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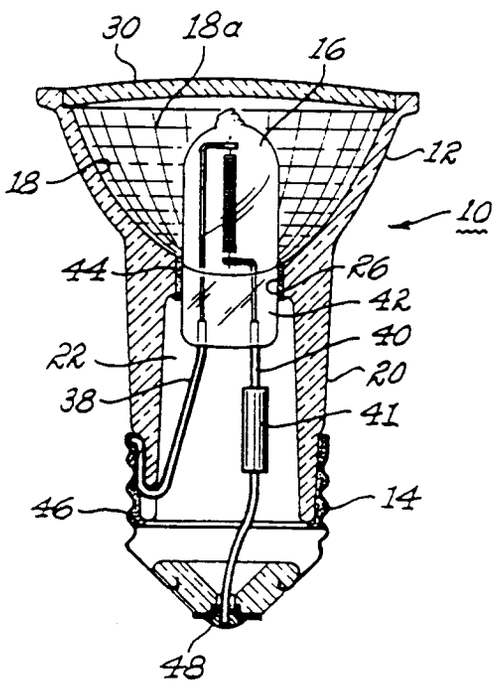
(54) Reflector lamp.

(57) A multifaceted reflector lamp has a tungsten-halogen lamp for the light source which is adapted for line voltage operation. Additionally, the molded glass reflector member being employed includes an extended lower portion enabling lamp installation in customary socket fixtures. In a preferred embodiment, the tungsten filament coil has an improved microstructure.

Fig. 2



EP 0 465 198 A2

In U.S. Patent Application Serial No. 07/521,-201, (Attorney Docket LD10,074) filed May 9, 1990 in the names of John W. Pugh and Donald L. Bly, (European Patent Application 91106807.0)there is disclosed an improved tungsten filament wire micro-structure particularly useful for lamp constructions of the present invention. Accordingly, the entire contents of said copending application are specifically incorporated herein by reference.

This invention relates generally to a multifaceted reflector lamp and more particularly to a multifaceted reflector lamp having an inner tungsten-halogen lamp for its light source and constructed in the manner enabling line voltage operation.

A variety of multifaceted reflector lamps are already known which employ a tungsten-halogen lamp as the light source to provide a precisely focused light beam pattern for many end product applications such as display and spot lighting. Conventional reflector lamps of this type such as disclosed in U.S. Patents 4,021,-659 and 4,494,176, both assigned to the present assignee, are of relatively compact construction having the tungsten-halogen lamp being mounted in the base of the reflector member and with said light source being operated at relatively low voltages, typically twelve volts. Such low voltage operation of the conventional lamps can further require transformers in order to lower the customary line voltages available which understandably raises lamp costs for the user. Accordingly, efforts have already been made by lamp manufacturers to introduce a lamp of this type for operation at existing line voltages of 100-130 volts.

The higher voltage operation lamps of this type introduced so far have been further constructed in a manner enabling lamp installation in existing screw type socket fixtures. One such lamp extends the length of said lamp with a ceramic collar or skirt being adhesively bonded at one end to the base of a conventional compact reflector member with the opposite end of said ceramic extension being adhesively bonded to a candelabra sized metal screw base shell. In a different lamp construction, a conventional compact reflector member is encased in a ceramic housing of extended length and with the other end of said ceramic housing being adhesively bonded to a conventional sized line voltage screw base shell. Both of said available lamp constructions prove undesirable in proliferating the number of lamp parts which must be assembled together as well as the attended costs in doing so. Moreover, the particular ceramic parts employed for said lamp constructions are found to have significant weight thereby possibly risking dislodgement if installed in overhead fixtures as well as further requiring fixture manufacturers and users to modify features in the existing fixtures.

Illustrative embodiments of the invention disclosed herein seek:

to provide an improved multifaceted reflector lamp for operation at line voltages such as 100-130 or 200-250 volts;

to provide such higher voltage lamp construction having an extended length enabling installation in existing socket fixtures; and/or

to provide a multifaceted reflector lamp for operation at line voltages which employs an improved tungsten-halogen lamp as the light source.

