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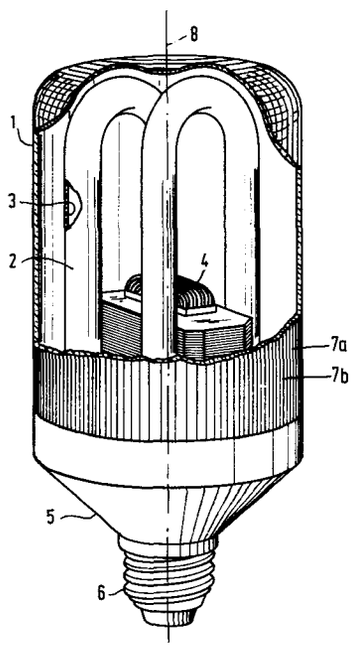
(54) Illumination unit.

(57) An illumination unit comprising a light source (2) which is surrounded at least in part by a transparent wall portion (1) with a prismatic refraction profile, whose refracting ribs (7a, 7b) extend parallel to each other.

According to the invention, the refraction profile is in the form of grooves which are provided in the surface of the wall portion (1) and consists of curved side walls intersecting each other, the walls of two adjacent grooves intersecting each other at the area of the ribs.



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"Illumination unit".

The invention relates to an illumination unit comprising a light source, which is surrounded at least in part by a transparent wall portion provided with a prismatic refraction profile, whose refracting ribs are substantially linear.

Such an illumination unit is well known and is used, for example, as a luminaire for illuminationof roads, streets and the like, the refraction profile then serving to scatter the light emitted by the light source (such as a lamp), for example in lateral directions.

An illumination unit is also known in the form of a compact low-pressure mercury vapour discharge lamp, which serves as an alternative to an incandescent lamp for general illumination purposes, a luminescent discharge tube of the lamp being curved at a number of areas and being surrounded by a substantially cylindrical envelope closed on one side. The outer wall of the envelope is provided with a refraction profile, whose refracting ribs on the cylindrical part extend parallel to the longitudinal axis of the envelope. Such a lamp is described in Netherlands Patent Application 8001833 laid open to public inspection.

In the known lamp, the light originating from the discharge tube is refracted and scattered by means of the said refraction profile, which results in the light-emitting part of the lamp having a reasonably uniform brightness. However, it has been found that especially with the use of a light source having a high luminance (such as the discharge tube of the aforementioned lamp) the brightness is nevertheless distributed with insufficient uniformity over the surface of the envelope and the light can be dazzling for an observer.

The invention has for its object to provide an illumination unit provided with a refraction profile by means of which the light originating from the light source is refracted so that the outer surface of the wall portion, which surrounds the light source at least in part, has more uniform brightness, while at the same time the light is less dazzling than in the known illumination unit.

For this purpose, according to the invention, an illumination unit of the kind mentioned in the opening paragraph is characterized in that the refraction profile is in the form of grooves which are provided in the surface of the wall portion and consist of side walls intersecting each other and having a curved cross-section, while the walls of adjacent grooves meet and form the ribs at this area.

Due to the presence of the said refraction profile, the light originating from the light source is refracted and scattered by the wall portion (which preferably consists of a transparent synthetic material) to a considerably greater extent than in the known illumination unit. It has been found that the wall portion in the illumination unit according to the invention has a surprisingly uniform brightness substantially throughout its surface. It has further been found that the strongly refractive effect of the refraction profile does not influence the intensity of the emanating light.

The extent of curvature of the two side walls of the grooves and the shape (concave or convex), the angle the two side walls of a groove enclose near their line of intersection, the angle two adjacent curved walls enclose with each other at the area of a rib and the combination of the said groove shapes in a profile are determinative of the degree of refraction and the extent of scattering of the light. These quantities strongly depend upon the use of the illumination unit.

When the illumination unit is in the form of a luminaire for tubular discharge lamps (such as luminescent

low-pressure mercury vapour discharge lamps), the wall portion takes the form of a substantially flat transparent plate which serves to close an elongate housing in which the said light sources are arranged. The ribs of the profile extend preferably parallel to the longitudinal axes of these lamps. In another embodiment, the illumination unit forms part of a road illumination luminaire, in which the light source is, for example, a high pressure sodium vapour discharge lamp which is surrounded by the wall portion in the form of a cylinder of synthetic material. The ribs of the wall portion extend parallel to the longitudinal axis of the cylinder. The refraction profile is then preferably located on the surface of the wall portion remote from the lamp in order to obtain an optimum light scattering.

