

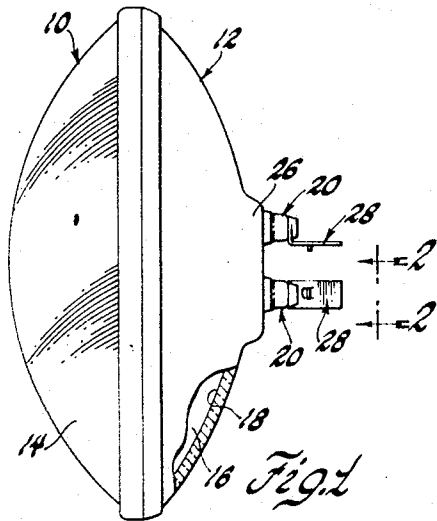
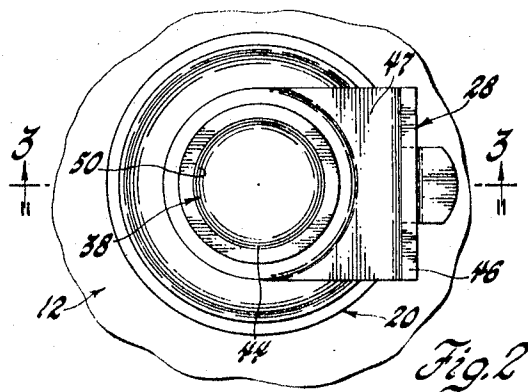
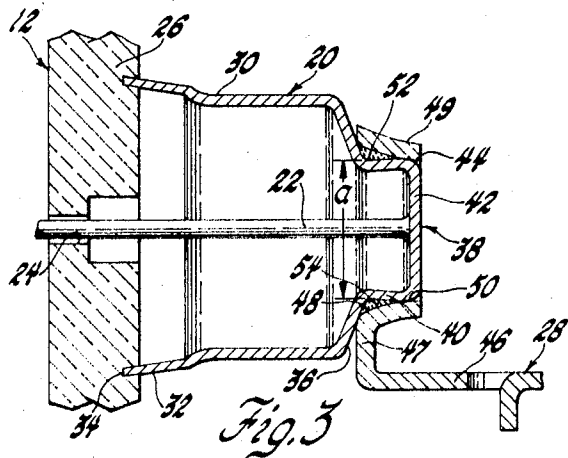
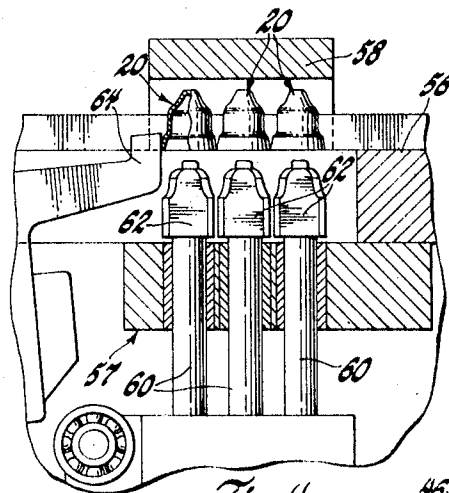
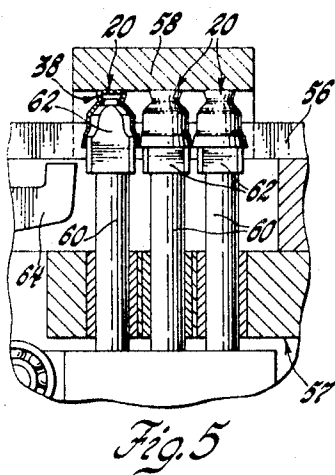
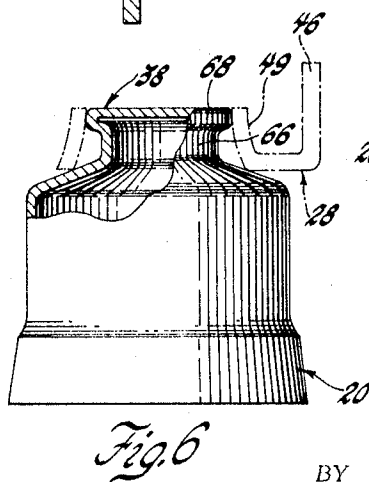
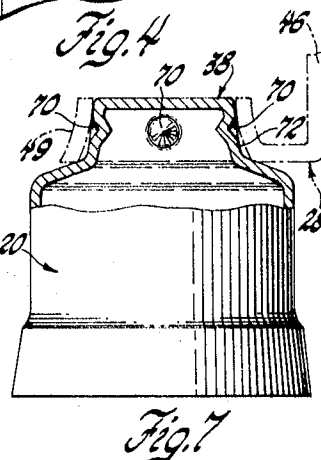
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D. R. BOYS ET AL

