

[54] **MOISTURE BARRIER FOR SEALED
BEAM HEADLAMP CONSTRUCTION**

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[51] Int. Cl. **F21m**

[58] Field of Search .240/41 R, 41 SB; 313/113, 114,
313/115, 116

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[57] **ABSTRACT**

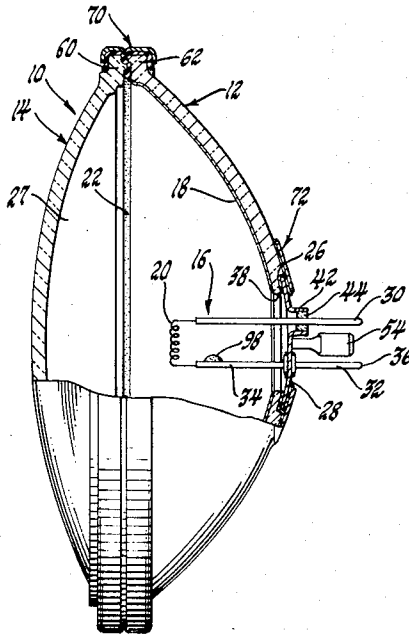
A sealed beam headlamp wherein the mating areas between component parts are structurally and hermetically joined by a plastic cement overlaid by a metallic moisture barrier, the latter establishing a tortuous moisture flow path of minimal cross section through the cement thereby reducing the rate of moisture diffusion into the lamp envelope and minimizing filament erosion due to "water cycle".

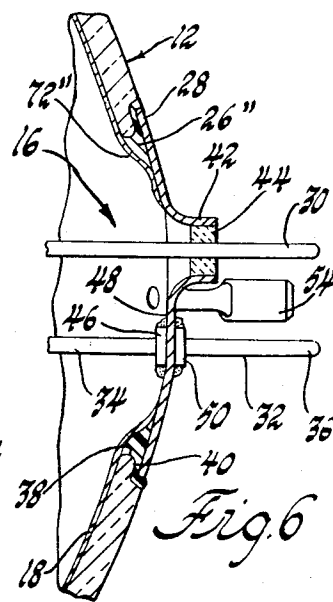
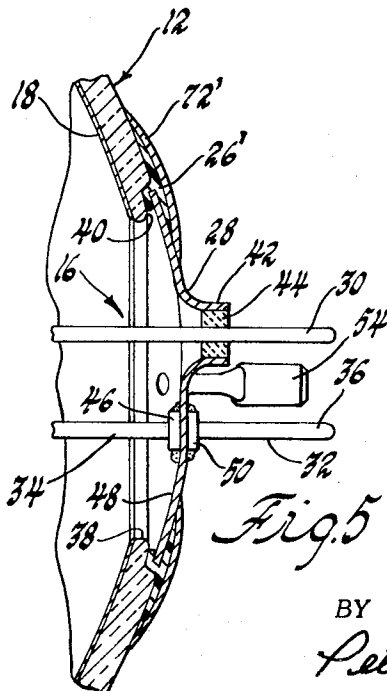
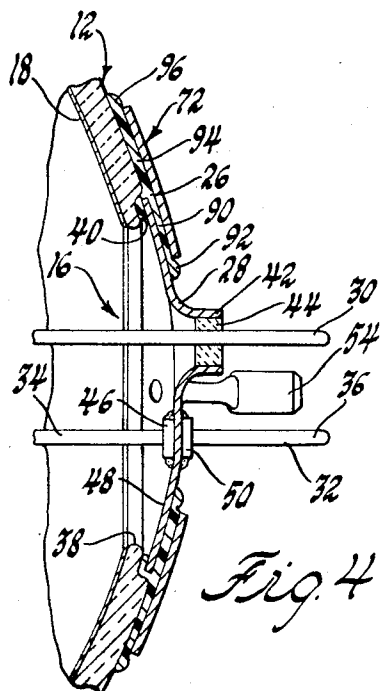
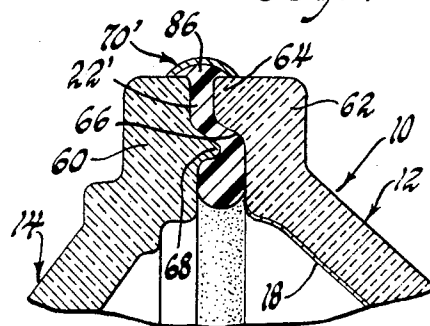
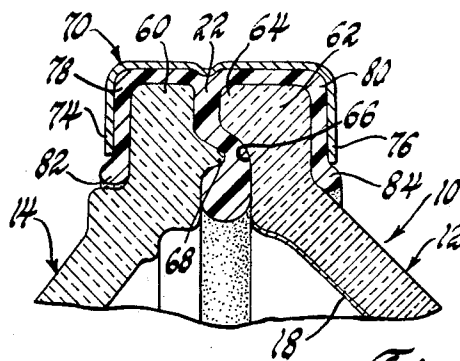
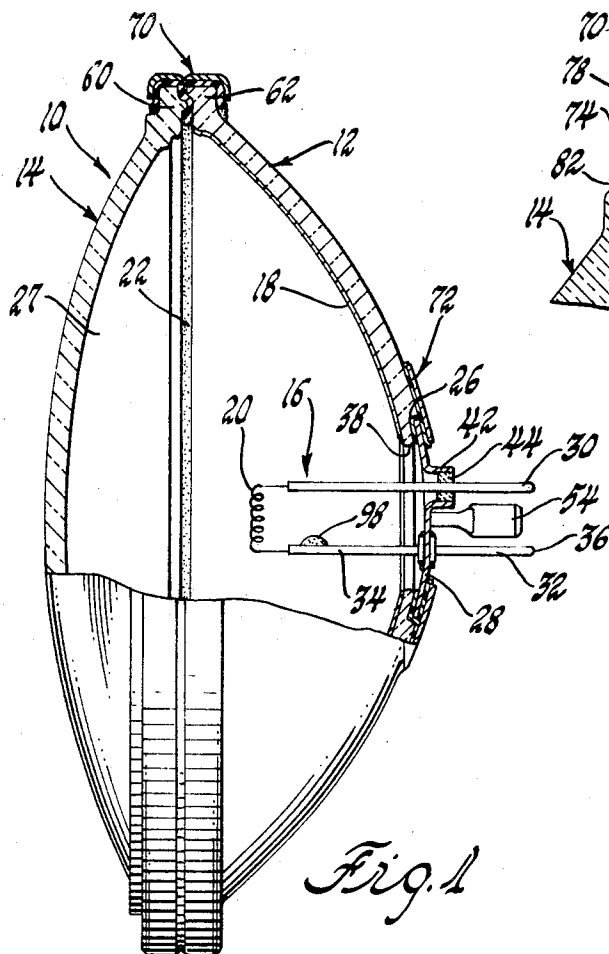
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4 Claims, 6 Drawing Figures





