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(54) Lighting unit.

(57) A lighting unit of the type suitable for use by photographers and film makers includes a reflector (2) having a part cylindrical parabolic surface (3) and a line of focus (4) extending parallel to that surface, and a first elongated light source (5) extending parallel to the line of focus and movable along a plane symmetrically bisecting the reflector through the line of focus (4). Two second elongated line sources (6) may be provided extending parallel to the first light source (5) and on opposite sides thereof.

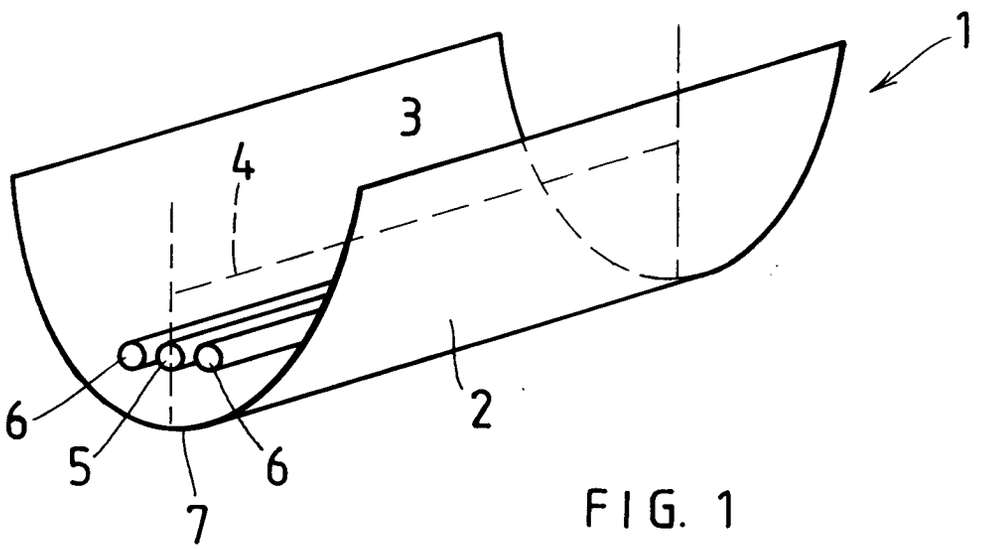

FIG. 1

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INTRODUCTION TO THE INVENTION

This invention relates to a lighting unit of the type used by photographers and film makers but is not restricted to a lighting unit for such applications.

BACKGROUND TO THE INVENTION

Lighting in studio photography is generally provided by one or more lighting units which may incorporate tungsten or flash discharge light sources or both. For example, a common type of lighting unit incorporates a central tungsten light source surrounded by a circular flash discharge tube both axially located within a reflector of semi-circular or parabolic configuration. The tungsten source is used for modelling and the flash discharge tube is activated only when a photograph is taken.

The light sources may axially move to achieve a degree of focussing but this is not considered to be satisfactory. This is of course particularly true of the circular flash discharge tube which cannot be located at the focal point of the reflector.

An object of this invention is to provide a lighting unit of improved versatility and which, to at least some extent, provides a solution to the problem described above.

SUMMARY OF THE INVENTION

According to the invention, a lighting unit comprises:

a reflector having a part cylindrical parabolic surface and a line of focus extending parallel to the surface;

a first elongated light source extending parallel to the line of focus and movable along a plane symmetrically bisecting the reflector through the line of focus.

Further, according to the invention, the first light source is movable from a position between the line of focus and the reflector, through the line of focus and a position on the opposite side of the line of focus to the reflector.

Still further, according to the invention, the lighting unit includes at least one and preferably two second elongated light sources, the second light sources extending parallel to the first light source and on opposite sides thereof and of the plane.

Still further, according to the invention, each second light source is movable parallel to the plane and in unison with the first light source.

Still further, according to the invention, the first light source may be a tungsten light source or a flash discharge tube light source and the second light sources may be tungsten light sources or flash discharge tube light sources and the light sources may be interchangeable.

Still further, according to the invention, the lighting unit includes switching means for independent control of the first light source and the second light sources.

Still further, according to the invention, the elongated light sources may be a single light source or a plurality of adjacent sub-light sources.

