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(56) Documents Cited:
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EP 0909919 A2 **WO 2011/082457 A1**
FR 002589984 A **US 20100149798 A1**
US 20040120141 A1

(58) Field of Search:
 INT CL **F21S, F21V**
 Other: **Online databases: EPODOC, WPI**

(54) Title of the Invention: **A lighting unit**
 Abstract Title: **Lighting unit with demountable lamp housing, fireproofing and removable waterproofing structure**

(57) The present invention relates to a lighting unit 42 comprising a recessed female structure 4 secured to and defining an aperture in a partition 14, and a male housing 3 mounted within the recessed structure. A light emitting element 38 is mounted within the housing and connected through an aperture of the housing to a power source. An intumescent material 32 is mounted in the housing above the light source. Light is emitted through a front side aperture of the housing by the light emitting element. The front may be protected by a water-proofing structure 44. The power source is accessible by separation of the housing from the recessed structure (figs.2A&B).

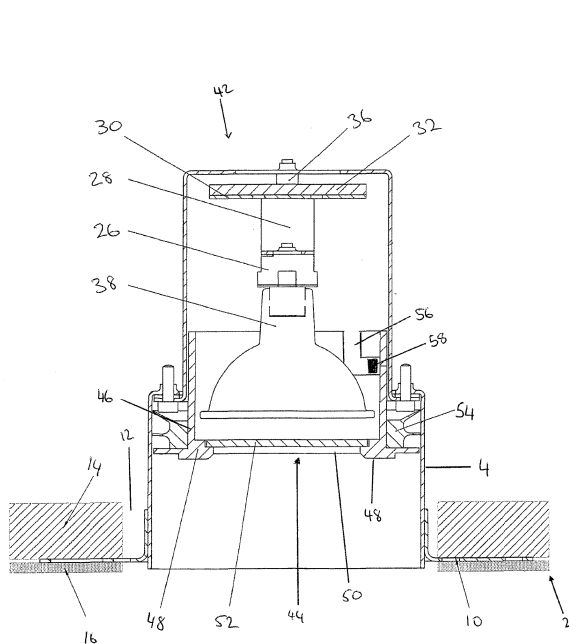


FIGURE 3

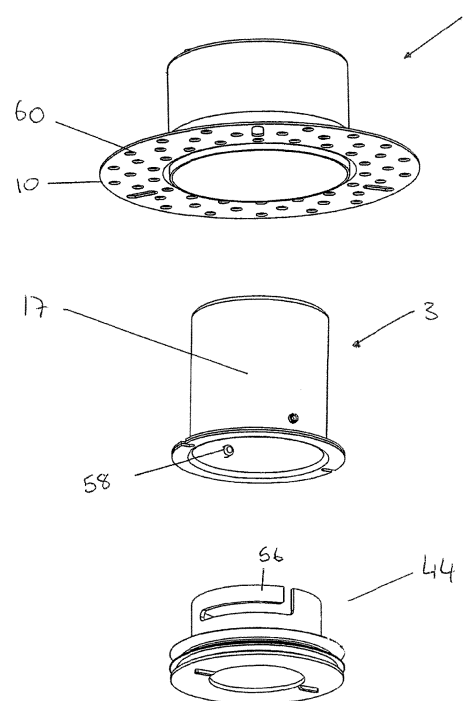


FIGURE 4

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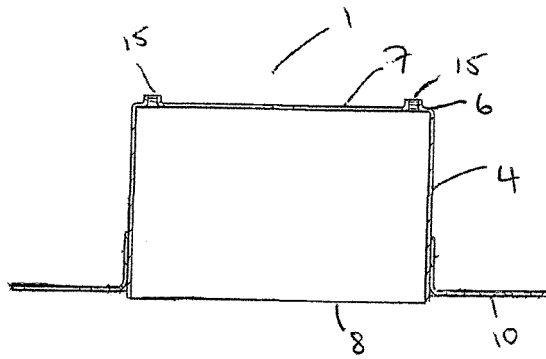


