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(54) Spotlight lantern projection system.

(57) A light projection system for a spotlight lantern, comprising a grid filament lamp and a rear reflector, wherein the grid filament (11) is located to extend axially along the optical axis of the reflector (12). The rear reflector (12) and/or a frontal reflector (13) used in conjunction therewith is preferably regularly or irregularly facetted in such a manner that each facet produces a patch of light just filling the aperture of a gate, shaping pattern or iris (15). The system shows remarkably improved efficiency compared to known systems having a grid filament disposed transverse to the optical axis.

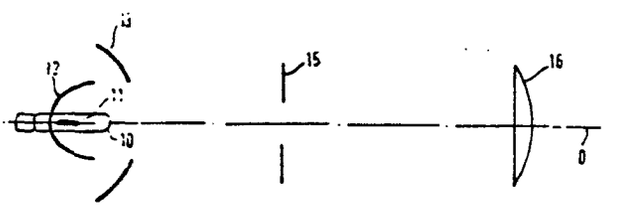

FIG. 2.

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Spotlight Lantern Projection System

This invention relates to a light projection system for a spotlight lantern.

A spotlight lantern is required to produce a well-defined beam of light having an even distribution of light through its cross-section. For reasons of efficiency, it is necessary to employ a light source, e.g. an electric filament, in conjunction with one or more reflectors. This combination is referred to herein as a light projection system. The light projection system concentrates light through a gate, shaping pattern or iris, and then through an optical objective, in order to produce the required beam.

The object in designing the light projection system is uniformly to fill the gate, pattern or iris with light so that as much light as possible is concentrated by the objective to produce the required uniform, well-defined beam having a minimum of light spill at its edges.

From the prior art, various reflectors and combinations of reflectors are known. Thus, European 220/240 volts lanterns conventionally employ a grid

filament mounted perpendicular or approximately perpendicular to the optical axis of the lantern. In conjunction with such filaments, it has been proposed to use rear reflectors defined by various part surfaces of revolution, in particular conic sections such as spherical sections, ellipsoidal sections and parabolic sections. It is also known to combine one such rear reflector with a partial frontal reflector likewise conforming to a surface of revolution, such as a spherical rear reflector with an ellipsoidal frontal reflector or an ellipsoidal rear reflector with a spherical, ellipsoidal or hyperbolic frontal reflector. More complicated reflectors have also been proposed, including reflectors defined by curves representing cartographic projections and reflectors based on surfaces of revolution modified by localised flattening, the aim being to improve efficiency and light distribution.

In the United States, the use of a 110/120 volts mains electric supply has made possible the development of spotlight lanterns incorporating a light projection system based on a linear spirally wound coil filament mounted along the optical axis. This system shows significantly improved efficiency compare with most European light projection systems. However, it has so far proved impossible to produce satisfactory short and reliable spirally wound coil filament lamps to operate at 220/240 volts. Existing 220/240 volts linear lamps

have fragile filaments which do not remain linear in use. Furthermore, the length of the filament results in poor light distribution and undesirably large lanterns.

The object of the present invention is to provide an improved light projection system which is suitable for the European 220/240 volts mains supply.

According to the invention, there is provided a light projection system for a spotlight lantern, characterised by a flat grid filament lamp mounted with the grid disposed axially on the optical axis of a rear reflector.

The main advantage of the invention is one of improved efficiency compared with known systems suitable for a 220/240 volts mains supply, and permitting use of a reflector arrangement which enables efficiency to be still further increased.

Thus, the rear reflector preferably comprises a partial surface of revolution defined by a large plurality of facets. These facets may cover the reflector regularly or irregularly.

A partial frontal reflector may be employed in addition. This may also be facetted, but alternatively may be spherical or hyperbolic. A spherical rear reflector may be employed when the frontal reflector

is facetted.

With any of these reflector arrangements, a preferred system is used in combination with a gate, shaping pattern or iris, each reflector facet in use producing a patch of light which just fills said gate, pattern or iris.

An arrangement of light projection system in accordance with the invention will now be described with reference to the accompanying drawings, in which:

Figures 1 to 3 respectively show three differing reflector arrangements which may be employed in conjunction with an axial grid filament, and

Figures 4 and 5 show constructional details of a facetted rear reflector.

