noted, is located to the right of the vertical axis V—V of the screen and has a sharp horizontal cut-off that maintains practically all of the light flux below the horizontal axis H—H of the screen. When mounted on the front of a motor vehicle, lamp **22a** would, accordingly, provide an intense beam of light that would be directed downwardly in front of the vehicle and to the right of the roadway and thus produce little or no glare.

As will be noted in FIG. **6**, the curvature of the two hemiparabolic reflector segments **24a** and **25a** is such that their respective focal points F_{24a} and F_{25a} are located on opposite sides of the transversely-extending filament **30a** and are spaced apart a distance "d" that is equal to or only slightly greater than the coil barrel diameter of the filament.

TRI-BEAM HEADLIGHTING SYSTEM EMBODIMENT (FIGS. 7–8)

In FIG. **7** there is shown a schematic representation of a headlighting system comprising the dual-segment reflector lamp **22a** of FIGS. **5–6** and three other headlamps **38, 40** of conventional design that can be selectively operated to provide three types or modes of illumination, depending upon driving conditions. The headlighting system shown in FIG. **7** can thus be termed a "tri-beam" headlighting system which, while similar in some respects to the systems disclosed and claimed in the aforementioned Neulinger et al, U.S. Pat. No. 3,373,311, is an improvement over that system.

While the four headlamps may be grouped vertically one above the other in pairs on either side of the centerline of the vehicle, in FIG. **7** they are shown arranged in a horizontal plane in pairs which are disposed on opposite sides of the centerline. The two outboard lamps **38** provide low-beam illumination and have a single horizontally-positioned (C**6**) filament that is located at the focus of a conventional parabolic reflector. The low-beam lamps **38** are provided with the usual prismatic type lens which provides the light control necessary to obtain the desired low-beam lighting pattern. The dual-segment lamp **22a** is the inboard lamp on the right side of the vehicle, as viewed head-on as shown in FIG. **7,** and is operated in conjunction with the two low-beam lamps **38** to provide a wider and brighter light beam for turnpike driving. Lamp **22a** will, accordingly, be referred to as the "turnpike" lamp.

The other inboard lamp **40** on the left of the vehicle centerline is similar to the low-beam lamps **38** in that it has a conventional parabolic reflector and a single on-focus filament. However, it has a higher wattage rating and a prismatic lens which provides a "spot light" beaming effect that directs the light along the center of the roadway directly in front of the car. Each of the lamps **22a, 38** and **40** are provided with a filament shield which prevents direct rays from the filament from passing through the lens and producing glare light that would blind the drivers of other vehicles. As an exemplary example of the relative wattages of the respective lamps, the low-beam lamps **38** may have a nominal rating of 50 watts, the turnpike lamp **22a** may also have a nominal rating of 50 watts, and the highbeam lamp **40** may have a nominal rating of 60 watts.

The lamps comprising the headlighting system of FIG. **7** are selectively operated to provide the three different modes of illumination by a suitable energizing and control circuit such as that shown in FIG. **8,** which circuit is the same as that disclosed in the aforementioned Neulinger et al patent. As shown, the circuit includes a two-position instrument panel switch **41** having an arcuate "keeper" segment **61** and the customary foot-operated dimmer switch **42,** both of which are shown in their open positions. When the panel switch **41** is pulled out to its first position "a," the two outboard lamps **38** are energized by the electrical system of the vehicle — thus providing low-beam illumination of the character which is described in the aforesaid Neulinger et al, patent and is thus suited for city driving and in traffic conditions where the use of the turnpike on high-beam modes of illumination would be undesirable.

When the panel switch **41** is in its first position "a" and the dimmer switch **42** is closed, the dual-segment 50 watt inboard turnpike lamp **22a** will be energized and its non-glare beam will be added to the illumination provided by the two low-beam lamps **38.**

When driving and traffic conditions are such that a more intense illumination of the roadway is required, the two-position panel switch **41** is pulled out to its second position "b" which thus energizes the inboard 60 watt highbeam lamp **40** and adds its illumination to the turnpike driving beam provided by the three other lamps **38, 22a** which remain energized by virtue of the "keeper" segment **61** of switch **41** bridges the two switch terminals *a* and *b*.