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MOISTURE BARRIER FOR SEALED BEAM HEADLAMP CONSTRUCTION

The present invention relates to sealed beam lighting units, and, in particular to a sealed beam headlamp construction suitable for automotive usage wherein the lamp component parts are hermetically and structurally joined by a plastic material.

At the present time, the major lighting units for headlamps for motor vehicles comprises a glass lens and a glass reflector which are fusion sealed at their mating peripheral surfaces to form a lamp envelope. An electrical current is applied to a filament which is supported in the lamp envelope by metal leads attached to the reflector at "housekeeper" type glass to metal seals. The "housekeeper" seals are conveniently formed by embedding the rim of cup shaped ferrules into the outside surface of the glass reflector while the latter is heated to a softened condition. The alloys and glass used in this type of construction require closely matched or identical thermal expansion rates to ensure complete structural fusion and a pressure tight seal at the mating areas between the ferrules, the lens and the reflector. Also, the component materials must withstand the high temperature associated with fusion joining. The sum of these requirements, to a large extent, dictates the aforementioned glass-alloy combination.

However, lighting designers have recognized that a greater latitude in the material selection for the lamp design could be achieved by using a cementitious material to join the several lamp components. This method, in effect, would permit the use of materials having greatly differing thermal expansion rates, a characteristic which would be incompatible with the temperature cycle required in fusion joining. Additionally, the cement construction would greatly simplify the manufacturing process.

