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Applicant: GTE Products Corporation, 100 West 10th Street, Wilmington, DE 19801 (US)

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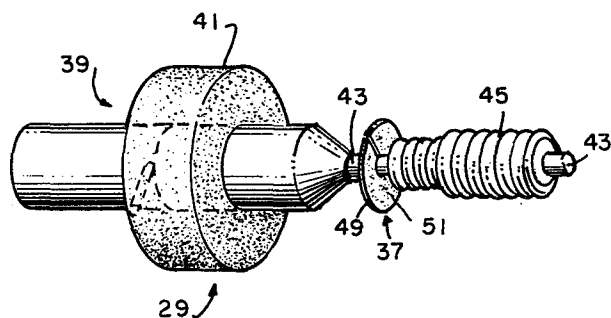
Inventor: White, Philip J., 343, North Street, Georgetown Massachusetts 01833 (US)
Inventor: White, Robert S., 12, Upland Road, Beverly Massachusetts 01915 (US)
Inventor: Scholz, John A., 35, Coolidge Road, Danvers Massachusetts 01923 (US)

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Representative: Bubb, Antony John Allen et al, GEE & CO. Chancery House Chancery Lane, London WC2A 1QU (GB)

Unsaturated vapor high pressure sodium lamp arc tube fabrication process.

In an arc tube fabricating process an oxygen-absorbing getter is affixed to at least one (29) of a pair of electrodes (29, 31), one of the electrodes (31) is sealed into the end of a tubular ceramic envelope (27), a dosage is deposited in the tubular ceramic envelope and the other one (29) of the pair of electrodes is sealed into the other end of the tubular ceramic envelope.



EP 0 122 050 A1

- 1 -

"UNSATURATED VAPOR HIGH PRESSURE SODIUM LAMP ARC TUBE
FABRICATION PROCESS"

CROSS REFERENCE TO OTHER APPLICATIONS

Concurrently filed Applications entitled "Unsatura-
5 ted Vapor Pressure Type High Pressure Sodium Lamp", bear-
ing Attorney's Docket No. 24,340, corresponding to U.S.
Serial No. 473895, and "Unsaturated Vapor High Pressure
Sodium Lamp Getter Mounting", bearing Attorney's Docket
No. 83-1-021 corresponding to U.S. Serial No. 473897,
10 relate to an arc tube and an arc tube fabricating process
for unsaturated vapor high pressure sodium lamps. Also,
concurrently filed Applications entitled "Arc Tube Fabri-
cation Process", bearing Attorney's Docket No. 24,833
corresponding to U.S. Serial No. 473896, and "Arc Tube
15 Dosing Process For Unsaturated High Pressure Sodium Lamps"
bearing Attorney's Docket NO. 24,517 corresponding to
U.S. Serial No. 473892, relate to arc tube fabrication
and arc tube dosing of unsaturated vapor type high pres-
sure sodium lamps.

20 This invention relates to high pressure sodium
lamps of the unsaturated vapor type and more particularly
to a process for fabricating arc tubes for unsaturated
vapor high pressure sodium lamps.

In the field of high pressure sodium lamps, the
25 best known configuration includes a tubular ceramic arc
tube disposed within an evacuated glass envelope. The
arc tube is filled or dosed with a rare gas and an
excessive amount of sodium and mercury. In other

words, the arc tube has a saturated sodium fill because of the well known tendency whereby large amounts of sodium are lost during operation of the lamp. Moreover, such saturated type high pressure sodium lamps leave much to be desired due to the undesired variations in color rendition and operational voltages which are encountered.

In order to eliminate or at least reduce the above-mentioned undesirable characteristics, the so-called unsaturated vapor type high pressure sodium lamp was developed. Herein the construction is somewhat similar to the saturated type lamp except that the dosage of sodium, in particular, is greatly reduced. Moreover, it was found that such a reduction in sodium content was possible so long as provision was made for absorbing the excess oxygen which undesirably accompanied the fill or rare gas which was dispensed into the arc tube.

One of the techniques for effecting this absorption of undesired oxygen within the arc tube is to enclose an oxygen-absorbing getter therein along with the usual dosage of sodium, mercury and a rare gas. One such structure is set forth and described in a concurrently filed application bearing Attorney's Docket No. 24,340, Serial No. , assigned to the Assignee of the present application.