Restoration of the headlighting system to the low-beam mode of illumination from either the turnpike or high-beam modes is accomplished by simply actuating the foot-operated dimmer switch **42** and returning it to its open position. Since the low-beam lamps **38** remain lit in each of the three different modes, the transition from one lighting mode to another is achieved without any temporary "black-outs" or "jumping" effects as disclosed in the aforementioned Neulinger et al, patent.

While lamp **22a** of FIGS. **5a–5c** is referred to as constituting the turnpike lamp in the above-described headlighting system, it will be appreciated that any of the other dual-segment headlamps disclosed herein may be used for this purpose.

ISOCANDLE DIAGRAMS (FIG. 9)

The improvement in the beam pattern achieved with the dual-segment reflector headlamps in accordance with the invention is illustrated by the isocandle diagrams (or light distribution patterns) of various lamps depicted in FIGS. **9**(*a*) to **9**(*c*). As is apparent from **9**(*a*), the light beam of a conventional sealed-beam lamp having a single on-focus C**6** filament, a clear lens, a shield and a standard parabolic reflector has the characteristic "bow-tie" configuration and a concentrated hot-spot that is located on the horizontal axis H—H slightly to the right of the vertical axis V—V.

In contrast, a dual-segment reflector lamp having a shielded C**6** filament and a clear glass lens provides a beam (FIG. **9b**) which is much more uniform as regards intensity and is centered well below the horizontal axis H—H and further to the right of the vertical axis V—V. The beam pattern, as shown in FIG. **9c**, is broadened laterally into generally rectangular configuration and the light flux more evenly distributed when the aforesaid clear glass lens of the dual-segment lamp is replaced by a lens that is provided with vertically-extending flutes that spread the light rays laterally through an angle of about 4°. The fluted lens is devoid of any horizontal risers and thus eliminates glare light which would otherwise be produced by such risers. A fluted lens of this type is, accordingly, preferred.

FLUTED LENS (FIG. 10)

A fluted lens having the aforementioned light-modifying characteristics is illustrated in FIG. **10.** As shown, the lens **43** comprises a circular plate of glass or other suitable light-transparent vitreous material that has a series of flutes **44** on its surface which extend vertically across the lens face. The flutes are of uniform width and, in the case of a glass lens, are molded into and constitute integral parts of the inner surface of the lens. The desired 4° lateral spread of the light rays passing through the lens has been achieved in the case of a PAR **46** type lamp with flutes that were approximately ¼ inch (6.35 mm.) wide and had an arcuate cross-section which gave the desired spread of light. Various flute configurations can be used as will be obvious to those skilled in the art. The lens **43** is, of course, dished and thus slightly convex outwardly in accordance with standard lamp-making practice.

FIGS. 11–12 LAMP EMBODIMENTS

While all of the lamps described above have been of the sealed-beam variety that contain a bare refractory wire filament, the invention is not limited to roadway-lighting systems which employ such light sources. The aforementioned advantages of light beam superimposition and more uniform light intensity with a sharp horizontal cut-off can also be obtained by using a compact halogen-incandescent lamp as the light source. Such lamps are well known in the art and consist of an elongated quartz envelope that contains a tungsten filament and an atmosphere of a suitable halogen gas, such as bromine or iodine, that sustains a gettering cycle which returns vaporized tungsten from the envelope walls back onto the filament.

A dual-segment reflector lamp having such a light source is shown schematically in FIG. **11** along with the beam pattern which it provides. As will be noted, the reflector is of the same type as previously described and has a top hemiparabolic segment R_t and a bottom hemiparabolic segment R_b that is axially displaced in a forward direction relative to the top segment. The halogen-incandescent lamp **45** is of tubular configuration and in this embodiment is oriented so that its longitudinal axis is coincident with the mechanical axis X—X of the reflector. The lamp **45** contains a linear filament **46** of coiled tungsten wire that also extends along the mechanical axis X—X of the reflector and the lamp is so positioned relative to the reflector that the filament **46** is located between the focal points F_t and F_b of the top and bottom segments of the reflector, respectively. The embodiment of FIG. **11** thus employs the same principles as the FIG. **1** embodiment except that a halogen-incandescent lamp is used as the concentrated light source. The beams from the top and bottom segments R_t and R_b of the reflector are thus superimposed and form a generally semi-circular beam pattern **47** on the screen **37,** which beam has a sharp horizontal cut-off and is generally symmetrical about the vertical axis V—V.