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FERRULE FOR SEALED BEAM HEADLAMP

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INVENTORS
Homer R. Gelling
John S. Millet &
Donald R. Boys
BY
C. J. Bishop
ATTORNEY

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FERRULE FOR SEALED BEAM HEADLAMP

Donald R. Boys, Homer R. Gelling, and John S. Miller, Anderson, Ind., assignors to General Motors Corporation, Detroit, Mich., a corporation of Delaware

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6 Claims

ABSTRACT OF THE DISCLOSURE

A ferrule for a sealed beam headlamp has a tapered or otherwise recessed head which interfits with an annular lip of an electrical terminal to form a chamber therebetween in which solder collects and solidifies to form a mechanical lock against relative axial movement between the ferrule and the terminal.

This invention relates generally to headlamps and more particularly to a ferrule for use with the electrical terminal assemblies of all-glass sealed beam headlamps.

Ferrules used in the manufacture of all-glass sealed beam headlamps are made of a special nickel-iron alloy which has a thermal coefficient of expansion approximately the same as that of the glass lamp. A number of these ferrules are commonly fusion sealed about apertures in the rear surface of the glass lamp. Filament lead wires from the lamp interior extend through the apertures and are secured to the inner surface of the electrically conductive ferrules. During manufacture, the glass lamp and attached ferrules are heated to temperatures which cause an oxide to form on the outer surface of the ferrules. A cleaning operation is performed to remove the oxide so that solder used to attach the electrical terminal to the ferrule will readily adhere to the surface of the ferrule. It has been found, however, in a relatively small, but significant, percentage of lamps manufactured that a complete removal of the oxide is not obtained and consequently the solder bond between the ferrule and the electrical terminal is weak and unable to withstand the stresses applied during lamp inspection. Use of a strong flux to obtain better cleaning of the ferrule surface has been found to cause microscopic pin holes at the base of the ferrule adjacent its connection to the glass lamp. This condition cannot be tolerated since the lamp must be hermetically sealed.

The present invention solves this problem by providing a mechanical connection between the ferrule and terminal so as to supplement the adhesive bond solely relied on formerly. According to one form of the present invention, the ferrule has a tapered head resembling an inverted conical segment which is formed integrally with the main cylindrical body of the ferrule. The base leg of the mating electrical terminal is received about the ferrule head and is formed so that a wedge-shaped annulus or chamber is defined between adjacent surfaces of the ferrule head and terminal. As the terminal is soldered to the ferrule, the chamber fills with solder which when solidified forms a lock ring to prevent mechanical separation of the ferrule and terminal. An adequate bond between the lock ring and terminal is assured since the terminal is not subject to the cleaning problems of the ferrule.

One of the features of this invention is that it provides a ferrule of improved design which makes possible a mechanical bond between the ferrule and associated electrical terminal in addition to the conventional adhesive bond.

Another feature of this invention is that the exterior surface of the ferrule is shaped to define at least one chamber with the adjacent terminal surface.

Still another feature of this invention is that a non-deformable lock ring is provided in a chamber formed in the ferrule and bonded securely to the terminal to prevent mechanical separation of the terminal and ferrule.

