

Description

This invention relates generally to a discharge lamp and, particularly, to the construction of a high output discharge lamp for illuminating an outdoor or indoor studio and the like and having superior color rendering property.

For illuminating an outdoor studio and the like a metal halide discharge lamp has been commonly utilized for its high output and superior color rendering property. Such a metal halide discharge lamp requires the presence of various elements in its discharge space. The light emitted from the lamp consists of the luminous spectrum of these elements. These elements are usually filled in the lamp bulb as a halide and, act such that they dissociate in the discharge gap and generate the luminous spectrum in receiving collision energy of the electrons. The elements move toward the low temperature zone in the bulb and form halide molecules. An amount of heat corresponding to the difference in the electro-negativity (the energy required for coupling) is emitted as heat. The phenomenon is repeated again and again and, is observed as a circulation between the electric discharge zone between the electrodes and the low temperature zone at side tube portions of the bulb. Such circulation can be expressed that energy generated as luminous spectrum in the discharge zone is converted into heat energy in the low temperature zone.

When the energy conversion is not properly performed, the intensity of the light and the color rendering property are affected. Further, the luminous output decreases due to the dielectric loss, the electrodes will be damaged and the wall of the bulb may be melted and pierced. Further, in discharge lamps other than the metal halide discharge lamp there is also a tendency of energy loss resulting in overheating of the electrodes and of the molybdenum foil acting as sealing member.

A discharge lamp usually comprises rod-like electrodes formed usually of tungsten rods having confronting ends defining therebetween a discharge gap, molybdenum foils connected respectively with the electrodes and being sealed from the atmosphere, and lead terminals connected respectively with the molybdenum foils and extending outwards of the bulb body. The portions connecting respectively the molybdenum foils with the lead terminals are usually disposed in the atmosphere, thus the foils will be contaminated and deteriorated due to the high temperature and be ruptured by getting as brittle.

For preventing the deterioration of the molybdenum foils the length of the sealing portion of prior art molybdenum foils has been elongated so as to increase the heat conductive resistance and to restrict the temperature of the molybdenum foils below the recrystallization temperature. However, in a large

output discharge lamp, the electric resistance increases due to the elongated length of the molybdenum foil sealing portion, which induces a temperature rise and accelerates the deterioration by rupture.

An object of the present invention is to provide a discharge lamp which enables to solve the above described shortcomings in prior art discharge lamps due to the sealing portions of the large output discharge lamp.

According to the invention, there is provided a large output discharge lamp comprising rod-like electrodes having confronting ends defining therebetween a discharge gap and being disposed in a bulb body, the other ends of said electrodes extending into two oppositely extending side tubes integrally formed with said bulb body, molybdenum foils connected respectively with the electrodes and being disposed and sealed respectively in the side tubes, flexible metal strips having a good thermal and electrical conductivity respectively connected with the molybdenum foils and disposed in the side tubes, lead rods connected respectively with the flexible metal strips through molybdenum cups and disposed in the side tubes, the molybdenum cups being sealed to the outer end portions of the side tubes, and bases respectively disposed on the outer ends of the side tubes and connected to the lead rods respectively.

The rod-like electrodes preferably formed of tungsten according to the invention are connected respectively with the molybdenum foils at a location in the side tubes near to the bulb body, the molybdenum foils being sealed in the side tubes, and the molybdenum foils are connected respectively with the flexible metal strips such as twisted or braided cord-like metal ribbon such as copper having a good thermal and electrical conductivity. Thus, the heat of the molybdenum foils is conducted to the metal strips and the foils are cooled, and the expansion or the contraction due to the heat is absorbed by the flexibility of the metal strips, and the side tubes will not be deformed. The lead rods connected to the metal strips are soldered to molybdenum cups respectively, and the molybdenum cups are sealingly connected to the side tubes of the discharge lamp respectively through fused quartz. The interior of the side tubes receiving therein the flexible metal strips is under reduced pressure and the temperature is sufficiently reduced, thus the molybdenum foils will not be contaminated and deteriorated by getting such as brittle.

A discharge lamp of another type having a tubular envelope and tungsten electrodes sealed in the narrowed ends of the tube and connected to external end pieces by means of molybdenum foils and copper braids, is per se known from GB-A-1541232.

The above and other features and advantages of the present invention and the manner of utilizing them will become more apparent, and the invention itself will best be understood, from the following descrip-

tion with reference to the drawings showing a preferred embodiment of the invention.

In the drawings:

Fig.1 is a longitudinal section of a discharge lamp according to an embodiment of the invention, and Fig. 2 is an enlarged sectional view of a molybdenum cup sealing portion of the discharge lamp of Fig.1.

