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(12) # EUROPEAN PATENT SPECIFICATION

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(54) **Metal halide lamp with arc tube shield support.**

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Description

The present invention relates, in general, to metal halide discharge lamps and more particularly to metal halide discharge lamps configured to prevent breakage of the lamp's outer envelope by reducing shard dispersion upon an arc tube fracture.

The high pressure discharge lamps of the invention operate by vaporizing mercury and selected metal halides and often are simply called metal halide lamps. High wattage metal halide lamps which achieve relatively high efficacy are known in the art. However, these high wattage lamps are too large for general illuminating purposes in a home or the like. Intermediate wattage metal halide lamps which can be used for some general illuminating purposes are known but their efficacy is low when compared with lamps of large sizes.

Through the recent development of miniature arc tubes, lamp designers have been able to achieve acceptable efficacies in smaller sizes of metal halide discharge lamps to justify its use as a replacement for the standard incandescent lamp. However, the remote possibility of a minor dispersion of glass shards resulting from a fracture of the pressurized light-source capsule (e.g., arc tube) contained within the lamp is a substantial impediment in the path of developing a feasible replacement in the industrial or commercial market. Although occurrence of such a fracture is rare, nevertheless, it could present a safety hazard to a person or object in the immediate vicinity of the lamp (i.e., food preparation). Therefore, it would be desirable to devise a simple method that would allow for the safe use of such a lamp in an open fixture. An arc discharge lamp which substantially eliminates the problem of shard dispersion upon the fracture of the light-source capsule would constitute an advancement in the art.

Methods have been suggested to improve the ability of tungsten halogen and arc discharge lamps to withstand a fracture of the inner light-source capsule. In one example, the shards are restricted from impacting with the outer envelope through the use of a cylindrical body disposed about the arc tube, U.S. Patent US A 4,281,274, issued July 28, 1981 to Bechard et al. The problem with the arrangement described in Bechard et al is that the structure for mounting both the arc tube and the particular cylindrical body is complex and requires welding several parts together. This leads to increased cost and manufacturing difficulties during the process of making such a lamp.

It is believed, therefore, that an electric lamp that provides for a simple and inexpensive means for mounting an arc tube and preventing shard dispersion upon an arc tube fracture, and would also overcome the other disadvantages associated with the prior art devices mentioned above, would constitute a significant advancement in the art.

It is, therefore, a primary objective of this invention to overcome the disadvantages of the prior art devices such as mentioned above.

It is another object of this invention to provide an electric lamp which will substantially eliminate the possibility of minor shard dispersion upon fracture of a pressurized light-source capsule that is simple and inexpensive to manufacture.

Another object of this invention is to provide means for supporting a light-source capsule and containment means about the capsule which will cause little or no loss of luminous efficacy in lamps utilizing such means.

These objects are achieved by a metal halide discharge lamp according to claim 1. Preferred embodiments of the invention are disclosed in the dependent claims.

The FIGURE illustrates one embodiment of the metal halide lamp made in accordance with the teachings of the present invention.

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 above described drawing.

As used herein, the term "light-source capsule" denotes: an arc tube of an arc discharge lamp, or any light emitting capsule within the outer envelope of the lamp wherein the light-source capsule operates at a pressure other than atmospheric and the possibility of minor shard dispersion upon fracture of the light-source capsule exists.

Referring now to the drawing with greater particularity, the FIGURE shows a metal halide lamp 10 made in accordance with the teachings of the present invention. Metal halide discharge lamp 10 includes an evacuated outer envelope 12, which is hermetically sealed to a glass stem member 14, and an external base 16. Base 16 is formed for easy connection to an electrical source and is affixed to the hermetically sealed stem member 14 and outer envelope 12. A pair of electrical conductors 18 and 20 are sealed into and pass through stem member 14 and are electrically connected to base 16, external of outer envelope 12, to provide access for energization of discharge lamp 10.

Within evacuated outer envelope 12 and affixed to electrical conductor 20 is an electrically conductive frame means 22. Frame means 22 extends along an axis substantially parallel to the longitudinal axis of discharge lamp 10 and includes a circular portion 24, in operative contact with an uppermost portion 23 of outer envelope 12, a helical

portion 25 and a substantially straight portion 26. Circular portion 24, in conjunction with the uppermost portion 23, and stem member 14 serve the dual function of maintaining frame means 22 in proper alignment and resisting deformation due to external shock to discharge lamp 10.

