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ARC TUBE MOUNTING FOR HIGH PRESSURE METAL VAPOR LAMPS

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Fig. 1.

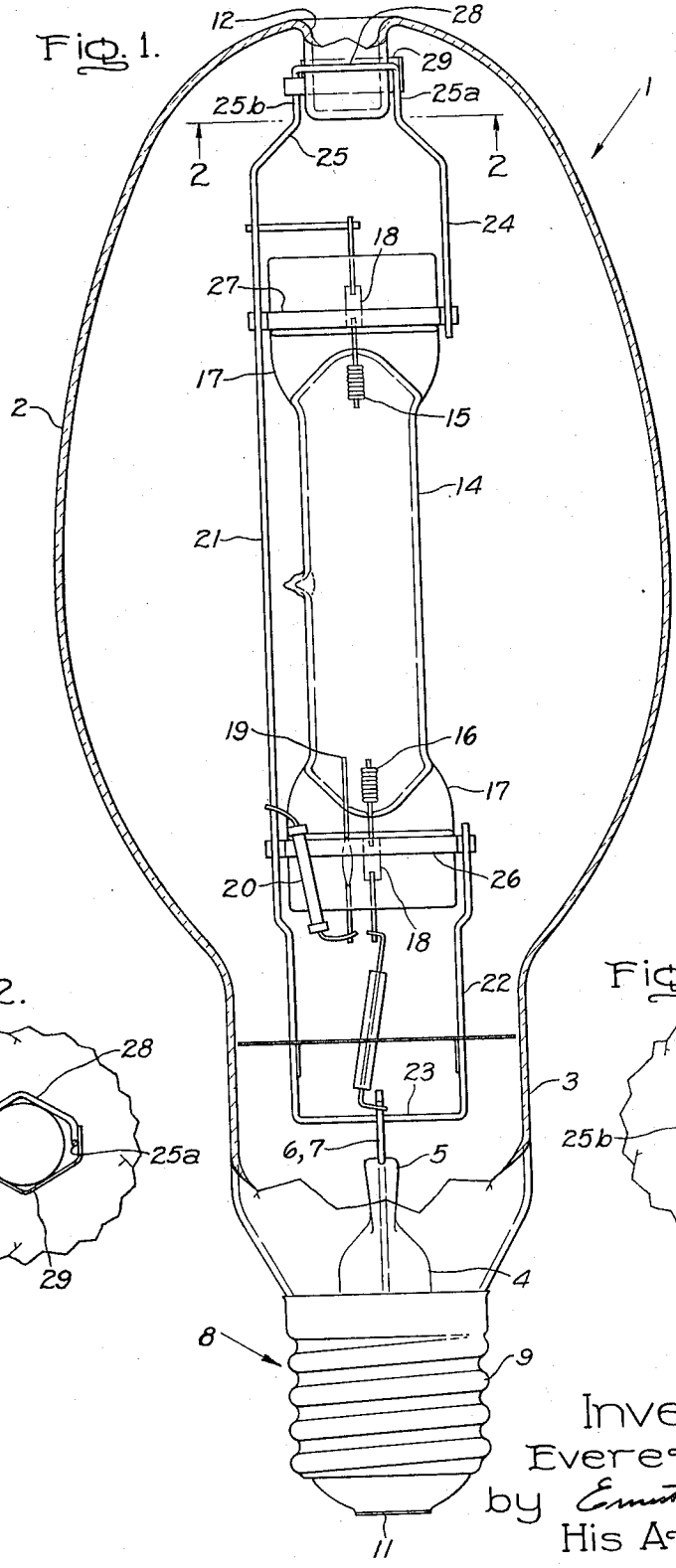
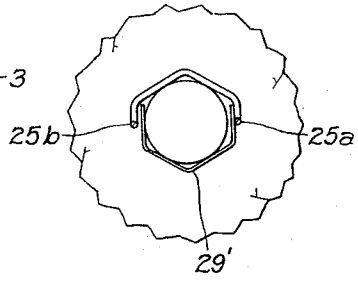


Fig. 2.

