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HIGH PRESSURE MERCURY VAPOR LAMP

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FIG. 1

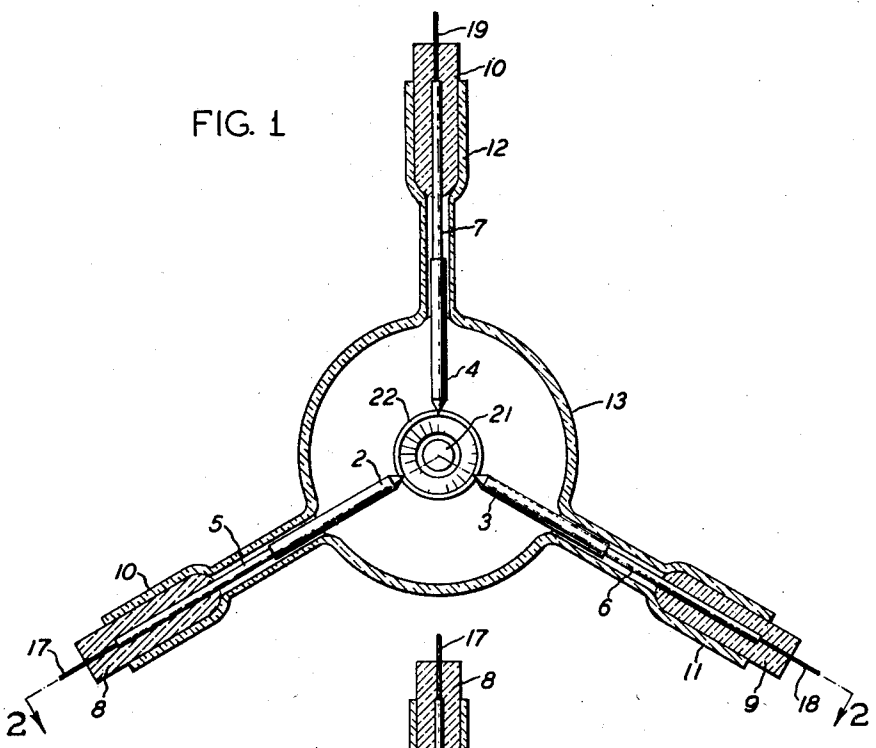
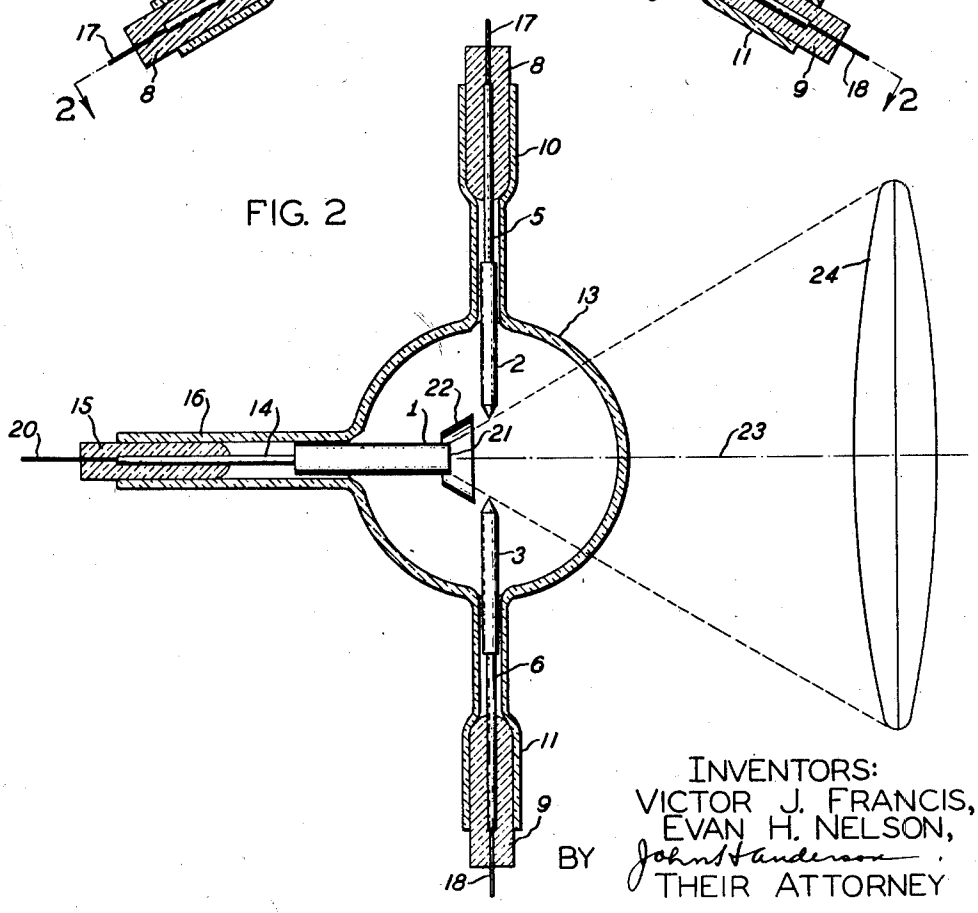