As set forth therein, a getter material is located within the arc tube and in contact with the gases therein. Thus, any undesired oxygen within the arc tube occurring during the sodium or mercury vaporization process or accompanying the admitted rare gas is absorbed by the getter material and compound reformation is inhibited.

However, it has been found that even though the above-described technique has provided great improvement over prior known unsaturated vapor high pressure sodium lamp construction and fabrication, there are still areas which leave something to be desired. More specifically, it has been found that direct contact between the enclosed getter material and the hottest portions of the tubular ceramic envelope of the arc tube tend to cause what appears

to be a chemical reaction therebetween and an undesired darkened area of the ceramic envelope. Obviously, arc tube darkening is not a desirable condition.

An object of the present invention is to provide an improved
5 unsaturated vapor type high pressure sodium lamp. Another object of
the invention is to enhance an unsaturated vapor high pressure
sodium lamp by improving the arc tube therein. Still another object
of the invention is to provide an improved process for fabricating
an arc tube employed in an unsaturated vapor type high pressure
10 sodium lamp. A further object of the invention is to provide a
process for fabricating an arc tube for an unsaturated vapor type
high pressure sodium lamp wherein undesired envelope discoloration
is inhibited.

These and other objects, advantages and capabilities are
15 achieved in one aspect of the invention by a process for fabricating
arc tubes for unsaturated vapor type high pressure sodium lamps
wherein an oxygen-absorbing getter is affixed to one of a pair of
electrodes, a tubular ceramic envelope is dosed with mercury, sodium
and a rare gas and the electrodes are each sealed into an end of the
20 tubular ceramic envelope with the getter therein and spaced from the
envelope.

The invention is illustrated by way of example in
the accompanying drawings, in which:

FIG. 1 is an elevational view of a preferred form of unsaturated
25 vapor type high pressure sodium lamp of the invention;

FIG. 2 is an exploded sectional view of an electrode formed for
attachment of an oxygen-absorbing getter thereto and placement
thereof within an arc tube; and

FIG. 3 is a flow chart illustrating the process steps of
30 fabricating an embodiment of an arc tube of the high pressure sodium
lamp of FIG. 1.

For a better understanding of the present invention, together with other and further objects, advantages and capabilities thereof, reference is made to the following disclosure and appended claims in conjunction with the accompanying drawings.

5 Referring to the drawings, FIG. 1 illustrates an unsaturated vapor high pressure sodium lamp having a hermetically sealed and evacuated glass envelope 5 formed to fit into an ordinary screw-type base member 7. A glass stem member 9 is sealed to the envelope 5 and projects therein. Electrical conductors, 11 and 13
10 respectively, are sealed into and pass through the stem member 9 to provide electrical connections from the interior to the exterior of the glass envelope 5.

An electrically conductive support member 15 is affixed to one of the electrical conductors 11 and has a pair of crossbars 17 and
15 19 affixed thereto at either end. Also, a plurality of spring-like members 21 are affixed to the support member 15 and formed for contact with the glass envelope 5. Moreover, a pair of getters 23 and 25 are attached to the support member 15 and serve to insure the integrity of the evacuated envelope 5.

20 Disposed within the glass envelope 5 and supported by the crossbars 17 and 19 is an arc tube 27. This arc tube 27, preferably of a material such as polycrystalline alumina for example, includes an electrode 29 and 31 at either end thereof. One electrode 29 is affixed to and supported by the crossbar 17 while the other
25 electrode 31 is insulatingly supported by the other crossbar 19, but electrically connected to the electrical conductor 13 passing through the stem member 9. Heat conserving elements 33 may be wrapped about the arc tube 27 at each end thereof in the vicinity of the electrodes 29 and 31 in order to reduce the heat differential
30 thereat from the center of the arc tube 27.

Referring more specifically to FIG. 2 and the placement of an oxygen-absorbing getter 37 therein, it is to be noted that the getter 37 is preferably in the form of a support member or substrate

49 whereon an oxygen-absorbing metal alloy 51 is affixed as by sintering. Preferably, the substrate 49 is of a material such as nickel plated iron and the sintered getter material is an alloy of metals selected from the group consisting of zirconium, aluminum, titanium, scandium, cerium, lanthanum, thorium or yttrium. However, other rare earth oxides are suitable gettering materials for attachment to the substrate 49.