In accordance with an embodiment of the invention, modified construction of a molded glass reflector member now enables manufacture of a multifaceted reflector lamp having a minimum number of lamp parts. More particularly, a reflector member in an embodiment of the present invention employs a multifaceted parabolic reflecting surface which terminates in a longitudinally extending bottom portion, the bottom portion being provided with a circular outer contour sized at the terminal end to accommodate insertion into a hollow metal screw base shell for adhesive bonding thereto while further being provided with a hollow internal cavity reduced in size at the reflector end of said bottom portion to provide a slot opening into which a tungsten-halogen lamp member is inserted for adhesive bonding thereto while the external lead conductors for said lamp member extend beyond the opposite end of said hollow cavity for electrical connection to the hollow metal screw base shell. Such assembled construction enables the tungsten-halogen lamp to be positioned approximately at the focal point of the multifaceted parabolic reflecting surface with the lamp member comprising an elongated sealed envelope of light transmissive vitreous ceramic material containing an inert gas fill and a halogen substance together with an axially aligned tungsten filament coil being suspended therein from electrical conductors sealed at one end of the lamp envelope in a pinch seal region and protruding from the sealed envelope. The tungsten filament coil in said lamp member is sized for line voltage operation at the desired wattage rating in a customary manner with selection of the improved tungsten filament wire disclosed in the aforementioned commonly assigned patent application desirably enabling a more sag resistant coil construction to be formed. An improved reflector lamp construction of this type can generally further include a lens element being affixed at the top portion of the reflector member.

Various type single-ended tungsten-halogen lamps can also be employed as the light source in the aforementioned precisely focused reflector lamp construction. For example, the lamp construction can employ a vitreous lamp envelope formed with fused quartz but which generally further requires that the electrical conductors supporting the lamp filament be hermetically sealed within the lamp envelope with thin refractory metal foil elements as illustrated in the above cited 4,021,659 prior art patent. Alternately,

various glass-halogen lamp constructions can be employed wherein the vitreous lamp envelope is formed with a refractory glass such as aluminosilicate glass compositions, and which differs structurally from a quartz-halogen lamp primarily with respect to the means employed to hermetically seal the filament electrical conductors to the lamp envelope. In this regard, a closer match in thermal expansion between the selected glass material and molybdenum metal generally employed to form said filament lead conductors, enables elimination of the foil elements conventionally employed for hermetic seal in the quartz-halogen lamp construction. A further economic benefit in the lamp costs is generally realized with such glass-halogen type lamp construction. Less costly metal wire of larger diameter can be joined to the filament electrical conductors in a pinch seal region of the lamp glass envelope and further provide structural support of the entire lamp member. The lamp fill is generally employed at substantially superatmospheric pressure in order to improve lamp efficacy at higher operating temperatures.

In a preferred embodiment, a reflector lamp enabling installation in line voltage socket fixtures comprises:

(a) a molded glass reflector having a multifaceted parabolic reflecting surface which terminates in a longitudinally extending bottom portion,

(b) a tungsten-halogen lamp being positioned approximately at the focal point of the reflector and being mounted in the bottom portion thereof, the lamp comprising an elongated sealed envelope of light transmissive vitreous ceramic material containing an inert gas fill and a halogen substance together with an axially aligned tungsten filament coil sized for line voltage operation which is connected at opposite ends to a first pair of reflector metal electrical conductors and with opposite ends of said refractory metal electrical conductors being joined to a second pair of larger diameter electrical conductors exhibiting greater thermal expansion characteristics in the pinch seal region at one end of the lamp envelope and with said larger diameter electrical conductors protruding from the sealed lamp envelope,

(c) the bottom portion of the reflector member being provided with a circular outer contour sized at the terminal end to accommodate insertion into a hollow metal screw base shell for adhesive bonding thereto while further being provided with a hollow internal cavity reduced at the reflector end of said bottom portion to provide a slot opening into which the pinch sealed end of the lamp envelope is inserted for adhesive bonding thereto while the terminal ends of both protruding lamp conductors extend beyond the opposite end of said hollow cavity for electrical connection to the hollow metal screw base shell, and

(d) one of said protruding lamp conductors further being electrically connected to a fuse element. The tungsten filament wire selected for optimum coil construction in said preferred lamp embodiment features the previously indicated sag resistant microstructure wherein a Grain Shape Parameter value of at least about 10 is exhibited. Adhesive bonding of both lamp and base shell members to the bottom portion of the reflector can employ conventional organic or ceramic cements. Likewise, conventional electrical connection of the protruding lamp conductors to the metal base shell can be provided with soldering or welding.