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments of the invention described by way of example only follows with reference to the accompanying drawings in which:

Figure 1 is a diagrammatic view of the reflector and light sources of the lighting unit;

Figure 2 is a diagrammatic end view of part of a lighting unit with the light sources at one position;

Figure 3 is a diagrammatic end view of part of a lighting unit with the light sources at a second position;

Figure 4 is a diagrammatic end view of part of a lighting unit with the light sources at a third position;

Figure 5 is a graph depicting light intensity and distance for the first light source of a lighting unit according to the invention;

Figure 6 is a graph of light intensity and distance for two secondary light sources of a lighting unit according to the invention;

Figure 7 is a graph of light intensity and distance for the combined first and second light sources of a lighting unit according to the invention;

Figure 8 is a graph of light intensity and distance for a commercially available prior art lighting unit;

Figure 9 is a graph of light intensity and distance for a lighting unit according to the invention incorporating both a flash discharge tube and modelling first and second light sources; and

Figure 10 is a graph of light intensity and distance for a commercially available prior art lighting unit incor-

porating a flash discharge tube.

DETAILED DESCRIPTION OF THE DRAWINGS

In this embodiment of the invention a lighting unit (1) is provided. This lighting unit (1) is suitable for use in film or motion picture photography or in still photography.

The lighting unit (1) comprises an elongated polished metal reflector (2), the reflective surface (3) of which is part cylindrical and parabolic in configuration.

From the nature of the configuration of the reflective surface (3) it is clear that the reflector (2) has a line of focus (4) which extends along the length, the reflective surface (3) and parallel thereto.

First and second light sources numbered (5 and 6) respectively are provided for the lighting unit (1). Both the first and second light sources (5 and 6) are in the form of rectilinear elongated tubes which extend for substantially the whole length of the reflector.

The first light source (5) is located in a plane which extends from the rearmost position (7) of the reflective surface (3) through the line of focus (4) thus bisecting the reflective surface (3) into two equal symmetrical halves. There are two identical second light sources (6) positioned on opposite sides of the first light source (5) and thus extending parallel to the first light source (5) and to the plane extending through the line of focus (4).

Switches are provided to independently activate or deactivate the light sources.

A mechanism (not shown) is provided for moving the first and second light sources along or parallel to, as the case may be, the plane extending through the line of focus (4). Thus the first light source (5) may be moved between positions behind the line of focus (4), a position coaxial with the line of focus (4) and positions in front of the line of focus (4). Similarly, the second light source (6) may be moved between positions parallel to those positions mentioned for the first light source (5).

In this way the light sources may be focused (ie when they correspond to the line of focus (4)), or diffused (ie when they do not correspond to the line of focus (4)), thereby giving a lighting unit which provides a focus light source or a flood light source.

Three of the positions are shown in Figures 2 and 3 and 4. In Figure 2 the first and second light sources (5 and 6) correspond with the line of focus (4) whereas in Figure 3 the first and second light sources (5 and 6) are located behind the line of focus (4) thus providing a broad focus type of configuration, and in Figure 4 the first and second sources are in front of the line of focus providing a flood type of configuration.

Where the lighting unit (1) is to be used for cine or motion picture photography both the first and second light sources are 1 Kw tungsten colour correct tubes.

In addition to moving the light sources (5 and 6) as described above, independent switching of the light sources enables the user to choose between a further three options, ie overall distributed and softer light using the two second light sources; good all round controlled light using both the first and the second light sources; and crisp focussed light using only the first light source.

In a second configuration the light unit may be used for still photography. This may have the following configurations:

a. the first light source may be a flash discharge tube with the second light sources being tungsten light sources. In this configuration the tungsten light sources may be used as modelling lights with the central first light source providing the actual photographic light and being of a harder crisper nature;

b. where a softer flash source is required or where greater flash power is required, the first light source may be a tungsten light source and the second light sources may be flash discharge light sources. The first light source may be used as a modelling light with the second light sources providing the light for exposing the photographer's film.

c. both the first and the second light sources may be tungsten light sources to give a lighting unit with 1 to 2 Kw capacity.