The features of the invention will be made apparent in the following detailed description wherein reference is made to the accompanying drawings in which:

FIGURE 1 is a side elevational view of a sealed beam headlamp embodying the invention;

FIGURE 2 is an enlarged view taken generally in a plane defined by the line 2—2 of FIGURE 1;

FIGURE 3 is a sectional view taken generally in a plane defined by the line 3—3 of FIGURE 2;

FIGURE 4 is a fragmentary view of a ferrule-shaping machine with ferrules in position to be formed;

FIGURE 5 is a view similar to FIGURE 4 showing the ferrules being formed;

FIGURE 6 is an enlarged view of one modification of the ferrule; and

FIGURE 7 is a view similar to FIGURE 6 of another modification.

Referring to FIGURES 1, 2, and 3, there is shown a conventional all-glass sealed beam headlamp 10 which includes a concave reflector section 12 and a lens section 14 fusion sealed to the reflector section 12 at their peripheries to form a sealed envelope or chamber 16. The inner surface 18 of the reflector section 12 is commonly shaped as a paraboloid and has a highly reflective coating. A light filament (not shown) is normally located in front of the reflector inner surface 18 and is supported thereat by lead wires which pass through apertures at the rear of the lamp and attach to the inner surface of ferrules 20. FIGURE 3 shows one such lead wire 22 passing through an aperture 24 in the back wall 26 of lamp 10 and brazed or otherwise attached to the inner surface of ferrule 20 which is fusion sealed to the lamp 10 about the aperture 24. An electrical terminal 28 is received about the ferrule 20 and is soldered thereto to electrically connect the filament lead wire 22 to a source of electricity.

The ferrule 20, according to this invention and as best seen in FIGURE 3, is a generally bell-shaped member of thin-wall metallic construction having a cylindrical body 30 which flares slightly outward at the bottom or open end thereof to form a skirt 32. The wall thickness of the skirt 32 tapers to a relatively thin edge 34 which is embedded in the back wall 26 of lamp 10 and fusion sealed thereto.

The upper or outer end of body 30 has an inwardly turned shoulder 36 and a cap or head 38 integrally formed therewith about the inner extent of the shoulder 36 to provide a closure for the outer end of body 30. Head 38 includes a tapered axially extending wall portion 40 and a base member 42 which extends transversely to the longitudinal axis of the ferrule. The tapered wall portion 40 may be envisioned as a segment of an inverted cone whose base is the base member 42 and whose apex lies on the longitudinal axis of ferrule 20. The base member 42 and the conical portion 40 form an annular rim 44 concentric with the body 30 and with a diameter greater than that of the constricted neck (a) at the shoulder 36 but smaller than the outer diameter of the body 30.

The electrical terminal 28 is generally L-shaped and includes a blade-type connector member 46 and an integral base member 47. An aperture or eyelet 48 is punched in the base member 47 and is sized to allow the base member 47 to be received about the head 38 with a close fit at rim 44. The base member 47 seats upon the shoulder 36 to locate the terminal 28 on the ferrule 20 and includes a flared portion 49 about eyelet 48 which has generally vertically projecting walls and forms a joint 50 with head 38 at the rim 44. Referring to FIGURE 3,

it may be seen that a chamber or annulus 52 is formed between the outer surface of the conical portion 40 and the inner surface of the flared portion 49. The annulus 52 is generally wedge-shaped in cross section with the thin edge or apex of the wedge near the rim 44 and the base at the shoulder 36.

The terminal 28 and ferrule 20 are secured together by soldering about the joint 50. During the soldering process molten solder is drawn into the annulus 52 where it solidifies into a nondeformable lock ring 54 which preferably bonds well with both the terminal 28 and ferrule 20. However, if the bond with the ferrule proves to be weak because of oxide deposits on the ferrule surface, an excellent bond is nevertheless assured between the terminal 28 and lock ring 54 since the terminal surface may be properly prepared for soldering purposes before the terminal is placed upon the ferrule. The terminal and ferrule are thus mechanically as well as adhesively joined together since the lock ring 54 is captured within the annulus 52 and cannot be pulled over the rim 44.