In another embodiment, the illumination unit is also constructed as a road illumination luminaire. It comprises a housing in which the light source can be included, which housing is provided with a conically extending transparent wall portion which is provided with a refraction profile in accordance with the invention. The refracting ribs and the grooves then extend from the narrowest part to the widest part of the said conical wall portion. Due to the presence of the said refraction profile (which is preferably present on the inner side of the wall portion), a homogeneous luminance distribution is obtained throughout the wall portion, the possibility of dazzling being small. Such a luminaire is very suitable to be used for illumination of roads and streets in residential surbubs.

In a preferred embodiment, the illumination unit is a low-pressure mercury vapour discharge lamp having a tubular discharge vessel which is sealed in a vacuum-tight manner, which is curved at least at one area and the inner wall of which is provided with a luminescent layer, this discharge vessel being surrounded by a transparent envelope, whose outer surface is provided with a refraction profile according to the invention. The discharge vessel acts as a

light source. It has been found that especially with lamps of such a kind having a high load capacity such an advantageous refraction of the light is obtained that dazzling is avoided. The use of a diffusely scattering layer detrimental to the light output on the inner wall of the lamp envelope, which layer is used in the known lamps for this purpose, is avoided.

Preferably, the envelope has a cylindrical shape according to the aforementioned Netherlands Patent Application 8001833 laid open to public inspection. In another embodiment, the envelope is spherical, with the ribs extending from the upper side of the envelope towards the lamp cap.

In a particular embodiment of the illumination unit according to the invention, the grooves in the wall portion are alternately deep and shallow, the curvature of the walls of the deep grooves being smaller (the radius of curvature then being bigger) than that of the walls of the shallow grooves.

The advantage of this embodiment is that with this wall portion, especially when it is arranged to surround a light source (the wall portion then taking the form of a cylinder), an optimum light scattering is obtained. This embodiment is preferably used as a part of a road illumination luminaire, in which the light originating from the wall portion is substantially not dazzling.

Embodiments of the invention will now be described more fully with reference to the accompanying drawing.

In the drawing:

Fig. 1 shows partly in elevation and partly broken away a low-pressure mercury vapour discharge lamp according to the invention;

Fig. 2 shows, also in elevation, an illumination luminaire according to the invention,

Fig. 3 shows in cross-section a part of the outer wall of the transparent wall portion of the lamp shown in Fig. 1, and

Fig. 4 shows another embodiment of a luminaire according to the invention.

The lamp shown in Fig. 1 comprises a cylindrical lamp envelope 1 which is sealed slightly spherically on one end and consists of a transparent synthetic material. Within this lamp envelope is arranged a comparatively thin discharge tube 2 which is sealed in a vacuum-tight manner and is folded three times so as to form a hook. At the ends of the tube there are arranged two electrodes (not shown in the drawing), between which a discharge is maintained during operation of the lamp. The inner wall of the discharge tube 2 is provided with a luminescent layer 3, which converts the ultraviolet radiation produced in the mercury discharge into visible light. The lamp further comprises an electrical stabilization ballast 4, a starter (not shown) and a thinwalled slightly conical lamp bowl 5 of synthetic material. The latter is secured to the lamp envelope 1 and is provided at its conical end with an Edison lamp cap 6, by means of which the lamp can be screwed into a fitting intended for incandescent lamps. The outer wall of the lamp envelope is provided with a prismatic refraction profile, whose refracting ribs (7a, 7b etc.) extend parallel to the longitudinal axis (8) of the lamp. On the sealed upper end of the envelope the said ribs have a circular form centred on the longitudinal axis of the cylinder.

The refraction profile is in the form of grooves provided in the surface of the envelope. This profile will be described more fully with reference to Fig. 3.

In Fig. 2, a road illumination luminaire 10 according to the invention is mounted on a lighting column 11. The luminaire has a housing 12 of synthetic material which is closed on the lower side by a dish-shaped transparent glass hood 13. The housing accomodates an electrical gas discharge lamp 14 (shown in dotted lines) which acts as a light source and is surrounded by a cylindrical wall portion 15 of synthetic material, which

is provided at its surface remote from the light source with a refraction profile according to the invention. The refracting ribs (16a, 16b etc.) extend parallel to the longitudinal axis of the cylinder and to the longitudinal axis of the lamp 14. Due to the presence of the said cylinder of synthetic material, the light originating from the light source is refracted so that for an observer at a certain distance from the luminaire it seems as if the light source has a size corresponding to the outer diameter of the cylinder. The light originating from the luminaire is then not dazzling.

