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

(11) **EP 2 088 368 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
12.08.2009 Bulletin 2009/33

(51) Int Cl.:
F21V 21/35 *(2006.01)*

(21) Application number: **08425078.6**

(22) Date of filing: **11.02.2008**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MT NL NO PL PT RO SE SI SK TR
Designated Extension States:
AL BA MK RS

(71) Applicant: **Bticino S.p.A.**
20154 Milano (IT)

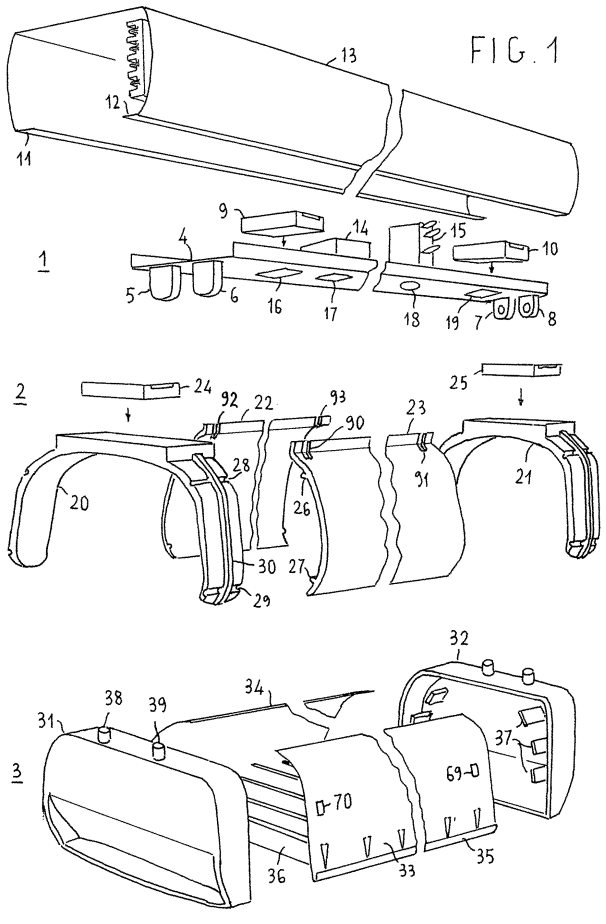
(72) Inventor: **Fabrizi, Fabrizio**
24100 Bergamo (BG) (IT)

(74) Representative: **Bonvicini, Davide et al**
Perani Mezzanotte & Partners
Piazza San Babila, 5
20122 Milano (IT)

(54) **Lighting apparatus for installation on a suspended electrical duct**

(57) Lighting apparatus for installation on a suspended electrical duct (13), comprising an elongated electrical unit (1) provided with means (9, 10) for engagement with the duct, a pair of brackets (20,21) also provided with means (24,25) for engagement with the duct, for installation thereof next to the ends of the electrical unit, a pair of outer covering panels (22,23) engaged with the brackets (20,21) and a louver reflector (3) provided with a pair of end pieces (31,32) which magnetically engage with the brackets (20,21).

FIG. 1



EP 2 088 368 A1

Description

[0001] The present invention relates to a lighting apparatus for installation on, or more precisely underneath, a suspended electrical duct and in particular to a lighting apparatus with a modular structure which can be assembled as required, having an ergonomic structure which allows easy installation thereof also in the awkward conditions for which it is designed and, at the same time, guarantees safe installation and simple maintenance operations.

[0002] It is known that suspended electrical ducts are widely used, for example, in offices, warehouses and shopping centres for the distribution of electrical power.

[0003] At any point along their length it is possible to connect, as required, branch-off plugs, lighting apparatus, fans and the like, using the duct as a suspension element.

[0004] Examples of these ducts are described in European patent EP 0015356, German patent application DE 10241941 and, more recently, European patent application No. 06425836.1 filed on 14 December 2006.

[0005] These ducts essentially consist of a metal housing which forms a channel which is open at the bottom and which internally accommodates conducting bars and may also house electrical components.

[0006] Along the bottom opening two parallel opposite edges of the housing which face each other act as a support for the apparatus which are connected to the duct.

[0007] Also known are lighting apparatus, in particular comprising straight fluorescent lamps, which are connected to these ducts.

