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DE-B- 2 548 301

⑤⑥ References cited :
GB-A- 965 225
GB-A- 2 072 939
GB-A- 2 087 141
US-A- 4 065 691

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Description

The present invention relates to an electric discharge lamp, particularly but not exclusively to such a lamp having an output not exceeding 400 W, and comprising a tube made of a translucent material and sealed at two ends by respective closing elements, electrodes arranged oppositely one another on respective electrode supports in the interior of the tube for defining a discharge space and lead-in conductors for supplying electric current to the electrodes, fixed to the respective electrode supports, at least one lead-in conductor including a hollow part for containing a liquid phase filling composition and having at least one capillary connecting the discharge space and the interior of the hollow space for ensuring a path of transportation of the filling composition when it is in vapour phase. The construction of the invention relates mainly to high pressure sodium vapour lamps.

The disclosure of the DE-A1 27 54 001 describes an electric discharge lamp, more exactly a discharge vessel made of a ceramic material based on polycrystalline alumina. The tube-shaped vessel is sealed by closing elements made of polycrystal-alumina, too. The closing elements are bored and their holes carry lead-in conductors made of a metal having a coefficient of thermal expansion approximately equal to that of the alumina. The lead-in conductors, made particularly of niobium, are connected to the electrodes of the discharge vessel and at least one of them constitutes an exhaust tube. By means of a seal the elements are connected together and the seal ensures hermetic closing. The discharge vessel contains a filling composed of sodium and mercury and a starting gas including a noble gas. The lead-in conductor is fastened by mechanical means to an electrode rod wherein the electrode rod has a long section placed within the exhaust type lead-in conductor passing through the closing element. The lead-in conductor joins the electrode rod at its part lying outside the discharge tube. The joint is made by mechanical flattening. During the manufacture of the discharge tube the lead-in conductor serves as a pumping (evacuation) pipe and as a tube for introducing the filling composition into the interior of the discharge tube. After finishing the process of manufacturing the interior of the discharge tube the lead-in conductor is hermetically closed as far from the discharge tube as possible. This closure is made also by means of mechanical flattening. Hence, the lead-in conductor is closed by flattening at both ends and the inner space, i.e. the interior of the lead-in conductor is used for storing the liquid state filling composition. By means of capillaries formed at the flattened part of the electrode rod it is possible to realise communication paths between the space of the discharge in the tube and the reservoir (interior of the lead-in conductor), whereby filling composition in vapour phase can be introduced into

the discharge space.

This solution has the disadvantage that the flattened part required for fixing the electrode rod and located outside the discharge tube results in an increased length of the exhaust tube, i.e. the lead-in conductor and this length is excessive. A longer lead-in conductor is more expensive than a shorter one, and this fact can be better appreciated when one takes into account that the lead-in conductor is of (rather expensive) niobium. What is more, the so-called cold spot of the tube is, in arrangements of the kind described above, too far from the heat source of the discharge, i.e. from the discharge arc and the electrodes. Therefore special measures have to be taken for assuring the required temperature of this cold point, and especially for discharge tubes having an output not exceeding 400 W.

The solution in practice to date has in most cases been to apply special heat-reflecting surfaces at both ends of the discharge tube, resulting in increased costs of manufacture and in creating thermal contact between the surface of the ceramic tube wall and the elements carrying the heat-reflecting surfaces. Such thermal contacts lead to a large scatter of discharge tube parameters.

Another possibility is to heat up the interior of the discharge tube and this is expensive.

GB-A-2 072 939 describes an electric metal vapour discharge lamp in which the lamp envelope is sealed at one end by a hollow metal tube in-lead projecting out of the envelope and serving as a reservoir for a sodium-mercury amalgam. The end of the tube outside the envelope is flattened to form a capillary while its inner end communicates with the interior of the envelope by way of a plain aperture.

An aim of the invention is to provide a discharge lamp having a special lead-in conductor for ensuring an advantageously arranged cold spot while maintaining the existing facility of exhausting the interior of the discharge tube through the exhaust tube type lead-in conductor and storing the filling composition without the necessity of applying special measures for discharge tubes with an output not exceeding 400 W, particularly 150 W.

