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(71) Applicant: **PHILIPS LIGHTING HOLDING B.V.** [NL/NL]; High Tech Campus 45, 5656 AE Eindhoven (NL).

(72) Inventors: **ENGELEN, Dirk, Valentinus, René**; c/o High Tech Campus 45, 5656 AE Eindhoven (NL). **DEKKER, Tim**; c/o High Tech Campus 45, 5656 AE Eindhoven (NL). **VAN GHELUWE, Jochen, Renaat**; c/o High Tech Campus 45, 5656 AE Eindhoven (NL).

(74) Agent: **VERWEIJ, Petronella, Danielle** et al.; Philips Lighting B.V - Intellectual Property - High Tech Campus 45, 5656 AE Eindhoven (NL).

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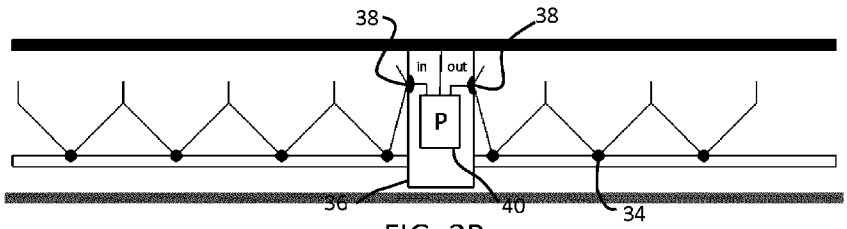

FIG. 3B

(57) Abstract: A lighting system which has adaptors fitted to the channel of a rail for receiving power. The rail has a sense conductor extending along the length of the channel, in the form of a set of discrete conductor elements and a biasing arrangement to urge the conductor elements together. The discrete conductor elements are separated by the head of an inserted adaptor thereby to interrupt the sense conductor by breaking a contact. The adaptor has a locator unit for identifying a location of the adaptor within the channel, comprising locator terminals for making electrical contact with the two sides of the broken contact of the sense conductor. The invention relates to the rail, the adaptor and the overall system.

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Track lighting system, and a track adaptor and a track rail of the system

FIELD OF THE INVENTION

This invention relates to track lighting systems, comprising a track and a set of lighting modules for attachment to the track. The invention further relates to the track and to the lighting modules.

BACKGROUND OF THE INVENTION

In retail and office environments it is common practice to use track-based systems to build the lighting system. These tracks can be suspended or recessed into the ceiling. To these tracks, lamps can be attached. Different types of these tracks are available. Some work with 230V but there are also lower voltage versions that enable different types of lamps to be used with the track.

The track has a power line which acts as a conductor of electricity, and the track also acts as a physical means to which the lamps can be attached. The lamps are usually mounted using some sort of clip, which is known as an adaptor. The main advantage of track-based systems is the flexibility they offer. They allow building an infrastructure of tracks which then allows lamps to be placed underneath the infrastructure of tracks built into that space.

There is an increasing demand for lighting systems which permit individual control of lamps. This individual control for example enables the lighting effect within a space to be controlled to create different effect at different times, and it also enables the lighting system to be reconfigured following changes in the room configuration, for example different allocation of spaces in an office area.

A problem with track based systems is that they generally do not permit individual control of the lamps connected to the track. It is known to provide multiple power lines, and to add data lines to the rail. For example, a track may carry three power lines and a neutral line, as well as a data line. The data line may be outside the rail.

The multiple power lines offer flexibility in that AC and DC lamps may be fitted to the same track design. The data bus enables individual control of lamps using standard lighting communication protocols.

The data bus may then be used to support lighting control methods like digital multiplex (DMX) or the digital addressable lighting interface (DALI). While this enables individual control of the lamps within a group, there remains a problem of such control bus systems that the order or location of the lamps in the rail cannot be determined.

When maximum flexibility, like plug and play, is needed, this becomes an issue. For example, a system may make use of multiple lamps which contribute to a single effect on a wall or painting. When a lamp adaptor is inserted at some location in the rail, commissioning is easier when the location of this new lamp can be detected automatically. This is not possible with a bus system: the presence can be detected, but not the location.

