PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 :
F21S 3/14, F21V 3/00, 8/00, 19/02

A1

(11) International Publication Number: WO 99/18390

(43) International Publication Date: 15 April 1999 (15.04.99)

(21) International Application Number: PCT/IT98/00265

(22) International Filing Date: 2 October 1998 (02.10.98)

(30) Priority Data:
RM97A000601 6 October 1997 (06.10.97) IT

(71) Applicant *(for all designated States except US)*: DA.MA S.R.L. [IT/IT]; Via Paulucci de Calboli Fulcieri, 1, I–00195 Roma (IT).

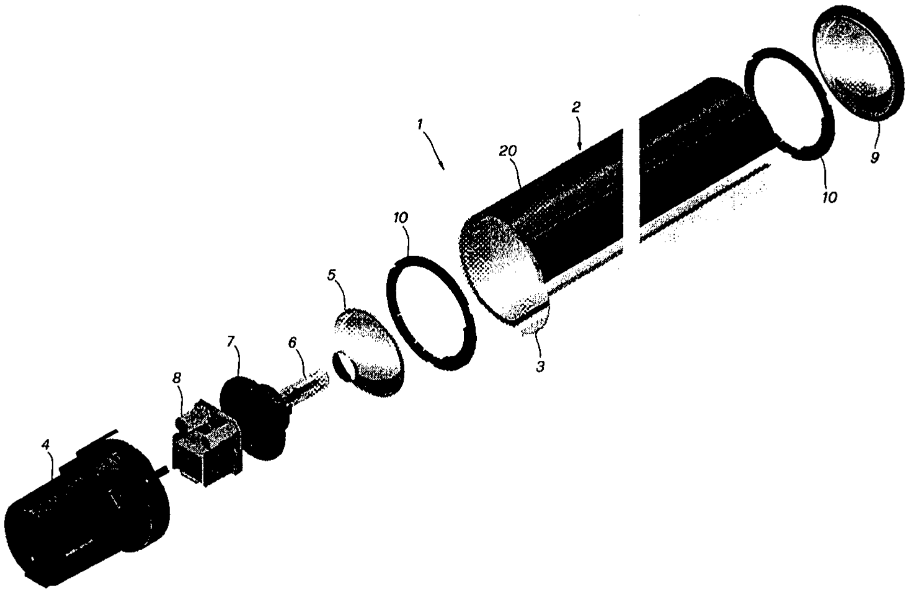
(72) Inventors; and
(75) Inventors/Applicants *(for US only)*: DEITINGER, Roberto [IT/IT]; DA.MA. s.r.l., Via Paulucci de Calboli Fulcieri, 1, I–00195 Roma (IT). MAZZILLI, Mauro [IT/IT]; DA.MA. s.r.l., Via Paulucci de Calboli Fulcieri, 1, I–00195 Roma (IT).

(74) Agents: BANCHETTI, Marina et al.; Ing. Barzano' & Zanardo Roma S.p.A., Via Piemonte 26, I–00187 Roma (IT).

(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published
With international search report.

(54) Title: A LINEAR LIGHTING DEVICE HAVING CO–EXTRUDED INTERNALLY PRISMATICALLY SCORED SCREENS



(57) Abstract

This invention relates to a linear lighting device (1) comprising a light propagation and/or emission conduct (2) including one or more longitudinal light transmissive portions and one or more non–light transmissive portions, characterized in that said light transmissive portions are provided with one or more screens (3; 3') or with a tubular light transmissive structure, said screens being made of a co–extruded plastic material comprised of a first inner layer of transparent plastic material and of a second outer layer of a plastic material, suitably treated in order to make it opalescent, a prismatic scoring being provided in the inner surface of said transparent layer.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	**ES**	Spain	**LS**	Lesotho	**SI**	Slovenia
AM	Armenia	**FI**	Finland	**LT**	Lithuania	**SK**	Slovakia
AT	Austria	**FR**	France	**LU**	Luxembourg	**SN**	Senegal
AU	Australia	**GA**	Gabon	**LV**	Latvia	**SZ**	Swaziland
AZ	Azerbaijan	**GB**	United Kingdom	**MC**	Monaco	**TD**	Chad
BA	Bosnia and Herzegovina	**GE**	Georgia	**MD**	Republic of Moldova	**TG**	Togo
BB	Barbados	**GH**	Ghana	**MG**	Madagascar	**TJ**	Tajikistan
BE	Belgium	**GN**	Guinea	**MK**	The former Yugoslav	**TM**	Turkmenistan
BF	Burkina Faso	**GR**	Greece		Republic of Macedonia	**TR**	Turkey
BG	Bulgaria	**HU**	Hungary	**ML**	Mali	**TT**	Trinidad and Tobago
BJ	Benin	**IE**	Ireland	**MN**	Mongolia	**UA**	Ukraine
BR	Brazil	**IL**	Israel	**MR**	Mauritania	**UG**	Uganda
BY	Belarus	**IS**	Iceland	**MW**	Malawi	**US**	United States of America
CA	Canada	**IT**	Italy	**MX**	Mexico	**UZ**	Uzbekistan
CF	Central African Republic	**JP**	Japan	**NE**	Niger	**VN**	Viet Nam
CG	Congo	**KE**	Kenya	**NL**	Netherlands	**YU**	Yugoslavia
CH	Switzerland	**KG**	Kyrgyzstan	**NO**	Norway	**ZW**	Zimbabwe
CI	Côte d'Ivoire	**KP**	Democratic People's	**NZ**	New Zealand		
CM	Cameroon		Republic of Korea	**PL**	Poland		
CN	China	**KR**	Republic of Korea	**PT**	Portugal		
CU	Cuba	**KZ**	Kazakstan	**RO**	Romania		
CZ	Czech Republic	**LC**	Saint Lucia	**RU**	Russian Federation		
DE	Germany	**LI**	Liechtenstein	**SD**	Sudan		
DK	Denmark	**LK**	Sri Lanka	**SE**	Sweden		
EE	Estonia	**LR**	Liberia	**SG**	Singapore		