Prior sealed beam lighting units of the aforementioned type have proposed joining the reflector to the lens, and sealing the filament support lead wires with an epoxy or like thermosetting plastic cement. Experience has shown, however, that in normal usage as encountered on motor vehicles, the service life has been unacceptably shortened by diffusion of water vapor through the cement. Such diffusion, after a relatively short time, allows sufficient moisture to enter the lamp envelope to cause premature filament burnout due to the erosive action of "water cycle," a phenomenon well known in the lighting industry.

The present invention contemplates overcoming the above "water cycle" problem by cladding the cemented joints with a moisture impervious barrier. By thus restricting the entrant moisture path between the atmosphere and the lamp envelope, the aforementioned diffusion rate is reduced with a consequent improvement in the service life of the headlamp unit. More particularly, this beneficial result is achieved by forming a metallic moisture barrier over cement joints thereby establishing a constricted and tortuous diffusion path through the cement between the atmosphere and the lamp interior. This, in turn, reduces the diffusion rate and "water cycle" erosion.

In one embodiment, the moisture barrier takes the form of a thin metallic foil tightly rolled over the cement joint so as to extrude the excess cement from beneath the foil edges. The layer of extruded cement,

owing to its thinness in relation to its width, creates a minimal moisture path which reduces the diffusion rate to a small fraction of previous values. An alternate moisture barrier construction is established by forming a metal foil plating entirely over the cement joint which, in effect, leaves little or no edge opening for moisture entry.

Accordingly, an object of the present invention is to provide an improved cemented lamp construction wherein the cement joining the lamp components is intimately surrounded by a moisture impervious barrier which serves to reduce the moisture diffusion rate through the cement joint thereby reducing lamp filament erosion due to "water cycle."

Another object of the present invention is to provide a sealed beam lighting unit wherein component parts are structurally and hermetically joined at mating surfaces by a plastic cement to form sealed joints which are thereafter constricted into tortuous entrant moisture paths by foil pressed tightly over the outer surface of the cemented joints thereby reducing filament erosion and extending the service life of the unit.

A further object of the present invention is to provide a cemented sealed beam lighting unit wherein the cement joints are covered by moisture impervious platings which serve to limit moisture diffusion rates through the joints and reduce "water cycle" filament erosion.

These and other objects will be apparent to one skilled in the art upon reading the following detailed description, reference being made to the accompanying drawings in which:

FIG. 1 is a partially section top view of a sealed beam headlamp made in accordance with the present invention;

FIG. 2 is an enlarged sectional view showing the cement joint between the lens and the reflector covered by a metallic moisture barrier;

FIG. 3 is a view similar to FIG. 2 showing an alternate form of a moisture barrier construction;

FIG. 4 is an enlarged view showing the cement joint between the light source assembly and the reflector covered by a metallic moisture barrier;

FIGS. 5 and 6 are views similar to FIG. 4 showing alternate forms of moisture barrier constructions.

Referring to FIG. 1, there is shown a sealed beam lighting unit 10 of the type commonly used for motor vehicle headlamps. Generally, the lighting unit 10 comprises a reflector 12 and a lens 14 enclosing the light source assembly 16. As is conventional, the reflector 12 has a paraboloidal reflective surface 18 formed by a bright metallic deposit for imparting directional control to the light rays emitted by a helically coiled filament 20 carried on the light source assembly 16. The lens 14 includes suitable optical flutes and facets for imparting directional control to light rays controlled by the reflector 12. The lens 14 and the reflector 12 are structurally joined at a cement joint 22. The light source assembly 16 is structurally joined to the reflector 12 at a cement joint 26. The inner surfaces of the assembled components define a sealed lamp envelope 27 having a controlled environment of pressurized inert gas.

The light source assembly 16 comprises the filament 20, a metallic mounting disc 28, and a pair of lead wires 30, 32. The lead wire 30 is the input or positive ter-

minal while the lead wire 32 constitutes the negative grounded terminal and includes an inner terminal 34 and an outer terminal 36. The filament 20 is conventionally energized by connecting the lead wires 30 and 32 by means of a suitable connector to a power source such as the vehicle battery.