A PAR **36** type sealed-beam lamp **22*b*** embodying the combination of a halogen-incandescent lamp and a dual-segment reflector is shown in FIG. **12,** which is a view looking down onto the lamp through the upper hemiparabolic segment **24*b*.** As in the previous embodiments, the molded glass reflector **23*b*** has its inner surface coated with a suitable specular material **26*b*** and rigid lead-in conductors **29*b*** that are electrically connected to metal ferrules **31*b*** sealed into the back of the reflector **23*b*** extend into the sealed envelope formed by the reflector **23*b*** and the glass lens **27*b*.** The inner ends of the conductors **29*b*** are attached to the outer leads of the axially-disposed halogen-incandescent lamp **45** and the coiled tungsten filament **46** of the lamp **45** extends along the reflector axis between the focal points of the reflector segments, an disclosed above. As in the previous lamps designed for use on vehicles, a suitable shield **34*b*** is mounted in front of the light source to avoid glare from direct light rays. In this embodiment, the shield **34*b*** comrpises a shallow concave metal member that is attached to the lower one of the leadin conductors **29*b*** and is of sufficient size to mask both the halogen lamp envelope and its protruding sealed tip **39** since it has been found that they can reflect light rays in such a manner as to constitute point light sources and glare-producing sites.

In contrast to the previous lamp embodiments, the glass lens **27*b*** according to this embodiment comprises a dome-shaped member that has a circular rim **19*b*** and a forwardly-extending annular side wall that forms a bezel **48** which is joined to and merges with a slightly convex face **52** of clear glass. The added depth of the lens member **27*b*** afforded by the bezel **48** and the resulting dome-shaped configuration of the lens accommodates the outermost end portion of the shield and lamp mount, as shown. Dome-shaped lenses of this type are, accordingly, required when the light source (whether a bare filament or a halogen-incandescent lamp) is axially mounted and the lamp is of small size. This is particularly true when the lamp is of the PAR **36** size (such as that shown in FIG. **12**) and has a diameter of 4-½ inches (approximately 11.4 centimeters).

As indicated on the lower portion of the lens **27*b*** (as viewed in FIG. **12**), the bezel portion **48** of the lens can, if desired, be colored with a dispersed colored pigment — for example, by an exterior coating **49** of a suitable colored lacquer (denoted by the stippled defect in the drawing) such as an amber-colored lacquer that has good weather-resistance properties. The resulting amber-colored bezel portion **48** of the lamp **22*b*,** when the latter is mounted on a vehicle and energized, will thus serve as a integral safety or "marker" light viewable from a position abreast of the vehicle.

The effectiveness of such a marker light can be increased by molding axially-extending flutes **50** on the inner surface of the bezel **48,** as shown in the upper portion of the lens **27*b*** as viewed in FIG. **12,** which flutes will spread the light in a vertical direction. The flutes **50** can be provided over the entire inner surface of the bezel **48** or can be restricted to the portions thereof that constitute the sides of the lens **27*b*.** Such light-spreading flutes **50** can be employed in combination with an exterior amber-colored coating or other suitable colored material, as indicated by the stippled effect on the upper portion of the bezel **48** as viewed in FIG. 12, or they can be used independently without a coloring material.

Coiled-coil filaments (CC6 or CC8) can also be used as the light source.

ALTERNATIVE LENS EMBODIMENT (FIG. 13)

If desired, a selected portion of the front face of the dome-shaped lens member can be provided with flutes to further minimize the possibility of light rays leaving the headlamp in a direction which would produce glare. Such a fluted lens embodiment 28c is shown in FIGS. 13(a) and 13(b). As will be noted, the glass lens 27c is of the same general type previously described and has a circular rim 19c, a bezel portion 51, and a slightly dished front face 53. The upper half of the lens face 53 that covers the top segment of the reflector is provided with a series of vertically-extending flutes 54 that are molded into the inner surface of the lens and extend around the periphery of that half of the lens face such that a window 58 of clear glass extends upwardly from the horizontal axis Z—Z of the lens 27c and has an arcuate upper terminus that matches the curvature of the lens face. Hence, any stray light rays that may be reflected through the fluted upper portion of the lens 27c will be spread horizontally and neutralized as far as glare is concerned.