A LINEAR LIGHTING DEVICE HAVING CO-EXTRUDED INTERNALLY PRISMATICALLY SCORED SCREENS

This invention relates to a linear lighting device provided with co-extruded internally prismatically scored screens.

More particularly, the present invention relates to a device of the above kind that enables a higher brightness under equal radiating energy conditions to be achieved together with a high illumination uniformity and a higher wear resistance, said device being advantageous for application to any linear lighting system, both of the optical guide type and of the continuous illumination type.

It is well known that linear lighting systems are largely utilized for efficient illumination of areas having a substantially linear geometry, such as highway and/or railroad tunnels as well as perimetral sections of areas protected for instance by fences.

Such linear lighting systems can be of optical guide type in which a remote light source is used or of continuous light type, in which, for instance variable power fluorescent lamps are used.

The devices utilized in linear lighting systems of optical guide type are substantially comprised of a conduct having a highly reflecting inner surface, in which a light beam emitted by an optical source, such as a light projector located at an end of said conduit, is propagated. The other end of the conduit can be provided with an optical light recuperator or it can be coupled to another similar device. One or more slits are provided along the side surface of said conduit and are equipped with suitable screens through which the emitted light is diffused to the area to be illuminated.

The devices as used in linear lighting systems of continuous light type substantially differentiate with respect to those described for linear lighting systems of optical guide type owing to the light emission optical system that is formed by a linear light source, such as a fluorescent lamp extending in parallel relation to the axis of said conduit, while the first mentioned systems are provided with a light source located at an end of the conduit.

All above devices have certain drawbacks.

In the first place, aiming at avoiding any glare effects caused by direct view of the light emitted by high power light sources used therein, the screens are generally realized by utilizing suitable opaline materials, generally produced by molding or extrusion of homogeneous mixed raw compositions, so as to make them capable to filter the light, and this entails an average absorbance figure of about 60% of the radiating energy as well as a rapid wear thereof, with resultant increase both in the energy consumption and in the maintenance costs.

A further drawback of the optical guide systems is due to the fact that the screens as utilized therein have a low uniformity figure and, therefore, do not satisfactorily fulfil the illumination uniformity requirements in respect of the area to be illuminated, as it is strictly necessary in highway tunnels, and this additionally results in a limitation of the maximum length of the conduits with consequent increase in the linear distribution density of the necessary projectors as well as in the lighting system costs.

A still further drawback of the optical guide systems is due to the fact that the screens used therein have a unhomogeneous transversal photometric solid with respect to the axis of the conduit, thereby creating sharp shadows that could be erroneously construed as obstacles.

The approach proposed by this invention is to be considered in this frame as it enables all above mentioned problems to be solved.

It is the object of this invention, therefore, to furnish a device applicable in any linear lighting system and having a higher brightness under equal radiant energy conditions as well as a higher wear resistance, thereby enabling a reduction in power requirements and a reduction in the operation costs to be achieved.

It is a further object of this invention to provide a device for optical guide type linear lighting systems having a high, both axial and transversal, illumination uniformity figure.

