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(54) **LIGHTING DRIVER WITH REMOTE INDICATOR LED AND EMERGENCY TEST BUTTON**

(57) Disclosed is a driver (1) for a light source (25), including a printed circuit board, PCB (11); a status indicator LED (111) preferably directly mounted on the PCB (11); and an optical fiber arrangement (23A; 23B) configured to deliver light emitted by the LED (111) at a light

sensor (112) preferably directly mounted on the PCB (11) and connected to a control circuitry of the driver (1). This avoids EMC and transient issues in connection with remotely arranged status indicator LEDs and emergency test buttons.

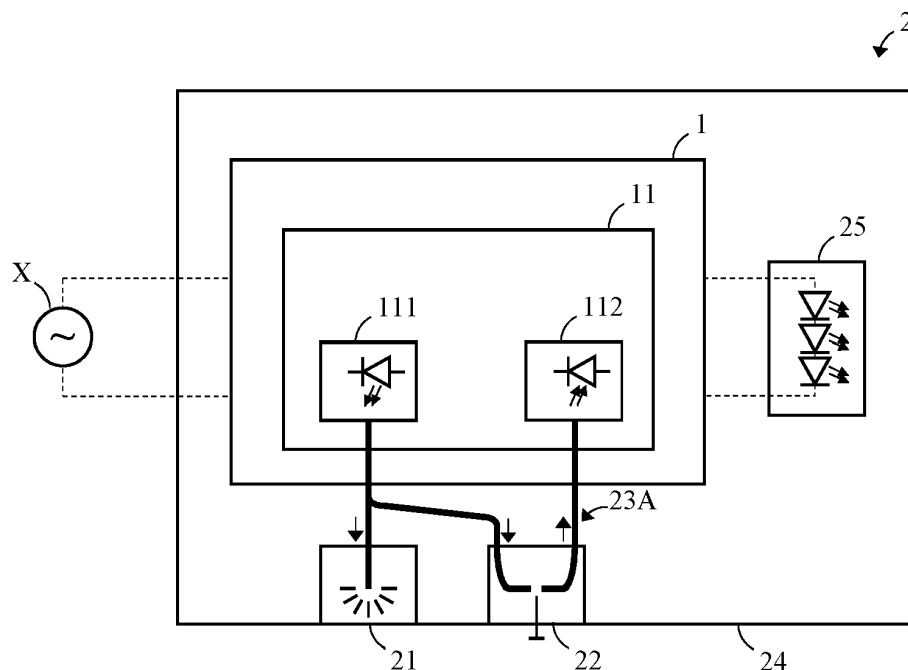


FIG. 1

Description

Technical Field

[0001] The present disclosure relates to lighting technology, and to status indicator LEDs as well as test switches thereof. In particular, the present disclosure relates to a driver for a light source, a method of operating the same, and a luminaire including the driver.

Background Art

[0002] Emergency lighting systems are compulsory in many official buildings and workplaces so that people can find their way around safely in the unlikely event of a power failure.

[0003] Emergency lighting drivers equipped for manually initiated testing may be provided with a status indicator LED and a test button. Long wire connections between such an assembly and the driver, for example in a meter range, can lead to problems with meeting EMC & transient standards as noise can be induced via the long leads. Avoiding these problems may complicate and/or impose limits on a design of the emergency lighting system.

Summary

[0004] In view of the above-mentioned drawbacks and limitations, the present disclosure aims to improve the emergency lighting systems of the background art. An objective is to provide a lighting driver avoiding EMC & transient issues in connection with remote status indicator and test button assemblies.

[0005] The objective is achieved by the embodiments as defined by the appended independent claims. Preferred embodiments are set forth in the dependent claims and in the following description and drawings.

[0006] A first aspect of the present disclosure relates to a driver for a light source, including a printed circuit board (PCB); a status indicator LED preferably directly mounted on the PCB; and an optical fiber arrangement configured to deliver light emitted by the status indicator LED at a light sensor preferably directly mounted on the PCB and connected to a control circuitry of the driver.

[0007] The optical fiber arrangement may be configured to deliver light emitted by the status indicator LED partly at a status indicator light output spaced apart from the driver, and partly at the PCB-mounted light sensor via a test button spaced apart from the driver. The test button may be arranged to selectively block incident light through actuation.

[0008] The driver may include an emergency lighting LED driver; and the light source may include an LED.

[0009] The LED may be arranged to emit visible light.

[0010] The LED may be arranged to emit invisible light.

[0011] The control circuitry may be arranged to monitor a reception of the light sensor for detecting the actuation

of the test button.

[0012] The optical fiber arrangement may include a 1x2 optic coupler.

[0013] The optical fiber arrangement may include a 1x2 fused fiber optic coupler.

[0014] The status indicator light output may include a 1x2 optic coupler.