Fig. 3.



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ARC TUBE MOUNTING FOR HIGH PRESSURE METAL VAPOR LAMPS

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This invention relates to high-intensity electric discharge lamps having an arc tube mounted in a vitreous outer envelope or jacket. The invention is more particularly concerned with the mounting arrangement or structure for supporting the arc tube within the jacket.

A common form of high intensity lamp is the high pressure mercury vapor lamp which generally comprises a quartz arc tube enclosed within a glass outer jacket fitted with a screw base at one end. The arc tube is provided with thermionic self-heating electrodes at opposite ends and contains a quantity of mercury along with a starting gas. Other kinds of high intensity lamps may use different gas or vapor fillings within the arc tube. Some arc tubes are of materials other than quartz, for instance a known high pressure sodium vapor arc tube utilizes an alumina ceramic envelope. The outer envelope may be left clear or may be coated internally with a phosphor in order to improve the quality or the total quantity of light emitted by the lamp.

The principal object of the invention is to provide a new and improved mounting or support structure for the arc tube within the outer envelope or jacket which is easy and economical to manufacture and strong and reliable in use.

Another object is to provide a support structure for the arc tube which allows the glass to be worked where the stem is sealed to the neck of the outer envelope.

In accordance with the invention, the outer envelope is provided with a reentrant dimple of generally cylindrical configuration at its closed or domed end opposite the base end, and the arc tube supporting frame engages the dimple by means of a clamping member which completes a loop around it. In a preferred embodiment, the supporting frame is a wire harness which extends from the stem at the base end of the outer envelope to the dimple at the closed end. Part of the harness forms a half loop around the dimple, and the loop is completed by a springy clip which is fastened to the harness at one end and provides a resilient clamping engagement between the mount and the dimple. The clip may be provided with a limit lock at its free end to prevent the mount from becoming completely disengaged from the dimple under shock or vibration.

For further objects and advantages and a better understanding of the invention, attention is now directed to the following description and accompanying drawing illustrating embodiments of the invention. The features believed to be novel will be more particularly pointed out in the appended claims.

In the drawing:

FIG. 1 is a side elevation view, partly in section, of a high pressure mercury vapor lamp incorporating the improved arc tube mounting of the invention.

FIG. 2 is an end sectional view looking up along line 2—2 in FIG. 1 and showing the engagement of the dimple in the domed end of the outer envelope by the frame.

FIG. 3 is a view similar to that of FIG. 2 and illustrating a variant in the attachment between frame and dimple.

Referring to the drawing and more particularly to FIG. 1, there is shown a high pressure mercury vapor lamp 1 comprising an outer vitreous envelope or jacket 2 generally of ovoid or ellipsoidal shape and fabricated of hard or soft glass. The neck 3 of the outer envelope is

closed by a reentrant stem 4 having a press 5 through which extend relatively stiff inlead wires 6, 7 connected at their outer ends to the contacts of the usual screw type base 8, namely the threaded shell 9 and the insulated center contact 11. At the dome end of the envelope, there is provided a recess or dimple 12 of generally cylindrical configuration with straight side walls.

The inner arc tube 14 is made of quartz and has enclosed therein at opposite ends a pair of main discharge supporting electrodes 15, 16 on inleads hermetically sealed through the pinched ends 17 of the arc tube by conventional ribbon seals 18. Each main electrode comprises a core portion which may be a prolongation of the inner end of the inlead made of tungsten and surrounded by a double tungsten wire helix. The turns of the helix and the interstices between turns are coated with an emitting mixture of alkaline earth oxides. An auxiliary starting electrode 19 is provided at the base end of the arc tube adjacent main electrode 15, and consists merely of the inwardly projecting end of the inlead. The auxiliary electrode is electrically connected to main electrode 15 at the opposite end of the arc tube through the usual current limiting resistor 20. The arc tube contains a charge of mercury and an inert gas such as argon at a pressure below 100 millimeters of mercury.