The light source assembly 16 projects into the lamp envelope 27 through a central circular opening 38 formed in the reflector 12. The mounting disc 28 is generally spherically shaped and has a concave surface facing and overlying a recess 40 formed in the rear surface of the reflector 12 concentric with the opening 38. A rearwardly projecting flared tube 42 is formed at the center of the mounting disc 28 and defines a circular opening in which an apertured glass insulating support 44 is received. By conventional techniques, the lead wire 30, the insulating support 44 and the tube 42 are fusion sealed to form hermetical joints. The inner terminal 34 of the lead wire 32 includes a flattened head 46 which is welded to the concave surface 48 of the mounting disc 28. In similar fashion, the outer terminal 36 includes a flattened head 50, juxtaposed with respect to the head 46, which is welded to the convex surface to the mounting disc 28. The ends of the filament 20 are respectively structurally and electrically connected across the innermost ends of the lead wires 30 and 32.

An exhaust tube 54 formed at the rear of the mounting disc 28 is conventionally used to initially evacuate the lamp envelope 27 and subsequently fill the latter with an inert gas. Thereafter, the exhaust tube 54 is flattened and fusion sealed or soldered to seal the lamp envelope.

The light source assembly 16 and the reflector 12 are structurally joined at the cement joint 26 by a suitable plastic cement such as an epoxy resin, a thermoplastic, or a polyester. More specifically, uncured plastic is deposited on the rear surface of the reflector 12 generally within the confines of the recess 40 and is suitably processed to a softened state. Thereafter, the light source assembly 16 is pressed against the cement until the filament 20 bears the desired spacial relationship to the reflective surface 18. During this step, the excess cement extrudes inwardly between the mounting disc 28 and the recess 40 as well as outwardly along the rear surfaces of the mounting disc 28 and the reflector 12.

The lens 14 and the reflector 12 are provided at their outer diameters with mating annular flanges 60, 62, respectively. A forwardly projecting annular lip 64 formed at the outer diameter of the flange 62 inwardly defines an annular recessed groove 66. A rearwardly projecting annular rib 68 on the flange 60 registers with and projects into the groove 66.

In a manner similar to the mounting of the light source assembly 16, the reflector 12 and the lens 14 are structurally and hermetically joined by initially placing an uncured plastic cement within the confines of the groove 66 and processing the same to a softened state. Thereafter, the lens 14 is pressed against the reflector 12 until the desired spacial relationship is established between the reflective surface 18 and the lens 14. This step forms an extruded bead circumferential at the mating outer surfaces of the flange 60, 62.

The cement joint formed in the manner outlined above creates an entrant moisture path between the atmosphere and the lamp envelope 27. Experience has revealed that the service life of such headlamp units is significantly reduced due to the diffusion of moisture inwardly through the cement joint. The moisture, over a period of time, corrosively reacts with the filament material causing premature filament burnout due to "water cycle," a phenomenon well known in the lighting industry. For this reason, the lighting units employing cement joints between the component parts generally have been commercially unacceptable.

The present invention, as shown in FIGS. 2 and 4, provides a positive means for significantly limiting the water diffusion rate by cladding the cement joints 22 and 26 with moisture impervious barriers 70 and 72, respectively. With particular reference to FIG. 2, while the cement joint 22 is still soft, the moisture barrier 70 in the form of a cylindrical hoop of a thin metallic foil is axially inserted over and across the flanges 60, 62. By appropriate means such as roll forming, the hoop is formed into intimate contact with the outer surfaces of flanges 60, 62. This rolling further axially extrudes the cement from the joint into an extremely thin layer bounded by the outer surfaces of the flanges. Thereafter, the ends of the hoop are radially inwardly turned at 74 and 76 to further extrude the cement and form the barrier 70 which is generally U-shaped when viewed in radial cross section. As a result of these operations, the cement is extruded into a pair of elongated paths 78 and 80 which respectively terminate at entrant beads 82, 84 to thereby establish a moisture entrant path which is extremely long and tortuous in comparison with its thickness. Inasmuch as the prospective diffusion path is thus confined to the aforementioned tortuous path by the impervious nature of the barrier 70, the moisture diffusion rate is reduced to a small fraction of the same construction without a similar barrier.

An alternate form of cement joint 22' between the lens 14 and the reflector 12 is shown in FIG. 3 wherein the moisture impervious barrier 70' takes the form of a thin metallic plating which exteriorly clads and overlies the extruded entrant bead 86 of the cement joint 22'. The barrier 70' may be conveniently formed by methods such as electrodeposition, electroless deposition, or vapor deposition. This construction also provides a constricted path for restricting moisture diffusion by leaving little or no edge opening for moisture entry.