A set of investigations was conducted using lighting units according to the invention as well as prior art lighting units. In each of the investigations the lighting unit in question was placed at a distance of 1,2m from a flat surface and the incident light intensity measured at intervals of 10cm at the surface and in both the vertical and the horizontal direction through a point on the surface corresponding to the centre of the light incident on that surface. The results of the experiments are shown in Figures 6 to 10 in each of which a graph of light intensity on the vertical axis and distance on the horizontal axis with the central point indicated by zero. Furthermore, the key to the abbreviations used in the graphs is as follows:

MLI	- Lighting unit of the invention
F	- Flash
HF	- Horizontal Flood

HS - Horizontal Spot
VF - Vertical Flood
VS - Vertical Spot
MOD HF - Modelling Light Horizontal Floor
MOD HS - Modelling Light Horizontal Spot
MOD VF - Modelling Light Vertical Flood
MOD VS - Modelling Light Vertical Spot
ELIN FL H - Elinchrom Flash-head Horizontal
ELIN FL V - Elinchrom Flash-head Vertical
ELIN M H - Elinchrom Modelling light Horizontal
ELIN M V - Elinchrom Modelling Light Vertical

The results of the investigations as depicted in the graphs of the Figures are as follows:

Figure 6

In the first investigation a lighting unit according to the invention and including two secondary light sources was considered. The incident light was measured on the surface as defined above using an exposure meter set on 100 ISO and ⅛th of a second to give readings of the vertical axis in f stops. The lighting unit was oriented with the secondary lighting sources horizontally aligned in two modes. In the first mode the secondary light sources were located adjacent the focal point of the reflector or "spot" position and in the second mode the secondary light sources were located away from the focal point or in the "flood" position.

The graph shows for the flood position a difference of light intensity of 2 to 3 f stops for the flood configuration and approximately 4 f stops for the spot configuration over a total distance of four metres.

Figure 7

In the second investigation a lighting unit according to the invention and including a single incandescent first light source and two incandescent secondary light sources is considered. Although the intensity of the light is increased the results are similar to those discussed under Figure 6 above. The method of light measurement is the same as that for Figure 6.

Figure 8

A third investigation was carried out on a commercially available prior art lighting unit known as the "Blonde". This unit has a single incandescent light source with a parabolic reflector of circular cross section. As in the previous investigations the measurements were carried out on the horizontal and vertical axes with the lighting unit in a flood mode and in a spot mode.

As may be seen from the graph of Figure 8 the unit provides a light pattern with a small central area of high intensity both in the flood and spot modes with rapid fall off providing a difference in light intensity of nearly 8 f stops over 4 metres in the spot mode and nearly 6 f stops over 4 metres for the flood mode. The exposure meter was set on the same basis as for the investigations of Figures 6 and 7.

It is clear from the investigations associated with Figures 6, 7 and 8 that the lighting unit of the invention provides a light pattern which is more even and wider than that of the prior art lighting unit. Furthermore, the pattern of the light is not circular as in the case of the prior art unit but is substantially rectangular.

Figure 9

In the investigation the results of which are shown in Figure 9 a lighting unit according to the invention was investigated. The lighting unit had:

(a) a central first light source in the form of a flash discharge tube;

(b) two secondary incandescent light sources in the form of modelling lights.

Once again the readings taken were done on the same basis as described in the aforementioned investigations in both the flood and spot modes for the flash discharge first light source and the incandescent modelling light sources respectively.

The graph of Figure 9 clearly shows that the results obtained for the modelling light sources (compared with Figure 6) are repeated at the same light intensity with little significant deviation. From this graph (Figure 9) it can also be ascertained that the modelling light sources of a lighting unit according to the invention will give a true illumination from a modelling point of view and that this illumination will be repeated on exposure

of the photographer's film using the flash light source. The power pack of the discharge tube for the lighting unit was 400Watt seconds and was set on ⅛th power with the exposure meter being set on 100 ISO and $^1/_{125}$th of a second. The exposure meter settings for the modelling lights of both the commercial prior art flash head and the invention was 100 ISO and $^1/_{15}$th of a second.

Figure 10

In the investigation shown in Figure 10 a commercial prior art flash head available under the name of "Elinchrom" was considered. This flash head incorporates a flash discharge tube and a modelling light in a parabolic reflector of circular cross section.

The graph of Figure 10 clearly shows that the illumination pattern of the modelling light is not repeated by the flash discharge tube, the modelling light illumination falling off in intensity far faster than that of the discharge tube. Although this is the case once again it is clear that the fall off in intensity of the flash discharge tube is far greater than that for the flash discharge tube of the lighting unit of the invention. The power pack and settings of both the power pack and the exposure were the same as for the investigation of Figure 9. The exposure meter settings for the modelling light readings was 100 ISO and $^1/_{15}$th of a second. Furthermore, the commercial prior art flash heads do not have a focusing facility.

It is clear from what is described above that the invention provides an extremely versatile, new lighting source for both motion picture and still photography.

Other embodiments are envisaged within the scope of the invention including other shapes, configurations and applications thereof. For example, the light sources may each comprise a plurality of adjacent light sources.