In the process of fabricating the previously-discussed arc tube, 27 of FIG. 1, an oxygen-absorbing gettering material or metal alloy 51 is sintered to a substrate 49 which is preferably in the form of a slitted apertured disc or getter 37. This getter is preferably formed for attachment to the shank portion 43 of the electrode member 39 such as by slipping the slitted apertured disc 37 onto the shank portion 43.

In the arc tube assembly, one of the electrodes 31 is sealed into one end of the ceramic envelope of the arc tube 27. Following, a dosing of sodium, mercury and a rare gas is deposited within the ceramic envelope of the arc tube 27. This dosing includes sodium and mercury in an amount which will become totally vaporized to provide a desired unsaturated vapor type high pressure sodium lamp. Preferably, a sodium-mercury amalgam, which will decompose within the arc tube 27, is deposited therein, and a rare gas is admitted into one end of the arc tube 27.

Thereafter, the other electrode, 29 of FIG. 1, having the oxygen-absorbing getter 37 affixed thereto is sealed into the other end of the arc tube 27. Moreover, this sealing of the electrodes 29 and 31 into the opposite ends of the tubular ceramic envelope of the arc tube 27 is preferably, not necessarily, effected by a frit sealing technique. Therein, a ceramic wafer, 41 of FIG. 2, is affixed to the electrode 39 and a glass frit material, not shown but preferably in the form of a wafer with a central hole, is utilized to effect the desired frit sealing of the electrodes 29 and 31 into the ends of the arc tube 27 in a manner such that the cathode portion 45 and the getter 37 are within the arc tube 27.

Referring to the flow chart of FIG. 3, it can be seen that the arc tube fabrication process is readily effected by sealing an

electrode into one end of a tubular ceramic envelope of the arc tube. Then a dose of sodium, mercury and rare gas is deposited into the envelope in an amount sufficient for vaporization and provision of an unsaturated vapor type high pressure sodium lamp. Thereafter
5 the other end of the tubular ceramic envelope is sealed with an electrode to which is affixed an oxygen gettering material to provide the desired arc tube.

Thus, a process has been provided for fabricating an arc tube for an unsaturated vapor type high pressure sodium lamp. Although
10 one technique for affixing the getter within and spaced from the envelope has been provided, it is obvious that other methods of attachment could be used. For example, the getter could be welded to the cathode shank or dispensed or affixed to the cathode portion
45 of the electrode. In any event, the getter is spaced from the
15 ceramic envelope of the arc tube.

While there has been shown and described what is at present considered the preferred embodiments of the invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the
20 invention as defined by the appended claims.

CLAIMS

1. A process for fabricating an arc tube for an un-saturated vapor type high pressure sodium lamp, characterised in that it comprises the steps of:
 - 5 sealing one (31) of a pair of electrodes (29,31) into one end of a tubular ceramic envelope (27);
depositing a dosing of mercury, sodium and rare gas within said envelope; and
sealing the other (29) of said pair of electrodes
10 into the other end of said tubular ceramic envelope to form the arc tube, and wherein an oxygen-absorbing getter (37) is affixed to at least one (29) of said pair of electrodes prior to sealing thereof into said envelope (27) whereby said getter is enclosed within the arc tube.
- 15 2. A process as claimed in Claim 1, wherein said getter is attached to said other (29) of said pair of electrodes (29,31).
3. A process as claimed in Claim 1 or 2, characterised in that said depositing of said dosing within
20 said envelope includes the depositing of a sodium-mercury amalgam therein.
4. A process as claimed in any one of Claims 1 - 3, characterised in that said oxygen-absorbing getter (37) is in the form of an apertured split supporting disc
25 (37) with an oxygen-absorbing material (51) sintered thereto.
5. A process as claimed in any one of Claims 1 - 4, characterised in that said oxygen-absorbing getter is in the form of a sintered metal (51) affixed to a sub-
30 strate (49).
6. A process as claimed in Claim 5 as appended to

Claim 4, characterised in that it includes the further steps of forming said oxygen-absorbing getter by sintering a metal (51) to an apertured disc support (37), splitting said disc support (37) and attaching said split disc support to said electrode (29) with said electrode passing through said apertured disc.