FIGURES 4 and 5 show one method of forming the head 38 of ferrule 20. In FIGURE 4 a number of pre-formed ferrules 20 are shown positioned on the feed track 56 of a ferrule-forming machine 57 which further includes a flattening plate 58 and a number of punches 60. The punches may be actuated by an air cylinder and have appropriately shaped heads 62 which fit within and support the ferrules 20 as the heads 38 are formed. As shown in FIGURE 5, the punches 60 are driven upward through an opening in the track 56 to drive the ferrules 20 against the plate 58 and form the heads 38. An arm 64 is cyclically operable to position the ferrules above the punches and to allow them to move forward on the track 56 after the ferrule heads have been formed and the punches retracted.

FIGURES 6 and 7 show two modifications of the ferrule 20. Referring to FIGURE 6, head 38 of ferrule 20 includes an axially extending wall portion 66 which is recessed beneath the radially outwardly extending annular rim 68. It will be apparent that an annular chamber is formed about wall portion 66 and beneath rim 68 when the electrical terminal 28 is seated on the ferrule 20. The chamber may be filled with solder in the manner previously described to form a lock ring therein which cannot be forced over the rim 68. The wall portion 66 may be straight or tapered. In FIGURE 7 head 38 of ferrule 20 has a number of indentations or recesses 70 formed about the circumference of wall portion 72. The recesses 70 may be of various shapes and may vary in number. Each such recess forms a chamber with the adjacent surface of electrical terminal 28 wherein solder may be deposited to form a mechanical locking member for the electrical terminal assembly.

While not shown in the drawings, it will be understood that the vertically extending flared portion or lip 49 of terminal 28 may project upwardly a short distance past the outer, generally flat surface of head 38, thus forming a pocket or basin therewith at the top of ferrule 20. This pocket serves as a retainer for the molten solder to allow for ease of assembly during the manufacturing process and provides a more secure soldered joint since the quantity of solder remaining in the pocket after hardening furnishes additional bonding between the ferrule and terminal.

While preferred embodiments of the invention have been shown and described, it will be understood that the invention includes any and all modifications falling within the scope of the following claims.

What is claimed is:

1. A ferrule for a sealed beam headlamp to support on an interior surface a lead wire of a filament located interior of the headlamp and on an exterior surface an electrical terminal having an annular lip defining an aperture, the ferrule being formed of a conductive material and serving as an electrical connector between said lead wire and said terminal, said ferrule comprising: a thin-wall

tubular body having an open end and a closed end, the open end of the ferrule adapted to be rigidly secured to said headlamp; a head of reduced diameter formed at the closed end of said tubular body and adapted to be received within said aperture and surrounded by said annular lip, said head being defined by: an inwardly turned annular shoulder, an axially extending cylindrical wall, and an annular base, said wall and said base forming an annular rim concentric with said tubular body; and at least one inwardly extending indentation formed in said wall between said shoulder and said base whereby the space between said indentation and said annular lip forms a chamber in which solder may be deposited to form an adhesive bond between the terminal and the ferrule and a supplemental mechanical lock against said indentation to prevent relative axial movement between the ferrule and the terminal.

2. A ferrule for a sealed beam headlamp to support on an interior surface a lead wire of a filament located interior of the headlamp and on an exterior surface an electrical terminal having an annular lip defining an aperture, the ferrule being formed of a conductive material and serving as an electrical connector between said lead wire and said terminal, said ferrule comprising: a cylindrical body having an open end and a closed end, the open end of the ferrule adapted to be rigidly secured to said headlamp; a head of reduced diameter formed at the closed end of said cylindrical body and adapted to be received within said aperture and surrounded by said annular lip, said head being defined by: an inwardly turned annular shoulder, an axially extending conical wall diverging outwardly from said shoulder and terminating at an annular base extending transversely to the longitudinal axis of said cylindrical body, said conical wall and said base forming an annular rim concentric with said cylindrical body whereby the space between the rim, the conical wall, the shoulder, and the annular lip forms a wedge-shaped annular chamber in which solder may be deposited to form an adhesive bond between the terminal and the ferrule and a supplemental mechanical lock against said head to prevent relative axial movement between the ferrule and the terminal.