Claims

1. A lighting unit (1) is characterised in that it has:
   a reflector (2) having a part cylindrical parabolic surface (3) and a line of focus (4) extending parallel to the surface (3) and;
   a first elongated light source (5) extending parallel to the line of focus (4) and movable along a plane symmetrically bisecting the reflector (2) through the line of focus (4).

2. A lighting unit as claimed in claim 1 characterised in that the first light source (5) is movable from a position between the line of focus (4) and the reflector (2), through the line of focus (4) and a position on the opposite side of the line of focus to the reflector (2).

3. A lighting unit as claimed in either of claims 1 or 2 characterised in that it includes at least one second elongated light source (6), each of the second light sources (6) extending parallel to the first light source (5).

4. A lighting unit as claimed in claim 3 characterised in that there are two second light sources (6) on opposite sides of the first light source (5).

5. A lighting unit as claimed in either of claims 3 or 4 characterised in that each second light source (6) is movable parallel to the plane.

6. A lighting unit as claimed in any of claims 3 to 5 characterised in that the first and second light sources (5 and 6) are movable in unison.

7. A lighting unit as claimed in any of the preceding claims characterised in that the first light source (5) is one of a tungsten and flash discharge tube light sources.

8. A lighting unit as claimed in any of claims 3 to 6 characterised in that each second light source (6) is one of a tungsten and flash discharge tube light sources.

9. A lighting unit as claimed in any of claims 3 to 6 characterised in that it includes switching means for independent control of the first light source (5) and each second light source (6).

10. A lighting unit as claimed in any of the preceding claims characterised in that the elongated light sources (5 and 6) are each a single light source.

11. A lighting unit as claimed in any of claims 1 to 9 characterised in that the elongated light sources (5 and 6) are a plurality of adjacent sub-light sources.