[0008] An example is described precisely in the already cited document DE 10241941 in which a lighting body is provided with means, in particular a rotating head, which perform at the same time the function of engagement and electrical connection to the duct.

[0009] During installation it is required to support the whole weight of the lighting body, which is not negligible, and, in addition to the problems which this causes, there is no adequate guarantee of safety from an electrical point of view unless the power to the duct is switched off.

[0010] Moreover, generally speaking, these lighting apparatus have a single-piece structure in the sense that the various constructional parts are irremovably connected together during the manufacturing process, with the sole exception of a louver reflector which must be removable to allow replacement of the fluorescent tubes.

[0011] This results in major problems with regard to management of the finished products since, depending on the length of the fluorescent tubes, different types of lighting apparatus must be produced and managed.

[0012] The present invention solves these problems with a modular lighting apparatus which can be assembled on-site and can be easily, safely and reliably installed, without the need for tools, by means of simple manual operations.

[0013] The advantages and aspects of the present invention as characterized by the claims will emerge more clearly from the following description of a preferred embodiment provided with reference to the accompanying drawings in which:

- Figure 1 is an overall, schematic, exploded, perspective view of a preferred embodiment of a lighting apparatus according to the present invention;
- Figure 2 is an exploded perspective view of a component of the apparatus according to Figure 1, more specifically a support bracket for an optical unit and the associated covering panels;
- Figure 3 is a front view of the bracket according to Figure 2;
- Figure 4 is a cross-sectional view, along the line A-A of Figure 3, of the bracket according to Figures 2 and 3;
- Figure 5 is an exploded perspective view of another component of the apparatus according to Figure 1, more specifically an end piece of the optical unit;
- Figure 6 is a centrally cross-sectioned view of the end piece according to Figure 5.

[0014] In the various figures the parts which are functionally and structurally equivalent are identified by the same reference numbers.

[0015] With reference to Figure 1, the lighting apparatus comprises an electrical unit 1, a cover unit 2 and an optical unit 3.

[0016] The electrical unit consists of an elongated base plate 4 made of sheet metal and with a length which depends on the length of the lamps which must be installed (for example, nominal length of 1.2 and 1.5 m).

[0017] The base plate is folded in the form of a C, with two lateral reinforcing ribs.

[0018] One or more sockets lugs 5,6,7,8, known per se, for connecting fluorescent tubes (not shown) are mounted at its ends by means of screws.

[0019] The plate has, mounted above it by means of screws, a pair of engaging devices 9,10 of the known type, comprising a rotating cam, or preferably of the twin slider type, with teeth which engage with the bottom edges 11,12 of the housing 13 of a suspended electrical duct.

[0020] This type of engaging device is fully described in European patent application number No. 08425053.9 filed on 31 January 2008 to which reference should be made for the constructional details (a short description is also given below).

[0021] The plate 4 also has, mounted above it, the electrical components, known per se, necessary for operation of the fluorescent tubes, such as an electronic power supply device 14, switching-off and switching-on of which

can be programmed or remotely controlled (or a unit consisting of reactor, possible rephasing capacitor and starter) and a rotating head 15 (also known per se) establishing electrical contact with the conducting bars housed inside the duct.

[0022] All these components are contained inside the duct housing 13.

[0023] Suitable openings formed in the plate 4 allow manual operation, from below, of the engaging devices (openings 16,19) and the rotating contact head (opening 18) as well as programming (opening 17) of the electronic power supply device (or replacement of the starter, where envisaged).

[0024] Installation of the electrical unit underneath the duct is completely separate from the other components of the lighting apparatus and is easily performed owing to the low weight of the unit which comprises only the essential electrical parts.

[0025] Moreover, owing to the separate mechanical arrangement of the engaging devices 9,10 and the contact head 15, installation may be performed in conditions of maximum safety from an electrical point of view.

[0026] It is also possible to envisage an interlocking device which prevents activation of the engaging devices if the rotating contact head is in an active electrical contact position.

[0027] Firstly, installation is performed by mounting the engaging devices 9,10 (among other things, this is able to ensure electrical earthing of the electrical unit) and only then is the contact head 15 operated in order to provide the connection to the conducting bars of the duct.

