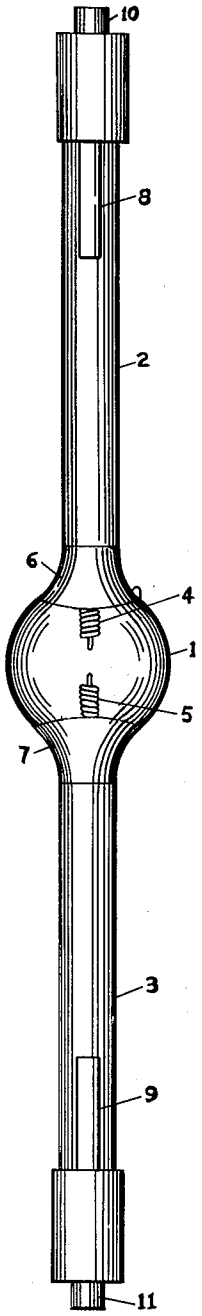
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GASEOUS ELECTRIC DISCHARGE LAMP

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GASEOUS ELECTRIC DISCHARGE LAMP

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The present invention deals with gaseous electric discharge lamps of the high pressure type.

A light source such as a tungsten filament incandescent lamp produces full illumination almost immediately because the time required to heat the filament to full brilliancy is less than one second. Commercial fluorescent lamps operating with mercury vapor at very low pressures, e.g. 0.015 millimeter, require less than one-half minute to reach full brightness. With commercial high pressure lamps and super high pressure lamps which require the attainment of mercury vapor pressures from about 300 to 60,000 millimeters, depending on the type of lamp, a time elapse of several minutes to about one-half hour may be required to reach full light output. Lamps of this type employ metals such as mercury, cadmium, sodium, caesium and the like for providing the metal vapors in which during operation, the electric discharge occurs. At room temperatures (25° centigrade) these metals are mostly either in a liquid or solid condition and have in the vapor phase pressures of less than about 0.002 millimeter on the mercury scale. As a result, when such lamps are started there is a very appreciable time period during which the metals must be evaporated and raised to high pressure vapor conditions. During the beginning of this period the lamps produce very little useful illumination.

The employment of mercury and a rare gas in the same lamp is not new. Rare atmospheric gases such as xenon, neon, argon and krypton at a few to about 150 millimeters pressure have been used in mercury lamps for purposes of starting the lamps and of providing the initial evaporation of the mercury. In these lamps the contribution of the rare gas to the light output of the lamp is entirely negligible. During the first few minutes of operation such lamps produce less than one percent of their ultimate average brightness. For some applications this behavior is not objectionable, e.g. for street lighting and the like, but for other applications the initially low light output and brightness of these lamps makes them impractical.

Super high pressure rare gas lamps operate with an efficiency which cannot be approached by filament type lamps and have a unit brightness greatly in excess of other light sources. Hence, they are desired for very many applications. These lamps, however, are difficult to ignite and require complicated starting equipment such as high voltage radio frequency apparatus to produce some ionization to facilitate establishment of the arc.

It is an object of the present invention to provide a high pressure and especially a super high pressure gas discharge lamp capable of producing brilliant light immediately upon starting.

It is another object of the invention to provide a high pressure gas discharge lamp containing a combination of gases as an atmosphere and whereby the gas combination facilitates ignition of the lamp. Other objects of the invention will become apparent from the description hereinafter following and the drawing forming a part hereof

which represents an elevational view of a lamp embodying the subject matter of the invention.

The present invention applies to compact arc type lamps in which the final or operating vapor pressure exceeds about 10,000 millimeters and which have short discharge paths of the order of one centimeter and less. It also applies to lamps of the capillary type containing high pressure gas and spaced electrodes which may exceed one centimeter spacing. The ionizable filling of the lamp according to this invention consists of a rare gas at a pressure between 1 and 20 atmospheres at about 25° centigrade or such gas together with a vaporized metal in an amount sufficient to become completely vaporized during the operation of the lamp together with a radioactive gas at a partial pressure less than that of the main rare gas component. The lamp is from the moment of start always a high pressure discharge lamp. The envelope contains a gas filling preferably of xenon gas at a pressure between 1 and 20 atmospheres. If one provides a lamp of the above named types with a high pressure gas filling of xenon and in addition, with a radioactive gas, especially radioactive krypton in an amount sufficient to provide a radioactivity of up to 200 microcuries, one can obtain substantially immediate starting of the lamp at 25° C. approximate ambient temperature without complicated starting equipment.

Referring to the illustration, the lamp is a compact type lamp comprising either a substantially spherical or elliptical light transmissive envelope **1** to provide the required strength and made of fused quartz or a high temperature glass, since it must withstand operating temperatures of the order of 1200° Kelvin. The envelope **1** is provided with tubular extensions, e.g. tubes **2** and **3** projecting outwardly therefrom preferably oppositely of each other, which support a pair of spaced electrodes **4** and **5**, which are preferably tungsten electrodes in solid or coiled form and spaced from each other. The other structures such as the reflecting members **6** and **7**, the vacuum-tight seals **8** and **9**, and the terminals **10** and **11**, are merely illustratory for purposes of the present invention and are intended to show a type of lamp unit to which the essential embodiments of the invention are applicable.

The electrodes **4** and **5** which are provided to supply electric power to the gas arc which forms between them, are spaced from each other at a distance of the order of one centimeter and less.

The envelope **1** contains a rare gas, e.g. xenon, at a pressure between 1 and 20 atmospheres at about 25° centigrade together with a radioactive gas, e.g. radioactive krypton, in an amount sufficient to provide a radioactivity of up to 200 microcuries, which would function to keep the lamp ionized and still safe for ordinary storage, operation and handling. The radioactivity of commercially available krypton is about 21,000 millicuries per gram so that about five to ten micrograms yields an activity of from about 100 to 200 microcuries, which is adequate for providing sufficient ionization of the lamp atmosphere to facilitate the initiation of an arc discharge upon the application of electrical energy.

While the lamp as illustrated is a compact arc lamp, other type high pressure and super high pressure arc lamps are contemplated within the scope of the appended claims.

What is claimed is:

1. A high pressure gaseous discharge lamp comprising a light transmissive envelope containing spaced electrodes

and an ionized atmosphere, the ionized atmosphere comprising a rare gas at a pressure of from 1 to 20 atmospheres and mercury in an amount sufficient to become completely vaporized during the operation of the lamp and from about five to ten micrograms of a radioactive gas to provide up to 200 microcuries of radioactivity.

2. A high pressure gaseous discharge lamp according to claim 1, wherein the radioactive gas is radioactive krypton.

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