[0015] The 1x2 optic coupler may be arranged to generate the light output through macro-bending.

[0016] The status indicator light output and the test button may be integral with one another.

[0017] The light sensor may include a photo diode.

[0018] A second aspect of the present disclosure relates to a luminaire, including a driver of the first aspect or any of its implementations; and a light source operable by the driver.

[0019] The test button may be arranged at a housing of the luminaire inside which the driver is arranged.

[0020] A third aspect of the present disclosure relates to a method of operating a driver for a light source. The driver includes a PCB and a status indicator LED preferably directly mounted on the PCB. The method includes: using an optical fiber arrangement to deliver light emitted by the status indicator LED at a light sensor preferably directly mounted on the PCB and connected to a control circuitry of the driver.

Advantageous Effects

[0021] The present disclosure proposes using a flexible fibre-optic cable and a PCB-mounted status indicator LED to replace leaded status indicator LEDs, and implementing the test button function using optical feedback from the indicator LED. Light guides have been seen on luminaires previously but they have been of the solid type, usually built into the construction of the luminaire itself.

[0022] Fibre-optic cables are non-conductive and thus immune to problems with passing transient tests & meeting EMC standards.

[0023] The flexible nature of optical fiber makes routing and positioning of the status indicator easier for the luminaire manufacturer when compared to solid light guides.

[0024] Placing the status indicator LED on the driver PCB and using a flexible optical fibre to carry the light from the indicator through the luminaire to where ever needed by the luminaire design without picking up any noise may simplify a design and reduce development time for the both the driver designer and the luminaire manufacturer.

Brief Description of Drawings

[0025] The above-described aspects and implementations will now be explained with reference to the accompanying drawings, in which the same or similar reference numerals designate the same or similar elements.

[0026] The features of these aspects and implemen-

tations may be combined with each other unless specifically stated otherwise.

[0027] The drawings are to be regarded as being schematic representations, and elements illustrated in the drawings are not necessarily shown to scale. Rather, the various elements are represented such that their function and general purpose become apparent to those skilled in the art.

FIG. 1 illustrates a luminaire and a driver in accordance with the present disclosure;

FIG. 2 illustrates a further luminaire and driver in accordance with the present disclosure;

FIG. 3 illustrates a flow chart of a method in accordance with the present disclosure of operating a driver.

Detailed Descriptions of Drawings

[0028] FIG. 1 illustrates a luminaire 2 and a driver 1 in accordance with the present disclosure.

[0029] The luminaire 2 includes the driver 1 and a light source 25 operable by the driver 1. The light source 25 may include an LED.

[0030] The driver 1 may include an emergency lighting LED driver. The driver 1 includes a PCB 11 and a status indicator LED 111 preferably directly mounted on the PCB 11. The status indicator LED 111 may be arranged to emit visible light, and may additionally be arranged to emit invisible light.

[0031] The driver 1 further includes an optical fiber arrangement 23A configured to deliver light emitted by the status indicator LED 111 at a light sensor 112 preferably directly mounted on the PCB 11 and connected to a control circuitry (not shown) of the driver 1. The light sensor 112 may include a photo diode.

[0032] The optical fiber arrangement 23A may be configured to deliver light emitted by the status indicator LED 111 partly at a status indicator light output 21 spaced apart from the driver 1, and partly at the PCB-mounted light sensor 112 via a test button 22 spaced apart from the driver 1.

[0033] To this end, the optical fiber arrangement 23A may include a 1x2 optic coupler, and may in particular include a 1x2 fused fiber optic coupler.

[0034] The test button 22 may be arranged at a housing 24 of the luminaire 2 inside which the driver 1 is arranged, and may be arranged to selectively block incident light through actuation. As such, an actuation of the test button 22 will selectively block the light emitted by the status indicator LED 111 and partly delivered at the PCB-mounted light sensor 112 via the test button 22.

[0035] The control circuitry of the driver 1 may be arranged to monitor a reception of the light sensor 112 for detecting the actuation of the test button 22.

[0036] The status indicator light output 21 and the test

button 22 may be integral with one another, i.e. may form an assembly.

[0037] FIG. 2 illustrates a further luminaire 2 and driver 1 in accordance with the present disclosure.

[0038] In view of the degree of similarity of FIGs. 1 and 2, similar items will not be described once again.

[0039] In the optical fiber arrangement 23B of FIG. 2, a 1x2 optic coupler may be included in the status indicator light output 21.

[0040] In particular, the 1x2 optic coupler included in the status indicator light output 21 may be arranged to generate the light output through macro-bending. In other words, the fiber cable may be subjected to a significant amount of bending above a critical value of curvature. This inhibits the light guidance mechanism and causes light energy to be radiated from the fiber.