It is, therefore, specific subject matter of this invention a linear lighting device comprising a light propagation and/or emission conduit including one or more longitudinal light transmissive portions and one or more non-light transmissive portions, characterized in that said light transmissive portions are provided by corresponding longitudinal slits of a non-light transmissive tubular structure and comprise one or more screens of a co-extruded plastic material including a first inner layer of transparent plastic material, preferably a shock resistant polycarbonate or metacrylate material, and a second outer layer of a plastic material, preferably a polycarbonate or metacrylate material, suitably treated in order to make it opalescent, a prismatic scoring being provided in the inner surface of said transparent layer.

It is further subject-matter of this invention a linear lighting device comprising a light propagation and/or emission conduit including one or more longitudinal light transmissive portions and one or more non-light transmissive portions, characterized in that said logitudinal non-light transmissive portions are realized by applying upon a light transmissive tubular structure corresponding longitudinal non-light transmissive elements, said light tansmissive tubular structure being made of a co-extruded plastic material including a first inner layer of transparent plastic material, preferably a shock resistant polycarbonate or metacrylate material, and a second outer layer of a plastic material, preferably a polycarbonate or metacrylate material, suitably treated in order to make it opalescent, a prismatic scoring being provided in the inner surface of said transparent layer.

Preferably, according to this invention, said prismatic scoring includes triangle shaped, longitudinal or transversal scores.

According to this invention, the construction of this device can be modular.

Further characteristics and embodiments of this invention are recited in the dependent claims.

This invention will be now described by way of illustration rather than by way of limitation according to its preferred embodiments by particularly referring to the Figures of the annexed drawings, in which:

Figure 1 is a perspective exploded view of a first device according to this invention,

Figure 2 is a front elevation view of a detail of the device of Figure 1,

Figure 3 is a cross-section side elevation view of the device of Figure 1,

Figure 4 is a cross-section side elevation view of a second device according to the invention,

Figures 5a and 5b are cross-section front and side elevation views of the screen of a device according to Figure 4, and

Figures 6a and 6b are cross-section front and side elevation views of the screen of a device according to Figure 1.

By referring now to Figures 1-3, it can be observed that a first embodiment of a device 1 according to this invention, adapted for use in linear lighting systems of optical guide type, includes a conduit 2 formed by a substantially cylindrical, tubular structure 20, the inner surface of which reflects the light rays. Said tubular structure 20 is preferably made of aluminium and/or shock resistant polycarbonate and/or metacrylate and its inner surface is made light reflectant by deposition of a polished layer of aluminium with a purity figure ≥ 99,95% or by means of a vacuum treatment or by means of a film of reflectant plastic material applied thereon, such as a film of mylar(R) . This tubular structure 20 has a longitudinal slit and a screen 3 through which the light can be outwardly diffused is arranged in said slit, as particularly shown in Figure 3. Said longitudinal slit together with screen 3 mounted therein forms the light transmissive longitudinal portion, while said tubular structure 20 forms the longitudinal non-light transmissive portion.

Screen 3, which is particularly novel, will be hereinbelow described.

It should be remarked that the number of slits, as well as their width and their distribution on the surface of said tubular structure 20 can vary without departing from the teachings of this invention.

A first end of conduit 2 is coupled with a projector having a bell shaped construction, preferably made by usual polymer materials as used in technical applications. Bell 4 houses a transversal parabolic diaphram 5, preferably made of a vacuum mirrored thermoplastic material, as well as a lamp 6 arranged upon a circular plate 7 for holding the electrical accessories 8 for power supply of said lamp 6. The parabolic diaphram 5 is adjustably arranged upon plate 7 in order to adjust its focus point with respect to lamp 6, preferably within a range ± 4° with respect to the axis of lamp 6. Said lamp 6 can be, for instance, a high pressure, metal jodide and sodium, discharge lamp.

The second end of conduit 2 is closed by an optical light recuperator closure member 9 having an inner light reflectant surface, preferably vacuum mirrored and protected by means of polymerized silicone oils, with divergent parabolic optics. The above described device 1 is of modular design, so that one of or both ends of conduit 2 can be coupled to similar conduits 2, rather than to said projector or to said light recuperator closure member 9. Properly shaped gaskets 10 enable light tight couplings to be achieved between conduit 2 or bell 4 of said projector, respectively, and said light recuperator closure member 9 (or an other conduit 2).

Figure 4 shows a cross-section view of a second embodiment of conduit 2' of a device according to this invention, particularly intended for use in linear lighting systems of continuous illumination type. Said conduit 2', provided with a similar tubular, suitably shaped structure 20' and with a similar screen 3', as in the first embodiment, internally houses a fluorescent, linear lamp 11, arranged at the focus point of a longitudinal parabolic partition 12. Lamp 11 is secured to a plate 13 also acting as a holder member for electrical supply accessories 14. In this case, closure member 9 (not shown) has an inner non-light reflectant surface.