US 2015/0253360 discloses a track lighting system which makes use of voltage measurements along a DC power conductor, in order to determine a location along the power conductor. This requires various voltage measurements and sensors and is an analog approach to the problem.

There is therefore a need for an alternative rail based lighting system which enables automatic detection of the positions of the lamps installed on the rail, which can be implemented with low cost and simple components.

SUMMARY OF THE INVENTION

Examples in accordance with a first aspect of the invention provide a lighting system rail, comprising:

a channel for receiving lighting unit adaptors;

a pair of power lines extending along the length of the channel for providing power to lighting unit adaptors received in the channel; and

a sense conductor extending along the length of the channel, wherein the sense conductor comprises a set of discrete conductor elements and a biasing arrangement to urge the conductor elements together, wherein the discrete conductor elements are separable by an inserted lighting unit adaptor thereby to interrupt the sense conductor.

This rail design incorporates a sense conductor, which provides a connection along the channel. It is interrupted by an inserted adaptor. In this way, the inserted adaptor has a means for identifying its physical location. In particular, the inserted adaptor can identify other adaptors upstream and downstream by using the sense conductor as a communication channel. This provides a simple way to provide location information in respect of an inserted adaptor.

In one set of examples, the sense conductor comprises a sequence of spring contact pairs which are biased together. Each contact pair can then be separated by pushing the contacts apart using the adaptor. If the adaptor has contact terminals for contacting the two separated contacts, the sensor conductor then includes the adaptor as a series electrical element.

The spring contact pairs may for example comprise V springs or they may comprise overlapping rocker arms.

In another set of examples, the sense conductor comprises a sequence of conductor elements which are biased together by springs at one or both ends of a chain of the conductor elements. These conductor elements may then be pushed apart by the insertion of an adaptor. For this purpose, they for example form a shape with insertion regions at the junctions between adjacent elements. This design requires fewer spring components. The conductor elements for example comprise balls.

The lighting system rail may further comprise a data line for providing data communication with lighting unit adaptors received in the channel. In this way, there is a separate location system and data communication system. Instead, the sense conductor may implement a data line for providing data communication with lighting unit adaptors received in the channel. In this case, the sense conductor also functions as the data communication channel.

Examples in accordance with a second aspect of the invention provide a lighting unit adaptor, comprising:

a head for insertion into a channel of a lighting system rail;

a pair of power input terminals on the head for contacting a pair of power lines of the channel; and

a locator unit for identifying a location of the lighting unit adaptor within the channel, wherein the locator unit comprises an interrupt unit for breaking a contact along a sense conductor extending along the length of the channel, wherein the interrupt unit comprises first and second locator terminals for making electrical contact with the two sides of the broken contact of the sense conductor.

This aspect provides an adaptor which is designed to interrupt the sense conductor of the rail of the first aspect. It has a locator unit which is able to identify a location of the adaptor (a physical location or an order relative to other adaptors) by interrupting a sense conductor.

The first locator terminal may comprise a data-in port and the second locator terminal may comprise a data out-port, and the locator unit comprises a controller for communicating with upstream and downstream lighting unit adaptors over the sense conductor, thereby to determine an ordering along the rail of the lighting unit adaptor relative to other lighting unit adaptors along the rail. The data-in and data-out ports enable a serial communication protocol to be implemented using the sense conductor.

The controller may further be adapted to measure a resistance between the lighting unit adaptor and one or both adjacent lighting unit adaptors along the rail, thereby to determine a position along the rail of the lighting unit adaptor relative to other lighting unit adaptors along the rail.

The locator unit may have an adjustable position in the rail direction relative to the head. If there are discrete possible positions at which connection is possible to the sense conductor, the position of the lighting unit (attached to the adaptor) is still continuously adjustable.

The controller is for example adapted to implement a daisy chain communication protocol between the adaptor units on the rail.

The invention also provides lighting system comprising:

a lighting system rail as defined above in connection with the first aspect;

one or more lighting unit adaptors for fitting to the rail, and each as defined above in connection with the second aspect; and

a respective lighting unit for coupling to each lighting unit adaptor.

