# United States Patent [19]

**Hosokoshi**

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[45] **Apr. 24, 1973**


[54] **MERCURY VAPOR DISCHARGE LAMP WITH RADIATION PLANE IN ENVELOPE**


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[30] **Foreign Application Priority Data**

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[52] **U.S. Cl.** .....**313/184,** 313/220, 313/227

[51] **Int. Cl.**.....**H01j 61/20,** H01j 61/33

[58] **Field of Search**.....313/184, 220, 204, 313/227, 109



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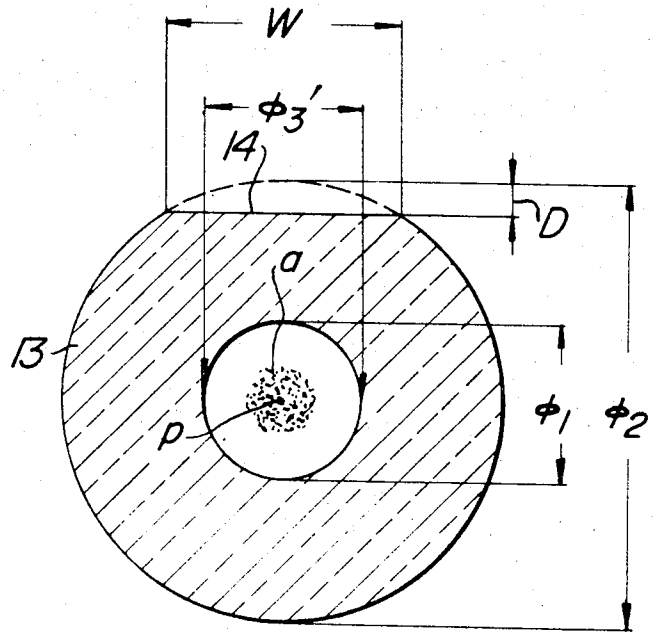
[57] **ABSTRACT**

Improvement of a mercury-vapor lamp, characterized by the provision of a radiation plane in the form of a flat portion on the outer wall of a substantially cylindrical envelope of a mercury-vapor lamp, said flat portion being formed parallel the axis of said envelope.


**3 Claims, 4 Drawing Figures**



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2 Sheets-Sheet 1

FIG. 1
PRIOR ART

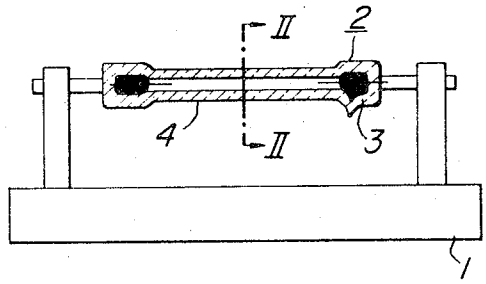


FIG. 2
PRIOR ART

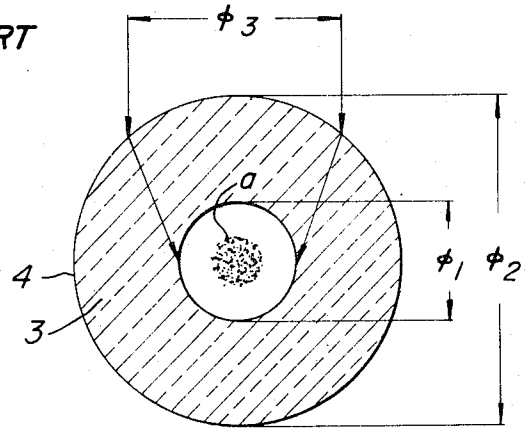


FIG. 3

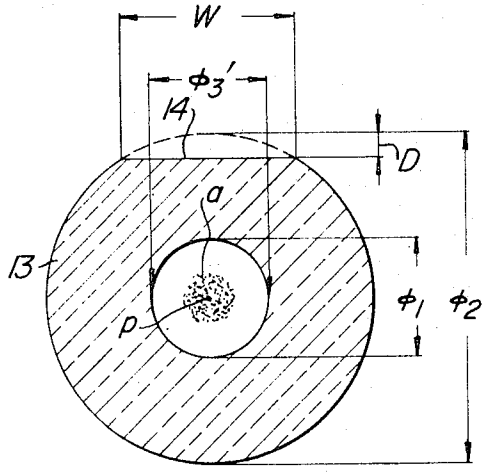


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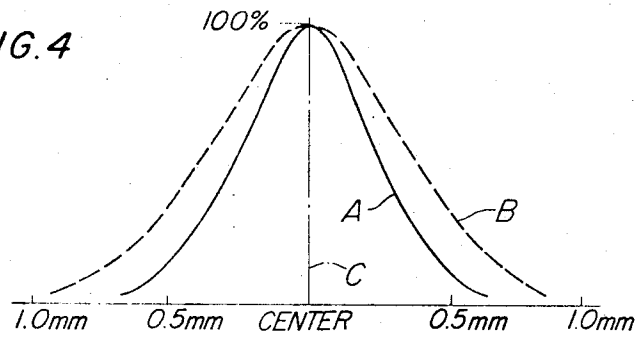
FIG. 4



# MERCURY VAPOR DISCHARGE LAMP WITH RADIATION PLANE IN ENVELOPE

This invention relates to improvement of a mercury-vapor lamp, characterized in that a radiation plane is provided on a flat portion formed on the outer wall of a substantially cylindrical envelope of a mercury-vapor lamp, parallel to the axis of the envelope.