ALTERNATIVE LENS EMBODIMENT (FIG. 14)

When lamps with segmented reflector components are utilized as fog lamps or as elements of an auxiliary headlighting system, as hereinafter disclosed, it may be desirable to increase the lateral spread or "throw" of the light rays to further reduce the glare effect. This can be readily accomplished by employing a lens 55 of the type shown in FIG. 14 which has vertically-extending interior fluting over its entire face. As illustrated, the central part (zone A) of the lens face can be provided with flutes 56 dimensioned and shaped to give about a 4° lateral light spread and the arcuate end segments (zones B) of the lens face can be provided with different type flutes 57 dimensioned and shaped to effect about a 32° lateral spread. The configuration of the flutes 56, 57 are shown in FIGS. 14(a) and 14(b), respectively. As shown, flutes 56 are of arcuate cross section having a radius of curvature R and a width dimension "d". Flutes 57 (FIG. 14b) are of the same width but are of compound arcuate configuration with a central portion having a radius of curvature R1 and end portions having a smaller radius of curvature r. The flutes 56, 57 can be of the same width (dimension "d") and flutes ¼ inch (6.35 mm.) have given excellent results as regards glare control.

The flutes 44 of the PAR 46 lens 43 (FIG. 10) can be of the same type as the flutes 56 formed on the central zone A of the PAR 36 lens shown in FIG. 14.

FIG. 15 LAMP EMBODIMENT

The invention is not limited to the use of headlamps which are of sealed-beam construction, such as those previously described, but encompasses the use of headlamps which have a sheet metal reflector that is mechanically fastened to a vitreous lens member to form a housing or enclosure which is not hermetically sealed. A headlamp 22d of this type is shown in FIG. 15 and comprises a dual-segment reflector 23d that is stamped from suitable sheet metal, such as aluminum or the like which has a specular concave surface, and is fastened to a dished lens 27d of glass or other suitable vitreous material. The lens 27d is attached to and held in place on the matching rim of the reflector 23d by a surrounding collar 62 of metal or the like that is provided with suitable locking means (not shown). The metal reflector 23b has a top hemiparabolic segment and a bottom hemiparabolic segment of the character described previously although only the top segment 24d is shown in the plan view of the headlamp 22d depicted in FIG. 15.

A suitable light source, such as a halogen-incandescent lamp 45d having a linear tungsten wire filament 46d, is axially mounted within the lamp housing on L-shaped lead wires 29d that are attached to the rigid outer leads of the halogen lamp 45d and are rigidly secured to the reflector 23d by bushings 59 of insulating material which are anchored in suitable openings in the rear of the reflector. The lead wires 29d are thus insulated from each other and from the metal reflector 23d by the bushing 59. The outer ends of the lead wires 29d are electrically connected as by soldering to metal contactor elements 60 that serve as the lamp terminals. A shield 34d of shallow concave configuration is fastened as by spot welding to the long lead wire 29d and suspended in front of the halogen lamp 45d to mask direct rays of light from the filament 46d and the tubular lamp envelope that would otherwise pass through the lens 27d. The axially-extending filament 46d is disposed between the focal points of the respective reflector segments as in the previously-described lamp embodiments.

While the halogen-incandescent lamp 45d in the FIG. 15 lamp embodiment is held in place within the lamp housing by lead wires 29d that are rigidly coupled to the back of the metal reflector 23d, it will be recognized by those skilled in the art that a suitable socket can be fastened to the back of the reflector 23d and that the halogen lamp 45d can be fitted with a base member adapted to be inserted into the socket to permit a new lamp to be placed within the reflector by removing the locking collar 62 and lens member 27d.

ALTERNATIVE HEADLIGHTING SYSTEM (FIG. 16)

The dual-segment reflector headlamps described above can also be employed as auxiliary headlamps to supplement the illumination provided by conventional four-headlamp lighting systems presently in use on motor vehicles. A schematic representation of such a modified headlighting system is shown in FIG. 16 and comprises a primary headlight system that consists of two outboard lamps 63 and two inboard lamps 64 that are arranged in pairs on opposite sides of the centerline of the vehicle. The two outboard lamps 63 each contain a pair of shielded C6 type filaments, one of which is positioned "on-focus" with the other positioned slightly above the focal point of the reflector. The two inboard lamps 64 each contain a single on-focus C6 filament that is also shielded. Each of the lamps 63 and 64 are of the conventional type and have nonsegmented parabolic reflectors and prismatic lenses that provide the proper optical control of the light rays.