Disposed within outer envelope 12 is a cylindrical member 36, which may be in the form of a quartz sleeve or shield, which is supported by frame means 22. Also supported by frame means 22 and contained within quartz shield 36 is an arc tube 28. Arc tube 28 has a chemical fill including a sodium halide and electrodes 29 and 30 at one end thereof. Moreover, electrode 29 is mechanically and electrically connected to frame means 22 through an electrical lead 32 while electrode 30 is affixed to an electrical lead 34 which passes above a portion of cylindrical member 36 and is electrically and mechanically connected to electrical connector 18 by a connector wire 40. Wire 40 is preferably made of molybdenum. Cylindrical member 36 is located within and is supported by helical portion 25 of frame means 22. Cylindrical member 36 is secured in frame means 22 by a bend 21 and a small nickel wire 38 which is welded to the upper most part of said straight portion 26 of frame means 22. A small kink or bend in the uppermost part of straight portion 26 may be substituted for wire 38 in securing cylindrical member 36 in position.

The purpose of the present invention is to provide a simple and inexpensive means for maintaining the cylindrical member about the arc tube and mounting the arc tube within the lamp without both a reduction in lamp performance and damage to the outer envelope. Three conditions had to be met in order to arrive at a solution to the aforementioned problem. Firstly, the particular cylindrical member to be used, which is a transparent shield or quartz tube, had to be securely held in place in such a manner so that it did not come in contact with the arc tube. Secondly, proper distances had to be maintained between the electrical conductors of opposite electrical potential. Thirdly, the arc tube and the cylindrical member had to be held securely in their proper positions during regular handling. Any breach of the above conditions would have reduced lamp performance, shortened lamp life and would not have provided a permanent solution to preventing outer envelope damage due to an arc tube fracture.

In the present invention the solution to the aforementioned problem was a cylindrical member 36 positioned about arc tube 28, in the form of quartz shield, in conjunction with frame means 22 within outer envelope 12. A single wire member is used to form frame means 22, thereby eliminating the need for welding together several wires in order to form the frame structure that supports quartz shield 36 and arc tube 28 itself. As illustrated in the FIGURE, arc tube 28 is parallel and substantially concentric to both quartz shield 36 and helical portion 25 of frame means 22. Lead 32 is electrically coupled to frame means 22 and lead 34 is electrically coupled to conductor 18, in stem member 14, by connector wire 40.

In one particular embodiment, a 40-watt lamp required the use of a quartz shield which had a wall thickness of about one millimeter in order to prevent the dispersion of shards and ultimate breakage of the outer envelope. The frame means was partially formed in a helix in order to allow the quartz shield to be inserted freely and pushed up to touch the bend in the frame means (see the FIGURE). The length of the frame means was about 95 millimeters (mm). The helical portion was about 30 mm in length and had an average diameter of about 20 mm. In addition, the length of the quartz shield was about 38 mm and the diameter was about 19 mm.

In laboratory tests of the 40-watt metal halide lamp, purposely induced fractures of arc tube 28in the lamps proved that quartz shield 36, with the one millimeter wall thickness, was sufficient to prevent glass shards from damaging outer envelope 12. Cylindrical member 36 may also be made of other materials suitable for withstanding shard impact (i.e., hard glass). Additional testing showed that the use of quartz tubing and the helical frame had a negligible effect on lamp performance and lamp life. Other similar type lamps can be made shard-dispersion-proof by varying the diameter of the helical frame and the thickness of the quartz shield.

Thus, there has been shown and described an improved metal halide lamp that provides frame means therein for mounting an arc tube and fixedly maintaining a cylindrical member about the arc tube which will prevent shard dispersion upon a fracture of the arc tube itself. More particularly, frame means is provided in the form of a single wire member, which is parallel to the longitudinal axis of the lamp, that will serve to support the arc tube and the cylindrical member about the arc tube, thereby simplifying and lowering the cost of making such a lamp.

While there have been shown what are at present to be the preferred embodiments of the invention, it will be apparent to those skilled in the art that various changes and modifications can be made herein without departing from the scope of the invention as defined in the appended claims.