Referring to Fig.1, a discharge lamp 1 according to the invention comprises a generally spherical lamp body defining therein a lamp space, and two side tubes 2 oppositely extending from opposite sides of the lamp body and integrally formed with the lamp body. Rod-like electrodes 3 formed preferably of tungsten are disposed in the side tubes 2 respectively and the inner ends thereof projecting into the lamp body and defining a discharge gap therebetween. Each rod-like electrode 3 is connected with a molybdenum foil 4 and is pinch sealed by corresponding side tube 2 as shown at 10. Each molybdenum foil 4 is connected with a flexible metal strip 5 preferably formed of twisted or braided cord-like metal ribbon such as copper because of its good thermal and electrical conductivity. Thus, the heat of the molybdenum foil 4 is conducted to the metal strip 5 and the foil is cooled, and the expansion or the contraction due to the heat is absorbed by the flexibility of the metal strip 5, and the side tubes 2 will not be deformed. The metal strips 5 are connected respectively to lead rods 6. The lead rods 6 are connected respectively by soldering with molybdenum cups 7 and are piercing there-through. As shown in Fig. 2, each molybdenum cup 7 is sealed to the outer end portion of the side tube 2 through quartz glass attached thereto with a flared portion thereof being turned up outward and sealingly connected to the inner wall of the side tube 2. A base 9 is mounted on the outer end of the side tube 2 and connected to the lead rod 6.

The molybdenum foil 4 connected to the rod-like electrode 3 transmit the heat generated by the electric discharge directly to the metal strip 5, thus, the temperature of the molybdenum foil does not excessively rise. Further, the interior of the side tube 2 is under reduced pressure, and the molybdenum foil 4 and the metal strip 5 do not contact with the atmosphere and rupture of the molybdenum foil 4 can be prevented.

In usual metal halide discharge lamps, the discharge space in the lamp is filled with an inert gas, mercury and various halides, but the discharge lamp according to the invention is not limited to such metal halide discharge lamps and the invention can also be applied to other discharge lamps such as a xenon discharge lamp, a high pressure mercury lamp and the like and, similar advantages can be attained.

As described heretofore, the discharge lamp ac-

cording to the invention comprises rod-like electrodes 3 and 3 having confronting ends defining therebetween the discharge gap and being disposed in a bulb body, the other ends of the electrodes 3 and 3 extending into two oppositely extending side tubes 2 and 2 integrally formed with the bulb body, zones 2a receiving therein molybdenum foils 4 and 4 which are connected respectively with the electrodes 3 and 3 and are respectively disposed and sealed in the side tubes 2 and 2, zones 2b receiving therein flexible metal strips 5 and 5 which are connected with the molybdenum foils 4 and 4 respectively and disposed in the side tubes 2, zones 2c receiving therein lead rods 6 which are respectively connected with the flexible metal strips 5 and 5 through molybdenum cups 7 disposed in the side tubes, zones 2c sealingly connecting the lead rods 6 respectively through molybdenum cups 7, and bases 9 provided on the outer ends of the side tubes 2. Thus, the heat generated from the electric discharge is instantly dissipated through molybdenum foils and the flexible and heat conductive metal strips, further the molybdenum foils do not contact with atmospheric air and rupture of the molybdenum foils can be prevented. Accordingly, the molybdenum foils will not be contaminated and deteriorated by getting brittle.

Therefore, the service life of the metal halide discharge lamp which has been restricted by the rupture of the molybdenum foils can be elongated by at least a factor two.

Claims

1. A large output discharge lamp comprising rod-like electrodes having confronting ends defining therebetween a discharge gap and being disposed in a bulb body, the other ends of said electrodes extending into two oppositely extending side tubes integrally formed with said bulb body, molybdenum foils connected respectively with the electrodes and being disposed and sealed respectively in the side tubes, flexible metal strips having a good thermal and electrical conductivity respectively connected with the molybdenum foils and disposed in the side tubes, lead rods connected respectively with the flexible metal strips through molybdenum cups and disposed in the side tubes, the molybdenum cups being sealed to the outer end portions of the side tubes, and bases respectively disposed on the outer ends of the side tubes and connected to the lead rods respectively.
2. A discharge lamp according to claim 1, wherein zones in the side tubes receiving therein the molybdenum foils and the flexible metal strips respectively are sealed from atmosphere and



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Referring to Fig. 1, a discharge lamp 1 according to the invention comprises a generally spherical lamp body defining therein a lamp space, and two side tubes 2 oppositely extending from opposite sides of the lamp body and integrally formed with the lamp body. Rod-like electrodes 3 formed preferably of tungsten are disposed in the side tubes 2 respectively and the inner ends thereof projecting into the lamp body and defining a discharge gap therebetween. Each rod-like electrode 3 is connected with a molybdenum foil 4 and is pinch sealed by corresponding side tube 2 as shown at 10. Each molybdenum foil 4 is connected with a flexible metal strip 5 preferably formed of twisted or braided cord-like metal ribbon such as copper because of its good thermal and electrical conductivity. Thus, the heat of the molybdenum foil 4 is conducted to the metal strip 5 and the foil is cooled, and the expansion or the contraction due to the heat is absorbed by the flexibility of the metal strip 5, and the side tubes 2 will not be deformed. The metal strips 5 are connected respectively to lead rods 6. The lead rods 6 are connected respectively by soldering with molybdenum cups 7 and are piercing therethrough. As shown in Fig. 2, each molybdenum cup 7 is sealed to the outer end portion of the side tube 2 through quartz glass attached thereto with a flared portion thereof being turned up outward and sealingly connected to the inner wall of the side tube 2. A base 9 is mounted on the outer end of the side tube 2 and connected to the lead rod 6.

