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3,445,713

HALOGEN CYCLE INCANDESCENT LAMP

Filed Dec. 12, 1966

FIG. 1.

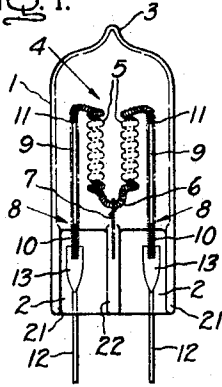


FIG. 2.

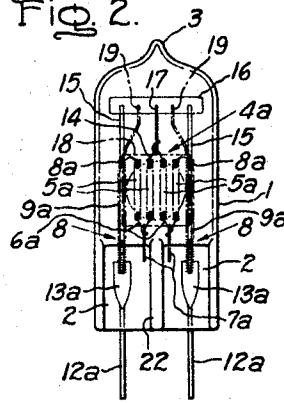


FIG. 3.

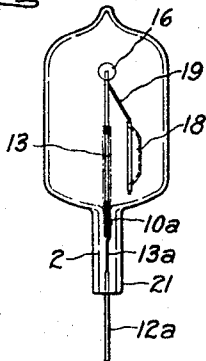
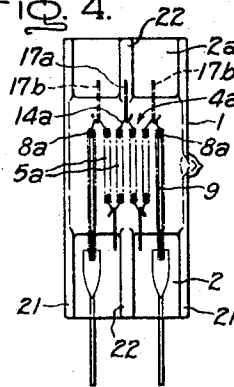


FIG. 4.



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HALOGEN CYCLE INCANDESCENT LAMP

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6 Claims

ABSTRACT OF THE DISCLOSURE

An incandescent halogen cycle lamp embodying a planar type filament and unique supporting structure, wherein the lamp envelope has a pinch seal at least at one (lower) end and which is located in a plane which generally contains the coiled segments of a planar filament. The outermost segments at each side of the filament serve as legs which snugly receive lead-in conductors which extend into and through the pinch seal. Inner segments of the filament are additionally supported at their lower ends by one or more supports extending from the pinch seal and engaging bight portions between adjacent segments. Depending upon the number of inner segments, they may be supported at their upper ends by one or more auxiliary support wires which may be anchored in an elongated bead or bridge extending between portions of the lead-in conductors which extend beyond the upper end of the filament. Such auxiliary support wires may also be anchored in a second pinch seal at the end of the envelope opposite the first-mentioned pinch seal.

BACKGROUND OF THE INVENTION

Field of the invention

This invention relates generally to electric incandescent lamps comprising a sealed envelope containing an incandescible filament. More particularly, the invention relates to lamps of the halogen cycle type comprising a tungsten filament and a gaseous atmosphere comprising a halogen which functions as a regenerative getter by reacting with tungsten particles vaporized from the filament to form a tungsten-halogen compound which returns to the vicinity of the filament where it is dissociated and the tungsten is deposited back upon the filament.

Description of the prior art

It is a requirement of halogen cycle lamps that the envelope be of compact size and shape such that the entire interior surface of the envelope be at a minimum wall temperature sufficient to effect the reaction between the tungsten and the halogen, and that the envelope interior be devoid of substantial pockets wherein halogen compound might condense with eventual removal of halogen from effective relationship with the filament and the hot bulb walls.

In most cases the filament has heretofore been in the form of a simple helical coil or coiled-coil extending axially of a cylindrical bulb or envelope as for example, in Patent 2,883,571—Fridrich et al., assigned to the same assignee as the present invention.

For certain high intensity lighting applications, such as movie light units, there has been a need for an improved lamp having a planar type filament, that is, one which comprises a plurality of coiled segments arranged in generally parallel side-by-side relationship, in or closely adjacent to a single plane and having the desirable features of the halogen cycle incandescent lamp, namely, longer life, greater total light output over life, higher stability of output and color and a compact size.

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Accordingly, it is an object of this invention to provide a halogen cycle lamp in a compact envelope only slightly larger than the planar type filament and having the above-stated features which are inherent in halogen cycle lamps.

It is also an object to provide such a lamp having a support structure of comparatively simple form with a minimum of internal components for comparatively simple assembly and to eliminate the possibility of adversely affecting the halogen regenerative cycle.

SUMMARY

In accordance with one aspect of the invention, the above objectives are achieved by providing a lamp construction wherein the envelope is provided with a flattened pinch seal at least at the lower longitudinal end thereof, and the planar filament is arranged to be substantially in a common plane which also includes the said pinch seal, with a pair of lead-in conductors extending through the said pinch seal into the envelope and through respective outermost side segments of the filament and fitted closely within said segments to provide a sturdy support, and with at least one lower support wire having one end thereof engaging a bight portion connecting the lower ends of adjacent segments of the filament and its other end embedded and anchored in said pinch seal.