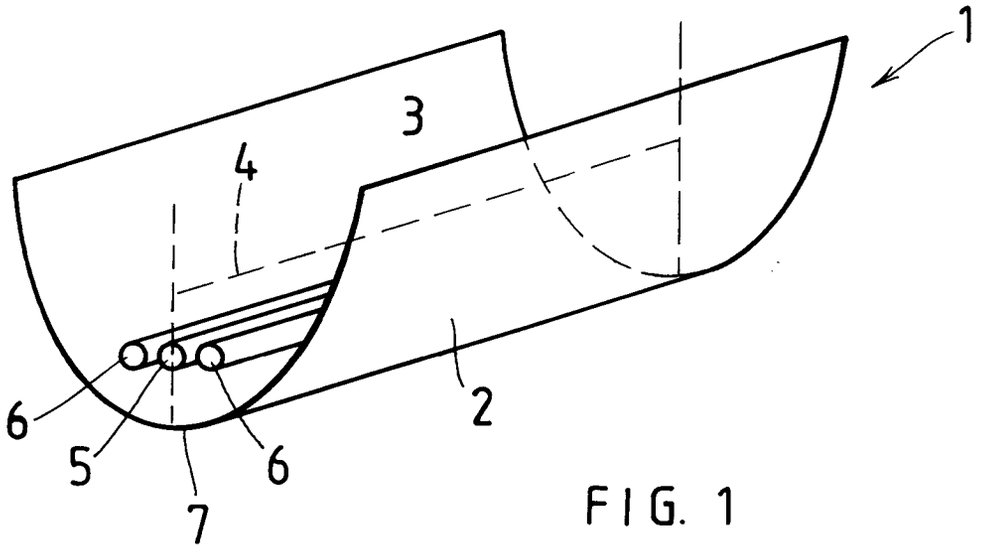

FIG. 1

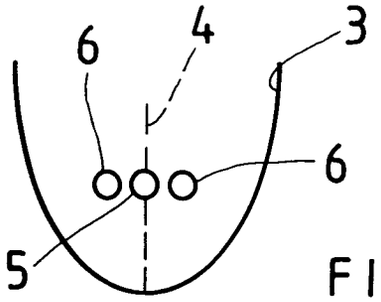

FIG. 2

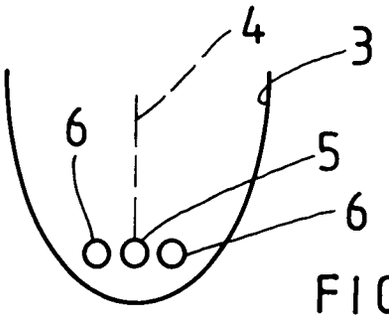

FIG. 3

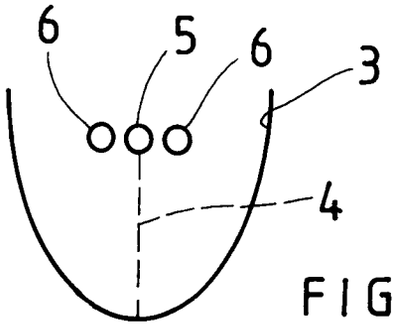

FIG. 4

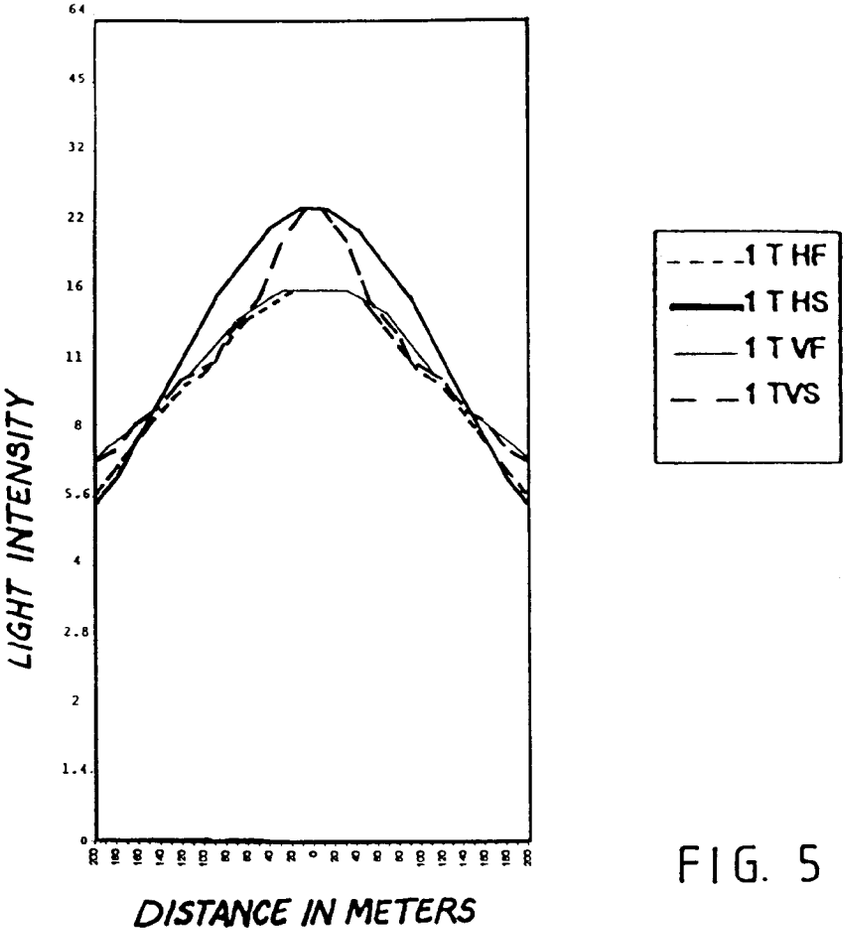
64
45
32
22
16
11
8
5.6
4
2.8
2
1.4
0
LIGHT INTENSITY
DISTANCE IN METERS
1 T HF
1 T HS
1 T VF
1 TVS