[0028] The cover unit 2 consist of four separate parts, more specifically a pair of brackets 20,21 and a pair of side cover panels 22,23.

[0029] The brackets 20,21, which are saddle-shaped and preferably obtained by means of plastic injection moulding, each have an engaging device 24,25 preferably of the twin slider type, as described further below.

[0030] An aspect of this type of device, which is essential in relation to the description below, is that the sliders of the device are made of ferromagnetic material (steel) and each have a flat surface which can be accessed from below through a pair of openings in the bracket.

[0031] These openings are used simultaneously for operating the engaging device and, as we shall see, also for magnetically engaging the optical unit with the pair of brackets.

[0032] For this purpose, in the case where the engaging devices are of the conventional rotating-cam type and may be made of plastic, it is sufficient to provide, in the brackets 20,21, as inserts, two ferromagnetic metal plates which can be accessed from the bottom of the bracket (or also a single suitably shaped plate).

[0033] The side cover panels 22,23, which are made of plastic or extruded aluminium and are of various types and varying shape in order to meet a wide range of requirements, are provided with a pair of ribs 26,27 which engage at their ends, inside corresponding grooves 28,29 formed on the sides of the brackets.

[0034] The brackets, which are directly fastened to the edges 11,12 of the duct, next to the plate 4 of the electrical unit, therefore act as a support for the side cover panels 22,23.

[0035] It can also be seen, from figure 1, that in a central position thereof the brackets 20,21 have a raised rib 30 (preferably with a thickness the same as that of the side cover panels) and have a symmetrical structure with respect to this central rib.

[0036] Therefore the same bracket acts as a support for covering panels, such as 22,23, arranged on either side of the central rib 30.

[0037] It is thus possible to arrange next to each other in succession several lighting apparatus and form practically continuous lighting systems, with a considerable reduction in the number of components.

[0038] In fact, if N is the number of lighting apparatus arranged next to each other, it is sufficient to use N+1 brackets in order to form the lighting system.

[0039] It is clear the installation of the brackets on the duct may be performed separately from each other, by a single operator, something which is particularly advantageous in the case where the lighting apparatus extends over a length of more than 1 metre.

[0040] Installation of the side panels 22,23 is particularly simple since it is possible to engage firstly in an effortless manner the upper rib 26 of the panels inside the corresponding groove 28 of the brackets and then snap-engage the bottom rib 27 separately with either one of the end brackets.

[0041] The optical unit 3 consists of three parts: a pair of end pieces 31,32, made of plastic, and a reflector 33, with a known structure, which has a pair of semi-parabolas made of thin sheet metal (or also metal-coated plastic) and connected together by a plurality of anti-dazzle louvers 36.

[0042] The end pieces 31,32, which are in the form of a shell with an outer profile which mates with the inner profile of the brackets 20,21, have internally tongues 37 between which the ends of the semi-parabolas 34,35 are positioned and engaged.

[0043] At the bottom the end pieces 31,32 are suitably shaped so as to form a kind of grip which facilitates handling of the optical unit and which allows both an upwards pushing force and a downwards pulling force to be exerted on it.

[0044] Another important aspect of the end pieces 31,32 consists in the fact that a pair of permanent magnets 38, 39 are mounted on their upper outer side.

[0045] In order to join the optical unit to the brackets it is sufficient to raise it, arranging the end pieces inside the brackets, which are suitably tapered so as to act as a guide during insertion.

[0046] When insertion has been completed, the end pieces are magnetically engaged with the ferromagnetic sliders of the connection device (or with the ferromag-

netic plates inserted in the brackets), thus keeping the optical unit suspended.

[0047] It is interesting to note that magnetic engagement of the end pieces, when this is performed on the sliders, intrinsically ensures that they are locked in the engaged position and prevents any accidental displacement thereof into the disengaged position.

[0048] For greater clarity, Figures 2, 3 and 4 respectively show an exploded perspective view, front view and cross-sectioned view, along the line A-A of Figure 3, of the structure of the bracket 20 and the associated engaging device 24.

[0049] In addition to that already stated, which will not be repeated here, it is pointed out that the bracket 20 has two ribs 40, 41 which, once the bracket is installed, are arranged next to the edges 11, 12 (Fig. 1) of the duct, situated at the bottom of the latter.

