

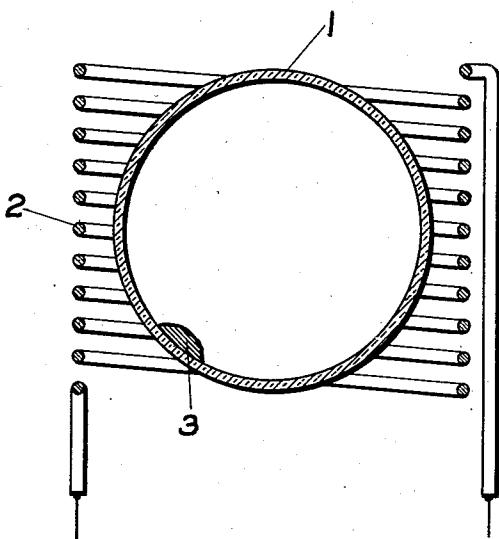
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ELECTRICAL GASEOUS DISCHARGE LAMP

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## ELECTRICAL GASEOUS DISCHARGE LAMP

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5 Claims. (Cl. 176—122)

This invention relates to an electrical gaseous discharge lamp of the type in which atoms of a material which has desirable spectral properties are introduced into a discharge space in which they are excited and caused to emit the desired radiation.

Many materials whose spectral properties are desirable in a lamp are difficult to vaporize at the relatively low temperatures at which it is usually desirable to operate the envelope of the lamp. These materials include, for example, bismuth, antimony, arsenic and osmium. If such materials were placed in the usual lamp, the envelope would have to be maintained at an undesirably high temperature in order to vaporize such material sufficiently to generate enough vapor to cause the desired excitation of these materials. However, in order to cause the material to emit its radiations, it is merely necessary to introduce a sufficiently large number of atoms of that material into a discharge space where said atoms may be subjected to the exciting effect of the discharge.

An object of this invention is to introduce atoms of the spectral material into a discharge space without corresponding elevated temperatures of the lamp envelope.

Another object is to accomplish such introduction by utilizing the spectral material in the form of a compound of that material, which compound is easily vaporizable, is decomposed in the discharge space, and subsequently the elements of such decomposition recombine to form the compound.

A further object is to utilize the spectral material in the form of halides, hydrides or the like.

A still further object is to generally improve the effectiveness and operation of such gaseous discharge lamps.

The foregoing and other objects of this invention will be best understood from the following description of an exemplification thereof, reference being had to the accompanying diagrammatic drawing, in which 1 represents a lamp envelope consisting of some suitable material, such as glass preferably transparent to the radiations which are generated within it. Surrounding the lamp 1 is an exciting coil 2, which when fed with alternating currents of proper frequency produce an electrodeless discharge within the atmosphere contained in the envelope 1. The envelope 1 contains a quantity 3 of the compound which is to be vaporized. It also may contain an inert gas, such as argon, at a pressure of a few millimeters in order to assist in the starting and running of

the lamp, if desired. In some instances where the material 3 is vaporized sufficiently, upon energization of the coil 2, the inert gas may be omitted.

Such elements as bismuth, antimony, arsenic and osmium, which are difficult to vaporize, form many compounds which are much more easily vaporizable than the elements themselves. Furthermore, such compounds decompose under the action of the discharge which occurs within the envelope 1 so as to liberate atoms of the elements, whereupon said atoms are subjected to collision by exciting particles within said discharge. Furthermore the products of such decomposition recombine to form the original compound which recondenses on the walls of the envelope 1, where it is again vaporized so as to participate in the discharge as described above. Certain halides of bismuth or antimony are compounds of this general nature. In a preferred embodiment of the lamp, I have utilized bismuth iodide ( $BiI_3$ ) for the material 3, together with argon at about two millimeters pressure. In such a lamp, although the envelope was operated at a relatively low temperature at which bismuth would ordinarily be substantially non-vaporizable, the spectrum of bismuth was present in a marked degree. Other compounds aside from the halides could be used. For example, antimony and arsenic form volatile hydrides which have the desired properties as specified above. Also other compounds aside from the halides and hydrides might be utilized. For example, osmium tetroxide is a vaporizable compound which also has the desired properties resulting in the possibility of producing the spectrum of osmium in a lamp with a relatively low temperature envelope.