The arrangement shown in Figure 1 comprises a 220/240 volt lamp 10 having a grid filament 11. Such a lamp has a conventional cylindrical envelope, but in accordance with the invention the grid filament 11 extends axially, lying in a plane containing the axis of the envelope, which is collinear with the optical axis O of the lantern. The lamp 10 is mounted longitudinally on the axis of a cup-shaped rear reflector 12, which axis is also collinear with the optical axis O. The surface of the reflector 12 generally conforms to a conic section such as a

paraboloid or an ellipsoid. An aperture is provided at the centre of the rear reflector 12 to accommodate the lamp 10 extending axially therethrough, so that the grid filament 11 is disposed along the axis of revolution of the reflector.

The reflector is more exactly defined by a large plurality of small facets or flats which sub-divide the reflector into annular zones. One example of rear reflector 12, shown in Figures 4 and 5, has about eleven annular zones 20 defined by the facets 21, each zone 20 having about thirty six facets 21 extending around the reflector to define a regular polygon having thirty six sides. In such a case the reflector 12 is said to be regularly facetted. The zones 20 are of approximately equal width w measured along a generator 22 of the reflector 12, and therefore the width of said zones measured by projection thereof on to the axis 0, increases from the centre of the reflector outwardly to the zone of greatest diameter. Figure 5 is also marked to show the respective angles made by the facets 21 of successive zones 20 with the intersecting zonal planes 23 normal to the axis 0. With regular facetting, the facets 21 are of increasing width x around successive zones 20 with increasing diameter of the reflector 12. It may sometimes be preferable to vary the widths x of

the facets 21 within each of some or all of the zones 20 depending on whether said facets are illuminated by the edge of the grid filament 11 or by the face thereof. In such a case the reflector 12 is said to be irregularly facetted.

The above-described arrangement can employ a partial frontal reflector in addition to the rear reflector, as shown in Figures 2 and 3. In Figure 2, such frontal reflector 13 is defined by an annular portion of a regular spherical or hyperbolic section, facing rearwardly to reflect light from the filament 11 on to the rear reflector 12, from which the light, together with that directly incident on the rear reflector 12 from the filament 11, is reflected forwardly through the axial zone defined by the inner diameter of the frontal reflector 13.

The modification shown in Figure 3 employs a facetted frontal reflector 14. In this case, however, the frontal reflector 14 is employed to reflect light from the filament 11 in the forward direction. When the facetted frontal reflector 14 is employed, a rear reflector 12 of regular spherical form may be used instead of a facetted rear reflector.

In all cases, the grid filament 11 is disposed axially, being contained in a plane also containing the

axis O of the reflector or reflectors (12, 13, 14). However, the location of the filament 11 along the axis O varies with the reflector arrangement employed. Generally, the filament 11 is situated deeper into the cup-shaped form of the rear reflector 12 when a frontal reflector 13 or 14 is omitted, and furthest outward from the bottom of the cup when a frontal reflector 13 is employed which reflects light rearwardly.

In all embodiments (see Figures 1 to 3), the light projection system is arranged so that each facet 21 reflects from the grid filament 11 a patch of light which just fills a beam-confining aperture means 15 located between the light projection system and an optical objective 16. The aperture means 15 may be constituted by a gate, a shaping pattern or an iris. In this way it is ensured that a spotlight lantern, in which the light projection system together with the aperture means 15 and the objective 16 are incorporated, will produce a well-defined beam with minimum light spill at the edges, with uniform distribution of light through the section of the beam, and also with minimum waste of light, thus ensuring high efficiency.

It should be appreciated that the above described arrangements are by way of example only and may be modified in various ways within the scope of the

invention, especially in respect of the arrangements of reflector or reflectors.

Claims

1. A light projection system for a spotlight lantern, characterised by a flat grid filament lamp (10) mounted with the grid (11) disposed axially on the optical axis of a rear reflector (12).

2. A system as claimed in claim 1, wherein the rear reflector (12) comprises a partial surface of revolution defined by a large plurality of facets (21).

