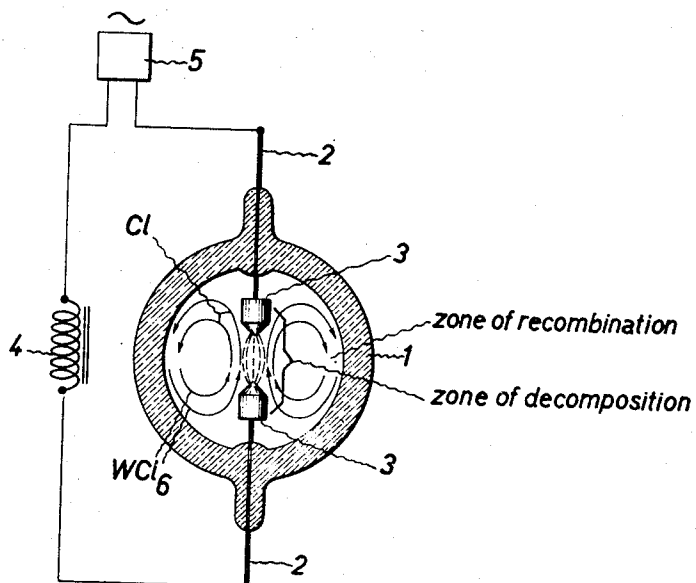


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HIGH-PRESSURE ELECTRIC DISCHARGE LAMP

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HIGH-PRESSURE ELECTRIC DISCHARGE LAMP

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This invention relates to a high pressure electric discharge lamp and more particularly to a high pressure discharge lamp containing a filling of rare gases at a pressure of more than 1 atmosphere.

The usual life of such an electric discharge lamp with glow electrodes is limited by the circumstance that material evaporated or sputtered off the electrodes is deposited on the wall of the envelope and blackens it.

An object of our invention is to provide a high pressure discharge lamp which is essentially free from blackening deposits on the inner wall of the envelope during a long time of lamp operation.

A further object of the invention is to bring the particles evaporating or sputtering off the glow electrodes back to the surface of the electrodes.

A further object is to enable a high temperature of the electrodes by a strong power input without blackening the lamp wall and without destroying of the electrodes even if an electrode material is used, which tends to evaporate at a large degree.

A still further object is a high pressure discharge lamp so positioned that its radiation in the direction of the upper part of the envelope can be used although the convection current of the gas filling tends preferably to blacken the upper part of the lamp.

Other objects of our invention will become apparent when reading the following specification taken in connection with the drawing, which shows an electric high pressure discharge lamp in a sectional view.

The spherical envelope 1 of the lamp in Fig. 1 consists of high melting glass or quartz. The vacuumtight embedded leading-in-wires 2 bear the incandescent electrodes 3 preferably of tungsten. The high pressure discharge lamp may be filled with krypton and xenon at 20 atmospheres or with argon and some mercury. In the latter case the high inner pressure arises after evaporation of the mercury by means of the high temperature during the operation of the lamp. The quartz envelope 1 has an internal diameter of about 35 mm. and shows a wall thickness of 2-4 mm.

By means of the ballast 4 the vacuumtight sealed leads 2 of the incandescent electrodes 3 are connected to a suitable voltage source 5 which is sufficiently high to start the lamp. For starting the lamp special auxiliary electrodes may be provided in known manner. Each main electrode may be also connected to two leads for the purpose of preheating.

The ballast 4 is adjusted in such a manner that there results an operating current of e. g. 8 amps. when the lamp is filled with mercury and of 20 amps. when filled with krypton or xenon. During operation of the lamp the incandescent electrodes 3 will have a high temperature of e. g. more than 1000° C. and tend to evaporate or to sputter. The evaporated particles incline to deposit on the cooler parts of the lamp preferably on the inner wall of the envelope. The resulting deposit weakens extremely the radiation of the lamp. This is prevented by adding to the lamp filling a little quantity of chlorine, bromine or iodine the partial pressure of which is about 0.05 mm. mercury during lamp operation. If the radiation of the halogen gases in the discharge passage is to be prevented their partial pressure should not be higher than 10 mm. mercury.

The wall temperature of the envelope 1 shall not exceed 700° C. to prevent there a chemical decomposition of the compound of the halogen gases with the evaporated material. But the wall temperature must be at least 250°

C. in order to avoid a deposit of the halide compound for instance tungsten hexachloride on the wall and to secure that all particles of this halide compound will evaporate off the wall. The desired temperature of the envelope 1 may be obtained in well known manner by a suitable proportion between the power input of the lamp and its size or by additional heating from outside or by heat insulation.