[0041] The macro-bending may be accomplished in many ways, including leading the fiber around a member having a curvature or cylindric radius which is suitable of causing enough macro-bending losses for delivering light emitted by the status indicator LED 111 partly at the status indicator light output 21.

[0042] FIG. 3 illustrates a flow chart of a method 3 in accordance with the present disclosure of operating a driver 1.

[0043] The driver 1 includes a PCB 11 and a status indicator LED 111 preferably directly mounted on the PCB 11.

[0044] The method 3 includes: using 31 an optical fiber arrangement 23A; 23B to deliver light emitted by the status indicator LED 111 at a light sensor 112, which is also preferably directly mounted on the PCB 11 and connected to a control circuitry of the driver 1.

[0045] Advantageously, the technical effects and advantages described above in relation with the driver 1 equally apply to the method 3 having corresponding features.

Claims

1. A driver (1) for a light source (25), including

a printed circuit board, PCB (11);
a status indicator LED (111) preferably directly mounted on the PCB (11); and
an optical fiber arrangement (23A; 23B) configured to deliver light emitted by the status indicator LED (111) at a light sensor (112) preferably directly mounted on the PCB (11) and connected to a control circuitry of the driver (1).

2. The driver of claim 1,
the optical fiber arrangement (23A; 23B) configured to deliver light emitted by the status indicator LED (111)

- partly at a status indicator light output (21)

- spaced apart from the driver (1), and
- partly at the PCB-mounted light sensor (112) via a test button (22) spaced apart from the driver (1), the test button (22) arranged to selectively block incident light through actuation. 5
3. The driver of claim 1 or claim 2,
- the driver (1) including an emergency lighting LED driver; and 10
the light source (25) including an LED.
4. The driver of any one of the preceding claims, the status indicator LED (111) arranged to emit visible light. 15
5. The driver of any one of the preceding claims, the LED status indicator (111) arranged to emit invisible light. 20
6. The driver (1) of any one of the preceding claims, the control circuitry arranged to monitor a reception of the light sensor (112) for detecting the actuation of the test button (22). 25
7. The driver (1) of any one of the claims 1 to 6, the optical fiber arrangement (23A) including a 1x2 optic coupler.
8. The driver (1) of claim 7, 30
the optical fiber arrangement (23A) including a 1x2 fused fiber optic coupler.
9. The driver (1) of any one of the claims 1 to 6, the status indicator light output (21) including a 1x2 optic coupler. 35
10. The driver (1) of claim 9, the 1x2 optic coupler arranged to generate the light output through macro-bending. 40
11. The driver (1) of any one of the preceding claims, the status indicator light output (21) and the test button (22) being integral with one another. 45
12. The driver (1) of any one of the preceding claims, the light sensor (112) including a photo diode.
13. A luminaire (2), including 50
a driver (1) of any one of the preceding claims; and
a light source (25) operable by the driver (1).
14. The luminaire (2) of claim 13, 55
the test button (22) arranged at a housing (24) of the luminaire (2) inside which the driver (1) is arranged.
15. A method (3) of operating a driver (1) for a light source (25),
- the driver (1) including a printed circuit board, PCB (11) and a status indicator LED (111) preferably directly mounted on the PCB (11);
the method (3) including
using (31) an optical fiber arrangement (23A; 23B) to deliver light emitted by the status indicator LED (111) at a light sensor (112) preferably directly mounted on the PCB (11) and connected to a control circuitry of the driver (1).