The illustrated lamp corresponds to a 400 watt size and the frame which locates and supports the arc tube within the outer envelope is a single side rod harness made from a continuous length of metal wire, suitably nickel-iron alloy or nickel-plated iron wire. The harness comprises a principal vertical portion or side rod 21 which extends longitudinally parallel to the envelope axis substantially from the stem at the base end to the dimple at the dome end. A short vertical portion 22 complements side rod 21 at the lower end and is joined to it by a transverse portion 23 which is welded at its mid-point to inlead wire 6. A similar short vertical portion 24 complements side rod 21 at the upper end and is joined to it by a transverse portion 25. The arc tube is supported in the harness by clamping the flat pinched ends 17 between metal bands 26, 27 which extend between side rod 21 and the complementary end portions 22, 24, respectively. The illustrated single side rod harness causes minimum obstruction of light. In larger sizes of lamps, for instance 1000 watt lamps, where more support is needed, a similar frame is used but having two side rods, the second rod being realized by extending one of vertical portions 22, 24 to join the other.

The frame is anchored at its upper end to the dimple 12 by means of a resilient clamp. The clamp is formed by shaping transverse wire portion 25 to make approximately a half loop 28 as it goes around the dimple. The full loop is completed by a springy metal clip or band 29 which is fastened to one side of half loop 28 at one end and extends to the opposite side of the half loop. As illustrated in FIG. 1, wire half loop 28 consists of straight-sided segments forming half a hexagon. Metal band half loop 29 is shaped in complementary fashion to complete the hexagon and has its end segments overlapping the end segments of the wire loop. One end segment of the band is welded to vertical harness portion 25*a* and the loop end segment next to it. The resiliency in the clamp comes from the metal band 29 which desirably should be made of a material which will withstand the heat of welding without losing its springiness; a suitable material is Monel metal consisting of an alloy of nickel and copper but stainless steel may also be used.

By shaping the loop members, namely the wire half-loop 28 and the metal band half-loop 29 with straight sides in a hexagonal configuration, the loop members engage the dimple at a few points, ordinarily three only, spaced around the circumference. In fabricating the

lamp, the mount assembly which includes the wire harness or frame fastened to the stem and the arc tube clamped into the frame, is first completed. Then the assembly is inserted into the outer envelope by sliding it in through the neck and forcing clamp **28**, **29** onto the dimple **12**. The sliding movement of the clamp on the dimple scrapes phosphor off the dimple in the case of a phosphor-coated lamp. By limiting the engagement of the clamp on the dimple to a few points only, the amount of phosphor which is dislodged is held to a minimum. In sealing the stem **4** to the neck **3**, it is desirable to work the glass of the joint by pulling and pushing the stem and mount assembly relative to the envelope **2** in order to stretch and compress the soft glass at the joint; the resiliency of the clamp allows the sliding movement of the clamp on the dimple necessary for this.

It is desirable that the clamp engage the dimple positively. In the absence of positive engagement, the arc tube frame will rattle in the outer envelope and this is undesirable. At the same time, the engagement must be resilient in order to accommodate dimensional variations in the dimple. The springy metal band **29** assures a positive engagement and can bend out to provide a certain range of tolerance. In order to avoid bending or distorting the wire frame of the mount assembly when the loop clamp is driven home around the dimple, a metal band **29** which is relatively light at the same time as it is springy, must be used. However, this presents the danger that should the lamp be struck sharply or subjected to a blow after assembly, springy band **29** may be forced open and the loop clamp thereupon become completely disengaged from the dimple. According to a feature of the invention, this result is guarded against by means of a limit lock formed by tab **31** at the free end of metal band **29**. The tab is made by bending back a portion of the terminal half segment of the metal band and is so placed that it engages vertical portion **25***b* of the wire frame should the band be forced open too wide. Upon such engagement, further opening of the band is prevented and this provides positive assurance against the loop clamp becoming disengaged completely from the dimple.