For a better understanding of the present invention, reference will now be made, by way of example, to the accompanying drawings, in which:-

FIG. 1 is a perspective view illustrating one reflector lamp embodiment of the present invention.

FIG. 2 is a side view partially in cross section for the FIG. 1 lamp embodiment.

Referring to the drawings, there is depicted in FIG. 1 an improved multifaceted reflector lamp construction 10 in accordance with one embodiment of the present invention. The reflector lamp 10 includes a reflector member 12 secured to a hollow metal screw base shell 14 in the manner hereinafter defined and a tungsten-halogen lamp 16. Reflector 12 has an internal reflective parabolic surface 18 which further includes a pattern of multiple facets 18a molded into the glass member when initially molded or pressed in a conventional manner. A reflective coating is further deposited on the internal parabolic surface which may be typically a silver, aluminum or dichroic type coating. Bottom portion 20 extending from the base of said parabolic surface 18 is of a circular shape with a slightly downward conical contour 21 being provided to facilitate molding of said reflector member. Bottom portion 20 further includes a hollow internal cavity 22 reduced in size at the reflector end of said bottom portion to provide a slot opening 26. A central opening (not shown in the present drawing) is also provided at the opposite end of said bottom portion to enable lamp member 16 to be electrically connected to the hollow metal screw base shell 14. Parabolic reflecting surface 18 is further closed at its top end with a conventional lens element 30. As can be seen in the present drawing, tungsten-halogen lamp 16 is physically mounted in slot opening 26 of the reflector bottom portion for adhesive bonding thereto with a suitable cement material (not shown).

Tungsten-halogen lamp 16 includes an axially aligned tungsten filament coil 31 hermetically sealed within an elongated lamp envelope 33 so as to have the center of the tungsten coil reside approximately at the optical focal point of reflector 12. Filament coil 31 is physically suspended within lamp envelope 33 by a composite assembly of "lead wire" type electrical

conductors 34, 36, 38 and 40. More particularly, such cooperating lead wire construction employs a first pair of electrical conductors 34 and 36 connected at one end to the lamp filament coil 31 while being individually connected at the opposite ends to larger diameter electrical conductors 38 and 40 in the stem press region 42 of the lamp envelope 33. For a typical lamp construction, suitable inner electrical conductors 34 and 36 can be formed with fine size diameter molybdenum alloy whereas suitable protruding electrical conductors 38 and 40 can be formed with an electrically conductive metal having greater thermal expansion characteristics, such as nickel plated iron or nickel iron alloy at larger diameter size. Electrical conductors 38 and 40 are shown (in phantom) to extend through the entire length of reflector bottom portion 20 and protrude therefrom for electrical connection to the hollow metal shell base 14. Fuse element 41 has also been shown (in phantom) for connection to conductor 40 in the conventional manner.

For optimum performance in providing a precisely focused light beam pattern with the herein illustrated reflector lamp embodiment 10, accurate positioning of the tungsten filament coil 31 with respect to the optical focal point of reflector 12 is understandably important. Accurate centering of said filament coil within lamp envelope 33 helps achieve this objective with the center axis of a cylindrical filament coil being aligned substantially coincident with the longitudinal center axis of the tubular shaped lamp envelope being depicted. Retaining such desired filament coil alignment during lamp operation becomes more difficult for lamps being operated at the customary household voltages previously indicated, however, due to smaller wire diameter sizes and longer filament lengths generally being required. To still further illustrate such difference in tungsten filament coil requirements, there is disclosed in further commonly assigned U.S. Patent 4,524,302 typical filament requirements for both low voltage type and line voltage type tungsten-halogen lamp constructions. As can be seen from reference to Tables 2-3 therein, typical 120 volt A-line type lamps require much longer filament wire length and significantly smaller wire diameter size than required for the lower operating voltage lamps. It becomes increasingly important in the present line voltage lamp construction, therefore, that the filament coil resist undue sagging or distortion at the relatively extreme lamp operating temperatures being encountered. Accordingly, construction of the low-sag tungsten filament coil as disclosed in the copending application specifically incorporated herein by reference is contemplated as a still further means of achieving optimum performance in the present reflector lamp construction.