3. A system as claimed in claim 2, in which the reflector (12) is regularly facetted.

4. A system as claimed in claim 2, in which the reflector (12) is irregularly facetted.

5. A system as claimed in any one of claims 1 to 4, in conjunction with a partial frontal reflector (13 or 14).

6. A system as claimed in claim 5, in which the frontal reflector (14) is facetted.

7. A system as claimed in claim 6 when appendant to claim 1, in which the rear reflector (12) is spherical.

8. A system as claimed in claim 5, in which the frontal reflector (13) is spherical.

9. A system as claimed in claim 5, in which the frontal reflector (13) is hyperbolic.

10. A system as claimed in any of claims 2 to 9, in combination with aperture means (15) in the form of a

gate, shaping pattern or iris, each reflector facet (21) in use producing a patch of light which just fills said gate, pattern or iris.

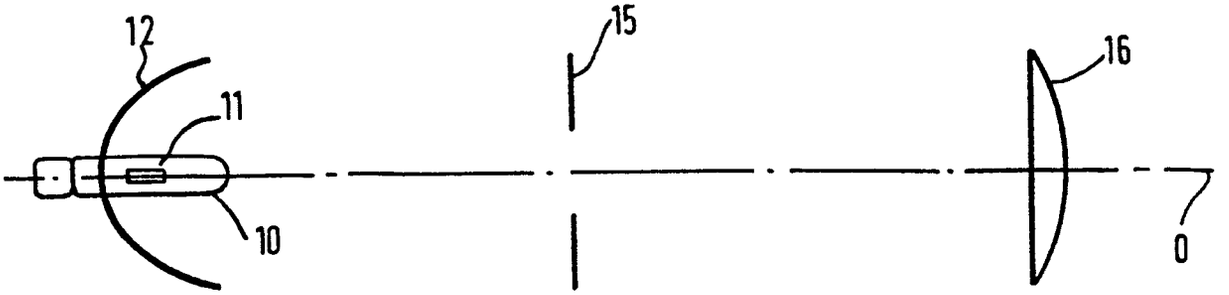

FIG.1 .

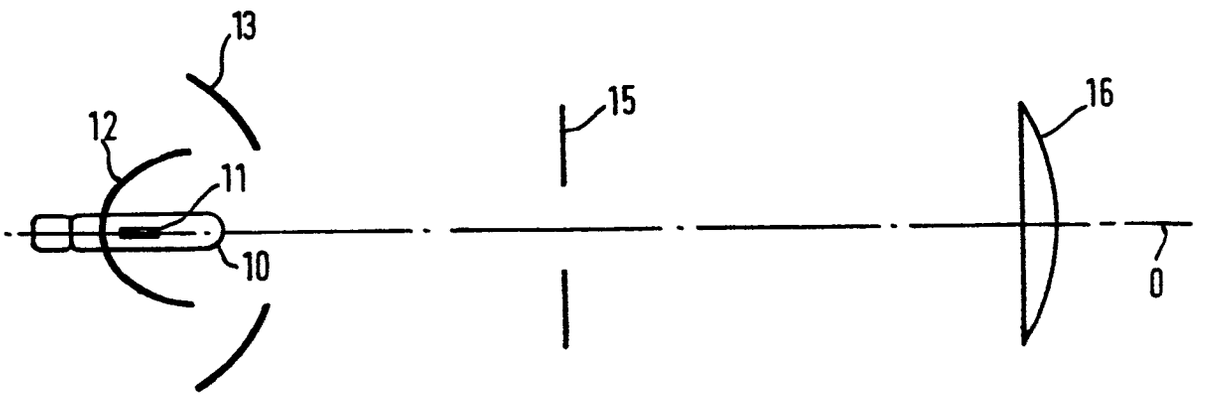

FIG. 2 .