A controller may be provided for communicating with the lighting unit adaptors using the sense conductor and based on a daisy chain communication protocol.

BRIEF DESCRIPTION OF THE DRAWINGS

Examples of the invention will now be described in detail with reference to the accompanying drawings, in which:

Figure 1 shows a known lighting track;

Figure 2 shows a lighting system having a set of lighting modules attached to a track;

Figure 3 shows a first design of a sense conductor for use as part of a lighting track;

Figure 4 is used to explain a communication protocol used for lighting modules fitted to a track having the sense conductor of Figure 3;

Figure 5 is used to explain how resistance measurement may be carried out;

Figure 6 shows the different parts of an adaptor in schematic form;

Figure 7 shows a second design of a sense conductor for use as part of a lighting track; and

Figure 8 shows a third design of a sense conductor for use as part of a lighting track.

DETAILED DESCRIPTION OF THE EMBODIMENTS

The invention provides a lighting system which has adaptors fitted to the channel of a rail for receiving power. The rail has a sense conductor extending along the length of the channel, in the form of a set of discrete conductor elements and a biasing arrangement to urge the conductor elements together. The discrete conductor elements are separated by the head of an inserted adaptor thereby to interrupt the sense conductor by breaking a contact. The adaptor has a locator unit for identifying a location of the adaptor within the channel, comprising locator terminals for making electrical contact with the two sides of the broken contact of the sense conductor. The invention relates to the rail, the adaptor and the overall system.

Figure 1 shows a track 2 which may be regarded as being a bus bar component. The track 2 comprises several electrical conductors 4 to 7 formed with a channel 8 and further conductors 9 to 11 formed outside the channel. The conductors may be regarded as being bus bar component conductors. A carrying element 12 is provided for carrying the electrical conductors 4 to 7 and 9 to 11. In this embodiment the carrying element is a substantially U-shaped profile forming a receiving channel 8. The several electrical conductors 4 to 7 and 9 to 11 are used for different purposes.

A first electrical conductor 6 is used for distributing a first DC power for powering purposes, with a second (reference) electrical conductor 7 being preferentially a ground conductor.

A pair of electrical conductors 4, 5 is used for distributing alternating current (AC) power, and the set of three electrical conductors 9, 10, 11 is used for communication purposes. This example thus has DC and AC power lines within the rail. A rail may instead by DC only or AC only. The electrical conductors are arranged along the length of the track 2.

Figure 2 shows a DC power distribution system which makes use of the track 2.

The DC power distribution system further comprises several lighting adaptors 13 attached to the track 2 and electrically connected to the electrical conductors, wherein the adaptors 13 each comprise a head for insertion into the channel 8 and a locator unit 16 for identifying a location of the adaptor within the channel.

Figure 3 shows a first example of how the lighting system rail of Figure 1 is modified to provide a sense conductor for identifying the relative positions of inserting lighting adaptors. In addition to the conventional power lines, such as at least one pair of power lines extending along the length of the channel for providing power to the lighting unit adaptors, there is a sense conductor 30. The sense conductor 30 is a conductor which runs the length of the channel, but which is modified by the presence of an adaptor. In particular, the adaptor becomes connected in series with the sense conductor.

To enable this function, the sense conductor 30 comprises a set of discrete conductor elements 32 and a biasing arrangement to urge the conductor elements 32 together.

In the example of Figure 3A, the conductor elements are V-shaped wire forms, having a tail at the top of the two arms of the V-shape. The tails of one conductor element are pressed against the tails of the conductor elements on each side. The V-shaped wire forms are sprung so that they are biased towards each other to form a continuous conduction path. Thus, in this example, the conductor elements implement both a biasing function (implementing an integrated biasing arrangement) and a conduction function. The apex of each V-shaped element is fixed in position as shown by fixings 34.

The space between each pair of fixings 34 defines an insertion zone.