Light-source devices using superhigh-pressure mercury-vapor lamps (i.e., lamps having an internal pressure in excess of 15 atmospheres) have extensive applications as point sources of light for projectors as well as for the exposure of photosensitive films, for example, in the manufacture of phosphor screens of color picture tubes, printed circuit substrates, etc.

In those light-source devices, which are usually operated in combination with condensing lenses, the arc in the form of a columnar light-emitting part of each light source is desired to be as small in diameter as possible, regardless of whether the condenser is used or not.

Also, it is noted that, in such a conventional device which makes use of an arc produced in the hollow of a cylindrical quartz envelope containing the superhigh-pressure mercury-vapor lamp as the principal light source, the diameter of the arc column appears to be comparatively large. This is because the apparent inside diameter of the envelope looks larger than the actual dimension due to the refraction of light on the outer wall of the envelope.

According to the present invention, the radiation surface is formed on a flat portion of the envelope as briefly mentioned above. Thus, when viewed from the outside through the flat portion, the apparent inside diameter of the envelope is equal to the actual dimension. Hence, the apparent diameter of the arc column is smaller than those of conventional columns. With such a construction, the mercury-vapor lamp in accordance with the present invention exhibits far better luminance distribution characteristics than those of prior art lamps.

The invention will be better understood from the following description taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a side elevation view, partly broken away, of a light-source device using a conventional superhigh-pressure mercury-vapor lamp;

FIG. 2 is a section view taken on the line II—II of FIG. 1;

FIG. 3 is a section view of a superhigh-pressure mercury-vapor lamp embodying the present invention;

FIG. 4 is a graph comparing the luminance distribution characteristics of a lamp according to the invention and a conventional lamp.

A conventional light-source device of the nature described, as can be seen from FIG. 1 and also from FIG. 2 which shows a section along the line II—II of FIG. 1, is constructed with a base 1 having sockets, a superhigh-pressure mercury-vapor lamp 2 supported by the base 1 generally parallel to the axis of the base, and a sealed envelope 3 of quartz for the lamp. The envelope 3 is formed with a cylindrical portion 4 having



an inside diameter $\phi_1$ and an outside diameter $\phi_2$, so that an arc column produced in the center hollow serves as a principal light source. The apparent inside diameter $\phi_3$ of the envelope 3 as viewed from either of the directions indicated by arrows in FIG. 2 is larger than the actual inside diameter $\phi_1$ because of refraction of the light through the outer wall surface of the envelope 3. Accordingly the diameter of the arc column looks relatively large.

By contrast, a mercury-vapor lamp according to this invention, as shown in FIG. 3, has a quartz envelope 13 which is formed with a flat portion 14 parallel to the axis P of the envelope 13 on the outer peripheral wall surface. This flat portion 14 constitutes a radiation plane. Its width W is larger than the inside diameter $\phi_1$ and extends across the same. The flat portion 14 is formed by cutting and grinding or otherwise machining the envelope of an ordinary superhigh-pressure mercury-vapor lamp. Alternatively, it may be formed simultaneously with the envelope 13.

With the superhigh-pressure mercury-vapor lamp above described, the apparent inside diameter $\phi'_3$, which is viewed through the flat portion 14, is equal to the inside diameter $\phi_1$. Therefore, the apparent diameter of the arc column that is formed inside the envelope 13 is smaller than those of conventional superhigh-pressure mercury-vapor lamps. In the figures, reference letter *a* indicates an arc, and reference letter D represents the extent of the flat portion.

In the light-source device of this invention, the superhigh-pressure mercury-vapor lamp is mounted on the base in such a manner that the flat portion 14 serves as a radiation plane. Its luminance distribution characteristic in percentage is compared in FIG. 4 with that of a conventional device. From the figure it can be seen that the former, represented by a curve A, is by far superior in centralizability to the latter represented by a curve B. The center axis of ordinate C represents a straight line normal to the axis P of the envelope and which passes through the center of the envelope. On the axis of abscissa is plotted the radial distance from the envelope.

What is claimed is:

1. In a mercury-vapor discharge lamp including a light-transparent elongate envelope with an electrode sealed at each end, the improvement wherein said envelope comprises a completely cylindrical inner wall coaxial with the longitudinal axis of said envelope and an outer wall, said outer wall having a cylindrical portion coaxial with said longitudinal axis and a flat portion parallel to said axis, the radial thickness of said envelope at said flat portion being less than at said cylindrical portion, said flat portion serving as a radiation plane.

2. A mercury-vapor lamp according to claim 1 in which said lamp is of the superhigh-pressure type.

3. A mercury-vapor lamp as defined by claim 1 wherein the width of the flat portion of the outer wall of said envelope is greater than the diameter of the inner cylindrical wall of said envelope and extends thereacross.

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