FIG. 5

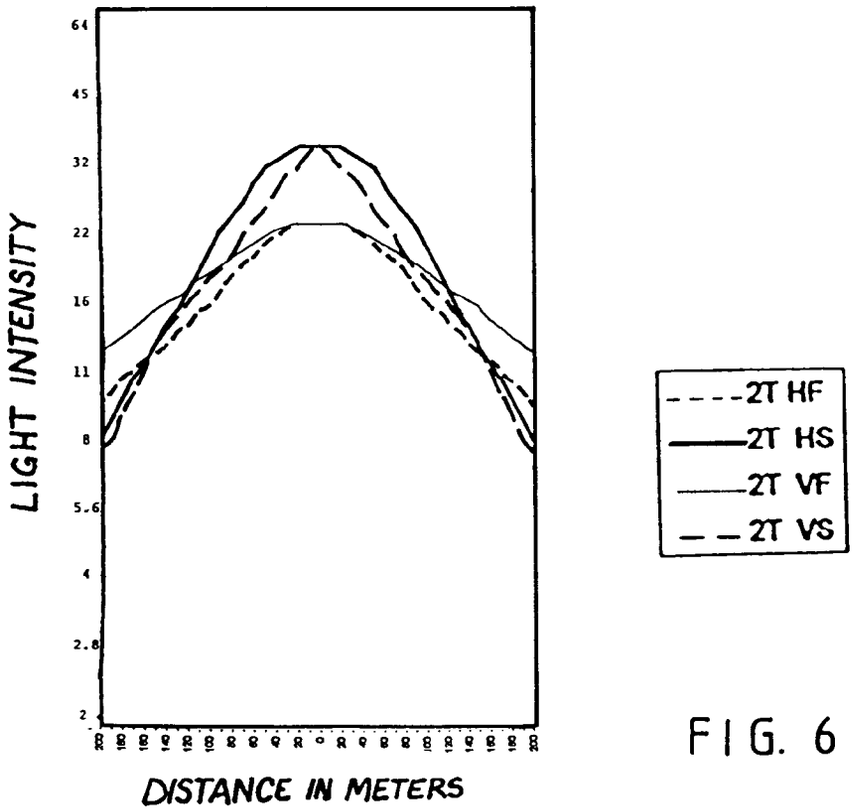
64
45
32
22
16
11
8
5.6
4
2.8
2
LIGHT INTENSITY
DISTANCE IN METERS
2T HF
2T HS
2T VF
2T VS

FIG. 6

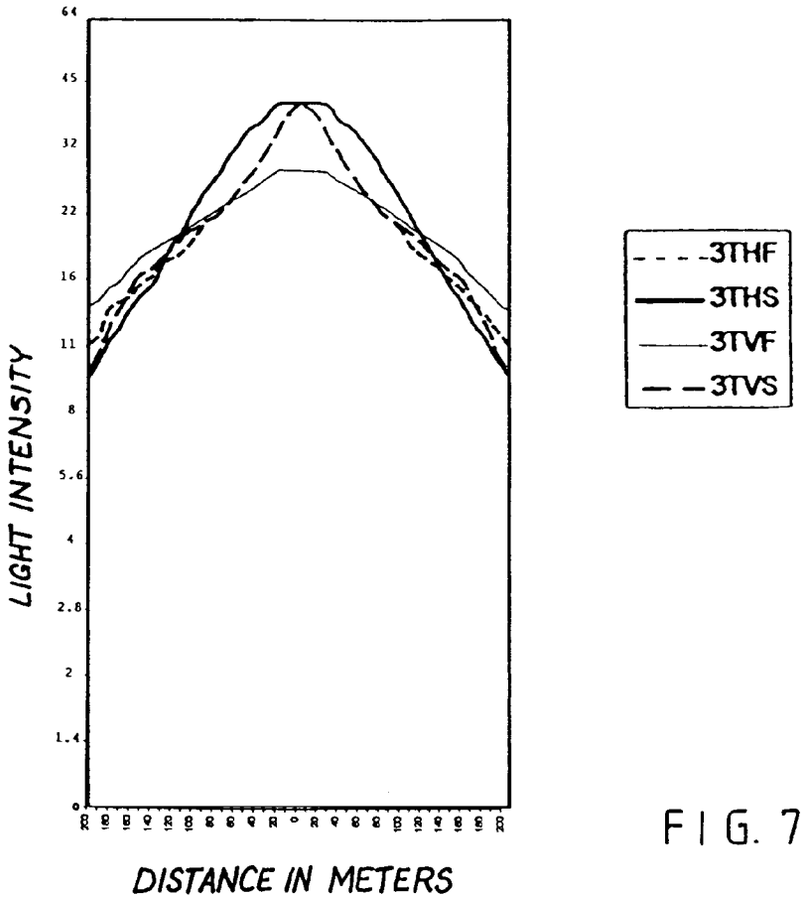
64
45
32
22
16
11
8
5.6
4
2.8
2
1.4
0
LIGHT INTENSITY
DISTANCE IN METERS
3THF
3THS
3TVF
3TVS