In accordance with a further aspect of the invention, the said lead-in conductors may be extended beyond the ends of the said outermost filament segments to a point above the filament, an elongated bead, preferably of fused silica, extends transversely of the envelope above the filament and between the upper ends of said lead-in conductors with portions of said conductors anchored in said bead, and with at least one upper support wire having one end thereof engaging a bight portion connecting the upper ends of adjacent segments of the filament and its other end anchored in said bead.

In accordance with a still further aspect of the invention, a second pinch seal may be provided at the upper end of the envelope, and at least one upper support wire has one end thereof engaging a bight portion at the upper end of the filament and its other end embedded and anchored in said second pinch seal.

BRIEF DESCRIPTION OF THE DRAWING

Further features and advantages of the invention will appear from the following detailed description of species thereof and from the drawing wherein:

FIG. 1 is a front elevation of a lamp comprising the invention;

FIG. 2 is a front elevation of another species of the invention;

FIG. 3 is a side elevation of the FIG. 2 lamp turned at an angle of ninety degrees from the FIG. 2 view; and

FIG. 4 is a front elevation of still another species of lamp comprising the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIG. 1 of the drawing, the incandescent halogen cycle lamp illustrated therein comprises an envelope 1 which is preferably composed of essentially fused silica such as quartz, or the material known as Vycor or as 96% silica glass, and having a flattened compressed portion or pinch seal 2 at its lower end (as shown in FIG. 1) which hermetically seals the envelope from the atmosphere. The envelope 1 contains a filling of inert gas such as argon, plus a small amount of a halogen such as iodine or bromine or compounds thereof which function as a regenerative getter. The evacuation and gas filling is performed through the upper end (as shown in FIG. 1) of the length of tubing of which the envelope 1 is constituted and tipped off at 3.

Filament 4, preferably of tungsten wire, in this case comprises a pair of helically coiled-coil inner segments 5 which constitute the light source proper, and a pair of outer or side segments 11 which serve as leg portions as hereinafter explained, all said segments being arranged in a generally parallel side-by-side relation in or adjacent to a common plane. The common plane defined by the segments 5 and 11 closely coincides with the plane containing the pinch seal 2 at the lower end of the envelope. The coiled-coil segments 5 are electrically connected in series by a lower bight portion 6 of filament 4, preferably a loop of coiled tungsten wire, between the adjacent segments 5. A lower support wire 7 is attached at one end by a hook portion to the lower bight portion 6 and the other end is embedded in pinch seal 2. Lower support wire 7 insures alignment of the coiled-coil segments 5 during lamp operation when the heating and cooling which expands and contracts the segments tends to distort them; in addition, it holds the filament in position in case of vibration or shock such as during shipping or installation of the lamp.

Lead-in conductors 8 comprise inner portions 9 of rigid tungsten or molybdenum wire, which have one (lower) end 10 (as viewed in FIG. 1), embedded in the pinch seal 2 and extend in parallel relationship longitudinally into the envelope. Inner portions 9 preferably are closely fitted along their entire length within the interior of the coiled outermost segments or leg portions 11 of filament 4. The leg portions 11 are preferably securely affixed to the inner portion 9 of the lead-in conductor 8 by tack welding, preferably at the lower end 10 which is embedded in the pinch seal 2.

Inner portions 9 of lead-in conductors 8 are electrically connected, preferably by tack welding, to outer portions 12, preferably composed of molybdenum or tungsten, at a flattened or foliated portion 13 which is hermetically sealed in pinch 2.

The diameter of the envelope 1 is correlated with the size of the filament 4 to maintain a short distance between the filament and the envelope wall to insure proper performance of the halogen regenerative cycle.

Referring to the species shown in FIG. 2, the filament 4a, preferably of tungsten wire, comprises a plurality of helically coiled inner segments 5a and outer segments 8a which are in a generally parallel side-by-side relation in or adjacent to a common plane. As in the previous embodiment, the common plane defined by the coil segments 5a, 8a closely coincides with the plane containing pinch seal 2 at the lower end of the envelope 1 (see FIG. 3). The coil segments 5a (four, or any other even number) are electrically connected in series by upper and lower intermediate loop or bight portions 14 and 6a, respectively. The outermost segments or legs 8a are similarly connected to the adjacent segments 5a at their upper ends.

Inner portions 9a of lead-in conductors 8 are closely fitted along their length within the full length of the interior of the helically coiled outermost segment or leg portions 8a of filament 4a, and they additionally extend beyond the top of filament 4a as shown at 15. To add rigidity and to insure proper alignment of the filament the ends of upper portions 15 of the inner portions 9a of lead-in conductors 8 are embedded in an elongated bead or bridge 16, preferably of quartz or high silica content glass.

The lower ends of inner lead portions 9a are electrically connected, preferably by tack welding, to outer portions 12a at flattened or foliated portions 13a which are hermetically sealed in pinch 2.