Low-beam illumination is provided in the conventional manner by energizing the on-focus filaments of both outboard lamps 63 and high-beam illumination is provided by energizing both of the inboard lamps 64 in conjunction with the off-focus filaments of both outboard lamps **63**. Selective operation of lamps **63** and **64** which comprise the primary headlighting system to provide the aforesaid low-beam and high-beam modes of illumination is accomplished in the usual fashion by a suitable energizing circuit that includes a panel switch and foot-operated dimmer switch.

In accordance with this embodiment of the invention the low-beam mode of illumination provided by the primary headlighting system is supplemented by a pair of auxiliary passing or fog lamps **65** of the dual-segment reflector type which have a single concentrated light source, such as a **C6** filament (or preferably a **C8** filament), that extends between the focal points of the reflector segments as disclosed previously. The auxiliary lamps **65** are of smaller size than the primary headlamps (preferably **PAR 36** type lamps when the primary lamps are **PAR 46**) and are mounted below each pair of the primary headlamps on opposite sides of the centerline of the vehicle, as shown in **FIG. 16.**

When driving in fog or in other adverse conditions which tend to increase the reflected glare level, the low-beam illumination provided by the primary headlight system is supplemented by energizing the two auxiliary lamps **65** by means of an energizing circuit that can be independent from, or coupled to, the energizing circuit for the primary headlamps **63, 64.** The depressed composite light beams and the sharp horizontal cut-off of the light rays provided by the auxiliary lamps **65** enhances the low-beam illumination of the primary headlight system in such a manner that the roadway in front of the vehicle is illuminated for a much greater distance with a minimum amount of glare. The auxiliary headlamps **65** could, therefore, be coupled with the primary headlighting system in such a way that they are automatically energized along with the low-beam headlamps **63** during passing to project more light further down the roadway during this critical and potentially hazardous driving maneuver.

SPECIFIC EXAMPLES

To assist those wishing to practice the invention, some specific examples of the various critical parameters for various types of headlamps that have given satisfactory results are given below in Table I.

TABLE I

Reflector					Light source		
Type	Dia., cms.	Tilt angle	Spacing between focal pts., mm.	Step dimen. at apex, mm.	Type	Coil dia., mm.	Coil length, mm.
PAR 36	11.4	None	4.3	4.3	C8 fil.	1.5	4.5
PAR 36	11.4	3° (bottom seg.)	4.3	3.0	C8 fil.	1.5	4.5
PAR 46	14.6	None	4.1	4.1	C8 fil.	1.5	4.5
PAR 46	14.6	2° (bottom seg.)	4.1	3.1	C8 fil.	1.5	4.5
PAR 46	14.6	2° (both seg.)	1.9	1.0	C6 fil.	1.5	4.5

When reflector segments having a common tilted optical axis are employed 2° tilt angle is preferred and tilt angles within a range of 2° to 3° are suitable. When only the bottom segment is tilted, a tilt angle of 3° is preferred but tilt angles within a range of 2° to 5° can also be used.

It will be appreciated from the foregoing that improved headlighting systems have been provided for motor vehicles which generate composite beams of light that are so controlled that they greatly improve the illumination of the roadway with a minimum of glare.