FIG. 2



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HIGH-PRESSURE MERCURY VAPOR LAMP

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4 Claims. (Cl. 176—122)

1

Our invention relates to electric lamps, and more particularly to high pressure mercury vapor discharge lamps intended for use in optical projecting apparatus.

An object of our invention is to provide a new and improved electric lamp.

Another object of our invention is to provide a new and improved high pressure mercury vapor lamp.

A further object of our invention is to provide an improved high pressure mercury vapor discharge lamp operable on either alternating or direct current and which is peculiarly adapted for use in optical projection systems.

Briefly stated, we provide a new and improved high pressure mercury vapor lamp for use in optical systems and which comprises a single electrode of one polarity and a plurality of electrodes of opposite polarity arranged to produce a conical array of electric discharges; the axis of the array may coincide with the axis of the optical system. The plurality of electrodes, which serve either as anodes or cathodes when the lamp is operated on alternating current, lie in a plane transverse or perpendicular to the optical axis or to the axis of the cone of radiation produced by the discharge; and the plurality of electrodes are symmetrically and radially positioned, having their principal axes radially arranged.

For a better understanding of our invention reference may be had to the following description taken in connection with the accompanying drawing and its scope will be pointed out in the appended claims. Figs. 1 and 2 diagrammatically illustrate an embodiment of our invention as applied to a high pressure mercury vapor discharge lamp.

In Fig. 1 our invention is there illustrated as applied to a high pressure mercury vapor discharge lamp comprising a plurality of electrodes including a single electrode of one polarity and a plurality of electrodes of opposite polarity which are positioned relative to each other to produce a conical array of arc discharges. The axis of the discharge cone being coincident with the axis of an associated optical system as illustrated in Fig. 2.

The single electrode is preferably an anode 1 constructed of a metal, such as tungsten, capable of withstanding high temperatures. We provide a plurality of electrodes of opposite polarity, such as cathodes 2, 3 and 4 having their principal axes lying in a plane transverse to the longitudinal axis of the single electrode and also

2

transverse to the axis of the associated optical system and to the axis of the cone of arc discharges. More particularly, the cathodes 2—4 inclusive lie in a plane perpendicular to the above-mentioned axis; and the principal axes of the cathodes 2—4 are radial so that upon the establishment of simultaneous arc discharges between the anode and the cathodes a cone of discharges is produced.

Cathodes 2—4 inclusive are also constructed of a high temperature resisting metal, such as tungsten, and are supported in the radial positions illustrated by means of analogous or similar lead-in conductors 5, 6 and 7 which in turn are embedded in quartz or vitreous seals 8, 9 and 10 adherent to the inner surfaces of tubular quartz or vitreous necks 10, 11 and 12 which comprise tubulations of a quartz envelope 13.