Figure 3B shows an adaptor 36 inserted into one of these insertion zones. The contact between an adjacent pair of the conductor elements 32 is pushed apart, and the spring bias pushes the limbs of the conductor elements on each side of the adaptor 36 against the side of the adaptor.

The adaptor sides each have an electrical contact 38. The contacts 38 are locator terminals for making electrical contact with the two sides of the broken contact of the sense conductor. These contacts connect to a (local) controller 40, so that the controller is in series with the sense conductor 30. One contact is a data-in port and one is a data-out port of the controller. The sense conductor is thus interrupted and the processor is introduced in series.

The sense conductor is used to provide data communication to the inserted adaptor and its associated lighting modules. When there is no adaptor in between the conductor elements 32, a direct contact is made.

The system can be implemented as a modification to conventional rail systems.

A known 3 circuit adaptor for example comprises a lever for fixing the adaptor in the channel and a dial for selecting one of the 3 power circuits. The lever urges contacts to project after the adaptor has been inserted into the channel and thereby make contact with the conductors in the channel.

A conventional rail system can be extended by introducing the sense conductor at the top of the rail (i.e. the bottom of the channel).

The adapter is then provided with a locator unit for identifying a location of the lighting unit adaptor within the channel. The locator unit is designed to be suitable for pushing apart a pair of contacts of the conductor elements 32. For this purpose, it has a mechanical/physical interrupt unit for breaking the contact along the sense conductor. The way power is provided to the adaptor is not altered, and the controller of the adaptor is powered from the same source.

Figure 4A shows an adaptor 36 which is about to be inserted between two existing adaptors; numbers 2 and 3 in a line of three. When a new adaptor is inserted between adaptor numbers 2 and 3, the data-in port of the controller detects that element 2 is the predecessor. The inserted adaptor assigns number 3 to itself and the address/number of further downstream elements is incremented. This is shown in Figure 4B.

This provides a daisy chain communication protocol. For example, a simple content protocol may be used. The first adaptor and lighting element receives all the control bytes for the complete system, and strips the first byte (or bytes) required for it to implement the desired control, and the remaining bytes are forwarded to the next adaptor and associated lighting module.

As shown in Figure 4, there is a controller 42 at the end of the sense conductor providing this daisy chain communication. The sense conductor in this example performs the dual role of sensing the locations of the different lighting elements but also providing data transfer to the adaptors.

When a new adaptor is inserted, it communicates its order position to the controller 42 and the control variables which may be set and the controller 42 can then deliver control instructions directly to that specific adaptor. There may be a transition period when the overall controller is not aware of the new adaptor, and during this time, the adaptor operates in a pass-through mode, until it has received confirmation that the network configuration has been updated in the controller. This confirmation may simply be based on

detection that the amount of data being sent for the daisy chain communication has been increased to reflect the added adaptor. It then consumes its data byte or bytes before passing on a controller message to the next adaptor in the daisy chain.

The daisy chain protocol outlined above is known and is implemented in existing lighting products.

Measures may need to be taken to ensure correct polarity of the data in/out connections. This can be achieved mechanically, for example by ensuring that the adaptor can only be inserted with the correct orientation. This is already the case for many existing track adaptors. The adapter may instead be inserted in either orientation but then automatically switch internally to the correct polarity once installed.

This approach provides location information which indicates an order along the rail of the adapters. It does not provide accurate position information, but even the relative positions are sufficient for example to provide dynamic lighting effects or to know the general areas which are illuminated by each lighting module.

As an optional additional feature, the conductor elements may have a measurable and standardized electrical resistance. The resistance between the data-in port of one adaptor element and the data-out port of the predecessor can then be measured. By dividing by the standardized resistance of one conductor element, a measure of the number of conductor elements between the adaptor and the preceding adaptor is obtained. The distance to the preceding adaptor can thus be derived. The position of every element on the track can then be determined.

Figure 5 shows one example of how this resistance measurement may be implemented.