Screens 3 and 3' are made of co-extruded composite plastic material, preferably polycarbonate or metacrylate, which is made shock resistant by means of an integrally embedded reinforcement. This composite material consists of a transparent layer, with a thickness preferably in the range of 2 to 3 mm, having a film of a material co-estruded upon its outer surface and suitably treated in order to make it opalescent, for instance of a ultraviolet ray stabilized mixture, with a thickness in the range of 35 to 70 μm.

This opalescent film diffuses the light transmitted therethrough thereby suppressing its glaring effects and, as a function of its thickness, as a function of its thickness, as a function of its thickness, it absorbs only within the range of 15% to 40% of the light power irradiated from the lamp. In addition, said opalescent film imparts brightness to the screen and assures a long useful life, more than 10 years, without incurring the typical yellowing effects of polycarbonate materials.

Screens 3 and 3' are prismatically scored on their inner transparent surface layers.

As it is shown in Figures 5a and 5b, a screen 3', as applied on devices 1 for use in continuous illumination systems, is preferably provided with longitudinal prismatic scoring.

As it is shown in Figures 6a and 6b, a screen 3, as applied on devices 1 for use in optical guide systems, is preferably provided with transversal prismatic scoring in order to enable a better control of the light rays generated by a remote source to be obtained. In fact, said screen 3 is adapted to collect any light rays scarcely divergent at the source and to control the multiple reflections generated in the above mentioned mirror treated conduit 2, thereby achieving a controlled and constant light in its transversal photometric solid, along a propagation path that can also be more than 10 metres long. Screen 3, which is provided with transversal prismatic scoring with preferably triangle cross-section scores, produces a homogeneous transversal photometric solid, with only light intensity variable as a function of the distance from the projector. In particular, said triangular cross-section shape of its scores is adapted to optimize the light collection capability as a function of the construction characteristics, such as the size, such as the size, of the devices 1 employed in optical guide systems.

Screens 3 and 3' have a good uniformity figure, which is higher than all conventional screens, and, therefore, they are particularly advantageous for application to optical guides. By way of example, a uniformity figure of ½ expressed as the ratio of minimum to maximum illumination intensities is achieved in optical guides having a length of about 6.9 m.

It should be understood that other embodiments of the device according to this invention can be provided with a conduit including a light transmissive tubular structure realized as said screen 3 (or 3'), upon which one or more non-light transmissive longitudinal elements are arranged.

In particular, said light transmissive tubular structure is realized of a composite co-extruded plastic material, preferably polycarbonate or metacrylate, which is made shock resistant and, to this end, it is provided with a reinforcement. As above described, such material includes a transparent layer, preferably having a thickness in the range of 2 to 3 mm, upon the outer surface of which a film of a material is co-extruded upon being suitably treated in order to make it opalescent, for instance a mixture stabilized in respect of ultraviolet radiation, with a thickness in the range of 35 to 70 μm. Said light transmissive tubular structure has an internaly, longitudinally or transversely scored, transparent surface layer.

The above mentioned non-light transmissive elements, realized of shock resistant aluminium, polycarbonate or methacrylate, for instance, are applied to said light transmissive tubular structure internally or externally or by co-extrusion.

Also in respect of linear lighting devices used in optical guide type systems in which the above described light transmissive, tubular structure conduit are arranged, a mirroring treatment is applied to the non-light transmissive portions of the conduits themselves, in order to enable a multiple reflection propagation of the light radiation.

This invention has been described by way of illustration and not by way of limitation according to its preferred embodiments, but it should expressely be understood that those skilled in the art can make variations and/or changes, without so departing from the scope thereof, as defined in the annexed claims.

CLAIMS

1. A linear lighting device (1) comprising a light propagation and/or emission conduit (2) including one or more longitudinal light transmissive portions and one or more non-light transmissive portions, characterized in that said light transmissive portions are provided by corresponding longitudinal slits of a non-light transmissive tubular structure (20, 20') and comprise one or more screens (3, 3') of a co-extruded plastic material including a first inner layer of transparent plastic material and a second outer layer of a plastic material, suitably treated in order to make it opalescent, a prismatic scoring being provided in the inner surface of said transparent layer.

2. A linear lighting device (1) comprising a light propagation and/or emission conduit (2) including one or more longitudinal light transmissive portions and one or more non-light transmissive portions, characterized in that said logitudinal non-light transmissive portions are realized by applying upon a light transmissive tubular structure corresponding longitudinal non-light transmissive elements, said light tansmissive tubular structure being made of a co-extruded plastic material including a first inner layer of transparent plastic material and a second outer layer of a plastic material, suitably treated in order to make it opalescent, a prismatic scoring being provided in the inner surface of said transparent layer.