FIGURE 1A

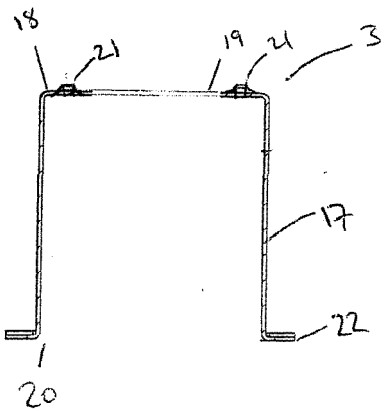


FIGURE 1B

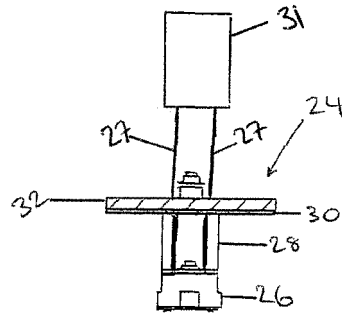


FIGURE 1C

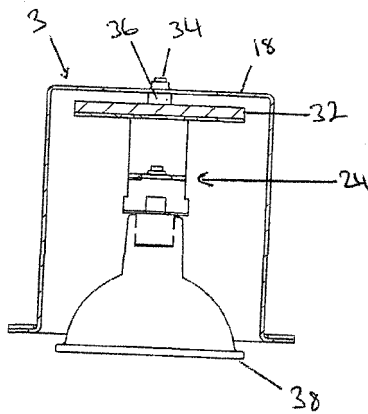


FIGURE 1D

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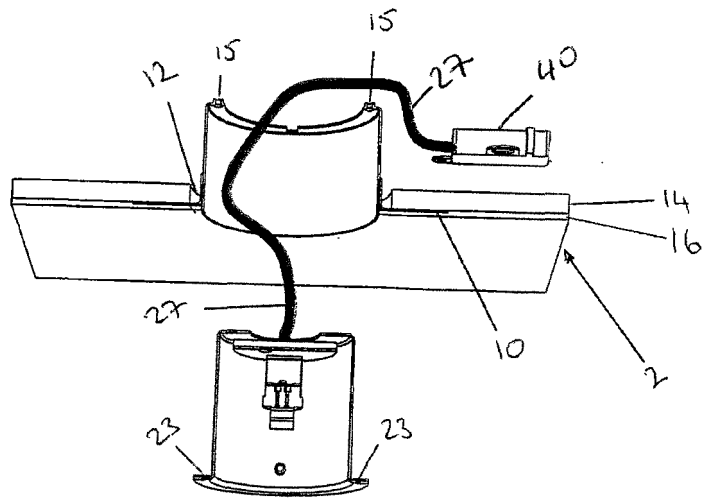


