(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 699 864 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
06.03.1996 Bulletin 1996/10

(51) Int. Cl.[6]: **F21V 1/00**, F21V 7/09, F21M 1/00

(21) Application number: **94202459.7**

(22) Date of filing: **29.08.1994**

(84) Designated Contracting States:
AT BE CH DE DK ES FR GB GR IE IT LI LU MC NL PT SE

(71) Applicant: **PHILIPS ELECTRONICS N.V.**
NL-5621 BA Eindhoven (NL)

(72) Inventor: **Maassen, Egbertus Johannes Petrus**
NL-5656 AA Eindhoven (NL)

(74) Representative: **Rooda, Hans**
INTERNATIONAAL OCTROOIBUREAU B.V.,
Prof. Holstlaan 6
NL-5656 AA Eindhoven (NL)

(54) Electric reflector lamp

(57) The electric reflector lamp has a reflector body (1) with a reflecting surface (2) which is a body of revolution of a branch (7) of a parabola which has been tilted towards the optical axis (3) of the reflecting surface. The reflecting surface has superimposed plane axial lanes (6) of which the number in a first zone (9) remote from the light emission window (4) is half that in a second zone (10) adjacent said window. The axial lanes give the reflecting surface cross-sections which are regular polygons. A light source (13) is positioned on the optical axis, while the focus (8) is inside this light source. The lamp has a universal burning position, a good mixing of the generated light, and a comparatively high luminous flux in the beam.

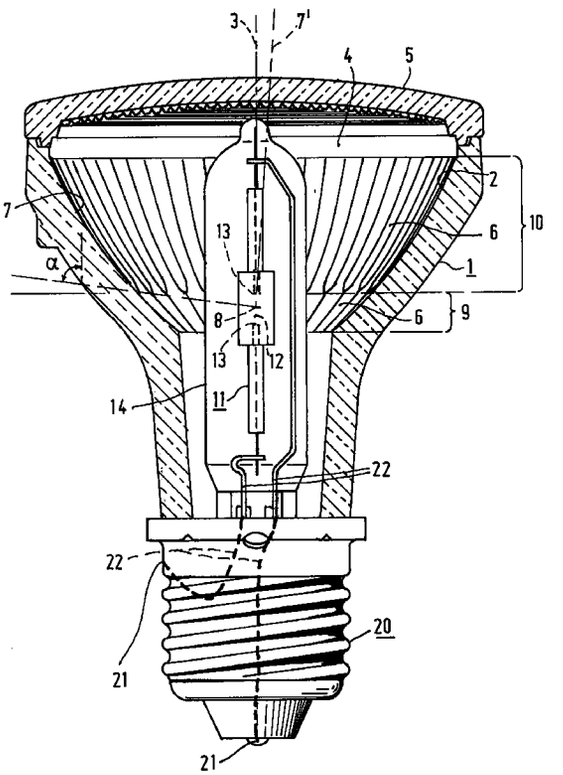

FIG.1

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Description

The invention relates to an electric reflector lamp provided with

a reflector body with a concave reflecting surface having an optical axis, which reflector body has a light emission window which is closed off with a light-transmitting cover,

a light source on the optical axis accommodated in a lamp vessel which is closed in a gastight manner,

a lamp cap provided with contacts and connected to the reflector body,

current conductors which connect the light source to respective contacts of the lamp cap,

the reflecting surface being subdivided into axial lanes.

Such an electric reflector lamp is known from EP-A 0 543 448 (PHN 13.900).

The known reflector lamp may have electrodes in an ionizable filling or an incandescent body as its light source.

The known lamp was found to yield a light beam in which, in the presence of an incandescent body as the light source, differences in brightness between portions of the incandescent body become evident, so that the beam is inhomogeneous. With a discharge arc between electrodes in an ionizable filling, differences in brightness may also arise in the beam, for example owing to a current conductor which extends alongside the discharge arc. With a high-pressure metal halide discharge, the lamp provides an illuminated field in which colour differences occur. When the lamp radiates predominantly upwards, the colour pattern is different from the pattern when it radiates predominantly downwards. The shape of the generated light beam, in addition, strongly depends on the location occupied by the discharge arc in the reflector body.