The invention is based on the recognition that the mechanical connection of the electrode support and special the lead-in conductor should be effected by deforming a part of the latter within the interior of the discharge tube and in such a way that capillaries are formed in restricted channels left between the deformed part and the electrode support.

According to the invention, there is provided an electric discharge lamp, particularly but not exclusively one having an output not exceeding 400 W, which is as claimed in claim 1.

In an advantageous embodiment of the proposed electric discharge lamp the said deformed part of said one lead-in conductor is pincushion-shaped.

In a further advantageous embodiment of the proposed electric discharge lamp the said one lead-in conductor is fastened to the electrode support by means of mechanical crimping and spot welding.

The discharge lamp of the invention can be manufactured without any specific change of the conventional technological process. On the basis of the said one lead-in conductor embodied in the invention it is possible to realise high-pressure electric discharge lamps of higher and lower out-puts having the required cold spot without special measures and being economic and reliable in production. The discharge lamp of the invention can be fixed in an outer vessel and advantageously equipped with an Edison-type screw thread.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be further described in more detail by way of examples and with reference to a preferred embodiment illustrated in the drawing, wherein:

Figure 1 is a cross-section of a part of the discharge lamp of the invention equipped with a novel lead-in conductor, and

Figure 2 is a cross-section II-II of the discharge lamp shown in Figure 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The preferred discharge lamp of the invention comprises (Figure 1) a discharge tube 1 made of polycrystalline alumina. Each end part of the discharge tube 1 is closed by a closing element 2 made of a ceramic material based on alumina. The closing element 2 ensures hermetic closure of the discharge tube 1 by means of a seal 3 composed of metal oxides according to the known principles. The same seal 3 is applied for fixing a lead-in conductor 4 in the closing element 2. The lead-in conductor 4 is of exhaust tube type element which is generally made of niobium.

The thin metal tube of the lead-in conductor 4 has an end part 5 which lies outside the discharge tube 1; it protrudes through the closing element 2. The end part 5 renders the pumping and filling process of the discharge tube 1 possible and after finishing this process it is hermetically closed by mechanical flattening. The lead-in conductor 4 has another end part 6 in the interior of the discharge tube 1 connected to an electrode 7 by means of an electrode support or rod 8 bearing the electrode 7. The electrode rod 8 is connected to a deformed part 10 prepared by mechanical crimping, and spot welding, see below.

According to the embodiment shown in Figure 1 the part 10 can be prepared by means of a four-jaw press equipment and this results in a deformation to a pincushion-shaped form of the cross-section of the lead-in conductor at the deformed part 10, as shown

in Figure 2. By this means the deformed part 10 is equipped with capillaries 9 with an inner diameter effective in hindering the flow of a liquid phase filling composition applied in the discharge lamp and introduced into the lead-in conductor 4 at its section bounded by the deformed part 10 and the end part 5 lying outside the discharge tube 1. The capillaries 9 do, however, assure a path of communication for the vapour phase part of the filling composition between the interior of the discharge tube 1, more exactly the discharge space defined by the electrodes 7 and the interior of the lead-in conductor 4.

The process of manufacture of the discharge vessel and discharge lamp is well-known from the literature and the practice in all further details. It can be seen, however, that the deformed part 10 connecting the electrode rod 8 and the lead-in conductor 4 lies in this case in the interior of the discharge tube 1, contrary to the known solutions characterized by this connection locus lying outside the discharge tube. Moreover, the cold point or, in other words, the reservoir of the discharge lamp reaches also into the interior of the discharge tube 1, whereby its temperature can be increased without specific heating means. The advantage of this solution is appreciable, especially in the case of discharge lamps with an output not exceeding 400 W, particularly in the range 50 to 250 W.

The apparatus applied for securing the lead-in conductor 4 to the electrode rod 8 includes means for spot welding, whereby electric contact of very high reliability can be ensured between the connected elements, because of a cohesive contact over the mechanical deformation.