FIGURE 2A

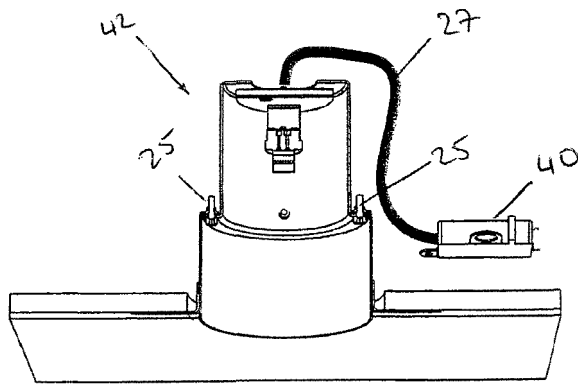


FIGURE 2B

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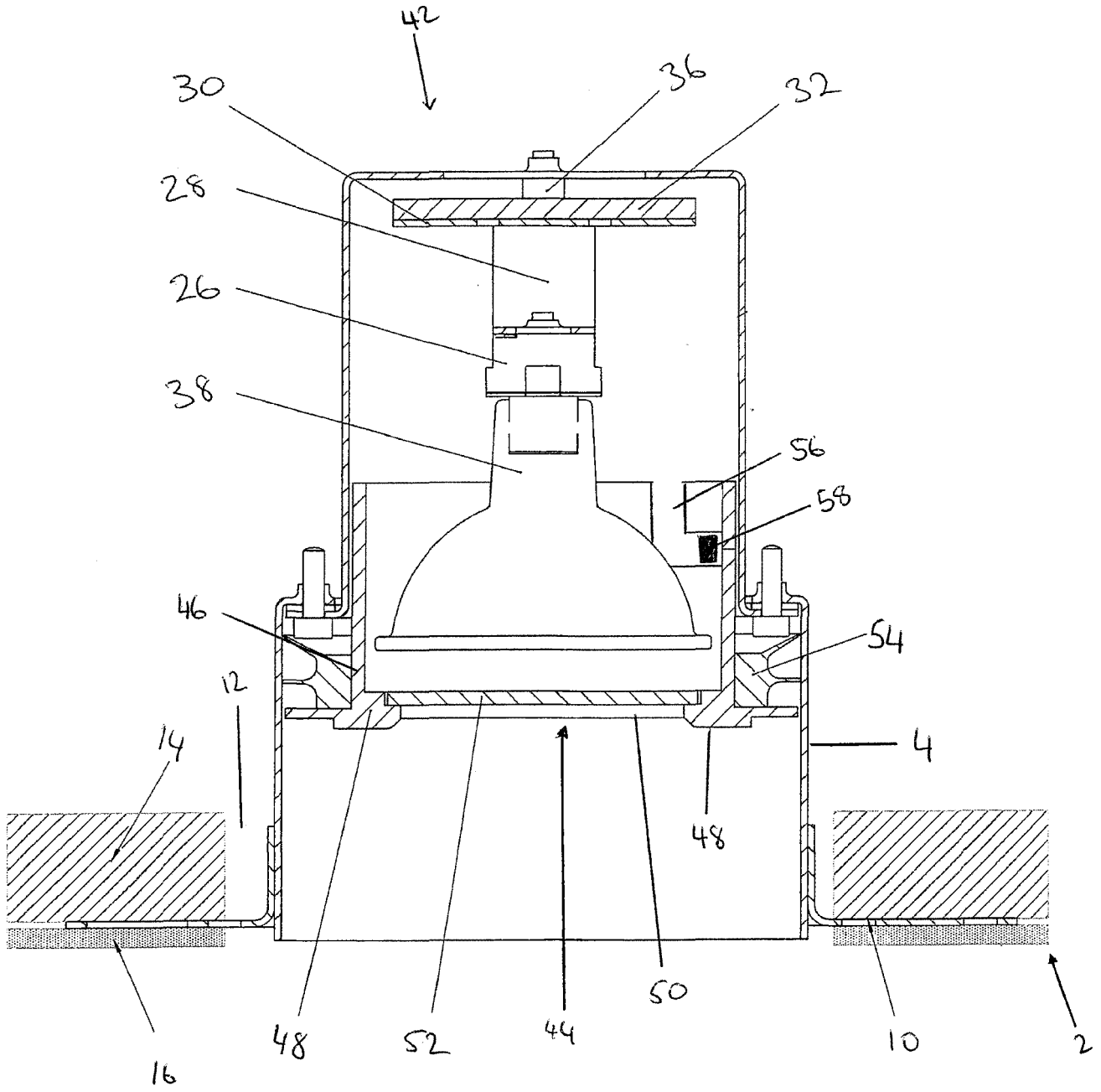


FIGURE 3

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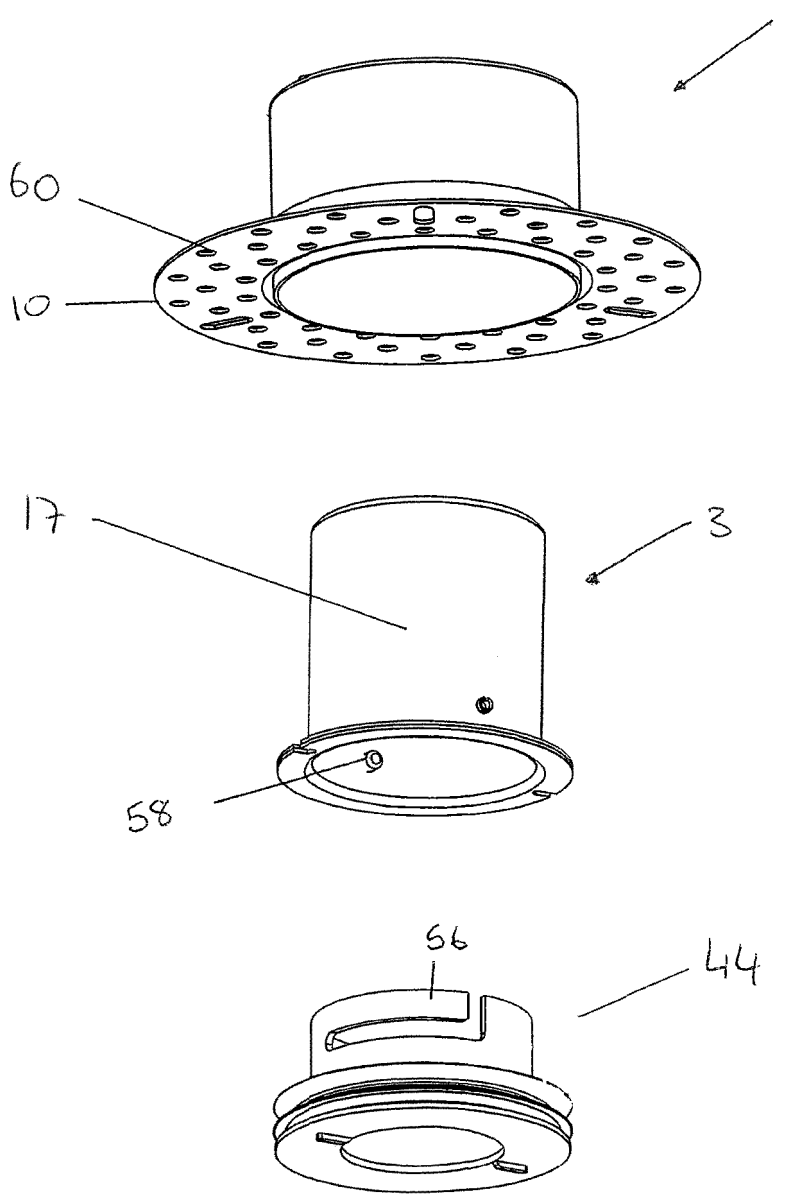