Claims

1. Metal halide discharge lamp (10) having an

outer envelope (12), a stem member (14) located within said outer envelope (12) having a pair of electrical conductors (18, 20) extending therefrom, frame means (22) located within said outer envelope (12) and supported by one (20) of said electrical conductors, an arc tube (28) supported by and electrically coupled to said frame means (22) having a chemical fill, said arc tube (28) having a pair of electrical leads (32, 34) sealed into and passing through at least one end thereof to provide a pair of electrodes (29, 30) therein, and a cylindrical member (36) supported by said frame means (22) and surrounding said arc tube (28), said frame means (22) being a single wire member which supports said arc tube (28) within said lamp (10) and fixedly maintains said cylindrical member (36) about said arc tube (28), said frame means (22) extending along an axis substantially parallel to the longitudinal axis of said lamp (10), said single wire member comprising a small circular portion (24) and a substantially straight portion (26), said circular portion (24) being in operative contact with said outer envelope (12), wherein there is a helical portion (25) of the single wire between the circular portion (24) and the straight portion (26) thereof and the cylindrical member (36) is located within and is supported by the helical portion (25).

2. Metal halide discharge lamp according to claim 1, **characterized** in that said straight portion (26) has means (38) for securing said cylindrical member (36) in position.

3. Metal halide discharge lamp according to claim 2, **characterized** in that said means for securing said cylindrical member includes a small wire (38) welded to said straight portion (26) of said frame means (22).

4. Metal halide discharge lamp according to claim 1, **characterized** in that said cylindrical member (36) is a quartz sleeve that prevents shard dispersion upon a fracture of said arc tube (28).

5. Metal halide discharge lamp according to claim 4, **characterized** in that said quartz sleeve has a wall thickness of about 1 millimeter for a 40-watt lamp.

6. Metal halide discharge lamp according to claim 4, **characterized** in that said arc tube (28) is parrallel and substantially concentric to said quartz sleeve and said helical portion (25) of said frame means (22), one (32) of said electrical leads (32, 34) of said arc tube (28) is electrically coupled to said frame means (22) and the other (34) of said electrical leads (32, 34) is electrically coupled to an electrical conductor (18) in said stem member (14) by a connector wire (40).

7. Metal halide discharge lamp according to claim 3, **characterized** in that said small wire (38) is made of nickel.

8. Metal halide discharge lamp according to claim 6, **characterized** in that said connector wire (40) is made of molybdenum.

9. Metal halide discharge lamp according to claim 1 **characterized** in that cylindrical member (36) is a hardglass sleeve.

Revendications

1. Lampe à décharge aux halogénures métalliques (10) comprenant une ampoule extérieure (12), un pied (14) logé à l'intérieur de la dite ampoule (12) ayant des entrées de courant (18, 20) le traversant, un moyen de cadre (22) logé à l'intérieur de la dite ampoule extérieure (12) et porté par une (20) des dites entrées de courant, un tube à arc (28) porté par et électriquement relié au dit moyen de cadre (22) ayant un remplissage chimique, le dit tube à arc (28) incluant deux entrées de courant électriques (32, 34) scellées dans et traversant au moins une de ses extrémités pour alimenter deux électrodes (29, 30) à l'intérieur, et un élément cylindrique (36) porté par le dit moyen de cadre (22) et entourant le dit tube à arc (28), le dit moyen de cadre (22) étant constitué par un unique fil portant le dit tube à arc (28) à l'intérieur de la dite lampe (10) et maintenant fermement le dit élément cylindrique (36) par rapport au dit tube à arc (28), le dit moyen de cadre (22) s'étendant le long d'un axe substantiellement parallèle à l'axe longitudinal de la dite lampe (10), le dit fil unique comprenant une petite partie circulaire (24) et une partie substantiellement rectiligne (26), la dite partie circulaire (24) étant en contact effectif avec la dite ampoule extérieure (12), dans laquelle il y a une partie hélicoïdale (25) du fil unique entre la partie circulaire (24) et la partie rectiligne (26) de celui-ci, et l'élément cylindrique (36) est logé à l'intérieur et est porté par la partie hélicoïdale (25).

2. Lampe à décharge aux halogénures métalliques selon la revendication 1 caractérisée en ce que la dite partie rectiligne (26) comporte

un moyen (38) pour fixer le dit élément cylindrique (36) en position.

3. Lampe à décharge aux halogénures métalliques selon la revendication 2 caractérisée en ce que le dit moyen pour fixer le dit élément cylindrique comprend un petit fil (38) soudé à la dite partie rectiligne (26) du dit moyen de cadre (22).