[0050] These ribs define the depth of insertion of the engaging device 24 inside the electrical duct.

[0051] The two ribs have, formed between them, a rectangular frame 42 which houses two metal sliders which are made of ferromagnetic steel 43,44 and folded in a double L shape and the opposite ends 45,46 of which protrude from the enclosure owing to the action of a compression spring 47 which tends to move the sliders away from each other.

[0052] The ends 45,46 form two engaging teeth which, during installation, are arranged on top of the edges 11,12 of the duct.

[0053] The sliders 43,44 are provided with a pair of wings 50,51 (one per slider) which form a kind of wedge intended to be inserted inside the duct.

[0054] This wedge performs the function of an insertion guide and, interfering with the edges 11,12 of the duct, causes retraction of the teeth 45,46 and allows their snap-engagement with the edges 11,12.

[0055] In order to facilitate this operation, a pair of openings 48,49 formed in the bottom of the enclosure allow an operator to operate the sliders 43,44, moving them towards each other in order to perform both the engaging operation and the opposite disengaging operation.

[0056] The seat formed by the enclosure 42 is closed by a metal cover 52 which is fixed by means of screws 53,54 to the bracket 20 and is conveniently shaped to allow the insertion and the movement of the wings 50,51 during the engaging and disengaging operations.

[0057] Further constructional details, which are not essential for the purposes of the present invention, are described and illustrated in European patent application No. 08425053.9 already mentioned.

[0058] Here it is merely pointed out, with reference to the cross-section in Figure 4, that the top part of the bracket, outside the enclosure 42, has formed therein two openings 55,56 for the insertion of snap-engaging teeth of an auxiliary suspension part of the end pieces of the optical unit, as discussed further below.

[0059] With reference to Figure 2 it can also be noted that a pair of teeth 88,89 are formed on the sides of the central rib 30, on either side of the bracket, said teeth engaging inside suitable notches 90,91,92,93 (Fig. 1) formed in the upper edge of the covering panels 22,23.

[0060] This connection ensures correct, relative, longitudinal positioning of the brackets and the covering panels and prevents the brackets being displaced from their position and moving away from each other.

[0061] Again for the sake of greater clarity, Figures 5 and 6 show, respectively, an exploded perspective view and centrally cross-sectioned view of the structure of the end pieces 31,32 of the optical unit.

[0062] In Figure 5 it can be seen that a pair of seats 58,59 are formed in the top of the end piece, these being suitably shaped to allow the snap-engagement therein, via a lateral opening, of a pair of permanent magnets 60,61 which preferably have a cylindrical shape with an enlarged head 62 for ensuring axial locking of the magnets inside the respective seats.

[0063] The wedge-shaped form of the seats acts as a guide for insertion and longitudinal and transverse centring inside the openings 48,49 (Fig. 2) of the bracket 20.

[0064] The end piece has, formed inside it, two groups of three tongues 63,64,65 and 66,67,68 between which the end edges of the reflectors 33, 34 are positioned (Fig. 1).

[0065] In each group of three, the middle tongue, i.e. 64 and 67, has an end tooth which snap-engages inside an opening 69,70 (Fig. 1) formed in the reflectors.

[0066] A further element for engaging and joining together the end pieces and the reflectors consists of two teeth 75,76 formed in the bottom of the sides of the end piece.

[0067] These teeth engage inside the bottom folded edge 35 (Fig. 1) of the two reflector panels 33,34.

[0068] The end pieces again also have internally two pairs of flanges 71,72 and 73,74 which define a central housing for a safety cable, the function of which will be explained further below.

[0069] The bottom flanges 73,74, which are arranged with their ends next to an anti-dazzle louver 36 (Fig. 1) of the optical unit, form a receiving pocket for the safety cable.

[0070] It is clear that the upper flanges may also be formed as one piece with the bottom flanges.

[0071] Since the optical unit is of the louver type, with transverse anti-dazzle louvers, replacement of the lamps requires removal of the optical unit which is magnetically engaged with the brackets.

[0072] In order to avoid having to support or place elsewhere the optical unit, during the course of this operation, the optical unit is provided with a pair of suspension cables so that, once disengaged from the brackets, it remains suspended underneath the duct at a suitable distance sufficient for performing the necessary maintenance operations.