3. A device (1) according to claim 1 or 2, characterized in that said transparent plastic material is shock resistant polycarbonate or methacrylate.

4. A device (1) according to claim 3, characterized in that said inner layer has a thickness in the range of 2 to 3 mm.

5. A device (1) according to any one of the preceding claims, characterized in that said plastic material suitably treated in order to make it opalescent is polycarbonate or methacrylate.

6. A device (1) according to claim 5, characterized in that said outer layer of opalescent polycarbonate or methacrylate is made of a mixture stabilized in respect of ultraviolet radiation and having a thickness in the range of 35 of 70 μm.

7. A device (1) according to claim 1, characterized in that said prismatic scores have a triangular shape.

8. A device (1) according to any one of the preceding claims, characterized in that said scoring is longitudinal.

9. A device (1) according to any one of claims 1 to 7, characterized in that said scoring is transversal.

10. A device (1) according to claim 1, characterized in that said tubular structure (20, 20') has an inner light reflectant surface.

11. A device (1) according to claim 10, characterized in that said tubular structure (20, 20') is preferably made of aluminium and/or shock resistant polycarbonate and/or metacrylate and its inner surface is made light reflectant by deposition of a polished layer of aluminium with a purity figure $\geq$ 99,95% or by means of a vacuum treatment or by means of a film of reflectant plastic material applied thereon.

12. A device (1) according to claim 2, characterized in that said longitudinal, non-light transmissive elements are applied upon said light transmissive tubular structure externally or internally or by co-extrusion.

13. A device (1) according to claim 2, characterized in that said longitudinal non-light transmissive portions are subjected to a mirroring treatment.

14. A device (1) according to any one of the preceding claims, characterized in that it is modular.

15. A device (1) according to any one of the preceding claims, characterized in that said conduit (2) is substantially cylindrical and it is coupled at first end to a projector having a parabolic diaphram (5) arranged therein together with a lamp (6) and/or it is provided, at the other end, with an optical light recuperator closure (9) having an inner light reflectant surface with divergent parabolic optics.

16. A device (1) according to claim 15, characterized in that said parabolic diaphram (5) has a focus point adjustable with respect to said lamp (6).

17. A device (1) according to claim 16, characterized in that said parabolic diaphram (5) has a focurs point adjustable with respect to said lamp (6) in a range of $\pm$ 4°.

18. A device (1) according to any one of claims 1-14, characterized in that a linear fluorescent lamp (11) and a longitudinal parabolic cross-section partition (12) are mounted in said conduit (2), said linear lamp (11) being arranged in the focus point of said longitudinal parabolic partition (12).