It is an object of the invention to provide a reflector lamp of the kind described in the opening paragraph in which inhomogeneities in the light beam formed are avoided and whose light beam moreover shows little dependence on the location of the light source in the reflector body, while still yielding a comparatively narrow beam.

According to the invention, this object is achieved in that the reflecting surface is the body of revolution around the optical axis of a branch of a parabola which has been tilted towards the optical axis and whose focus lies on the optical axis inside the light source, the axial lanes being superimposed on said surface,

the axial lanes are plane transverse to their axial direction and give the reflecting surface cross-sections transverse to the optical axis which are regular polygons,

a first zone remote from the light emission window has half the number of axial lanes which a second zone adjacent the light emission window has.

The measures taken in the reflector lamp according to the invention result in an effective beam concentration and mixing of the light generated by the light source. As a result, a light beam with a comparatively high luminous flux and a high degree of homogeneity is obtained. The reflector lamp with a discharge arc yields a beam with a high colour uniformity, also when it is operated in a random position.

The properties of the light beam of the reflector lamp show little dependence on the position of the light source in the reflector body, so that the light source has a wide mounting tolerance.

The lamp vessel of the reflector lamp may be made of glass, for example of quartz glass, or alternatively of hard glass with an incandescent body acting as the light source, or of a ceramic material, for example mono- or polycrystalline aluminium oxide. If so desired, for example in the case of a ceramic lamp vessel, it may be accommodated in an envelope, for example of quartz glass, which is closed in a gastight manner, for example if the space within the reflector body is not evacuated or filled with an inert gas.

The reflector body and the cover may be moulded from glass, but may alternatively be made from, for example, a synthetic resin. The reflector body may alternatively be made from metal. The reflecting surface in the latter case may be obtained, for example, through polishing, or in the case of aluminium, through anodizing. The reflecting surface may be obtained through deposition of a metal film, for example by vapour deposition, for example an aluminium, silver, or gold film. Alternatively, a light-reflecting interference film may be provided built up from alternating layers of high and low refractive index such as, for example, of niobium oxide, tantalum oxide, silicon nitride, *etc.*, and silicon oxide, respectively.

The cover may be formed as a lens, for example a prismatic lens. In that case the cover has, for example, prismatic rings at its inner surface. An otherwise narrow beam of approximately 10° may then be widened to, for example, approximately 30°.

It is favourable when the second zone having the greater number of axial lanes extends entirely between the light emission window and a plane perpendicular to the optical axis and through the focus. In particular, the second zone extends up to locations which enclose an angle α of $80 \pm 5°$ with the optical axis, measured from the focus.

The reflector lamp according to the invention provides a welcome solution especially where the light source is formed by electrodes in an ionizable filling containing metal halides because of the unpleasant colour differences in the beam which occur with conventional reflector lamps having such light sources.

An embodiment of the reflector lamp according to the invention is shown in the drawing,in which

Fig. 1 shows a lamp partly in axial section, partly in side elevation;

Fig. 2 is the axial elevation of the reflecting surface of Fig. 1; and

Fig. 3 is a burner for an embodiment different from that in Fig. 1 in side elevation.

The electric reflector lamp of Fig. 1 is provided with a reflector body 1 with a concave reflecting surface 2 having an optical axis 3. The reflector body has a light emission window 4 which is closed with a light-transmitting cover 5. A light source 13, in the Figure electrodes in an ionizable gas with a discharge path 12 in between, is arranged on the optical axis, accommodated in a lamp vessel 11 which is closed in a gastight manner and which is made of polycrystalline aluminium oxide in Fig. 1. A lamp cap 20 with contacts 21 is connected to the reflector body 1. Current conductors 22 connect the light source 13 to respective contacts 21 of the lamp cap 20. The reflecting surface 2 is subdivided into axial links 6.

The reflecting surface 2 is the body of revolution about the optical axis 3 of a branch 7 of a parabola which has been tilted towards the optical axis 3 and whose focus 8 lies on the optical axis inside the light source 13, between the electrodes. The axis of the parabola branch 7 is referenced 7' in Fig. 1. This axis encloses an angle of a few, for example 3 to 6, degrees with the optical axis 3. The axial lanes 6 are superimposed on said surface. The axial lanes 6 are plane in a direction transverse to their axial direction and give the reflecting surface 2 cross-sections transverse to the optical axis 3 which are regular polygons.