Fig. 3 shows a cross-section of the refraction profile in detail, as present on the outer surface of the lamp shown in Fig. 1. The refraction profile of the cylindrical wall portion 15 of the luminaire of Fig. 2 is generally similar. The profile consists of adjacent grooves 18a, 19a, 18b, 19b etc. Each groove consists of side walls, whose surface have a concave shape. The grooves are alternately shallow (18a, 18b) and deep (19a, 19b). The curvature of the walls (20, 21) of the deep grooves is smaller (the radius of curvature is bigger) than that of the walls (22, 23) of the shallow grooves. The walls (20, 21 and 22, 23, respectively) of the said grooves meet one another continuously so as to form a continuous line of intersection. This line of intersection is indicated by reference numeral 24 for groove 19a and is indicated by reference numeral 25 for groove 18b. The curved side walls of the groove 19a enclose an angle α of about 80° with each other. Of the groove 18b the angle α is about 150°. The refracting ribs of the prismatic refraction profile are formed by the line of intersection of walls of two adjacent grooves, for example rib 26, which is formed by the walls 21 and 22 of adjacent grooves 19a and 18b.

In practice, the curved sidewalls of the grooves do not always meet in such a manner that a sharp line is formed. Due to the manufacturing process, a small flat surface is formed at the area of the lines of intersection

shown. The angles α and β are then calculated by extrapolation of the relevant sidewalls. Their aforementioned values are maintained.

In a practical embodiment of the road illumination luminaire shown in Fig. 2, the outer diameter of the cylindrical wall portion is 25 cm. The thickness of the wall is 5 mm. The depth of the groovesis 3 mm and 1,5 mm, respectively. The distance between the ribs extending parallel to the longitudinal axis is 3 mm. When arranged on the top of a vertical column having a length of about 4m, by means of a high-pressure sodium vapour discharge lamp having a power of 50 W present in the luminaire (SON-50W, 3300 lm), a substantially constant brightness was obtained throughout the circumference of the luminaire.

The road illumination luminaire shown in Fig. 4 comprises a housing 30 which is mounted on a lighting column 31, The housing comprises a transparent conical wall portion 32 which is in the form of a hood of synthetic material and is provided on the inner side with a refraction profile in accordance with the invention. The profile consists of adjacent grooves having a configuration as shown in Fig. 3. Both the ribs and the grooves extend from the upper side to the lower side, i.e. in substantially vertical direction. The ribs are diagrammatically denoted by reference numeral 33. The light source 34, for example a high-pressure sodium vapour discharge lamp, is preferably arranged in the longitudinal direction and is indicated in the drawing by dotted lines. The ribs are formed by the meeting curved wall portions of two adjacent grooves. In this case, in contrast with Fig. 3, a line of intersection is not formed. However, due to the manufacturing process, the ribs are slightly flattened. Furthermore, the depth of the grooves is smaller at the narrowest part of the wall portion than at the widest part thereof.

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CLAIMS

1. An illumination unit comprising a light source, which is surrounded at least in part by a transparent wall portion provided with a prismatic refraction profile, whose refracting ribs are substantially linear, characterized in that the refraction profile is in the form of grooves provided in the surface of the wall portion and consisting of side walls intersecting each other and having a curved cross-section, the walls of adjacent grooves meet and form the ribs at this area.

2. An illumination unit as claimed in Claim 1, characterized in that the grooves are alternately deep and shallow, the curvature of the walls of the deep grooves being smaller than that of the walls of the shallow grooves.

3. An illumination unit as claimed in Claim 1 or 2, characterized in that the grooves are provided in the outer surface of the wall portion.

4. An illumination unit comprising a housing in which the light source can be included, which housing is provided with a conically extending transparent wall portion, characterized in that the wall portion is provided with a refraction profile as claimed in Claim 1 or 2, the refracting ribs and the grooves extending from the narrowest part to the widest part of the conical transparent wall portion.