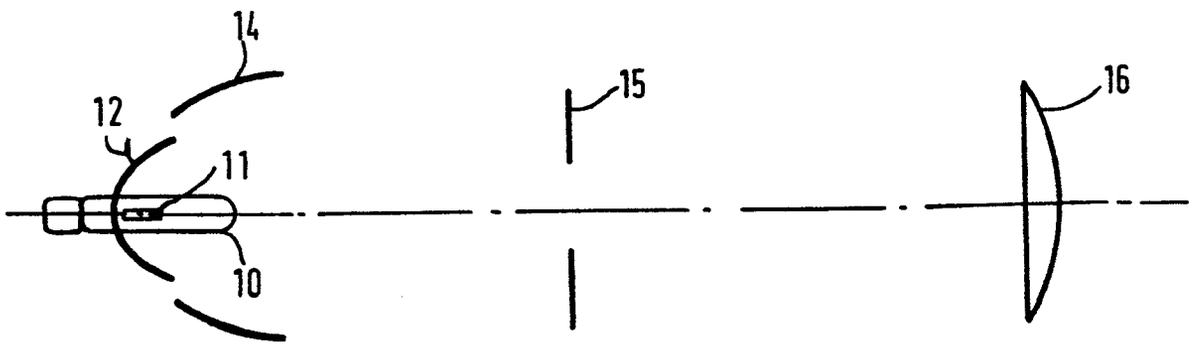

FIG. 3 .

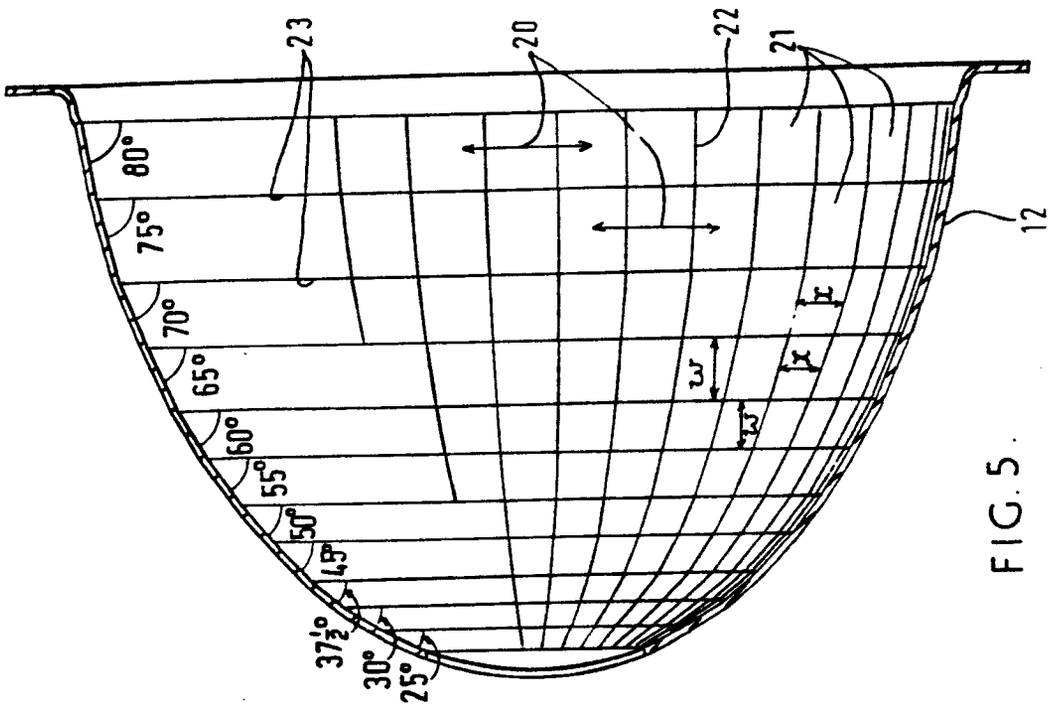

FIG. 5.