FIGURE 4

A Lighting Unit

The present invention relates to a lighting unit, more specifically, but not exclusively to a modular down-lighting assembly capable of, when installed in a ceiling, providing access to control electronics associated with the assembly, without the need to remove the entire down-lighting assembly from the ceiling.

Down-lighting assemblies are generally installed in buildings to illuminate rooms, and are used for both their functional and aesthetic characteristics. Down-lighting assemblies provide high lighting quality, multiple beam angles and have, arguably better lifetimes than conventional incandescent lighting systems.

Historically, all down-lighting assemblies were low voltage (usually 12v), having large transformers to enable the assemblies to run off mains voltage. Today, down-lighting assemblies run off both low voltage and conventional mains voltage. The low voltage systems continue to require electronic transformers, generally provided on a per assembly basis.

Down-lighting assemblies are generally installed in an aperture in a ceiling partition, such that they are flush with the ceiling, or recessed therewithin, thereby giving the appearance that the light is shining from inside the ceiling. Such an appearance is achieved by placing the down-light assembly and any associated control electronics, inside the ceiling and securing the assembly in place using clips, glue or plaster, thereby encasing the down-light assembly in the ceiling. The overall appearance of the assembly may be further improved by applying a trim on the ceiling to conceal any such clips, glue and/or plaster. Trims may also be used to provide water resistant qualities to a down light, but such trims may be undesirable to a user.

One problem associated with such an arrangement is that if a problem occurs with the associated control electronics, such as the electronic transformers, power cables or dimmer controls, then one must remove the down-light assembly from the ceiling to access the problematic control electronics, thereby causing damage to the down-light assembly and to the ceiling itself, resulting in high repair costs.

A further problem associated with down-light assemblies is that halogen bulbs are a popular choice of bulb. However, halogen bulbs tend to run extremely hot and have the potential to ignite surrounding material. If a fire starts within the down-light assembly, the fire may ignite material surrounding the down-light assembly in the ceiling, such as insulation, resulting in a potentially fatal scenario.

An even further problem is that down-light assemblies are not necessarily compatible with all types of bulbs which are made and one is required to replace the entire down-light assembly if one wishes to change from one type of bulb to another e.g. halogen bulbs to LED bulbs, thereby potentially resulting in damage to the ceiling or down-light assembly when changing the assembly.

Furthermore, if one wishes to change from a low voltage driven assembly to a mains voltage driven assembly or vice versa, one must remove the original down-light assembly from the ceiling to replace the original with the new assembly, and to insert/remove an electronic transformer depending on the desired voltage type.

The present invention therefore seeks to provide a lighting unit which overcomes, or at least reduces some of the above-mentioned problems of the prior art.

In accordance with a first aspect of the present invention, there is provided a lighting unit comprising a recessed structure secured to and defining an aperture in a partition, a housing mounted within the recessed structure and a light emitting element being mounted within the housing and connected through an aperture of the housing to a power source, the front side of the housing being located towards the light emitting element such that, in use, light is emitted through a front side aperture of the housing by the light emitting element; wherein the power source is accessible by separation of the housing from the recessed structure.

30

Preferably, the housing is a fire-resistant housing, wherein a trim is provided around the front side aperture of the housing, wherein the trim comprises a cover which covers the front side aperture of the housing.