In the above embodiment I have illustrated an electrodeless discharge arrangement so that there are no electrodes with which the decomposition elements might react in an undesirable manner. If, however, the lamp were in the form having electrodes, the vaporizable compound and its elements of decomposition should preferably be inert with respect to said electrodes. The preferred embodiment in such an arrangement would probably utilize the hydrides, as for example antimony hydride, instead of the bismuth iodide referred to above.

By the term "lamp," as used in the specification and claims, I mean a device for generating light. The term "light," in the sense employed in the foregoing definition, is broad enough to include both visible and invisible light radiations.

Since the compounds described above are read-

ily formed by the interaction of its components, in many instances said components may be initially introduced into said lamp instead of the compound itself. For example, a quantity of bismuth and iodine may be introduced separately into the envelope or a quantity of antimony and some gaseous hydrogen might be introduced separately. In each instance the vapor of the iodine or the gaseous hydrogen would react with the respective metallic element to form the vaporizable compound. In each case also there is preferably an excess of the metallic element so that there is substantially no free iodine, hydrogen or other corresponding component.

It is to be understood that this invention is not limited to the particular details as described above as many equivalents will suggest themselves to those skilled in the art. It is accordingly desired that the appended claims be given a broad interpretation commensurate with the scope of the invention within the art.

What is claimed is:

1. A lamp comprising an envelope containing bismuth iodide, and means for producing a space discharge in said lamp, said iodide being more easily vaporizable than bismuth at the normal operating temperature of said envelope, said iodide being decomposable into components, including bismuth under conditions prevailing in said discharge.

2. A lamp comprising an envelope containing bismuth iodide, and an excess of bismuth, and means for producing a space discharge in said lamp, said iodide being more easily vaporizable than bismuth at the normal operating temperature of said envelope, said iodide being decomposable into components, including bismuth under conditions prevailing in said discharge.

3. A lamp comprising an envelope, means for producing an electrical space discharge in said lamp, and a compound arranged within the envelope, said compound including a material adapted to be introduced in the path of the discharge and to be excited by the discharge to emit radiation, said material being relatively non-vaporizable at the normal operating temperature of envelope and pressure conditions within the lamp, said compound being substantially more easily vaporizable than said material under said temperature and pressure conditions, said compound being characterized by the property of vaporizing at said temperature and pressure con-

ditions to supply to said discharge a substantial quantity of said compound in vapor form, said compound being adapted, upon diffusion into the discharge path, to be decomposed therein to release a quantity of said material, said material being adapted to be excited by the discharge to emit radiations.

4. A lamp comprising an envelope, means for producing an electrical space discharge in said lamp, a compound arranged within the envelope, said compound including a material adapted to be introduced in the path of the discharge and to be excited by the discharge to emit radiation, and an excess of said material within said envelope, said material being relatively non-vaporizable at the normal operating temperature of envelope and pressure conditions within the lamp, said compound being substantially more easily vaporizable than said material under said temperature and pressure conditions, said compound being characterized by the property of vaporizing at said temperature and pressure conditions to supply to said discharge a substantial quantity of said compound in vapor form, said compound being adapted, upon diffusion into the discharge path, to be decomposed therein to release a quantity of said material, said material being adapted to be excited by the discharge to emit radiations.

5. A device for generating light by the excitation of a gaseous atmosphere comprising an envelope, means for producing an electrical space discharge in said lamp, and a compound arranged within the envelope, said compound including a material adapted to be introduced in the path of the discharge and to be excited by the discharge to emit radiation, said material being relatively non-vaporizable at the normal operating temperature of envelope and pressure conditions within the lamp, said compound being substantially more easily vaporizable than said material under said temperature and pressure conditions, said compound being characterized by the property of vaporizing at said temperature and pressure conditions to supply to said discharge a substantial quantity of said compound in vapor form, said compound being adapted, upon diffusion into the discharge path, to be decomposed therein to release a quantity of said material, said material being adapted to be excited by the discharge to emit radiations.

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