A side view of the FIG. 1 lamp embodiment is depicted in FIG. 2 to still further help explain said lamp construction. More particularly, a cross section of the hereinbefore illustrated reflector lamp 10 is provided enabling more details of the electrical interconnection between tungsten-halogen lamp 16 and hollow metal screw base shell 14 to be seen along with the particular physical disposition of said lamp member in reflector 12. Accordingly, it can be seen in the present drawing that the press seal end 42 of tungsten-halogen lamp 16 extends below the slot opening 26 provided in said reflector member and with joinder thereto being further provided by a suitable electrically non-conductive refractory cement 44. Bottom portion 20 of said reflector member 12 can also be seen similarly joined to base shell 14 with a suitable non-conductive cement 46. Electrical interconnection of protruding conductor 38 to the side of hollow metal base shell 14 can be provided in the customary manner such as by welding or soldering whereas remaining protruding conductor 40 can be similarly interconnected to a center eyelet 48 provided in said hollow metal base shell. While fuse element 41 is shown in the herein depicted lamp construction as a discrete component it can be further appreciated that parameters of electrical conductor 40 itself can also be selected to serve such function.

It will be apparent from the foregoing description that a generally improved multifaceted reflector lamp construction has been provided which can be installed in conventional socket fixtures. It is contemplated that modifications can be made in the lamp embodiments herein illustrated, however, without-departing from the spirit and scope of the present invention. For example, the parabolic reflecting surface of the reflector member herein illustrated can be provided with already known contours while the reflective surface can be provided with stippling or a diffuse reflective coating as well as still other known multifaceted configurations. Similarly, the present tungsten-halogen lamp construction can include various type tungsten filament coils, sized for the particular wattage requirements, as well as various shape elongated lamp envelope configurations.

Claims

1. A reflector lamp enabling installation in line voltage socket fixtures which comprises:

   (a) a molded glass reflector having a multifaceted parabolic reflecting surface which terminates in a longitudinally extending bottom portion,

   (b) a tungsten-halogen lamp being positioned approximately at the focal point of the reflector and being mounted in the bottom portion thereof, the lamp comprising an elongated sealed envelope of light transmissive vitreous ceramic material containing an inert gas fill and a halogen substance together with an axially aligned tungsten filament coil sized for line voltage operation

and being suspended therein from electrical conductors sealed at one end of the lamp envelope in a pinch seal region and protruding from the sealed envelope, and

(c) the bottom portion of the reflector member being provided with a circular outer contour sized at the terminal end to accommodate insertion into a hollow metal screw base for adhesive bonding thereto while further being provided with a hollow internal cavity reduced in size at the reflector end of said bottom portion to provide a slot opening into which the pinch sealed end of the lamp envelope is inserted for adhesive bonding thereto while the terminal ends of both protruding lamp conductors extend beyond the opposite end of said hollow cavity for electrical connection to the hollow metal screw base.

2. The lamp of claim 1 wherein one of said lamp conductors includes a fuse element.

3. The lamp of claim 1 wherein the lamp envelope is formed with fused quartz and the tungsten filament coil is connected at opposite ends to a first pair of refractory metal electrical conductors with the opposite end of said refractory metal electrical conductors being joined to a second pair of larger diameter electrical conductors exhibiting greater thermal expansion characteristics.

4. The lamp of claim 3 wherein the dissimilar electrical conductors are joined together in the pinch sealed end of the lamp envelope with thin refractory metal foil elements.

5. The lamp of claim 1 wherein the parabolic reflecting surface is formed with an aluminized film.

6. The lamp of claim 1 wherein the parabolic reflecting surface is formed with a dichroic film.

7. The lamp of claim 1 wherein the longitudinally extending bottom portion of the reflector member is of sufficient length to enable lamp installation in existing socket fixtures.