- 5 Preferably, the trim is fixed to at least one of the recessed structure and housing and is releasable upon access to the power source.

10 Preferably, the trim comprises a wall which locates with a wall of the recessed structure to provide ingress protection, wherein the wall of the trim comprises a flexible seal.

Preferably, a fire resistant material is provided on a platform located between the light emitting element and rear side of the housing.

- 15 Preferably, the fire resistant material is an intumescent material, wherein the platform is spaced from the rear side of the housing by a spacer fixed to the platform and rear side of the housing.

20 Preferably, the platform is a planar element parallel to an inner surface of the rear side of the housing.

25 Preferably, the recessed structure is suitable for defining an aperture in a partition and the housing is mountable within the recessed structure and adapted to contain a light emitting element, wherein fixing means are provided in the recessed structure and housing such that the fixing means enable the housing to be fixed to the recessed structure and also separated from the recessed structure, and wherein the lighting unit is a fully-recessed down light assembly.

- 30 One embodiment of the invention will now be more fully described, by way of example, with reference to the drawings, of which:

Figure 1A is a diagram showing a cross section side view of a female retaining structure of a down-light assembly installed in a ceiling;

Figure 1B is a diagram showing a cross section side view of a male structure of a down-light assembly;

5 Figure 1C is a diagram showing a cross section view of lamp seating structure;

Figure 1D is a diagram showing a cross section view of a male structure of a down-light assembly having a lamp seating structure assembled therein;

10 Figure 2A is a diagram showing a cross section side view of a female structure of the down-light assembly installed in a ceiling;

Figure 2B is a diagram showing a cross section side view of both male and female structures of the down-light assembly installed in a ceiling;

15 Figure 3 is a diagram showing a cross section view of a fully assembled down-light structure; and

20 Figure 4 is a diagram showing an exploded perspective view of a down-light assembly of the present invention.

Figure 1A is a diagram showing a cross section side view of a down-light female structure 1 installed in a ceiling partition 2. The female structure 1 comprises a steel frame 4 having a base 6, base aperture 7 and main aperture 8. In the present embodiment the steel frame 4 comprises a cylindrical shape with a circular aperture 8, but it should be know that any suitable shape may be used, for example frustoconical, cuboid, triangular or hexagonal. The frame 4 also comprises a flange 10, which protrudes substantially perpendicular from the frame 4. The flange 10 may be attached to the frame 4 by way of welding, gluing, riveting or any similar means, or the flange 10 may be fabricated as part of the frame 4. The flange is used to anchor the female structure 1 into the ceiling 2. Such functionality is described below in Figure 2.

25

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The steel frame 4 further comprises a plurality of threaded apertures 15. The threaded apertures 15 will be described in greater detail with respect to Figure 2 below.

5 Figure 1B is a diagram showing a cross section side view of a down-light male structure 3. The male down-light structure 3 comprises a steel frame 17, having a main aperture 20, a base 18, which has a base aperture 19. Furthermore, the frame also comprises a flange 22. The flange 22, further comprises screw apertures 23 (not shown), which are complementary to the threaded apertures
10 15 of the female structure 1, such that when the male structure 3 is inserted into the female structure 1, the screw apertures of the male structure 3 align with the threaded apertures of the female structure 1, thereby allowing threaded screws (not shown) to be inserted through the screw apertures into the threaded apertures 15, thereby securing the male and female structures 3 and 1 relative
15 to each other. The male structure 3 also comprises two threaded apertures 21, capable of receiving M3 10mm screws 25 (not shown). It should be obvious that although M3 screws are used in this embodiment, screws of any sizes may be used interchangeably depending on the desired application.

20 Figure 1C is a diagram showing a cross section view of lamp seating structure 24, which is locatable within the male structure 3. The lamp seating structure 24 comprises a powered lamp-holder 26. Furthermore, the lamp-holder comprise formations (not shown) which are capable of receiving complementary structures formed on a lamp (not shown) to be inserted therein. The formations
25 are generally formed from conductive material and are connected to a power supply (not shown) using cables (not shown). Such lamp-holders are well known to those skilled in the art.

The lamp-holder 26 is attached to a spacer unit 28 by means of 2 off M3 8mm
30 steel screws (not shown). The spacer unit 28 is formed from steel, but may be formed from any suitable heat resistant material known in the art, for example or heat-treated material, alloy based material or ceramic material.

The spacer-unit 28 is attached, by means of 2 off M3 12mm steel screws (not shown), to a substantially planar base structure 30, which is fabricated from steel, but could in fact be formed from any suitable material known in the art.