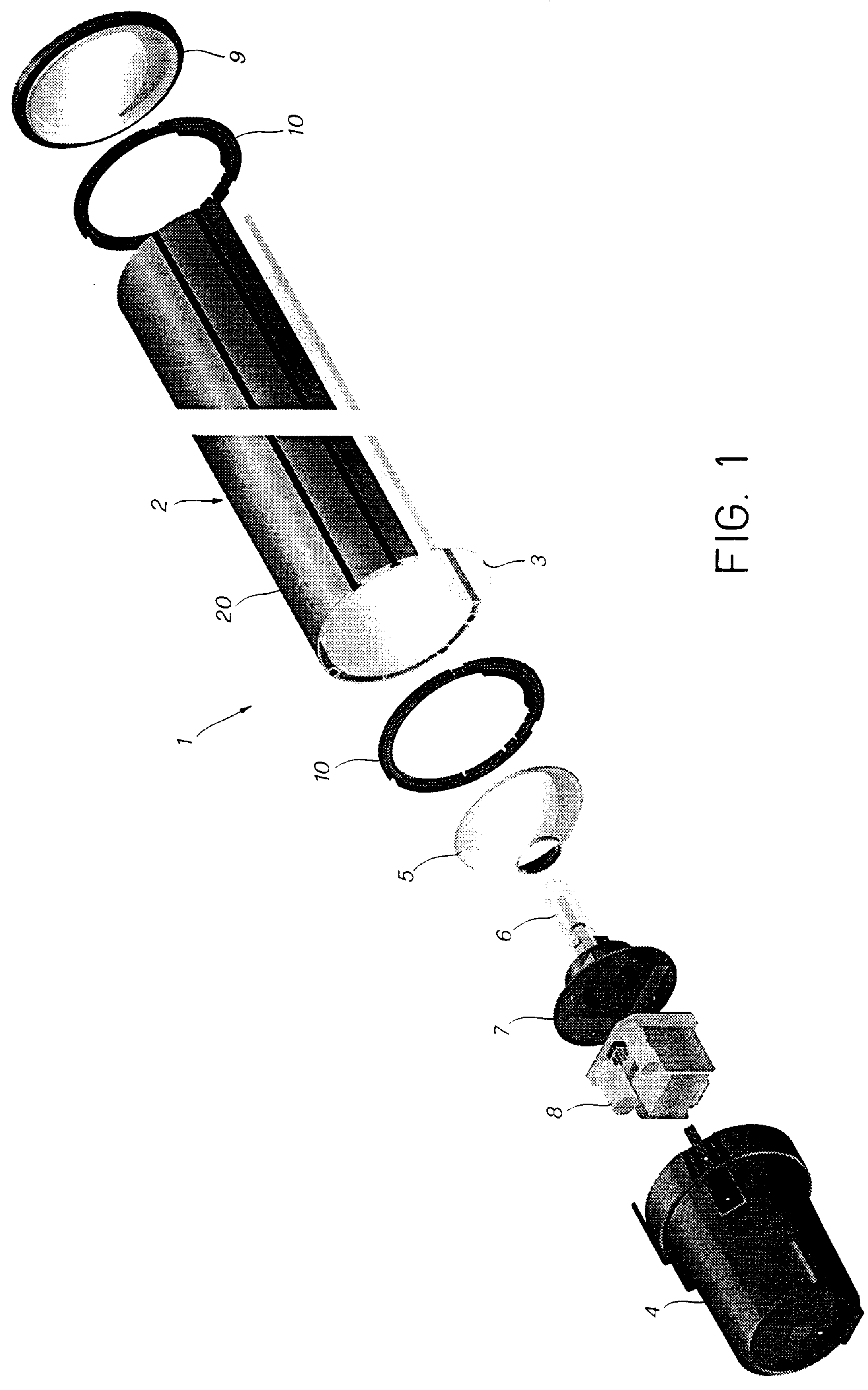


FIG. 1

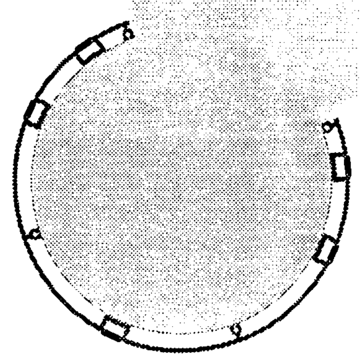


FIG. 3

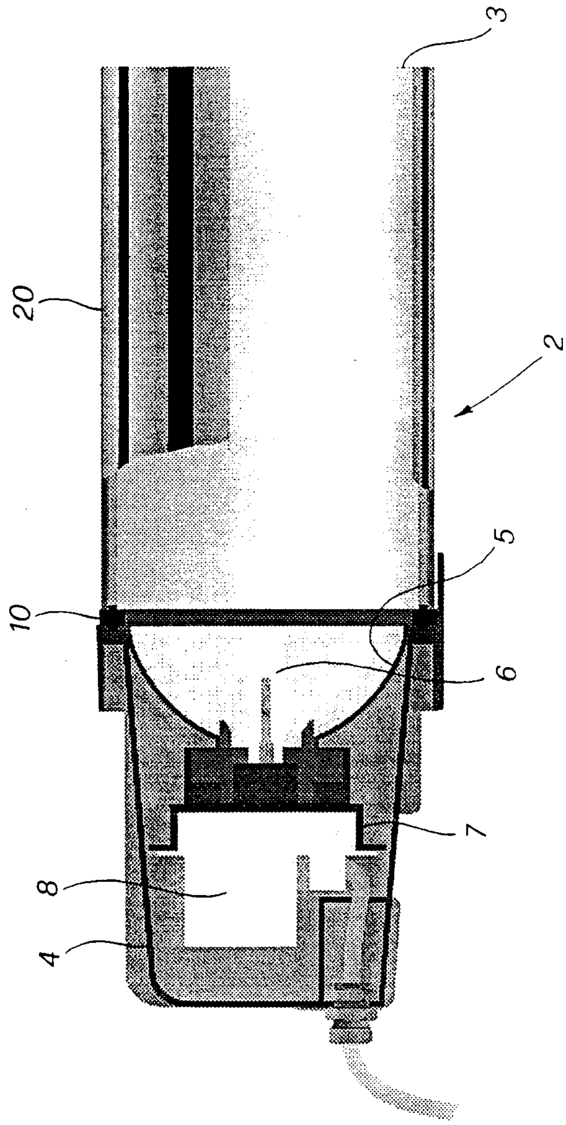


FIG. 2