[0073] There exists the problem, however, of fastening in a simple and automatic manner the suspension cable

to the brackets already installed, the first time that the optical unit is installed, bearing in mind that the latter, once installed, prevents access to the brackets and to the electrical unit.

[0074] For this purpose, the top of the end piece has an opening 77 for inserting and fixing the end of a cable 78.

[0075] In the vicinity of the opening 77 the end piece has a recess 79 inside which an engaging member 80 is inserted.

[0076] This member essentially consists of a resilient two-pronged clamp with end teeth 81,82 which snap-engage inside the opening 56 (Fig. 4) of the bracket and a pair of lugs 83,84 which rest on the top of the end piece, while the bottom of the clamp is inserted in the end piece via the recess 79.

[0077] At the bottom the two prongs of the clamp are connected by a middle body provided with an opening 85 for inserting and fixing the other end of the cable 78, which is housed inside the pocket formed between the flanges 73, 74.

[0078] When the end piece is engaged for the first time with the bracket, the clamp snap-engages inside the opening 56 and the engaging member 80 is joined to the bracket.

[0079] Subsequent release of the end piece does not cause disengagement of the clamp 80 such that the optical unit is kept suspended.

[0080] In order to remove the optical unit completely, should this be necessary, it is sufficient to apply force to the clamp so as to cause disengagement thereof.

[0081] Figure 6 shows a central cross-section through the end piece 31 essentially in order to show clearly its configuration at the bottom.

[0082] The end piece is shaped so as to form a recess 86 which terminates at the bottom in a gripping lip 87 which is used for handling the optical unit in order to raise it and engage the end piece with the bracket or, where necessary, to disengage it.

Claims

1. Lighting apparatus for installation on a suspended electrical duct (13), comprising an elongated electrical unit (1) provided with means (9, 10) for engagement with the duct, **characterized in that** it comprises furthermore

   - a pair of brackets (20,21) provided with means (24,25) for engagement with the duct, for installing said brackets at the ends of said electrical unit (1),
   - a pair of outer covering panels (22,23) engaged with said brackets (20,21) and
   - a louver reflector (3) provided with a pair of end pieces (31,32) which magnetically engage with said brackets (20,21).