As shown in FIG. 4, the cement joint 26 between the light source assembly 16 and the reflector 12 is exteriorly clad and overlaid by the moisture barrier 72 which is in the form of a thin spherical ring. The ring is pressed against the cement thereby outwardly extruding the latter into an inner band 90 terminating in an entrant bead 92 and an outer band 94 terminating in an entrant bead 96. As outlined above, the relatively long lengths of the bands 90 and 94, in comparison with their thicknesses, establish tortuous moisture flow paths which minimize the moisture diffusion rate into the lamp envelope 27. Whatever moisture enters the envelope 27 can, of course, be scavenged by a conventional gettering material 98 deposited on the light source assembly 16.

An alternate construction is shown in FIG. 5 wherein the moisture impervious barrier 72' is in the form of a metal foil plating which exteriorally overlies the cement joint 26'. A further modification is shown in FIG. 6 wherein the moisture impervious barrier 72'' constitutes a continuation of the reflective surface 18 and minimizes the entrant moisture path through the cement joint 26'' by establishing a bonded seal with the mounting disc 28.

Recent tests have shown that the service life of a lighting unit made in accordance with the above teachings can be successfully manufactured using the following guidelines:

Cement	3M Scotchweld Structured Adhesive Type EC 2186 (premixed)
Curing time	350° F, for 30 minutes
Outer Diameter of Flanges 60, 62	5 3/4"
Thickness of the barriers	0.001"
Material for the barrier	Aluminum
Thickness of cement joints	1/32"
Thickness of cement at the flanges	0.005" to 0.0015"

Since other changes and modification will be apparent to one skilled in the art, the scope of the invention, as defined by the appended claims is intended to cover such alterations of the illustrative embodiments.

What is claimed is:

1. A sealed beam lighting unit comprising: a reflector member; a lens member, said members having interior surfaces defining a lamp envelope and being formed of moisture impervious materials; a filament carried in said lamp envelope having a shortened service life upon exposure to moisture; a plastic material joining said members and establishing a moisture entrant path into said lamp envelope; and a continuous circumferential metallic plating intimately exteriorally cladding said plastic material that minimizes the entrant moisture path thereby increasing the service life of said filament.

2. A sealed beam lighting unit, comprising: a lens; a reflector; a light source assembly including a filament susceptible to premature burnout occasioned by water

cycle erosion promoted by exposure to moisture; a first cement joint joining the lens and the reflector to define a lamp envelope; a second cement joint mounting the light source assembly on the reflector with the filament being positioned within said lamp envelope, said cement joints being formed of a water pervious material which creates a moisture diffusion path between atmosphere and the lamp envelope; and continuous circumferential metallic moisture barriers intimately contacting and overlying the cement joints to limit the entrant moisture diffusion paths therethrough thereby reducing the moisture diffusion rate and water cycle erosion of the filament.

3. A sealed beam lighting unit, comprising:

15 a reflector member; a lens member, said members having mating peripheral flanges and interior surfaces defining a lamp envelope and being formed of moisture impervious materials; a filament carried in said lamp envelope having a shortened life caused by water cycle erosion promoted by moisture in said envelope; a plastic cement between said members radially outwardly terminating with a peripheral bead, said cement forming a sealed joint and establishing an entrant diffusion path through said bead for moisture entry into said lamp envelope; and a continuous circumferential metallic foil intimately surrounding said joints and extruding said bead at the joint into an elongated tortuous path along said flanges thereby reducing the moisture diffusion rate and prolonging filament life.

30 4. A sealed beam lighting unit comprising: a reflector; a lens, said lens and said reflector having interior surfaces establishing a lamp envelope therebetween; a light source assembly including a filament carried in said lamp envelope, said filament being susceptible to premature burnout due to water cycle erosion promoted by moisture in said lamp envelope; a plastic cement hermetically joining the lens to the reflector, said cement establishing a moisture diffusion path through which moisture can diffuse into said lamp envelope; and circumferentially continuous barrier means formed of a moisture impervious material intimately surrounding and exteriorally overlying said cement for reducing the entrant moisture path into the envelope thereby diminishing said water cycle erosion.

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