7. A process as claimed in any one of Claims 1 - 6, characterised in that said getter is in the form of a metal alloy selected from the group consisting of aluminium, zirconium, titanium, scandium, hafnium, cerium, lanthanum, thorium and yttrium.

8. A process as claimed in any one of Claims 1 - 7, characterised in that said oxygen-absorbing getter (37) is contiguous to at least one of said electrodes (29).

9. A process as claimed in any one of Claims 1 - 5, characterised in that said oxygen-absorbing getter is in the form of a zirconium-aluminium alloy sintered to an apertured split nickel-plated iron substrate and said getter is affixed to an electrode by means of said apertured split substrate.

10. A process as claimed in any one of Claims 1 - 9, characterised in that said step of attaching said oxygen-absorbing getter (37) to said at least one electrode (29) includes the step of locating said getter thereon in such a manner that in the finished arc tube it is spaced from said tubular ceramic envelope (27).

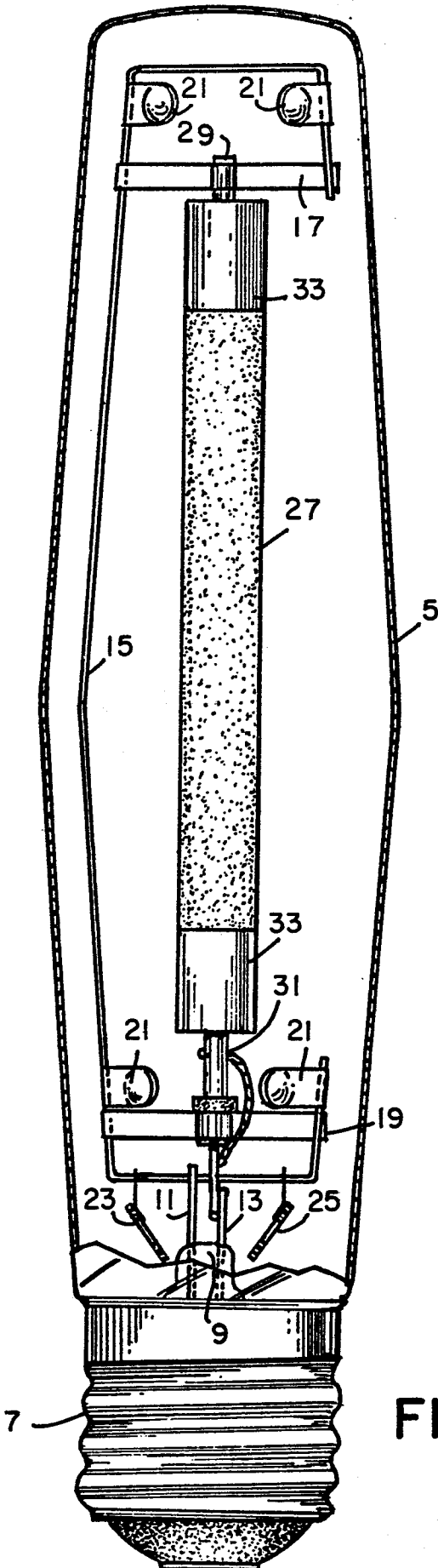


FIG. 1

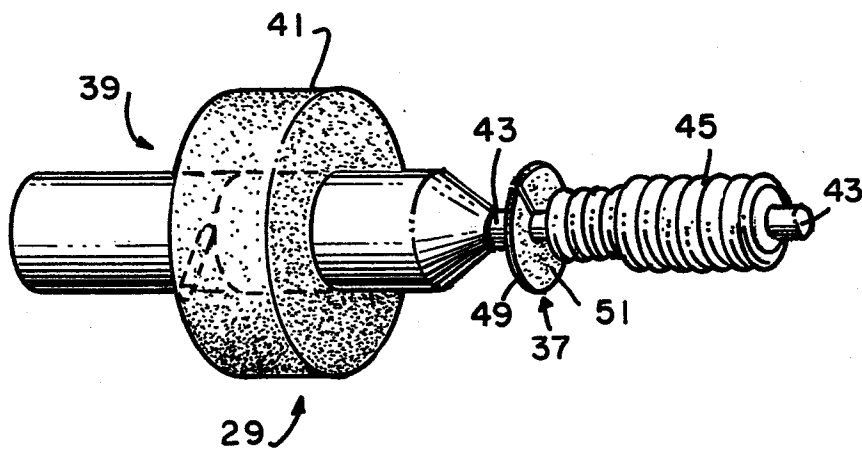


FIG. 2

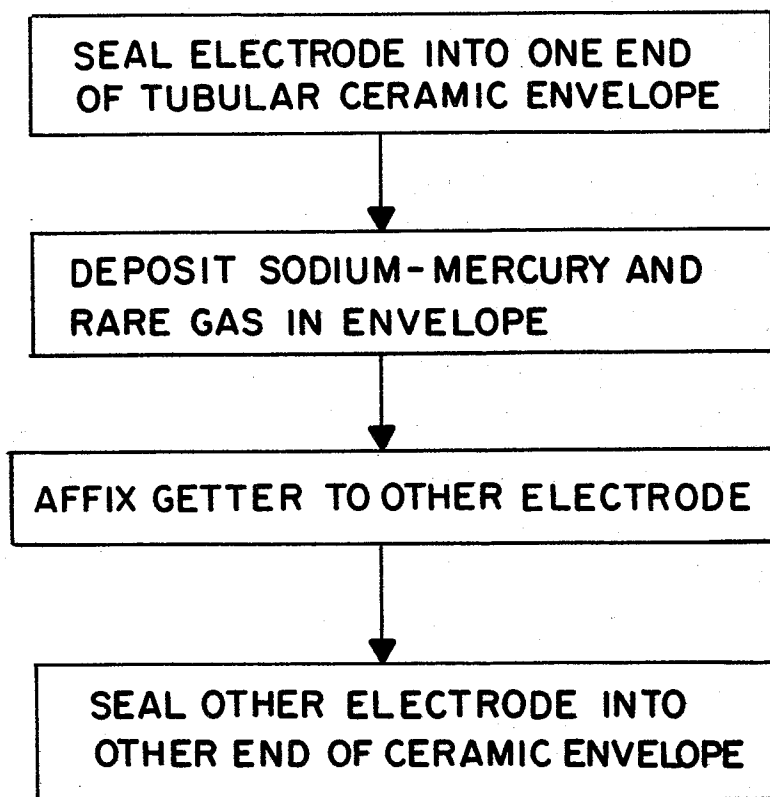


FIG. 3