The supporting structure for the anode 1 is generally similar to that employed for supporting the cathodes and comprises a lead-in conductor 14, a quartz or vitreous seal 15 in which the lead-in conductor is embedded and a quartz or vitreous tubulation 16. Suitable connections to the electrodes of the lamp may be effected by conductors 17, 18 and 19 which are connected to the cathodes, and conductor 20 which is connected to the anode.

In discharge lamps of the type which we provide, the distance between any pair of electrodes between which the discharge passes in normal operation is much less than the distance of either member of the pair from the envelope of the device.

Anode 1 is preferably provided with a flat electrode operating face or arc-supporting surface 21 at its free end and enjoys an uninterrupted view of the arc-supporting surfaces of each of the symmetrically positioned cathodes 2–4.

Optionally, we may employ an annular shield 22 having at least a part thereof surrounding the face 21 of the anode 1 and positioned so that it prevents radiation incident to the operation of the lamp from traveling backwards. As shown, this shield 22 may be in the form of a truncated cone having its axis in alignment with the conical array of arc discharges and also in alignment with an optical axis 23 associated with a conventional type projecting lens 24.

The above described lamp is operable on either direct current or alternating current. When the lamp is operated on direct current, of course, the polarity of the electrodes does not change, and consequently anode 1 continuously operates as an anode and the cathodes 2–4 serve their corre-

sponding functions. This lamp may also be operated on alternating current, in which case the polarities of the electrodes reverse during each cycle of alternating current supplied thereto.

If the lamp is operated on direct current, the plurality of electrodes 2–4 are preferably operated as cathodes, since there is likely to be appreciable thermal radiation from the anode, which will be least obstructed if it is at the center of the ring. During normal operation of the lamp described a plurality of arc discharges are simultaneously established between the single electrode 1 and the plurality of electrodes 2–4.

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

1. In combination, a high pressure mercury vapor discharge lamp comprising an envelope, and a plurality of electrodes positioned within said envelope including a single electrode of one polarity having a free end affording an operating electrode face and a plurality of electrodes of opposite polarity having their principal axes lying in a plane transverse to the longitudinal axis of said single electrode and longitudinally spaced therefrom, the distance between any pair of electrodes between which an arc discharge passes in normal operation being less than the distance of either electrode of the pair from said envelope and said plurality of electrodes being radially and symmetrically positioned to produce with said single electrode a conical array of electric discharges.

2. In combination, a high pressure mercury vapor discharge lamp comprising an envelope, and a plurality of electrodes positioned within said envelope including a single anode having a free end affording an operating electrode face and a plurality of cathodes having their principal axes lying in a plane parallel to the plane of said face and longitudinally spaced therefrom, the distance between any pair of electrodes between which an arc discharge passes in normal operation being less than the distance of either electrode of the pair from said envelope and said cathodes being radially and symmetrically positioned to produce with the anode a conical array of electric discharges.

3. In combination, a high pressure mercury vapor discharge lamp comprising an envelope, and a plurality of electrodes positioned within said envelope including a single electrode of one polarity and a plurality of electrodes of opposite polarity, the distance between any pair of electrodes between which an arc discharge passes in normal operation being less than the distance of either electrode of the pair from said envelope and said plurality of electrodes lying in a plane transverse to an optical axis and positioned radially in said plane to produce a conical array of electrical discharges the axis of the array coinciding with the optical axis.

4. In combination, a high pressure mercury vapor discharge lamp comprising an envelope, a plurality of electrodes positioned within said envelope including a single electrode of one polarity having a free end affording an operating electrode face and a plurality of electrodes having their principal axes lying in a plane parallel to the plane of said face and longitudinally spaced therefrom, the distance between any pair of electrodes between which an arc discharge passes in normal operation being less than the distance of either electrode of the pair from said envelope and said plurality of electrodes being radially and symmetrically positioned to produce with said single electrode a conical array of electric discharges, and a truncated conical shield positioned between said single electrode and said plurality of electrodes to prevent back radiation.

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