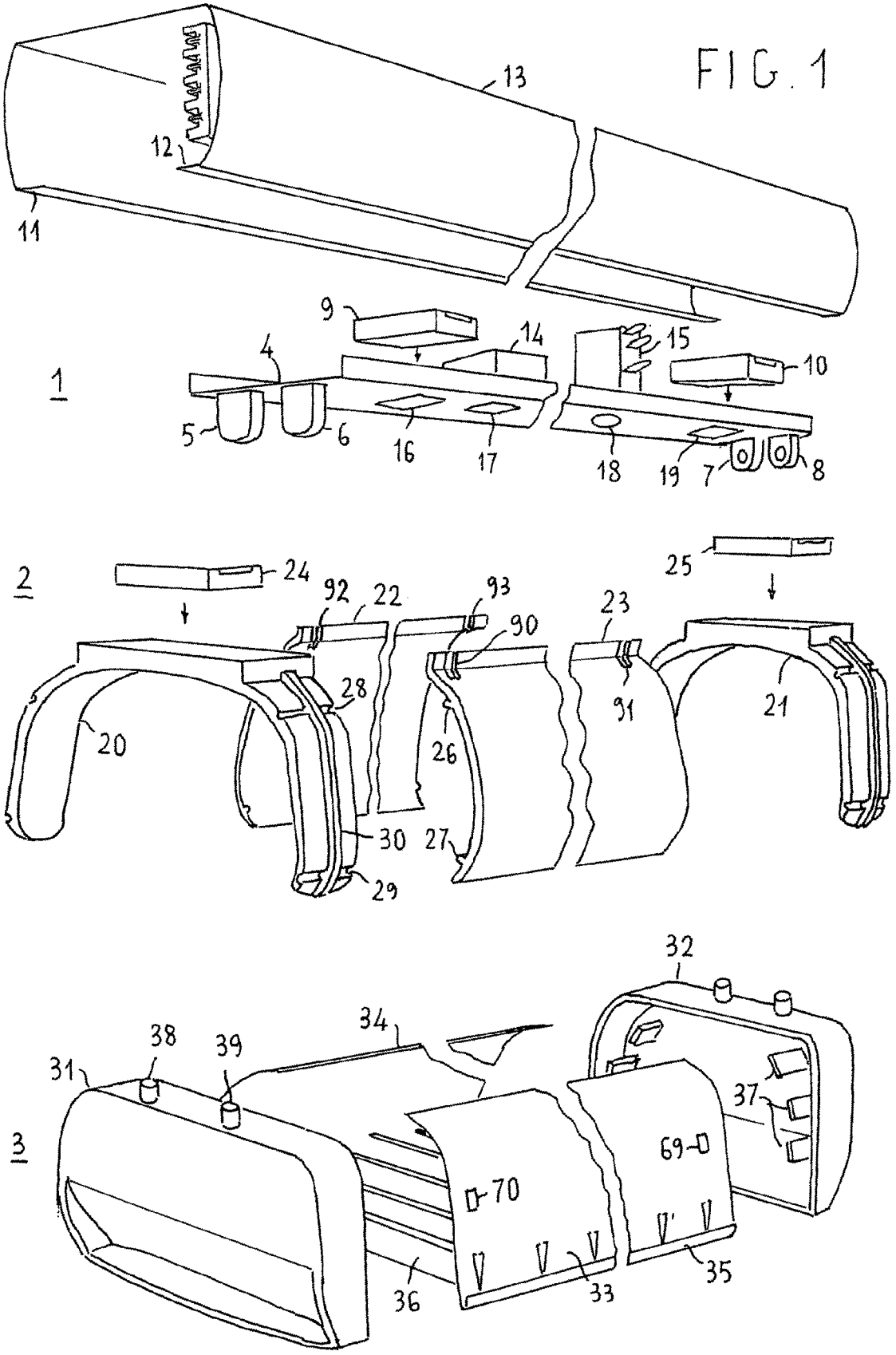
2. Lighting apparatus according to Claim 1, in which said means (24,25) for engaging said brackets with said duct each comprise a pair of ferromagnetic sliders (43,44) which are pushed into an engaged position by a compression spring (47) and are able to be manually operated into the released position.

3. Lighting apparatus according to Claim 1 or 2, in which each of said brackets (20,21) has in the central position a rib (30) along the sides of which it is possible to engage with the bracket, on either side of said rib (30), two pairs of covering panels (22,23), the relative positioning of bracket and panels, in the longitudinal direction of the lighting apparatus, being defined by a pair of teeth (88,89) which are formed in said bracket, on both sides of the central rib, and which engage inside notches (90,91,92,93) formed in the upper lip of the covering panels.

4. Lighting apparatus according to any one of the preceding claims in which said end pieces (31,32) each have a pair of seats (58,59) which house a pair of permanent magnets (60,61).

5. Lighting apparatus according to any one of the preceding claims, in which each of said end pieces (31,32) removably supports an engaging member (80) provided with teeth (81,82) for engagement with one of said brackets, the end of a suspension cable (78) being fixed to said engaging member (80), with the other end being fixed to said end piece.

FIG. 1


13
12
11
9
14
15
10
4
1
5
6
16
17
18
19
7
8
2
24
92
22
93
90
23
25
28
20
26
91
21
30
27
29
32
38
39
34
31
37
3
69
70
36
33
35