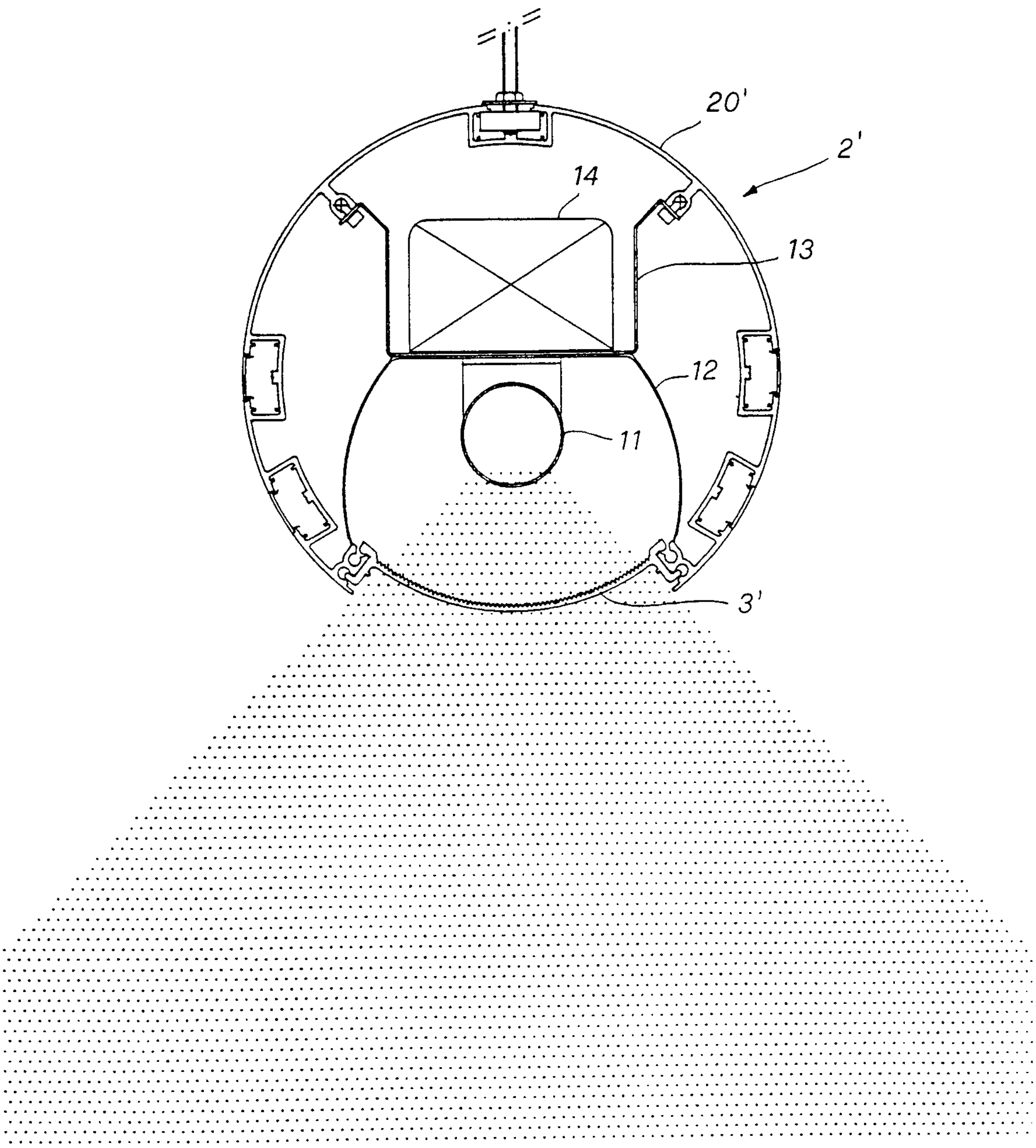
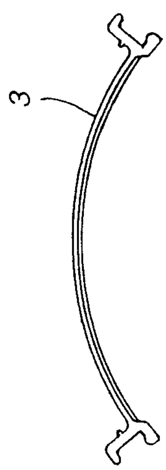


FIG. 4

FIG. 6b



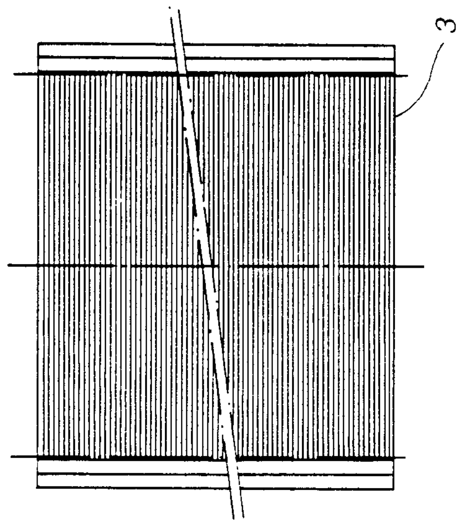
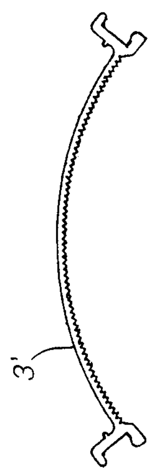