Claims

1. An electric discharge lamp, preferably having an output not exceeding 400 W, comprising a tube (1) made of a translucent material and sealed at the two ends by respective closing elements (2), electrodes (7) arranged oppositely on respective electrode supports (8) in the interior of the tube (1) for defining a discharge space, and lead-in conductors (4) for supplying electric current to the electrodes (7) fixed to the respective electrode support (8), at least one lead-in conductor (4) including a hollow part for containing a liquid phase filling composition and having at least one capillary (9) connecting the discharge space and the interior of the hollow part for ensuring a path of communication for the filling composition when it is in vapour phase, wherein one of said lead-in conductors (4) is fastened by deformation to a said electrode support (8) at a part (10) of said conductor (4) which is disposed within the interior of the tube (1), and wherein the or each said capillary (9) is formed by a channel of restricted cross-section left between the deformed

part (10) as a result of the said deformation and said electrode support (8).

2. An electric discharge lamp according to claim 1, characterised in that the lead-in conductor (4) including the hollow part for containing a liquid phase filling composition is fastened to the electrode support (8) by means of mechanical crimping and spot welding.

3. An electric discharge lamp according to claim 1 or 2, characterised in that said deformed part (10) is pincushion-shaped.

Ansprüche

1. Elektrische Entladungslampe, bevorzugt mit einer 400 W nicht überschreitenden Leistung, mit einer aus einem transparenten Material gefertigten und an den beiden Enden mit entsprechenden Verschlußelementen (2) abgedichteten Röhre (1), in dem Inneren der Röhre (1) an entsprechenden Elektrodenabstützungen (8) einander entgegengesetzt angeordneten Elektroden (7) zum Festlegen eines Entladungsraums, und Stromzuleitungen (4) zum Zuführen elektrischen Stromes zu den an der entsprechenden Elektrodenabstützung (8) befestigten Elektroden (7), wobei wenigstens eine Stromzuleitung (4) einen Hohlteil zum Aufnehmen einer flüssigen Füllungszusammensetzung und wenigstens eine den Entladungsraum und das Innere des Hohlteils verbindende Kapillare (9) aufweist zum Sicherstellen eines Verbindungsweges für die flüssige Füllungszusammensetzung, falls diese sich in der Dampfphase befindet, wobei eine der Stromzuleitungen (4) mit einem Teil (10) der Stromzuleitung, der in dem Inneren der Röhre (1) angeordnet ist, an einer Elektrodenabstützung (8) durch Deformierung befestigt ist, und wobei die oder jede Kapillare (9) von einem als Folge des Deformierens zwischen dem deformierten Teil (10) und der Elektrodenabstützung (8) zurückgebliebenen Kanal mit verengtem Querschnitt gebildet wird.

2. Elektrische Entladungslampe nach Anspruch 1, dadurch gekennzeichnet, daß die den Hohlteil zum Aufnehmen der flüssigen Füllungszusammensetzung aufweisende Stromzuleitung (4) an der Elektrodenabstützung (8) mit Hilfe von mechanischem Sicken und Punktschweißen befestigt wird.

3. Elektrische Entladungslampe nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß der deformierte Teil (10) skabiosenförmig ist.

Revendications

1. Lampe à décharge électrique, de préférence d'une puissance qui ne dépasse pas 400 W, comprenant un tube (1) en une matière translucide, scellé aux deux extrémités par des éléments de fermeture (2)

correspondants, des électrodes (7) disposées de manière opposée sur des supports d'électrode (8) correspondants, à l'intérieur du tube (1) pour définir un espace de décharge, et des conducteurs d'alimentation (4) pour amener un courant électrique aux électrodes (7), fixés au support d'électrode (8) correspondant, au moins un conducteur d'alimentation (4) comprenant une partie creuse pour recevoir une composition de remplissage en phase liquide et ayant au moins un capillaire (9) reliant l'espace de décharge et l'intérieur de la partie creuse, pour assurer un chemin de communication pour la composition de remplissage quand elle se trouve en phase vapeur, dans laquelle un desdits conducteurs d'alimentation (4) est fixé par déformation à un dit support d'électrode (8) à un endroit (10) dudit conducteur (4) se trouvant à l'intérieur du tube (1), et dans laquelle le ou chacun desdits capillaires (9) est formé par un chenal d'une section transversale réduite, laissé entre la partie (10) déformée, comme résultat de ladite déformation, et ledit support d'électrode (8).