The molybdenum foil 4 connected to the rod-like electrode 3 transmit the heat generated by the electric discharge directly to the metal strip 5, thus, the temperature of the molybdenum foil does not excessively rise. Further, the interior of the side tube 2 is under reduced pressure, and the molybdenum foil 4 and the metal strip 5 do not contact with the atmosphere and rupture of the molybdenum foil 4 can be prevented.

In usual metal halide discharge lamps, the discharge space in the lamp is filled with an inert gas, mercury and various halides, but the discharge lamp according to the invention is not limited to such metal halide discharge lamps and the invention can also be applied to other discharge lamps such as a xenon discharge lamp, a high pressure mercury lamp and the like and, similar advantages can be attained.

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cording to the invention comprises rod-like electrodes 3 and 3 having confronting ends defining therebetween the discharge gap and being disposed in a bulb body, the other ends of the electrodes 3 and 3 extending into two oppositely extending side tubes 2 and 2 integrally formed with the bulb body, zones 2a receiving therein molybdenum foils 4 and 4 which are connected respectively with the electrodes 3 and 3 and are respectively disposed and sealed in the side tubes 2 and 2, zones 2b receiving therein flexible metal strips 5 and 5 which are connected with the molybdenum foils 4 and 4 respectively and disposed in the side tubes 2, zones 2c receiving therein lead rods 6 which are respectively connected with the flexible metal strips 5 and 5 through molybdenum cups 7 disposed in the side tubes, zones 2c sealingly connecting the lead rods 6 respectively through molybdenum cups 7, and bases 9 provided on the outer ends of the side tubes 2. Thus, the heat generated from the electric discharge is instantly dissipated through molybdenum foils and the flexible and heat conductive metal strips, further the molybdenum foils do not contact with atmospheric air and rupture of the molybdenum foils can be prevented. Accordingly, the molybdenum foils will not be contaminated and deteriorated by getting brittle.

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2. A discharge lamp according to claim 1, wherein zones in the side tubes receiving therein the molybdenum foils and the flexible metal strips respectively are sealed from atmosphere and



maintained under reduced pressure.

Patentansprüche

1. Entladungslampe hoher Leistung umfassend stabartige Elektroden mit gegenüberliegenden Enden, die dazwischen einen Entladungsspalt definieren und in einem Kolben- bzw. Glühbirnenkörper angeordnet sind, wobei sich die anderen Enden der genannten Elektroden in zwei entgegengesetzt verlaufende Seitenröhren bzw. -röhren erstrecken, die einstückig mit dem genannten Kolben- bzw. Glühbirnenkörper ausgebildet sind, Molybdänfolien, die jeweils mit den Elektroden verbunden sind und jeweils in den Seitenröhren bzw. -röhren angeordnet und abgedichtet sind, flexible Metallstreifen mit guter Wärme- und elektrischer Leitfähigkeit, die jeweils mit den Molybdänfolien verbunden sind und in den Seitenröhren bzw. -röhren angeordnet sind, Leiterstäbe, die jeweils durch Molybdänschalen bzw. -becher mit den flexiblen Metallstreifen verbunden sind und in den Seitenröhren bzw. -röhren angeordnet sind, wobei die Molybdänschalen bzw. -becher mit den äußeren Endabschnitten der Seitenröhren bzw. -röhren dicht verbunden bzw. zu diesen hin abgedichtet sind, sowie Basis- teile, die jeweils an den äußeren Enden der Seitenröhren bzw. -röhre angeordnet sind und jeweils mit den Leiterstäben verbunden sind.
2. Entladungslampe nach Anspruch 1, worin Zonen in den Seitenröhren bzw. -röhren, die darin die Molybdänfolien und die flexiblen Metallstreifen aufnehmen, jeweils gegenüber der Atmosphäre abgedichtet sind und unter verringertem Druck gehalten sind.

Revendications

1. Lampe à décharge de sortie importante comprenant des électrodes en forme de tiges ayant des extrémités se confrontant définissant entre elles un espace de décharge et étant disposées dans un corps en bulbe, les autres extrémités des électrodes s'étendant dans deux tubes latéraux s'étendant de façon opposée intégralement formés avec le corps en bulbe, des feuilles de molybdène reliées respectivement aux électrodes et étant disposées et scellées respectivement dans les tubes latéraux, des bandes de métal flexible ayant une bonne conductivité thermique et électrique reliées respectivement aux feuilles de molybdène et disposées dans les tubes latéraux, des tiges en plomb reliées respectivement aux bandes de métal flexible par des coupes en mo-

lybdène et disposées dans les tubes latéraux, les coupes en molybdène étant scellées aux portions d'extrémités externes des tubes latéraux, et les bases respectivement disposées sur les extrémités externes des tubes latéraux et reliées respectivement aux tiges en plomb.

2. Lampe à décharge selon la revendication 1, dans laquelle des zones dans les tubes latéraux recevant dans celles-ci les feuilles en molybdène et les bandes de métal flexible sont respectivement rendues étanches à l'atmosphère et maintenues sous pression réduite.