In FIG. 3 a variant of the loop clamp is illustrated wherein the metal band **29'** is welded on the inside of the wire half loop and no locking tab is provided. It is primarily on the larger sizes of lamps that the locking tab is desirable, and the arrangement of FIG. 3 has been found suitable for the smaller sizes of high pressure mercury vapor lamps, in general lamps of less than 400 watts rating.

While the invention has been most useful to date in conjunction with high pressure mercury vapor lamps and has been so illustrated and described, the principles are broadly applicable to any type of electric discharge device involving a dual-envelope construction. The specific embodiment which has been illustrated and described in detail is intended of course as exemplary and the scope of the invention is to be determined by the appended claims.

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

1. A dual envelope electric discharge lamp comprising a vitreous outer envelope having a base at one end and an inwardly turned dimple at the other end, an inner arc tube within said outer envelope, and a frame supporting said arc tube within said outer envelope and including a transverse portion at said other end, said frame engaging said dimple by means of a clamp comprising a first half loop formed in said transverse portion and a resilient second half loop formed by a springy clip fastened to one side of the first half loop and extending to the opposite side thereof.

2. A dual envelope electric discharge lamp comprising a vitreous outer envelope having a base at one end and an inwardly turned dimple at the other end, an inner arc tube within said outer envelope, and a metal frame supporting said arc tube within said outer envelope and including a transverse portion at said other end, said frame engaging said dimple by means of a clamp comprising a first half loop formed in said transverse portion and a resilient second half loop formed by a springy clip fastened to one side of the first half loop and extending to the opposite side thereof, said clamp being proportioned to achieve a positive engagement of said dimple, and said clip allowing entry of the dimple into the clamp upon axial insertion of the frame into the outer envelope.

3. A dual envelope electric discharge lamp comprising a vitreous outer envelope having a base at one end and an inwardly turned dimple at the other end, an inner arc tube within said outer envelope, and a metal frame supporting said arc tube within said outer envelope and including a transverse portion at said other end, said frame engaging said dimple by means of a clamp comprising a first half loop formed in said transverse portion and a resilient second half loop formed by a springy metal band fastened to one side of the first half loop and extending to the opposite side thereof, both said half loops being made up of straight-sided segments whereby to engage said dimple at spaced points only.

4. A dual envelope electric discharge lamp comprising a vitreous outer envelope having a dome end and a stem end with a base attached thereto, said envelope having an inwardly turned dimple in the dome end, an inner arc tube within said outer envelope, and a wire harness supporting said arc tube within said outer envelope comprising a side rod extending parallel to the axis of said outer envelope from stem to dome end and including a transverse wire portion at the dome end, said harness engaging said dimple by means of a clamp comprising a first half loop formed in said transverse wire portion and a resilient second half loop formed by a springy metal band fastened to one side of the first half loop and extending to the opposite side thereof.

5. A dual envelope electric discharge lamp as defined in claim **4** and including a limit lock on said resilient second half loop comprising a tab at the free end of said metal band adapted to engage said opposite side of said first half loop after a given opening movement of said metal band in order to limit the extent of said movement.

6. A duel envelope electric discharge lamp comprising a vitreous outer envelope having a stem end and a dome end with a base attached thereto, inleads sealed through said stem, said envelope having an inwardly turned dimple in the dome end, an inner arc tube within said outer envelope, and a wire harness supporting said arc tube within said outer envelope comprising a side rod extending parallel to the axis of said outer envelope from stem to dome end, complementary parallel-extending wire portions at both ends, and transverse wire portions joining the complementary portions to the side rod, one transverse wire portion being fastened to one inlead, the other transverse wire portion having a half loop formed therein, a resilient second half loop formed by a springy metal band fastened to one side of the first half loop and extending to the opposite side thereof, said half loops together forming a clamp engaging said dimple.

7. A dual envelope electric discharge lamp as defined in claim **6** and including a limit lock on said resilient second half loop comprising a tab at the free end of said metal band adapted to engage said opposite side of said first half loop after a given opening movement of said metal band in order to limit the extent of said movement.

No references cited.

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