2. Lampe à décharge électrique selon la revendication 1, caractérisée en ce que le conducteur d'alimentation (4) comprenant la partie creuse pour recevoir une composition de remplissage en phase liquide, est fixé au support d'électrode (8) par sertissage mécanique et soudage par points.

3. Lampe à décharge électrique selon la revendication 1 ou 2, caractérisée en ce que ladite partie (10) déformée est en forme de coussinet.

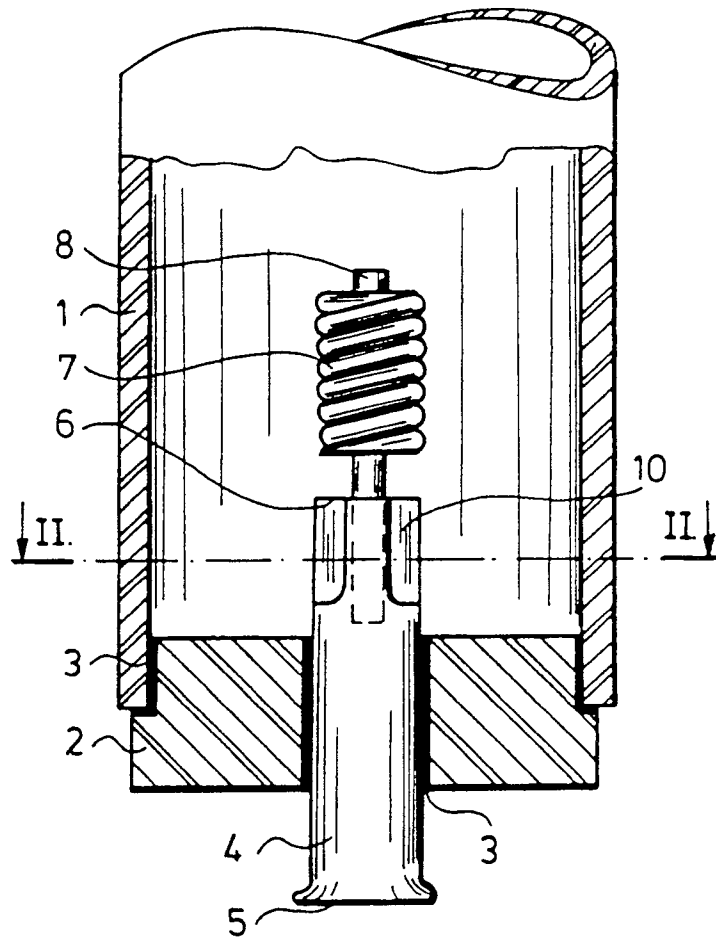


Fig. 1

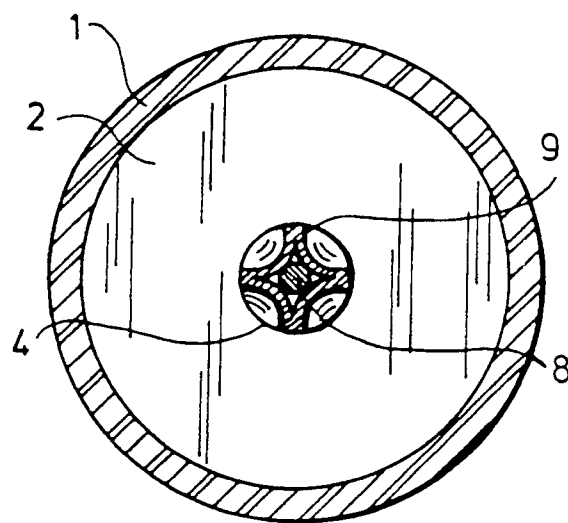


Fig. 2