4. Lampe à décharge aux halogénures métalliques selon la revendication 1 caractérisée en ce que le dit élément cylindrique (36) est un manchon de quartz qui évite une dispersion des éclats lors d'une rupture du dit tube à arc (28).

5. Lampe à décharge aux halogénures métalliques selon la revendication 4 caractérisée en ce que le dit manchon de quartz comporte une paroi d'une épaisseur de 1 millimètre environ pour une lampe de 40 Watt.

6. Lampe à décharge aux halogénures métalliques selon la revendication 4 caractérisée en ce que le dit tube à arc (28) est parallèle et substantiellement concentrique au dit manchon de quartz et à la dite partie hélicoïdale (25) du dit moyen de cadre (22), qu'une (32) des dites entrées de courant électriques (32, 34) du dit tube à arc (28) est électriquement reliée au dit moyen de cadre (22) et l'autre (34) des dites entrées de courant électriques (32, 34) est reliée électriquement à un conducteur électrique (18) dans le dit pied (14) par un fil de connexion (40).

7. Lampe à décharge aux halogénures métalliques selon la revendication 3 caractérisée en ce que le dit petit fil (28) est en nickel.

8. Lampe à décharge aux halogénures métalliques selon la revendication 6 caractérisée en ce que le dit fil de connexion (40) est en molybdène.

9. Lampe à décharge aux halogénures métalliques selon la revendication 1 caractérisée en ce que le dit élément cylindrique (36) est un manchon en verre dur.

Patentansprüche

1. Metallhalogenid-Entladungslampe (10) mit einer äußeren Hülle (12), einem innerhalb der äußeren Hülle (12) angeordneten Ständerelement (14) mit einem Paar sich von demselben wegerstreckenden elektrischen Leitern (18, 20), einem innerhalb der äußeren Hülle (12) von einem (20) der Leiter abgestützten Rahmen (22), einer von dem Rahmen (22) gestützten und elektrisch an denselben angeschlossenen Lichtbogenröhre (28) mit einer chemischen Füllung, wobei diese Lichtbogenröhre ein Paar elektrischer Leiter (32, 34) aufweist, die in zumindest ein Ende derselben eingesiegelt sind und durch dasselbe hindurchlaufen, um ein Paar darin angeordneter Elektroden (29, 30) zu bilden, und mit einem vom Rahmen (22) gestützten und die Lichtbogenröhre (28) umgebenden zylindrischen Element (36), wobei der Rahmen (22) ein einstückiges Drahtelement ist, das die Lichtbogenröhre (28) innerhalb der Lampe (10) trägt und das zylindrische Element (36) um die Lichtbogenröhre (28) herum hält, sich der Rahmen (22) längs einer im wesentlichen parallel zu der Längsachse der Lampe (10) angeordneten Achse erstreckt, das einstückige Drahtelement einen kleinen kreisförmigen Bereich (24) und einen im wesentlichen geradlinigen Bereich (26) aufweist, der kreisförmige Bereich (24) in betriebsmäßigem Kontakt mit der äußeren Hülle (12) steht, und wobei schließlich ein schraubenförmiger Bereich (25) des einstückigen Drahtelements zwischen seinem kreisförmigen Bereich (24) und dem geradlinigen Bereich (26) vorhanden ist und das zylindrische Element (36) innerhalb des schraubenförmigen Bereichs (25) angeordnet und von diesem gehalten ist.

2. Metallhalogenid-Entladungslampe nach Anspruch 1, **dadurch gekennzeichnet**, daß der geradlinige Bereich (26) Mittel (38) für die Befestigung des zylindrischen Elements (36) in seiner Stellung besitzt.

3. Metallhalogenid-Entladungslampe nach Anspruch 2, **dadurch gekennzeichnet**, daß das Mittel zur Befestigung des zylindrischen Elements aus einem kleinen Draht (38), der an dem geradlinigen Bereich (36) des Rahmens (22) angeschweißt ist, besteht.

4. Metallhalogenid-Entladungslampe nach Anspruch 1, **dadurch gekennzeichnet**, daß das zylindrische Element (36) eine Quarzmanschette ist, die eine Verbreitung von Splittern nach einem Bruch der Lichtbogenröhre (28) verhindert.