European Patent
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EUROPEAN SEARCH REPORT

0122050

Application number

EP 84301611.4

DOCUMENTS CONSIDERED TO BE RELEVANT			EP 84301611.4
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 7)
A	<p><u>US - A - 3 821 585</u> (JANSSON et al.)</p> <p>* Fig. 3; column 1, lines 47-62; column 4, lines 4-29; 30-47, 62-67; claims 3,4, 5,6 *</p> <p>--</p>	1,7,10	<p>H 01 J 61/26</p> <p>H 01 J 9/24</p>
A	<p><u>DE - B - 2 131 887</u> (CHOW)</p> <p>* Fig. 1,2; column 2, lines 55-65; column 3, lines 35-48; column 4, lines 17-23 *</p> <p>--</p>	1,2	
A	<p><u>DE - A1 - 2 848 891</u> (HEIMANN)</p> <p>* Fig. 2; claim 5; page 8, lines 1-24 *</p> <p>--</p>	2,5	
A	<p><u>DE - A1 - 2 704 323</u> (SUGA)</p> <p>* Fig. 5,7; page 7, lines 22-26 *</p> <p>----</p>		<p>TECHNICAL FIELDS SEARCHED (Int. Cl. 7)</p> <p>H 01 J 61/00</p> <p>H 01 J 9/00</p> <p>H 01 J 17/00</p> <p>H 01 J 7/00</p>
The present search report has been drawn up for all claims			
Place of search VIENNA		Date of completion of the search 30-05-1984	Examiner BRUNNER

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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