3. A ferrule for a sealed beam headlamp to support on an interior surface a lead wire of a filament located interior of the headlamp and on an exterior surface an electrical terminal having an annular lip defining an aperture, the ferrule being formed of a conductive material and serving as an electrical connector between said lead wire and said terminal, said ferrule comprising: a cylindrical body of thin-wall metallic construction having an open end and a closed end, the open end of the ferrule adapted to be rigidly secured to said headlamp; a head of reduced diameter formed at the closed end of said circular body and adapted to be received within said aperture and surrounded by said annular lip, said head being defined by: an inwardly turned annular shoulder, a cylindrical wall extending axially from said shoulder and terminating at an annular base extending transversely to the longitudinal axis of the cylindrical body and having a diameter greater than said cylindrical wall whereby the space between said cylindrical wall, said base, said shoulder, and said annular lip forms a ring-like chamber in which solder may be deposited to form an adhesive bond between the terminal and the ferrule and a supplemental mechanical lock against said head to prevent relative axial movement between the ferrule and the terminal.

4. An electrical terminal assembly for the lead wires of a sealed beam headlamp, comprising: a ferrule of general cylindrical configuration having an open end and a closed end, the closed end terminating with an integral head defined by an inwardly turned annular shoulder, an axially extending cylindrical wall, and an annular base, said wall and said base forming an annular rim concentric with said open end; at least one inwardly extending recess formed in said wall between said rim and said

5

shoulder; a terminal including a base member having a raised annular lip defining an aperture, said head being received within said aperture and surrounded by said lip with a portion of said terminal engaging said shoulder, said lip and said recess forming a pocket therebetween; and solder bonding the inner surface of said lip to the outer surface of said wall and located in said pocket to electrically join said terminal to said ferrule and mechanically lock said terminal and said ferrule against relative axial movement.

5. An electrical terminal assembly for the lead wires of a sealed beam headlamp, comprising: a ferrule of general cylindrical configuration having an open end and a closed end, the closed end terminating with an integral head defined by an inwardly turned annular shoulder, an axially extending conical wall diverging outwardly from said shoulder and terminating at an annular base extending transversely to the longitudinal axis of the ferrule, said wall and said base forming an annular rim concentric with said open end; a terminal including a base member having a raised annular lip defining an aperture, said head received within said aperture with said base member engaging said shoulder whereby said shoulder, said wall, said rim and said lip define an annular chamber therebetween; and solder bonding the inner surface of said lip to the outer surface of said shoulder and said wall to electrically join said terminal to said ferrule, said solder cooperating with said head to mechanically lock said terminal and said ferrule against axial separation.

6. An electrical terminal assembly for the lead wires

6

of a sealed beam headlamp, comprising: a ferrule having an open end and a closed end and including a tubular body; a head of reduced diameter, said head being formed at the closed end of said ferrule and being defined by an inwardly turned annular shoulder, an axially extending cylindrical wall terminating at an annular base extending transversely to the longitudinal axis of the ferrule, said base defining an annular rim having a greater diameter than said cylindrical wall; a terminal including a base member having a raised annular lip defining an aperture, said head being received within said aperture with said base member engaging said shoulder whereby said rim, said wall, said shoulder and said lip define an annular chamber therebetween; and solder bonding the inner surface of said lip to the outer surface of said rim, said wall and said shoulder to electrically join said terminal to said ferrule and mechanically lock said terminal and said ferrule against axial separation.

References Cited

UNITED STATES PATENTS

1,650,289	11/1927	McGinley	313—318
2,317,032	4/1943	Cotman et al.	174—50.61 X

LEWIS H. MYERS, *Primary Examiner*.

D. A. TONE, *Assistant Examiner*.

U.S. Cl. X.R.

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