It is evident from Fig. 2 that, when the reflecting surface is intersected by a plane transverse to the optical axis 3, for example adjacent its greatest or its smallest width, the lanes which are plane transversely to their axial direction give the cross-sections a regular polygonal shape. Similar cross-sections are obtained elsewhere with the exception of the small transitional area where the number of lanes changes.

A first zone 9 (Fig. 1) remote from the light emission window 4 has half the number of axial lanes, *i.e.* 30 in the Figure, of a second zone 10 adjacent the light emission window, which has 60 lanes. The number of lanes in the first zone, however, may be chosen to be greater or smaller.

The second zone 10 extends completely between the light emission window 4 and a plane perpendicular to the optical axis 3 and through the focus 8, in Fig. 1 up to locations which enclose an angle α of $80 \pm 5°$ with the optical axis, measured from the focus 8.

The ionizable filling of the discharge vessel 11 comprises rare gas and metal halides, for example sodium, thallium, and dysprosium halides. A high-pressure discharge is maintained therein during operation.

The cover 5 is a lens with a prismatic inner surface.

In Fig. 1,the lamp vessel 11 is arranged in a gastight quartz glass envelope 14.

The lamp shown has a light emission window of approximately 6.5 cm, consumes a power of 35 W during operation, and yields approximately 3400 lm. The reflector lamp yields a light beam which is independent of the burning position and homogeneous in colour, and which has a width of 30° and a luminous intensity of 7 kcd in the centre of the beam. The current conductor 22 which runs alongside the lamp vessel has no observable influence on the beam. When an optically inactive cover is used, the beam width is 10° and the luminous intensity in the centre approximately 33 kcd. The beam formed shows little dependence on the location of the focus inside the light source.

In Fig. 3, the burner has an incandescent body in the shape of an M in the elevation shown as its light source 33, accommodated in a glass lamp vessel 31 from which current conductors 42 issue to the exterior, capable of connecting the light source to respective contacts of the lamp cap of a lamp. The burner may be accommodated in the reflector body of Fig. 1, so that the focus 8 thereof will be positioned inside the light source. The light source consumes a power of 75 W when operated on mains voltage. The lamp vessel has a filling of rare gas and hydrogen bromide. Inhomogeneities are avoided in the beam formed by the reflector lamp having this burner. The location of the focus within the light source is found to be of little influence.

Claims

1. An electric reflector lamp provided with

   a reflector body (1) with a concave reflecting surface (2) having an optical axis (3), which reflector body has a light emission window (4) which is closed off with a light-transmitting cover (5),

   a light source (13) on the optical axis accommodated in a lamp vessel (11) which is closed in a gastight manner,

   a lamp cap (20) provided with contacts (21) and connected to the reflector body (1),

   current conductors (22) which connect the light source (13) to respective contacts (21) of the lamp cap (20),

   the reflecting surface (2) being subdivided into axial lanes (6), characterized in that

   the reflecting surface (2) is the body of revolution around the optical axis (3) of a branch (7) of a parabola which has been tilted towards the optical axis (3) and whose focus (8) lies on the optical axis inside the light source (13), the axial lanes (6) being superimposed on said surface,

   the axial lanes (6) are plane transverse to their axial direction and give the reflecting surface (2) cross-sections transverse to the optical axis (3) which are regular polygons,

   a first zone (9) remote from the light emission window (4) has half the number of axial lanes which a second zone (10) adjacent the light emission window has.

2. An electric reflector lamp as claimed in Claim 1, characterized in that the second zone (10) extends entirely between the light emission window (4) and a plane perpendicular to the optical axis (3) and through the focus (8).

3. An electric reflector lamp as claimed in Claim 2, characterized in that the second zone (10) extends up to locations which enclose an angle α of $80 \pm 5°$ with the optical axis, measured from the focus (8).

4. An electric reflector lamp as claimed in Claim 1, 2 or 3, characterized in that the light source (13) is formed by electrodes in an ionizable filling containing metal halides.