I claim as my invention:

1. In a road-way lighting system for a motor vehicle, the combination comprising;

four headlamps mounted on the front of the motor vehicle with a pair of headlamps disposed on each side of the centerline thereof,

one headlamp in each of said pairs of headlamps being a low-beam headlamp having a prismatic type lens and a single on-focus light source and, when operated together, producing a depressed light beam which is directed toward the right side of the roadway and is thus adapted for use in heavy traffic conditions,

another headlamp in either one of said pairs of headlamps being a turnpike-beam headlamp having (*a*) a unitary reflector which is divided into two hemiparabolic segments that are axially offset relative to one another and have focal points that are spaced from one another along the mechanical axis of the reflector, (*b*) a single compact light source which extends between said focal points, and (*c*) a shield that is disposed in front of and in masking relationship with said light source so that said turnpike-beam headlamp, when energized, produces a composite beam of light that supplements the illumination produced by the two low-beam headlamps and thereby provides a modified light beam that is intensified in the direction of the center of the roadway and is thus adapted for turnpike driving,

the remaining headlamp in said pairs of headlamps being a high-beam headlamp which has a prismatic lens and a single on-focus light source and, when energized, produces a beam of light which is centered on the roadway and supplements the turnpike-driving beam and thereby provides a high-beam mode of illumination adapted for driving in low-density traffic, and

an energizing circuit including (*d*) a main two-position switch operable in one position to energize the two low-beam headlamps, and (*e*) an auxiliary switch operable to energize the turnpike-beam headlamp without deenergizing the low-beam headlamps,

said main switch in its other position being operable to energize the remaining high-beam headlamp and thus provide high-beam illumination, and said auxiliary switch being operable to return said lighting system to the low-beam mode of illumination from both the turnpike-beam and high-beam modes of illumination.

2. The vehicular roadway-lighting system of claim 1 wherein the light source in said turnpike-beam headlamp comprises a tubular halogen-incandescent lamp.

3. The vehicular roadway-lighting system of claim 1 wherein;

each of said low-beam headlamps contains a shield that is disposed in front of and in masking relationship with the associated light source, and

said turnpike-beam headlamp has a vitreous lens with vertically-extending integral flutes that bend the transmitted light rays in a lateral direction.

4. The vehicular roadway-lighting system of claim 1 wherein;

each of said headlamps are of the sealed beam type, and

each of said light sources comprises a coiled C6 type filament.

5. The vehicular roadway-lighting system of claim 1 wherein;

each of said headlamps, are of the sealed beam type, and

said high-beam headlamp has a nominal wattage rating which is higher than that of any of the other said headlamps.

6. The vehicular roadway-lighting system of claim 5 wherein;

the light source in each of the said headlamps comprises a coiled refractory wire filament,

said low-beam and turnpike-beam headlamps each have a nominal rating of 50 watts, and

said high-beam headlamp has a nominal rating of 60 watts.

7. In a combination with a primary headlamp lighting system for a motor vehicle wherein the headlamps are mounted on the front of the vehicle and connected to an energizing system adapted to permit selective operation of the headlamps to provide low-beam and high-beam modes of illumination,

an auxiliary lighting system for supplementing said low-beam mode of illumination comprising;

1. a pair of auxiliary headlamps that are mounted on the front of the vehicle below the headlamps of the primary lighting system and on opposite sides of the vehicle centerline,

each of said auxiliary headlamps having (a) a unitary reflector that is divided by a horizontally-extending step into a top and a bottom hemiparabolic reflector segment that are axially offset relative to one another and have focal points which are spaced from one another along the mechanical axis of the reflector, (b) a single elongated light source extending between the focal points of the reflector segments and adapted, when energized, to produce in conjunction with said reflector segments a pair of light beams that are substantially superimposed and thus form a composite light beam which has a sharp horizontal cut-off, (c) a shield disposed in front of said light source and adapted to intercept direct light rays therefrom, and (d) a vitreous lens attached to said reflector and forming therewith a housing that encloses said shield and light source, and

2. an electrical circuit for energizing said auxiliary headlamps including a switch operable to energize said auxiliary headlamps when the primary headlamps are operating in their low-beam mode of illumination,

both of said auxiliary headlamps being so oriented on the vehicle that the respective composite beams therefrom provide illumination which supplements the low-beam illumination of the primary headlamp lighting system and projects light further down the roadway with a minimum amount of glare.

8. The combination of claim 7 wherein said auxiliary headlamps comprise sealed-beam type lamps.

9. The combination of claim 8 wherein the light source in each of said auxiliary sealed-beam headlamps comprises a tubular halogen-incandescent lamp the filament whereof extends between the focal points of the associated hemiparabolic reflector segments.

10. The combination of claim 8 wherein the light source in each of said auxiliary sealed-beam headlamps comprises a coiled filament of refractory metal.

* * * * *