The gaseous or vaporous chemical compound of the evaporated electrode particles with the halogen gases is led by the convection current of the filling into the arc passage and near the incandescent electrodes where they will be again decomposed by the high temperature of the glow electrodes and the arc exceeding 1000° C. into halide and metal e. g. tungsten. This metal deposits on the glow electrodes—also called incandescent or hot electrodes—while the halogen gas e. g. chlorine will be again free. In consequence of the convection currents of the gas filling, indicated on the drawing by arrows, the halogen gas enters a new compound with evaporated particles of the glow electrodes. By this cyclic continuous process the halogen gas takes off evaporated electrode material in the near of wall or on it by chemical reaction and brings it back to the electrode by thermal decomposition. To secure this cyclic process the named temperatures of the wall and of the electrodes must be chosen.

Instead of adding pure halogen gases to the gaseous or vaporous filling of the lamp there may be added a chemical compound of one of these halogen gases with a high melting metal such as tungsten, molybdenum, tantalum, rhodium. It is not necessary to choose the same metal of which the electrodes consist. This compound will be decomposed in the described manner by means of the high temperature of the electrodes and the discharge passage whereby the halogen gas becomes free and the metal is depositing on the electrodes forming a coating upon them which may be desired under certain circumstances.

What we claim as new and desire to secure by Letters Patent of the United States is:

1. A high pressure electric discharge lamp comprising an envelope of high melting vitreous material, an inert gaseous filling at a pressure between 10 and 40 atms. therein consisting of a rare gas, said envelope containing incandescent electrodes of high melting metal and also containing besides said inert gaseous filling a little quantity of halogen gas of low partial pressure, the halogen gas operating to combine at the wall temperatures of said envelope with vaporized or sputtered particles of the electrodes and to decompose at the higher temperature adjacent to the electrodes settling said particles again onto said electrodes.

2. A high pressure electric discharge lamp comprising an envelope of high melting vitreous material, an inert gaseous filling at a pressure between 10 and 40 atms. therein consisting of rare gas such as krypton, xenon, said envelope containing incandescent electrodes of tungsten, and also containing besides said inert gaseous filling a little quantity of halogen gas of low partial pressure, the halogen gas operating to combine at the inner wall temperatures of said envelope with the vaporized or sputtered tungsten particles of the electrodes and to decompose at the higher temperatures adjacent to the electrodes, thereby settling said tungsten particles again onto said electrodes.

3. A high pressure electric discharge lamp comprising an envelope of high melting vitreous material, an inert gaseous filling at a pressure between 10 and 40 atms. therein consisting of rare gas, said envelope containing incandescent electrodes of tungsten, and also containing besides said inert gaseous filling a little quantity of halogen gas at a partial pressure of 0.01-10 mm. mercury during lamp operation, the halogen gas operating to combine at the inner wall temperatures of said envelope with the vaporized or sputtered tungsten particles of the electrodes and to decompose at the higher temperatures adjacent to the electrodes, thereby settling said tungsten particles again onto said electrodes.

4. A high pressure electric discharge lamp comprising an envelope of high melting vitreous material, an inert gaseous filling at a pressure between 10 and 40 atms. therein consisting of rare gas, said envelope containing incandescent electrodes of tungsten, and also containing besides said inert gaseous filling a little quantity of chlo-

rine gas at a partial pressure of 0.01–10 mm. mercury during lamp operation, the chlorine gas operating to combine with vaporized or sputtered tungsten particles of the electrodes forming tungsten hexachloride, the hexachloride operating to decompose adjacent to the electrodes setting free tungsten atoms to condense onto the electrodes and further setting free chlorine atoms.

5. A high-pressure electric discharge lamp comprising an envelope of high melting vitreous material, an inert gaseous filling at a pressure exceeding 1 atm. therein, said envelope containing incandescent electrodes of metal, and also containing besides said inert gaseous filling a little quantity of halogen gas, the halogen gas operating to combine at the inner wall temperature of said envelope with vaporized or sputtered particles of said electrodes and to decompose at the higher temperature adjacent to the electrodes settling said particles again onto said electrodes, said envelope being sized with relation to the watts consumed by the lamp as to limit said inner wall temperatures between 250–700° C. during lamp operation.

6. A high-pressure electric discharge lamp comprising an envelope of high melting vitreous material, an inert

gaseous filling at a pressure exceeding 1 atm. therein, said envelope containing incandescent electrodes of metal and also containing besides said inert gaseous filling a little quantity of halogen gas, the halogen gas operating to combine at the inner wall temperature of said envelope with vaporized or sputtered particles of said electrodes and to decompose at the higher temperature adjacent to the electrodes settling said particles again onto said electrodes said envelope being sized with relation to the watts consumed by the lamp as to limit said inner wall temperatures between 250–700° C. during lamp operation, said electrodes being sized as to exceed a temperature of 1000° C. during lamp operation.

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