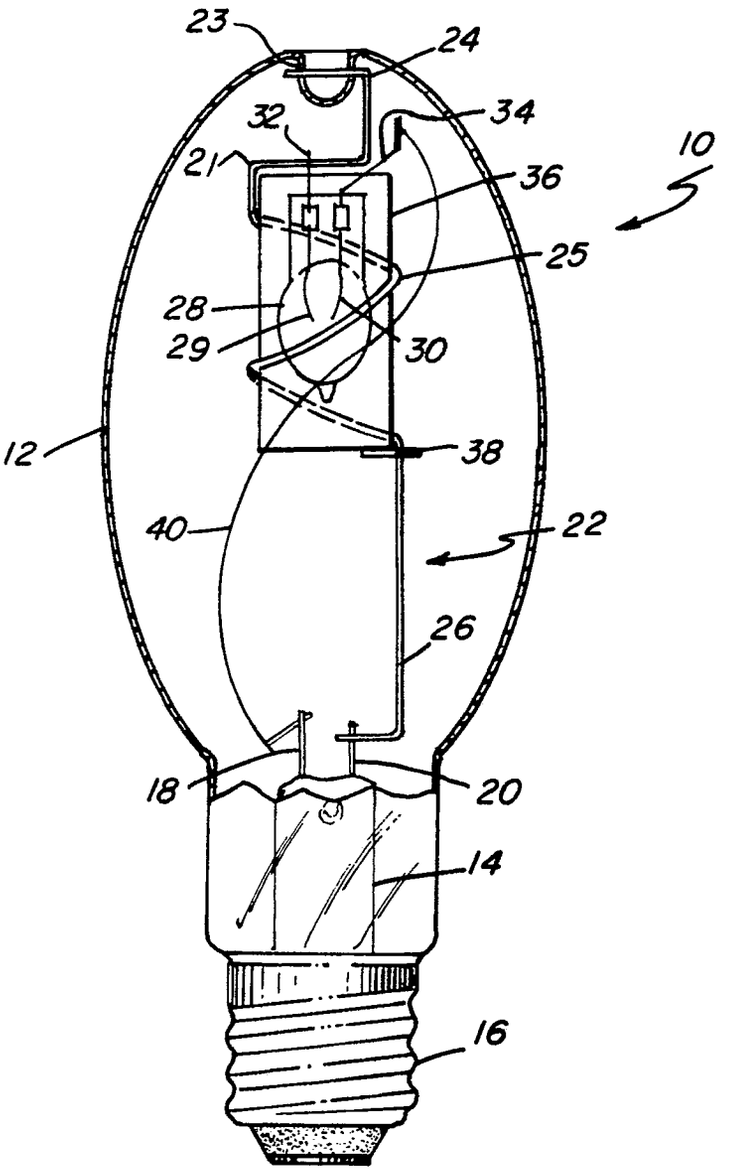
5. Metallhalogenid-Entladungslampe nach Anspruch 4, **dadurch gekennzeichnet**, daß die Quarzmanschette eine Wandstärke von etwa 1 mm für eine 40 Watt Lampe besitzt.

6. Metallhalogenid-Entladungslampe nach Anspruch 4, **dadurch gekennzeichnet**, daß die Lichtbogenröhre (28) parallel und im wesentlichen konzentrisch zur Quarzmanschette und zum schraubenförmigen Bereich (25) des Rahmens (22) angeordnet ist, und daß eine (32) der elektrischen Zuführungen (32, 34) der Lichtbogenröhre (28) an den Rahmen (22) elektrisch angeschlossen ist und daß die andere (34) der elektrischen Zuführungen (32, 34) mittels eines Verbindungsdrahts (40) an einen elektrischen Leiter (18) in dem Ständerelement (14) elektrisch angeschlossen ist.

7. Metallhalogenid-Entladungslampe nach Anspruch 3, **dadurch gekennzeichnet**, daß der kleine Draht aus Nickel hergestellt ist.

8. Metallhalogenid-Entladungslampe nach Anspruch 6, **dadurch gekennzeichnet**, daß der Verbindungsdraht (40) aus Molybdän hergestellt ist.

9. Metallhalogenid-Entladungslampe nach Anspruch 1, **dadurch gekennzeichnet**, daß das zylindrische Element (36) eine Hartglasmanschette ist.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