5. A low-pressure mercury vapour discharge lamp having a tubular discharge vessel which is sealed in a vacuum-tight manner, which is curved at least at one place and on the inner wall of which a luminescent layer is provided, this discharge vessel being surrounded by a transparent envelope, whose outer surface is provided with a refraction profile as claimed in Claim 1 or 2 whose refracting ribs extend parallel to the longitudinal axis of the envelope.

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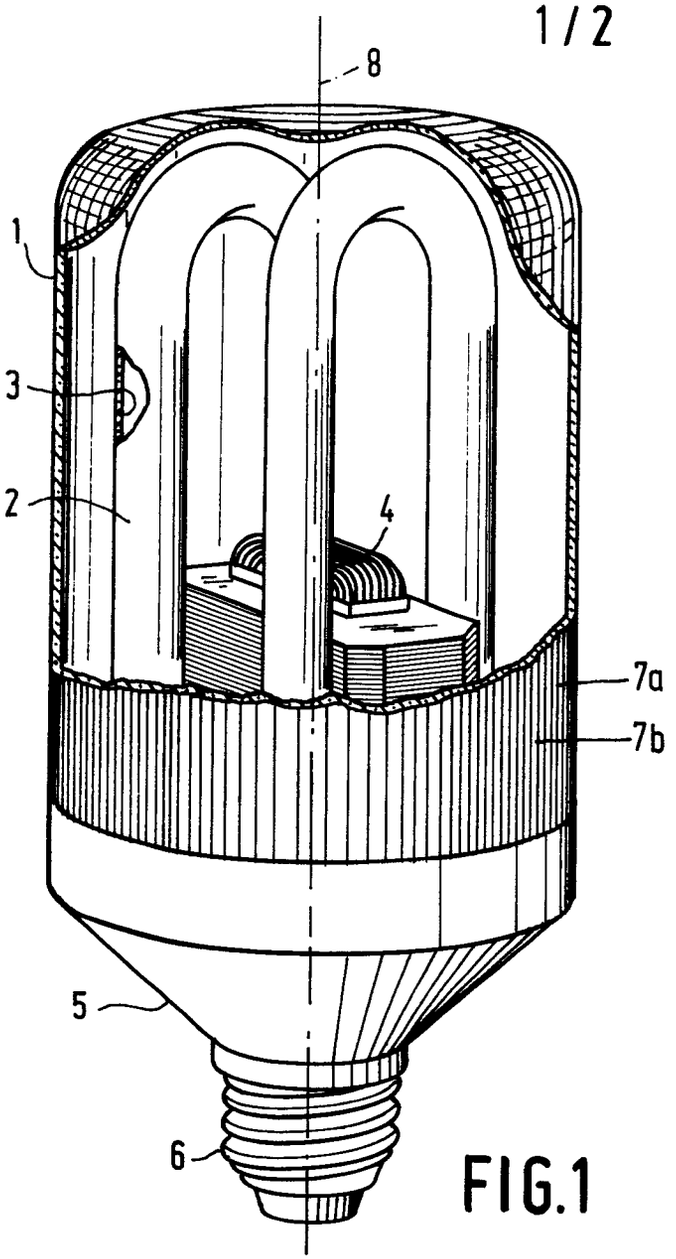