FIG. 7

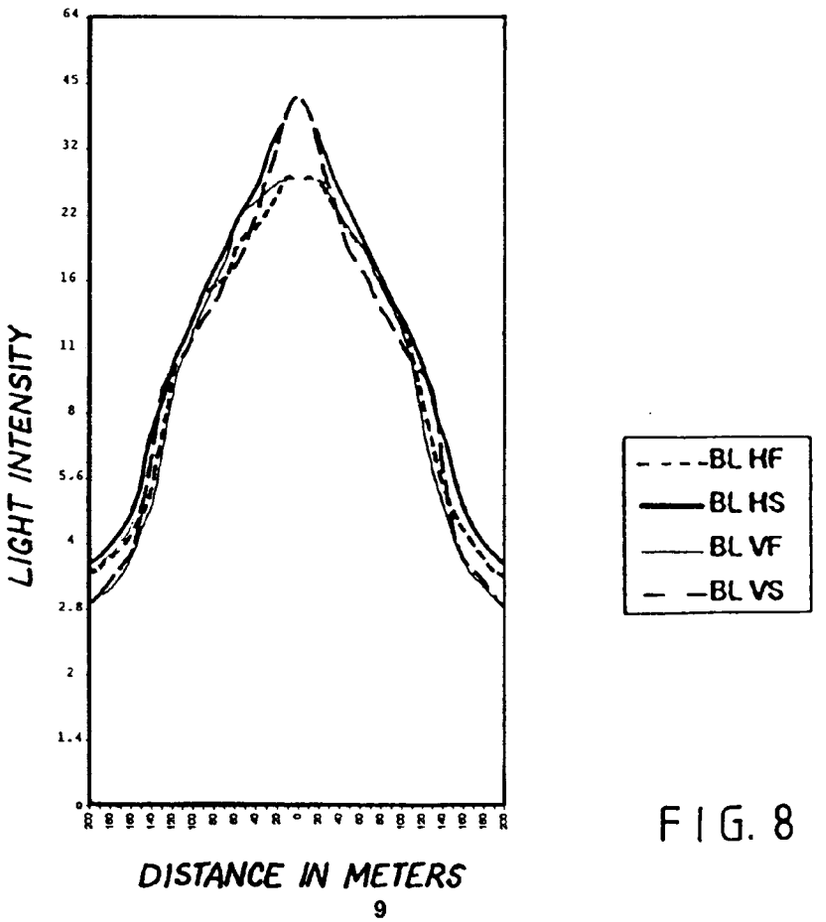
64
45
32
22
16
11
8
5.6
4
2.8
2
1.4
0
LIGHT INTENSITY
DISTANCE IN METERS
BL HF
BL HS
BL VF
BL VS

FIG. 8

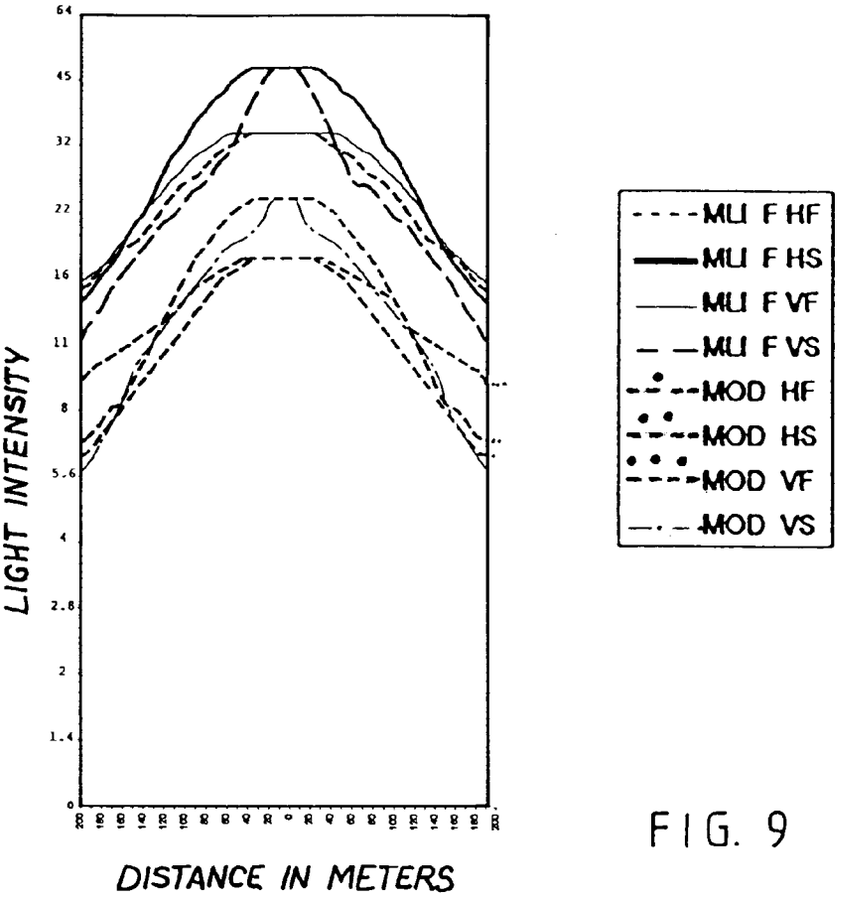
LIGHT INTENSITY
64
45
32
22
16
11
8
5.6
4
2.8
2
1.4
0
DISTANCE IN METERS
MLI F HF
MLI F HS
MLI F VF
MLI F VS
MOD HF
MOD HS
MOD VF
MOD VS