5. An electric reflector lamp as claimed in Claim 1, characterized in that the cover (5) is a lens.

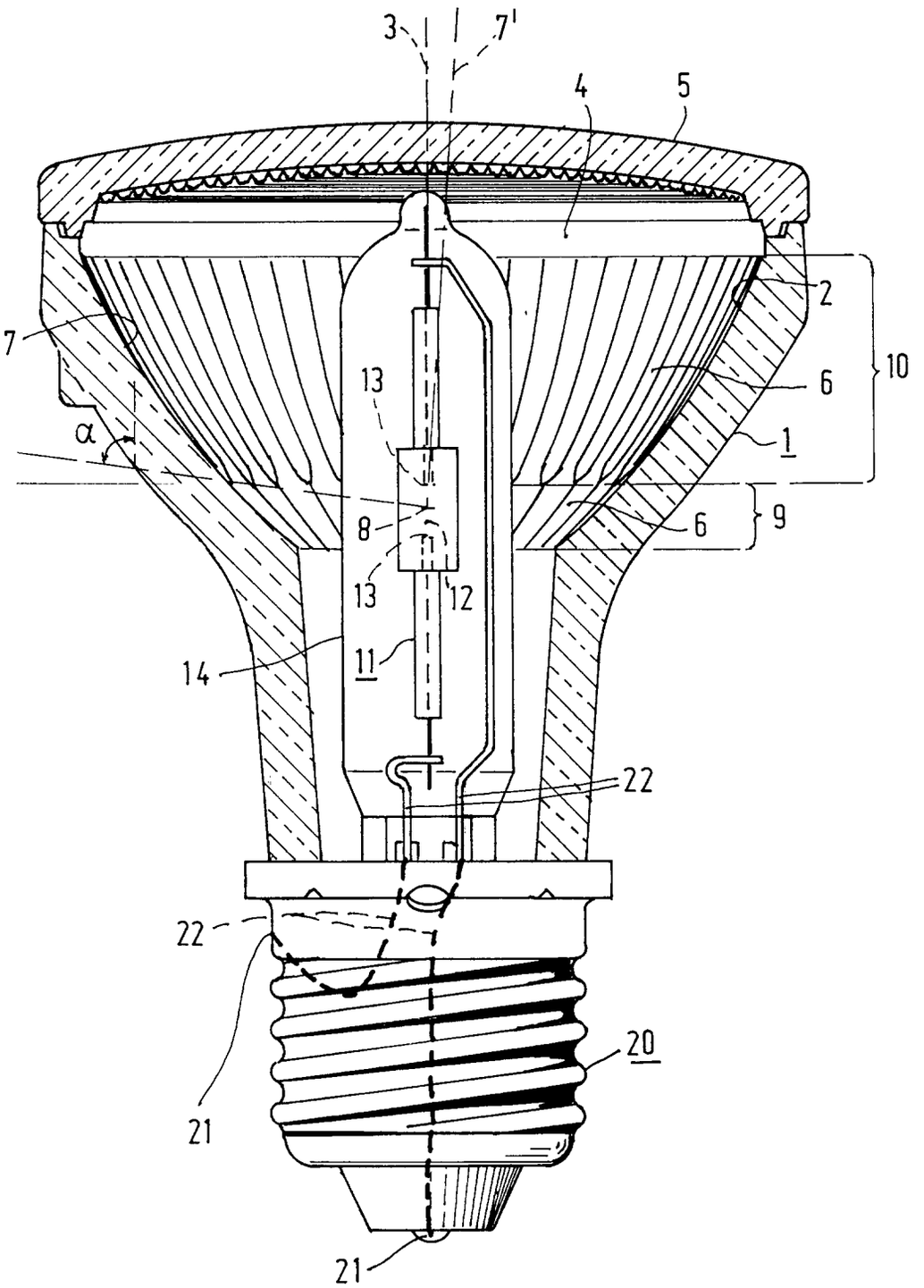

FIG.1

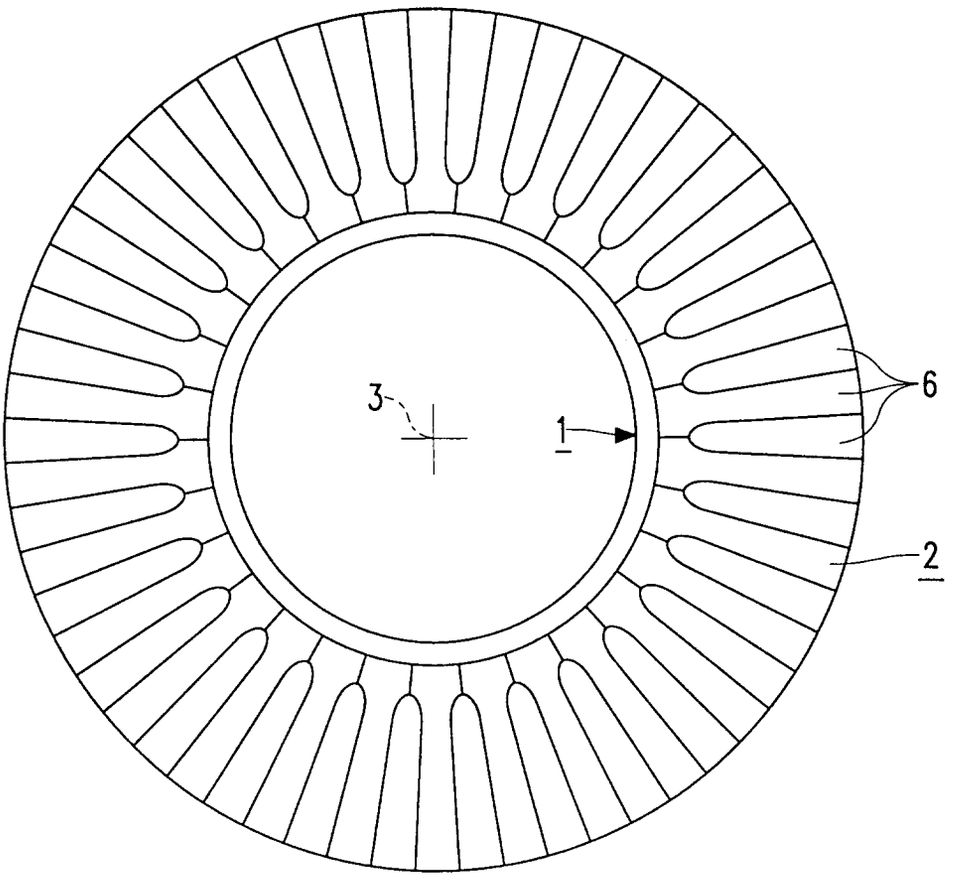

FIG. 2

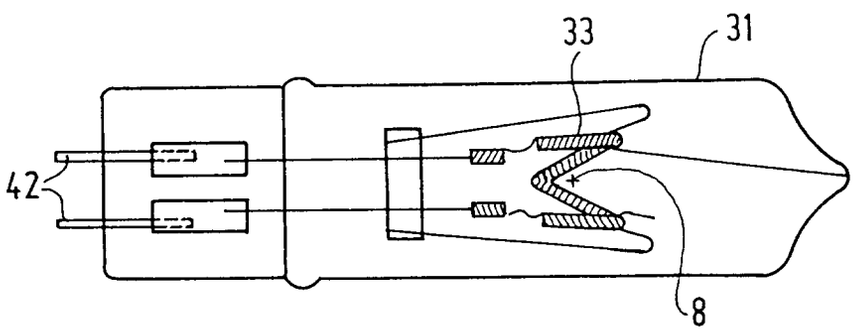

FIG. 3

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 94 20 2459

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	EP-A-0 465 198 (GENERAL ELECTRIC CO.) * column 4, line 22 - line 32 * * column 4, line 45 - line 47 * * column 5, line 14 - line 18 * * figures 1,2 *	1,5	F21V1/00 F21V7/09 F21M1/00
A	GB-A-2 198 516 (N.V. PHILIPS' GLOEILAMPENFABRIEKEN) * page 1, line 27 * * page 2, line 21 - line 26 * * page 3, line 14 - page 4, line 22 * * figures 1,2 *	1,4	
A	GB-A-2 080 969 (PATENT-TREUHAND-GESELLSCHAFT FÜR ELEKTRISCHE GLÜHLAMPEN GMBH) * claims 1,4,5,7; figures 1,2,4 *	1-3	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

F21V
F21M

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	23 January 1995	De Mas, A

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
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T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

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EPO FORM 1503 03.82 (P04C01)