5 Attached to the opposing side of the spacer unit 28 to the planar base structure 30, is a piece of intumescent material 32. Intumescent material is material which undergoes a chemical change when exposed to heat or flames, becoming viscous then forming expanding bubbles that harden into a dense, heat insulating multi-cellular char. Also attached to the lamp holder 26 are electrical
10 cables 27 which are used to power a lamp. In the present invention, the electrical cables 27 are also connected to a connector 31. The electrical connector 31 can then be connected to a power supply depending on the application. For instance, for DC applications the electrical connector 31 would be connected to an electronic transformer which would provide the required
15 voltage for DC applications. Alternatively, the electrical connector 31 would be connected to the mains supply if using an AC application. Such applications, electrical connector 31, electronic transformers and power supplies are well known to people skilled in the art.

20 Figure 1D is a diagram showing a cross section view of a down-light male structure 3 having a lamp seating structure 24 assembled therein. The lamp seating structure 24 is attached to the male structure 3 by means of two M3 12mm steel screws 34 attached which protrude through apertures in the spacer unit 28, the planar base structure 30 and the intumescent material 32. 6mm
25 steel spacers 36 are also inserted between the intumescent material 32 and the base 18 of the steel frame 17 of the male structure 3. Also shown in Figure 1D is a lamp 38.

The lamp used in this embodiment is an MR16, which is a halogen bulb used in
30 DC applications. The MR16 bulb is used along with an electronic transformer for DC applications, but the present invention is also compatible with AC applications. Therefore, it should be known to a person skilled in the art that the present invention is not limited to the use of halogen bulbs, and that any suitable lamp may be used as required by a user. For example, an LED bulb may be

used along with, if necessary, LED-compatible transformers, incandescent bulbs, neon bulbs, metal Halide lamps, CFL (Compact Fluorescent) lamps, Dedicated LED modules or any suitable light emitting structure,

5 Figure 2A is a diagram showing a cross section side view of a female structure 1 of down-light assembly installed in a ceiling, Figure 2B is a diagram showing a cross section side view of both female and male structures 1, 3 of the down-light assembly installed in a ceiling. The same numbering is used for like features throughout the description.

10

In this embodiment the down-light assembly is used within a ceiling 2, whereby the ceiling 2 is formed from plasterboard 14, but could be fabricated from wood, concrete, aluminium or any suitable material. Furthermore, it should be evident that the present invention is not limited for use in ceilings, but could, in fact, be used as a down-lighting assembly located within a suitable flooring arrangement whereby the light may be emitted in an upward direction, or in a wall, whereby the down-light assembly may be located within the wall, whereby the light may be emitted in a sideways direction.

15

20 Initially, the female structure 1 is inserted into an aperture 12 in the plaster board 14, such that flange 10 is adjacent the plaster board 14. The flange is then secured to the plasterboard 14 through by applying nails, screws and/or any suitable securing means (not shown) through apertures (shown in Figure 4 below) in the flange 10. When the flange 10 is secured to the plasterboard 14, a layer of plaster 16 is then applied to the plasterboard 14, thereby encasing the flange 10 and the suitable securing means (not shown). Such a configuration ensures that the suitable securing means (not shown) is concealed by the layer of plaster 14, and therefore, a trim is not required to conceal the suitable securing means (not shown) unless desired by a user.

25

30

The electrical connection 27 is inserted through the apertures 7 and 8, and is connected to an external connection 40 as required by a user, for example to the mains power supply, or a transformer if required, or to a dimmer switch.

The male structure 3 is then inserted into the female structure 1 through the apertures 7 and 8, and is assembled such that the screw apertures 23 of the male structure 3 are aligned with the threaded apertures 15 of the female structure 1. An M3 screw 25 is inserted into each of the screw apertures 23 and
5 screwed into the threaded apertures 15 using any suitable means e.g. screwdriver, Allen key or wrench, thereby securing the male structure 3 relative to the female structure 1 to form an assembled down-light structure 42.

Furthermore, if the external connection 40 failed at any time, a user would
10 disassemble the down-light structure 42, such that the failed external connection could be accessed by the user through the main aperture 20.