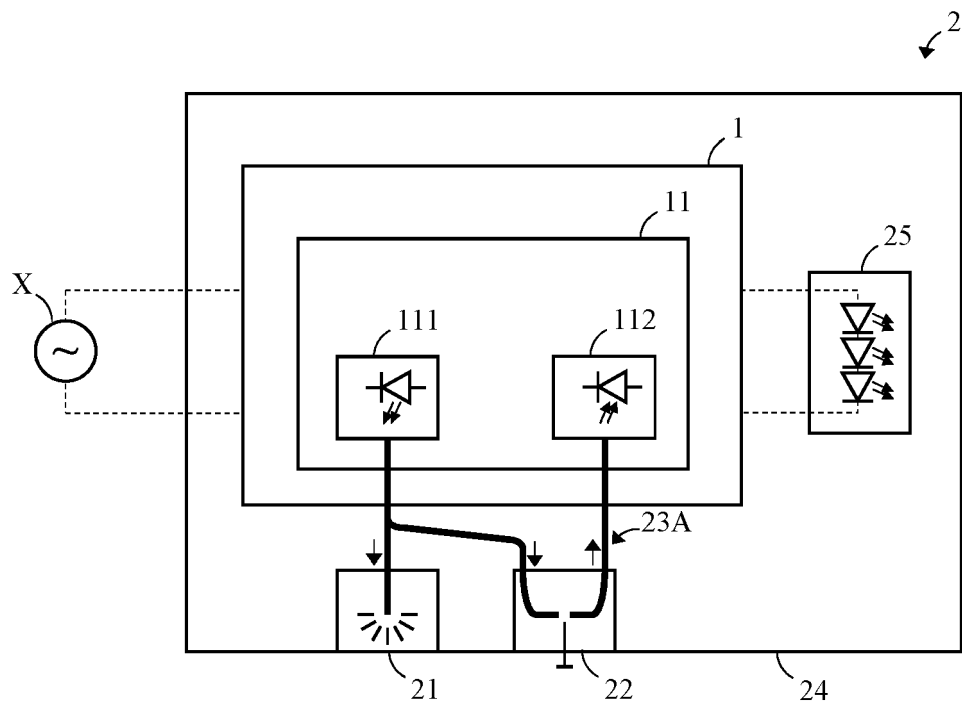


FIG. 1

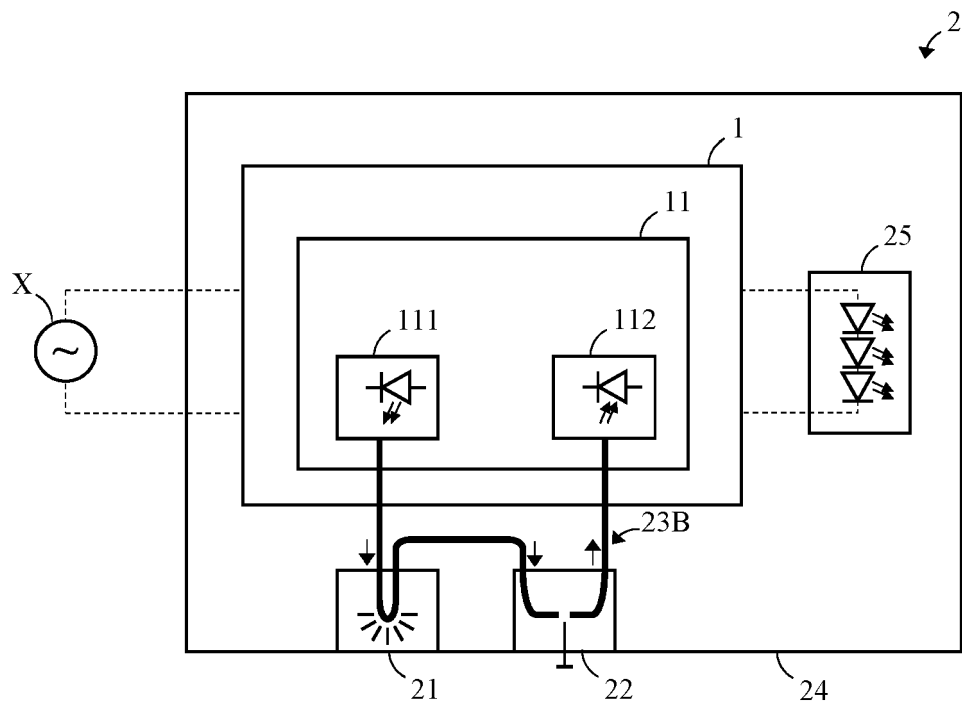


FIG. 2

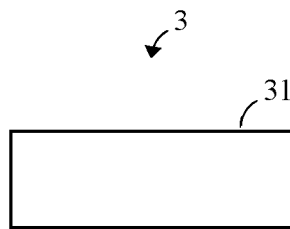


FIG. 3



EUROPEAN SEARCH REPORT

Application Number

EP 21 20 0649

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EPO FORM 1503 03.82 (P04C01)

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2018/103303 A1 (SCHELL J DAVID [US]) 12 April 2018 (2018-04-12) * paragraphs [0009] - [0037]; figure 6 * * paragraph [0065] - paragraph [0067] * -----	1, 3-5, 7-11, 13, 15	INV. H05B45/50 H05B45/00
X	US 2012/302874 A1 (HOLLSTIEN DAVID S [US]) 29 November 2012 (2012-11-29) * paragraphs [0005], [0062], [0082]; claim 2; figure 7 * -----	1-6, 12, 14, 15	
A	JP 2010 071715 A (FUJI XEROX CO LTD) 2 April 2010 (2010-04-02) * the whole document * -----	1, 15	
			TECHNICAL FIELDS SEARCHED (IPC)
			H05B
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 21 February 2022	Examiner Henderson, Richard
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			

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 21 20 0649

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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
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2018103303 A1	12-04-2018	US 2018103303 A1	12-04-2018
		WO 2018071560 A1	19-04-2018
US 2012302874 A1	29-11-2012	NONE	
JP 2010071715 A	02-04-2010	NONE	

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