FIG. 6a

FIG. 5b



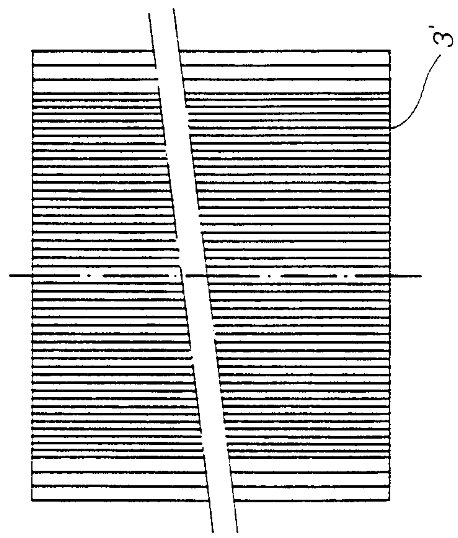


FIG. 5a

INTERNATIONAL SEARCH REPORT

International Application No
PCT/IT 98/00265

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 F21S3/14 F21V3/00 F21V8/00 F21V19/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 F21S F21V F21M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP 0 645 580 A (E.G.O.HOLDING EUROPE OPTIC GUIDE) 29 March 1995 see column 3, line 55 - column 4, line 31 see claims 3-5,7; figure 3 ---	1,3,5, 7-11,14, 15
Y	WO 94 19643 A (TIR SYSTEMS LTD.) 1 September 1994 see page 8, line 18 - line 22 see figure 1 ---	2,13

-/--

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
21 January 1999	28/01/1999

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	De Mas, A

1

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Inte onal Application No
PCT/IT 98/00265

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
Y	DATABASE WPI Week 9301 Derwent Publications Ltd., London, GB; AN 93-002818 XP002090056 & JP 04 327937 A (SEKISUI CHEM IND CO LTD) , 17 November 1992 see abstract ---	1-3,5, 7-11, 13-15
A	DE 297 06 409 U (NORKA NORDDEUTSCHE KUNSTSTOFF- UND ELEKTRO- GESELLSCHAFT STÄCKER) 22 May 1997 see page 3, line 22 - line 29 see figure 2 ---	1,2, 7-10,18
A	WO 92 22768 A (TIR SYSTEMS LTD.) 23 December 1992 see page 6, line 11 - line 29 see figures 2A,2B,3 ---	1,2,9,15
A	US 5 122 935 A (PETERSON) 16 June 1992 see column 1, line 55 - line 57 see column 1, line 67 - column 2, line 32 see figure 1 ---	1,16,17
A	US 4 827 386 A (MACKIEWICZ) 2 May 1989 see column 2, line 5 - line 10 see claim 1 ---	1-6
A	WO 90 02291 A (HARTSHORN ET AL.) 8 March 1990 see page 8, line 27 - page 9, line 3 see figures 2,37,813,14 -----	1,2,8

1

Form PCT/ISA/210 (continuation of second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Information on patent family members

Inteɔnal Application No
PCT/IT 98/00265

Patent document cited in search report		Publication date	Patent family member(s)			Publication date
EP 645580	A	29-03-1995	IT	1261995	B	11-06-1996
			AT	161935	T	15-01-1998
			DE	69407708	D	12-02-1998
WO 9419643	A	01-09-1994	US	5339382	A	16-08-1994
			CA	2156435	A,C	01-09-1994
			DE	69407273	D	22-01-1998
			DE	69407273	T	16-07-1998
			EP	0686247	A	13-12-1995
			JP	2675677	B	12-11-1997
			JP	8512166	T	17-12-1996
			NO	953289	A	20-10-1995
DE 29706409	U	22-05-1997	NONE			
WO 9222768	A	23-12-1992	US	5243506	A	07-09-1993
			AU	1785792	A	12-01-1993
			CA	2111437	A,C	23-12-1992
			DE	69209838	D	15-05-1996
			DE	69209838	T	28-11-1996
			DK	593499	T	06-05-1996
			EP	0593499	A	27-04-1994
			FI	935681	A	14-02-1994
			JP	2711481	B	10-02-1998
			JP	6507996	T	08-09-1994
			NO	934663	A	17-12-1993
US 5122935	A	16-06-1992	NONE			
US 4827386	A	02-05-1989	NONE			
WO 9002291	A	08-03-1990	EP	0382798	A	22-08-1990