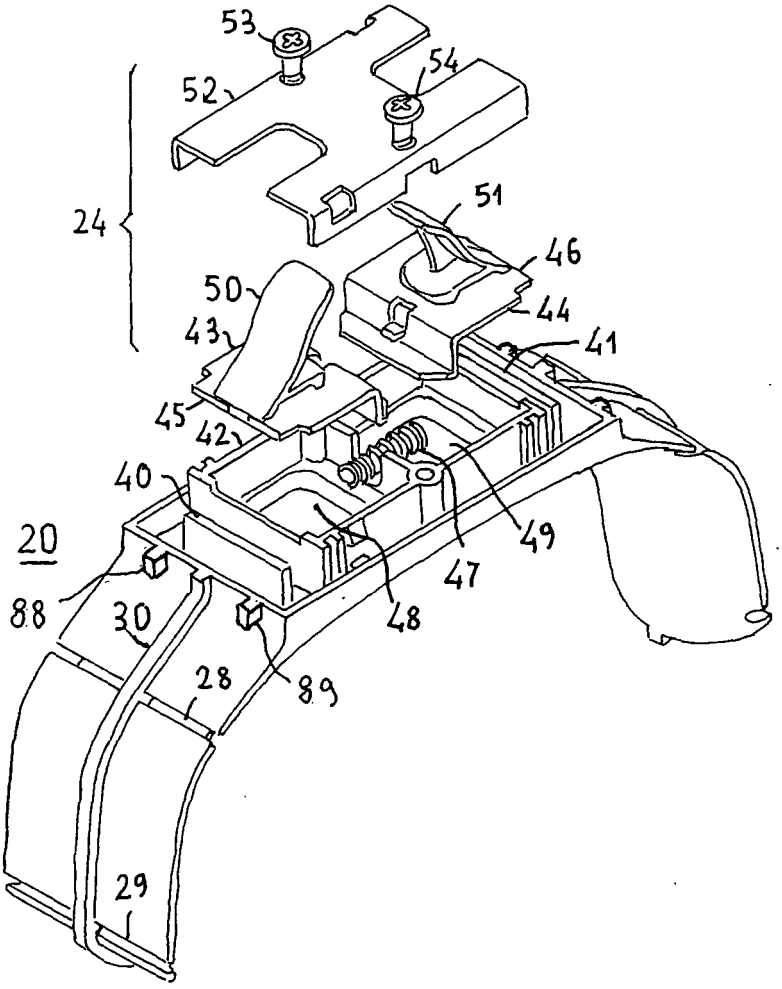


FIG. 2

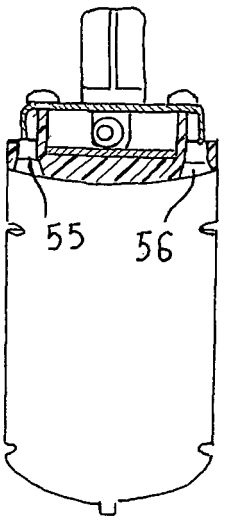


FIG. 4

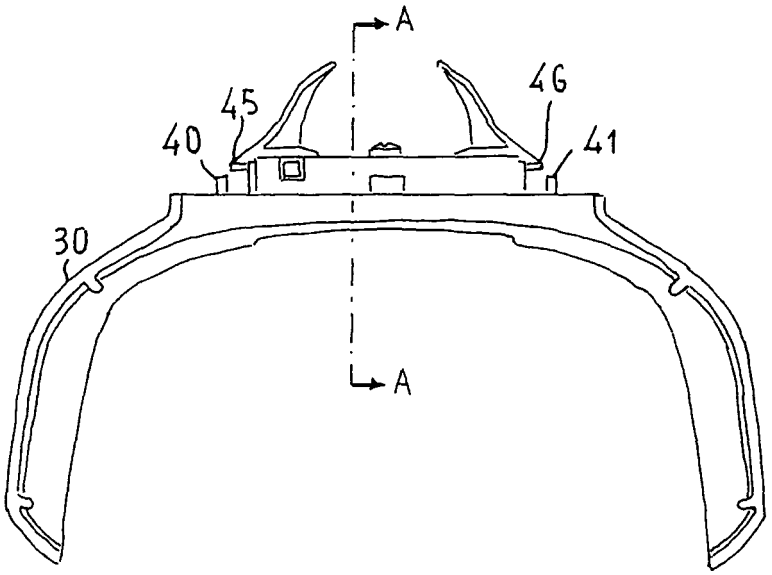


FIG. 3

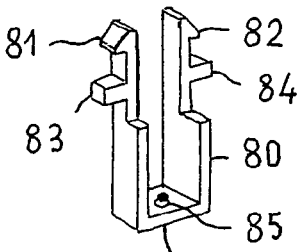
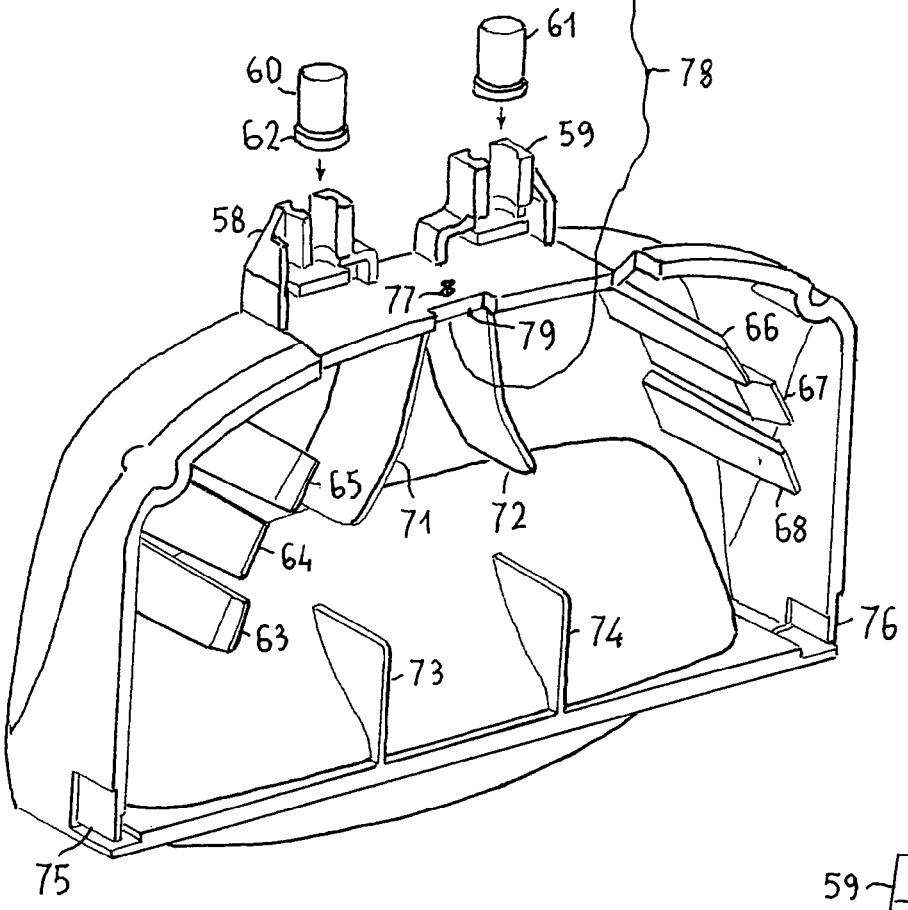

81
82
84
83
80
85

FIG. 5


61
60
78
62
59
58
77
79
66
67
65
71
72
68
64
63
74
76
73
75

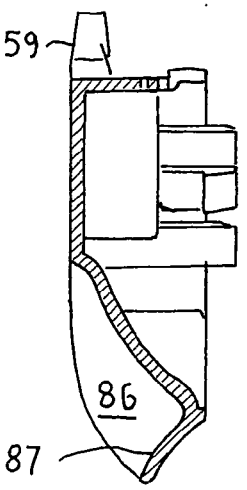

59
86
87

FIG. 6

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 08 42 5078

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
D,A	DE 102 41 941 A1 (ZUMTOBEL STAFF GMBH DORNBIRN [AT]) 18 March 2004 (2004-03-18) * paragraph [0013] - paragraph [0027]; figures 1-5 *	1-5	INV. F21V21/35
A	EP 0 302 029 A (ISOLA ROBERTO) 1 February 1989 (1989-02-01) * column 1, line 37 - column 3, line 10; figures 1-4 *	1-5	
A	US 6 079 992 A (KUCHAR JAMES [US] ET AL) 27 June 2000 (2000-06-27) * column 3, line 55 - column 7, line 16; figures 1-13 *	1-5	

TECHNICAL FIELDS SEARCHED (IPC)

F21S
F21V
H01R

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	29 September 2008	Arboreanu, Antoniu

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
O : non-written disclosure
P : intermediate document

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

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 08 42 5078

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

29-09-2008

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 10241941 A1	18-03-2004	NONE	
EP 0302029 A	01-02-1989	NONE	
US 6079992 A	27-06-2000	CA 2244041 A1	21-04-1999

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- EP 0015356 A **[0004]**
- DE 10241941 **[0004] [0008]**
- EP 06425836 A **[0004]**
- EP 08425053 A **[0020] [0057]**