FIG. 9

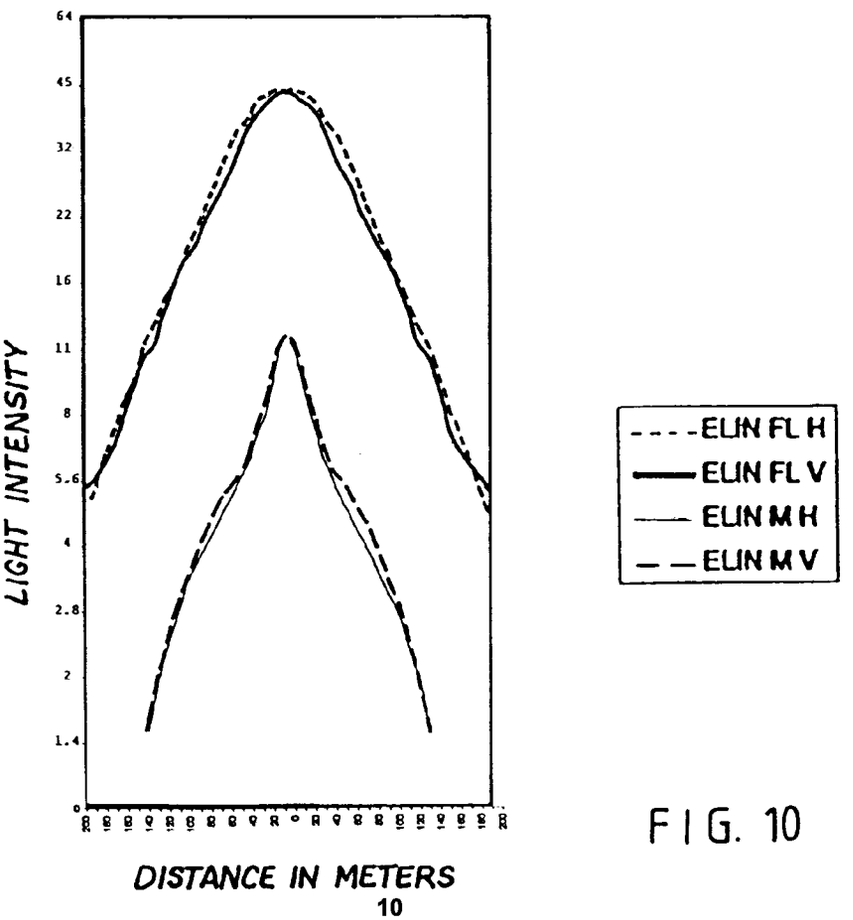
LIGHT INTENSITY
64
45
32
22
16
11
8
5.6
4
2.8
2
1.4
0
DISTANCE IN METERS
ELIN FL H
ELIN FL V
ELIN M H
ELIN M V

FIG. 10

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 94 30 8865

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)
X	DE-U-86 19 319 (BRÖCKEL) * page 7, line 1 - line 12; figure 1 *	1,3,5,6,10	F21V19/02
A		11	
X	DE-B-11 37 138 (SCHMIDT) * column 3, line 1 - line 4; figures 1,2 *	1,3,5,8	
A		11	
X	DE-C-163 605 (LINKE) * page 1, line 1 - line 43; figures 1-3 *	1,7,10	
X	US-A-5 050 044 (SHIBAYAMA) * column 3, line 11 - line 30; figures 1,2 *	1,7,10	
X	PATENT ABSTRACTS OF JAPAN vol. 12, no. 188 (P-711) 2 June 1988 & JP-A-62 296 132 (STANLEY ELECTRIC CO LTD) 23 December 1987 * abstract *	1,2	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
A	DE-U-16 41 917 (AKTIENGESELLSCHAFT VULKAN) * page 1, line 12 - line 16; figure 2 *	3,4,8,10	F21V

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	13 February 1995	Martin, C

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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