Figure 3 is a diagram showing a cross section view of a male structure 3 attached to a female structure 1 to form an assembled down-light structure 42, as described previously in Figures 2A and 2B. Once the down-light is
15 assembled, a user may install the lamp 38. Furthermore, a user may install a water-proofing structure 44. The water-proofing structure 44 comprises a frame 46, base 48 and aperture 50, such that the bulb is encased within the down-light assembly 42 and the water-proofing structure 44, thereby being protected from
20 the atmosphere below the ceiling partition 2. A 2mm pane of toughened glass 52 is attached to the base using glue, or any suitable material, such that the glass covers the aperture 50. Toughened glass 52 provides thermal protection required by this application, as described in above. Furthermore, the water-proofing structure 44 further comprises a silicon flange 54 located around
25 periphery of the base 48 of the water-proofing structure 44. The water-proofing structure 44 further comprises locating formations 56, which are formed on the frame 46. The locating formations 56 are such that they are engageable with complementary locating structures 58 located on the frame 17 of the male structure 3. By turning the water-proofing structure 44 in a
30 clockwise/anticlockwise direction relative to the down-lighter assembly 42, a user can lock the water-proofing structure 44 in position with respect to the down-lighter assembly 42 or release the water-proofing structure 44 such that it can be removed from the down-lighter assembly. It should be evident that the

term 'water-proofing' in the context of the present invention does not relate exclusively to water, but to all solids, liquids and gases.

When the water-proofing structure 44 is installed into the down-light assembly
5 42, the silicon flange 54 maintains constant contact with the frame 4 of the female structure 1, thereby providing sealing functionality. The configuration of the silicon flange 54 and the glass sealed aperture 50 ensures that water projected by a nozzle (6.3mm), at 12 litres/minute, at a pressure of 30kN/m², and at a distance of 3m for at least 3 minutes against the outside of the
10 assembly 42 from any direction shall have no harmful effects. Furthermore, the sealing functionality is such that although dust will not be entirely prevented from entering the assembly 42, it will not enter in sufficient quantity to interfere with the satisfactory operation of the equipment.

15 In use, the lamp 38 has the potential to combust, thereby causing a fire. Furthermore, a fire may start in a space below the ceiling partition 2 in which the assembly 42 is installed. In the event of a such fire, the configuration of the down-light assembly 42 is such that the heat from any fire within the down-light assembly 42, or below the ceiling partition 2, will cause the intumescent material
20 32 to undergo a chemical change thereby expanding to completely cover the aperture 19, whilst also hardening into a dense, heat insulating multi-cellular char, thereby maintaining the heat within the down-light assembly 42. The material used to construct the female male structure 1 and 3 will also retain the flames within the down-light assembly. Such a configuration will prevent material
25 above the level of the ceiling partition, for example insulation, electrical connections and/or wooden beams, from being affected by the fire through the down-light assembly. In the present invention, although steel is used as a fire resistant material, any suitable fire resistant material could be used, for example heat-treated materials, alloy based materials, fire resistant polymers or fabrics,
30 or woven type material that can be formed from such materials as carbon fibre based materials.

Figure 4 is a diagram showing an exploded perspective view of a down-light assembly of the present invention. The inter-engageable locating formations 56

of the water-proofing structure 44 and the locating structures 58 within the frame 17 are clearly evident. The locating structures 58 may be rivets, or punched formations or may simply be suitably shaped material attached to the frame 17. The operation of such formations is well known in the art.

5

Furthermore, the apertures 60 (as described in Figures 2A and 2B) are formed in the flange 10 by any suitable method known in the art, for example punching, mechanical cutting, laser cutting. Any number of apertures 60 may be formed on the flange 60, to allow a user to secure the female structure 1 in place as desired. Furthermore, the functionality of the flange 10 is such that it is not limited to a circular shape as shown in Figure 4, but could, in fact, be any shape as defined by a user.

15 It should now be evident that, in the event of an emergency, the down-light assembly of the present invention provides access to the inside of a ceiling partition to a user, such that the user can access electrical connections located within the partition, removing the risk of potentially damaging the ceiling during the removal the down-light assembly. The present invention allows a user to perform repairs and/or upgrades to the electrical connections located within a ceiling partition.

20 Furthermore, a user may change from a down-light assembly using a DC power supply to a down-light assembly using an AC power supply or vice-versa, by simply removing the male structure and electrical connections associated with a DC and replacing it with a male structure having the desired connections.

30 Unlike the prior art, there is no need to create a hole, or remove the whole of the down light assembly in order to access the electrical connections because the modular configuration of the present invention provides apertures which allow access to the electrical connections inside the ceiling partition.