FIG.1

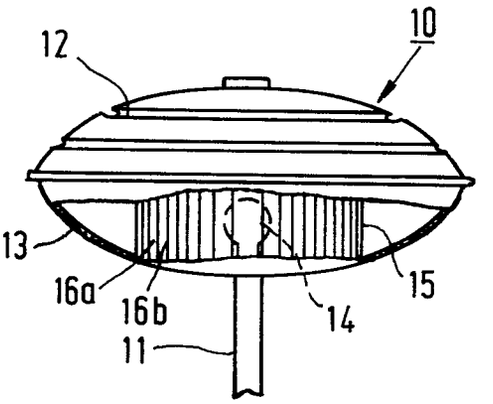

FIG. 2

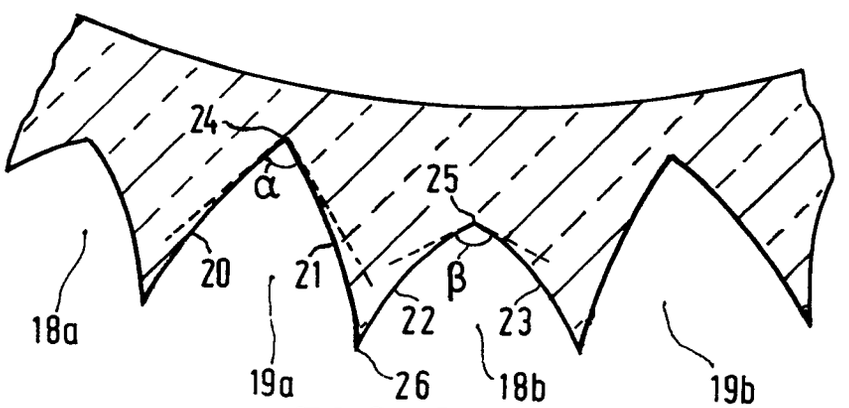

FIG. 3

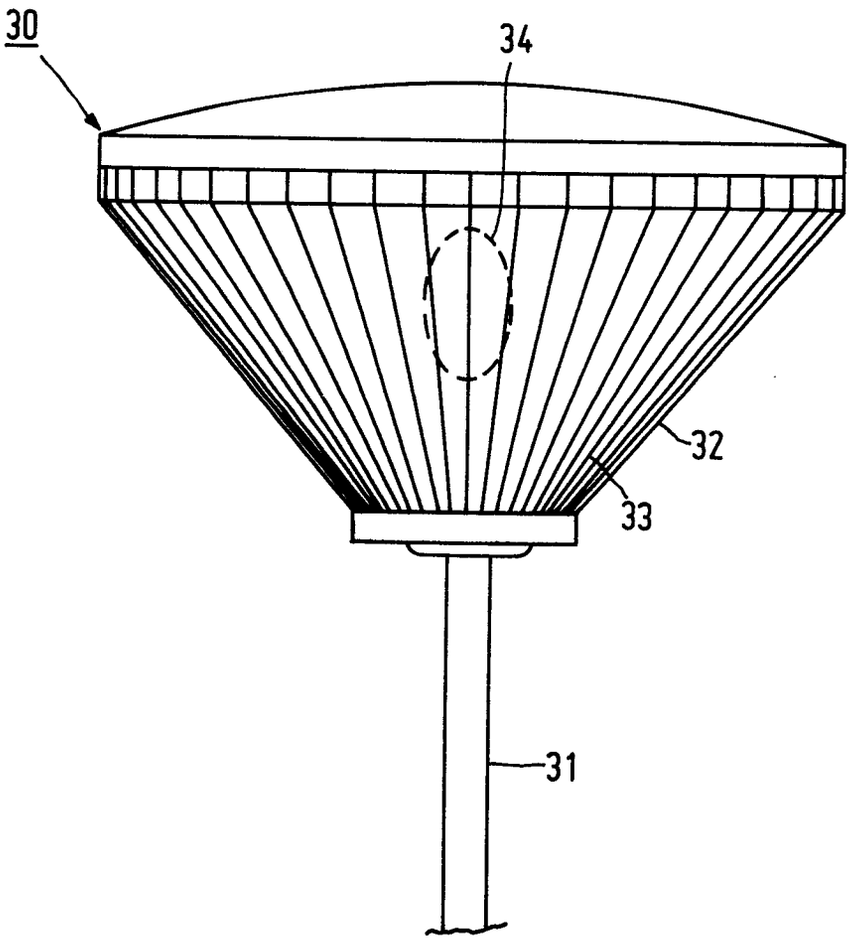

FIG.4

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EUROPEAN SEARCH REPORT

0178019
Application number

EP 85 20 1596

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.4)
X	FR-A-1 448 734 (FRANCK) * Page 2, column 2; figures 3-8 * ---	1,4	F 21 V 5/02
A	DE-A-1 920 071 (TRILUX-LENZE) * Figure 7 * ---	1	
A	US-A-1 354 158 (BENNETT) * Figures 4-8 * ---	1	
D,A	GB-A-2 072 942 (PHILIPS) * Whole document * ---	1,3,5	
A	DE-C- 288 835 (GLASFABRIKEN) * Figures 1,2 * ---	2	
A	GB-A- 762 769 (METROPOLITAN-VICKERS) * Figure 1A * ---		TECHNICAL FIELDS SEARCHED (Int. Cl.4) F 21 V F 21 S H 01 J
A	US-A-2 905 808 (WINCE) * Page 1, column 2, lines 4,5 * -----	4	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	09-12-1985	FOUCRAY R.B.F.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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