To provide further support and alignment for the upper portion of the filament 4a, an upper support wire 17 is attached at one hook-shaped end to intermediate bight portion 14 and the other end is embedded in bead 16. The lower portion of filament 4a is held in position by lower support wires 7a which are each attached at one

hook-shaped end to a lower bight portion 6a and have their other ends embedded in pinch seal 2.

When desired, the lamp shown in FIG. 2 may contain a reflector 18 located behind the filament 4a and in close proximity thereto (as also shown in FIG. 3). As illustrated therein, the reflector 18 is preferably composed of sheet molybdenum, and is supported by a pair of support wires 19 which have their ends embedded in the bridge or bead 16 (see FIG. 3). The exact geometric shape and location of reflector 18 is not critical in the optical system of a light projection device; it is preferably of approximately the shape of the filament structure and is therefore of a substantially rectangular shape and is also preferably dish-shaped within its boundaries. Such a reflector acts to direct light in a direction to increase the apparent brightness of the light source. The spaces between the turns and segments of the filament coils are at least partially filled in with light, the effect of which is to increase the black body characteristics of the surface and to thereby increase the apparent brightness of the source.

In FIG. 4, still another species of the invention is illustrated which has pinch seals at both ends of the envelope. The second pinch seal 2a is formed at the upper longitudinal end of envelope 1 and in a plane coincident with the lower pinch seal 2 and filament segments 5a. The inner portions 9 of lead-in conductor 8 extend longitudinally of the envelope only to the upper portion (as viewed in FIG. 4) of filament 4a. The leg segments 8a of filament 4a are closely fitted along the entire length of the inner lead portions 9.

Additional support and alignment is provided for the upper portion of the filament 4a by upper support wire 17a which is attached at one hook-shaped end to intermediate bight portion 14a and the other end embedded in the second pinch seal 2a. If further support is desired or necessary, additional upper support 17b may be attached to the bight portions connecting the leg segments 8a and the adjacent segments 5a as shown in broken lines in FIG. 4.

The pinch seals 2 (and 2a) may be of a conventional "confined" type which is of I-shaped cross-section having side rail portions 21, and which may also have a central longitudinal rib 22 along each of its flat surfaces.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. An electric incandescent halogen cycle lamp comprising a compact envelope of essentially fused silica having an external flattened pinch seal at the longitudinal lower end thereof and containing an inert gas filling and a halogen functioning as a regenerative getter, a planar type filament comprising a plurality of coiled tungsten wire segments arranged in side-by-side relation longitudinally of the envelope and closely adjacent a common plane which also includes said pinch seal, the proximate ends of adjacent said segments being serially connected by bight portions, a pair of lead-in conductors extending through said pinch seal with rigid inner portions thereof anchored in said pinch seal and extending into the envelope and through respective outermost said segments of the filament to the upper end of the filament and fitted closely within said segments, and at least one lower support wire having one end thereof engaging a bight portion at the lower end of the filament and its other end embedded and anchored directly in said pinch seal.

2. A lamp as set forth in claim 1 wherein the said outermost segments extend downwardly along said rigid inner portions of the lead-in conductors to a point within the said pinch seal.

3. A lamp as set forth in claim 1 wherein the said rigid inner portions of the lead-in conductors extend beyond the ends of said outermost filament segments to a point above the filament, an elongated bead of vitreous material extending transversely of the envelope above the filament and between the upper ends of said lead-in conductors with portions of said conductors anchored in

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said bead, at least one upper support wire having one end thereof engaging a bight portion at the upper end of the filament and its other end anchored in said bead.

4. A lamp as set forth in claim 3 including a proximity reflector member behind said filament, and means supporting said reflector from said bead.

5. A lamp as set forth in claim 1 wherein the envelope has a second flattened pinch seal at its longitudinal upper end and also located in said common plane, at least one upper support wire having one end thereof engaging a bight portion at the upper end of the filament and its other end embedded and anchored in said second pinch seal.

6. An electric incandescent halogen cycle lamp comprising a compact envelope of essentially fused silica having an external flattened pinch seal at the lower longitudinal end thereof and containing an inert gas filling and a halogen functioning as a regenerative getter, a filament comprising a pair of helically coiled-coil segments arranged in side-by-side relation longitudinally of the envelope and closely adjacent a common plane which also includes said pinch seal, the lower ends of said segment being serially connected by a bight portion, a pair of lead-in conductors extending through said pinch seal with

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rigid inner portions thereof anchored in said pinch seal and extending into the envelope alongside respective said filament segments and up to the upper ends thereof, the upper ends of said segments terminating in helically single coiled segments which are fitted snugly around respective said rigid inner portions of the lead-in conductors, and a lower support wire having one end thereof engaging the bight portion at the lower ends of said coiled-coil segments and its other end embedded and anchored directly in said pinch seal.

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313—115, 174, 222, 279