Furthermore, the fire resistant property of the present invention allows a user to achieve fire protection whilst easily accessing the electrical connections if required. Therefore, in the event of a fire, any combustible material within the

ceiling partition will not catch fire and, therefore, will potentially prevent serious damage or loss of life.

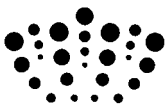
5 The ingress rating of the down-lighter assembly allows the present invention to be used in humid environments such as a shower room, steam room or sauna, whilst still achieving the accessibility functionality. Unlike the prior art, the waterproofing structure allows for modular assembly/disassembly of the down-light, which is not present in the prior art.

10 It will be appreciated that although only one particular embodiment of the invention has been described in detail, various modifications and improvements can be made by a person skilled in the art without departing from the scope of the present invention.

Claims:

- 5 1. A lighting unit comprising a recessed structure secured to and defining an aperture in a partition, a housing mounted within the recessed structure and a light emitting element being mounted within the housing and connected through an aperture of the housing to a power source, the front side of the housing being located towards the light emitting element such that, in use, light is emitted through a front side
10 aperture of the housing by the light emitting element; wherein the power source is accessible by separation of the housing from the recessed structure.
- 15 2. A lighting unit as claimed in claim 1, wherein the housing is a fire-resistant housing.
3. A lighting unit as claimed in claim 1 or claim 2, wherein a trim is provided with the front side aperture of the housing.
- 20 4. A lighting unit as claimed in claim 3, wherein the trim comprises a cover which covers the front side aperture of the housing.
- 25 5. A lighting unit as claimed in claim 4, wherein the trim is fixed to at least one of the recessed structure and housing and is releasable upon access to the power source.
- 30 6. A lighting unit as claimed in claim 5, wherein the trim comprises a wall which locates with a wall of the recessed structure to provide ingress protection.
7. A lighting unit as claimed in claim 6, wherein the wall of the trim comprises a flexible seal.

8. A lighting unit as claimed in any one of the preceding claims, wherein a fire resistant material is provided on a platform located between the light emitting element and rear side of the housing.
- 5 9. A lighting unit as claimed in claim 8, wherein the fire resistant material is an intumescent material.
- 10 10. A lighting unit as claimed in claim 8 or 9, wherein the platform is spaced from the rear side of the housing by a spacer fixed to the platform and rear side of the housing.
11. A lighting unit as claimed in claim 10, wherein the platform is a planar element parallel to an inner surface of the rear side of the housing.
- 15 12. A recessed structure and housing for a lighting unit as claimed in any preceding claim, wherein the recessed structure is suitable for defining an aperture in a partition and the housing is mountable within the recessed structure and adapted to contain a light emitting element, wherein fixing means are provided in the recessed structure and housing such that the fixing means enable the housing to be fixed to the recessed structure and also separated from the recessed structure.
- 20 13. A lighting unit as claimed in any one of the preceding claims, wherein the lighting unit is a fully-recessed down light assembly.
- 25 14. A down-light assembly as hereinbefore described and/or with reference to Figures 1 to 4 of the accompanying drawings.
- 30 15. A method of installing a down-light assembly as hereinbefore described and/or with reference to Figures 1 to 4 of the accompanying drawings.



Application No: GB1108467.0

Examiner: Bill Riggs

Claims searched: 1 - 15

Date of search: 20 September 2011

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X	1-6	GB 2436673 A (MAGENTA GROUP INTL Corp) See e.g. fig.5
X	1-5	GB 2321515 A (ILLUMA LIGHTING Ltd.) See e.g. fig.6
X	1, 3-6	US 2004/120141 A1 (Beadle, Joshua) See e.g. fig.3
X	X: 1, 3-5, 12; Y: 8 & 9	WO 2011/082457 A1 (GERARD LIGHTING PTY LTD) See e.g. fig. 4 items 3 & 110 and figs 6a,b,c, 10, 2 & 26.
X	X: 1, 3-5; Y 8 & 9	FR 2589984 A (MEGALIT Sarl) See e.g. fig.1
X	1	US 2010/149798 A1 (Scott, Keith) See e.g. fig.6
Y	8 & 9	EP 0909919 A2 (NULLFIRE LTD.) See e.g. par.4

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

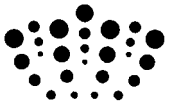
Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^X :

Worldwide search of patent documents classified in the following areas of the IPC

F21S; F21V

The following online and other databases have been used in the preparation of this search report



Online databases: EPODOC, WPI

International Classification:

Subclass	Subgroup	Valid From
F21S	0008/02	01/01/2006