8. A reflector lamp enabling installation in line voltage socket fixtures which comprises:

(a) a molded glass reflector having a multifaceted parabolic reflecting surface which terminates in a longitudinally extending bottom portion,

(b) a tungsten-halogen lamp being positioned approximately at the focal point of the reflector and being mounted in the bottom portion thereof, the lamp comprising an elongated sealed envelope of light transmissive vitreous ceramic material containing an inert gas fill and a halogen substance together with an axially aligned tungsten filament coil sized for line voltage operation which is connected at opposite ends to a first pair of refractory metal electrical conductors and with the opposite ends of said refractory metal electrical conductors being joined to a second pair of larger diameter electrical conductors exhibiting greater thermal expansion characteristics in the pinch seal region at one end of the lamp envelope and with said larger diameter electrical conductors protruding from the sealed lamp envelope,

(c) the bottom portion of the reflector member being provided with a circular outer contour sized at the terminal end to accommodate insertion into a hollow metal screw base for adhesive bonding thereto while further being provided with a hollow internal cavity reduced at the reflector end of said bottom portion to provide a slot opening into which the pinch sealed end of the lamp envelope is inserted for adhesive bonding thereto while the terminal ends of both protruding lamp conductors extend beyond the opposite end of said hollow cavity for electrical connection to the hollow metal screw base, and

(d) one of said protruding lamp conductors further being electrically connected to a fuse element.

9. The lamp of claim 1 or 8 wherein the tungsten filament coil has a microstructure characterized by a Grain Shape Parameter value of at least about 10.

Fig. 1

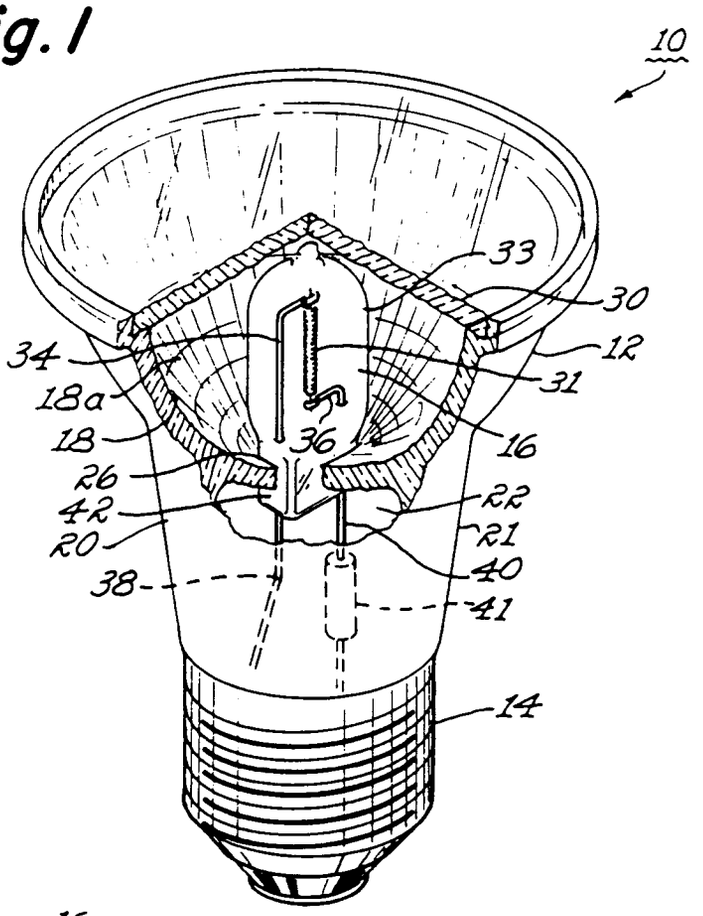

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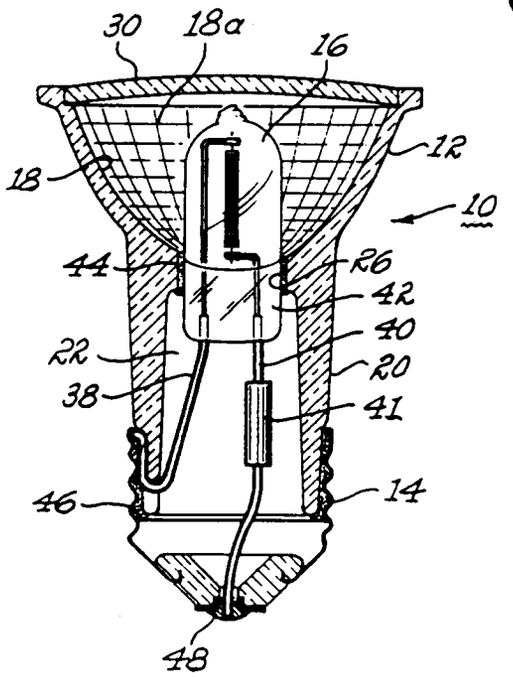
Fig. 2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