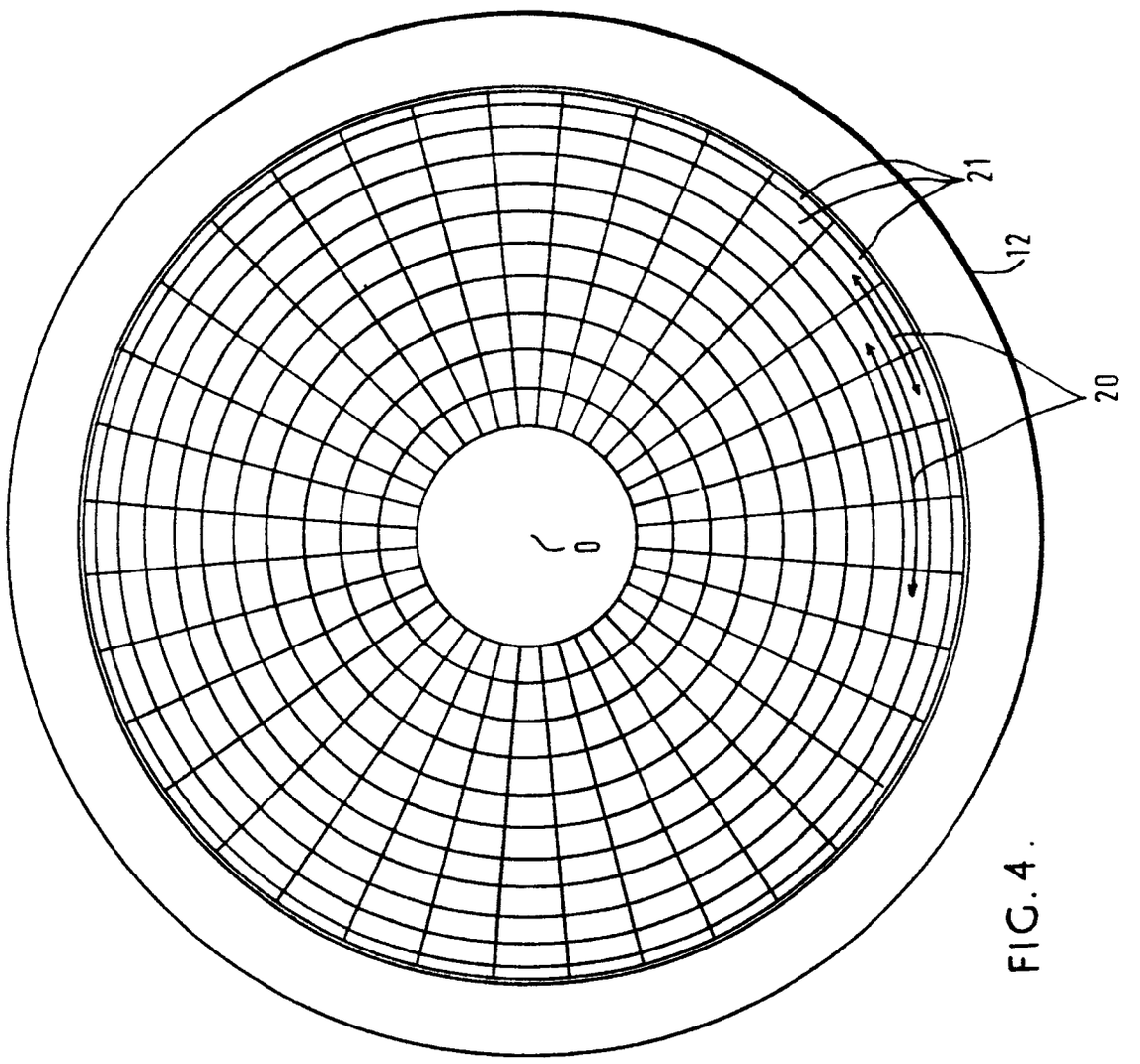

FIG. 4.

European Patent Office

EUROPEAN SEARCH REPORT

Application number

EP 79 30 0700

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
	US - A - 2 597 681 (SMITH) * Column 2, lines 10-11; figure 1 *	1
	US - A - 1 408 875 (FOLEY) * Figures 2,4 *	2,3
	US - A - 4 021 659 (WILEY) * Column 2, lines 32-65 *	2,3
	GB - A - 255 589 (DAVIS) * Figure 3 *	4
	FR - A - 751 001 (SEME) * Page 3, lines 43-47 *	5,7,8
	US - A - 3 930 149 (FRENCH) * Column 3, lines 22-34 *	10

CLASSIFICATION OF THE APPLICATION (Int. Cl.³)

F 21 M 1/00
H 01 K 7/02

TECHNICAL FIELDS SEARCHED (Int.Cl.³)

H 01 K
F 21 M
F 21 V

CATEGORY OF CITED DOCUMENTS

X: particularly relevant
A: technological background
O: non-written disclosure
P: intermediate document
T: theory or principle underlying the invention
E: conflicting application
D: document cited in the application
L: citation for other reasons

&: member of the same patent family, corresponding document

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	27-07-1979	FOUCRAY

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