Figure 5A shows a portion of one of the conductor elements 32. It comprises a set of tracks. The example shown has three low resistance tracks and one higher resistance track for implementing resistance measurement. Each track has a connection terminal for connecting to corresponding terminals of the adaptor. Thus, the adaptor in this example has multiple terminal connections on each side instead of a single contact terminal as explained above. The conductors are for example for data transfer and the resistors formed by the resistance track have a known resistance value R_s for each conductor element.

The sense conductor may thus comprise one or more conductor lines. A simplest implementation may use a single conductor, but multiple conductors enable dedicated functions to be performed such as data communication and sensing.

For the example of Figure 5, each adaptor 36 includes a current source 44 and a voltage measurement unit 46 at one side, and provides a shortcut to a common ground from the resistor track on the other side.

Figure 5B shows three adaptors 36 inserted into the channel. The circuit diagram below represents this situation. As shown, the adaptors interrupt the resistor track and provide insertion of the voltage measurement unit and current source within the resistor track.

The right side of each adaptor couples the resistor track (which extends from that adaptor to the next adaptor to the right) to a common ground 48. This common ground may be one of the three conductor lines in Figure 5A which runs along the conductor elements 32, or else it may simply be a connection to the grounded carrying element 12.

The left side of each adaptor couples the resistor track (which then connects to the previous adaptor to the left) to the current source 44 and voltage measurement unit 46.

The current source 44 delivers a known amount of current to the resistor track towards the ground connection of the resistor track at the preceding adaptor. Thus, two adjacent adaptor function together to form an isolated resistor path, but all measurements are taken at one adaptor only. The voltage measurement unit provides the total resistance ($R = V/I$) and can thus derive the number of conductor elements ($n = R/R_s$) between the adaptor and the preceding adaptor. In this way, the spacing between successive pair of adaptors may be derived.

No data communication is needed between adaptors in order to perform the resistance measurement. The measurement is carried out in one adaptor to determine the distance to the preceding adaptor. This can then be reported to the overall controller 42 using a data line as part of the individual data communication. For example, this data line may implement a backchannel to the controller. The adaptors may add data for communication to the backchannel in a daisy chain manner. For example, the most right adaptor sends a byte of information, and the next one to the left forwards the byte and adds an extra byte. By doing this, the controller derives information about the positions of all of the adaptors and can build up a map of the complete network.

This approach uses a current source and voltage sensing in each adaptor. Other approaches can of course be taken. For example, part of the measurement may be under the control of the overall controller 42, which may then act as a current source or voltage source to the resistor track.

The sensing function may instead make use of some of the conductors in the channel 8 instead of or as well as conductor lines on the conductor elements. For example, the conductor lines 4,5,6,7 may include a ground line which may be used in the manner explained above.

The sense conductor may be used to transfer all the control data as explained above, but it may also be used only as a means to determine the location of an adaptor in the rail, while the lighting control data is still provided via a (conventional) data bus on the rail.

Figure 6 shows an adaptor 36 with a locator unit for identifying a location of the lighting unit adaptor within the channel. The locator unit comprises an interrupt unit 50 for breaking a contact along a sense conductor extending along the length of the channel. The interrupt unit is provided as an added part on top of the normal adaptor head 52. Figure 5 is shown in cross section perpendicular to the elongate channel axis. A lighting module is shown as 54.

The lighting module may be an AC lamp, or a DC lamp, or a set of lamps.

There may also be other units fitted to the track such as PIR sensors, temperature sensors, humidity sensors, cameras, speakers etc. The track functions as a power supply channel to which different devices of an overall system may be attached.

Other mechanical options are possible for the sense conductor. The main feature is that an electrical contact is pushed open when inserting an adaptor, and that an adaptor port makes contact with the port of an adjacent processor to exchange information relating to order and optionally the distance relative to this adjacent adaptor.

Figure 7 shows an alternative with flat springs 60 used to form the conductor elements. The conductor elements again form a sequence of spring contact pairs which are biased together. In this example, the spring contact pairs comprise overlapping rocker arms. A rocker arm is spring biased to pivot to a closed overlapping state, and may be pushed open to break contact so that the contacts 38 connect to adjacent rocker arms of a separated pair.

Because the conductor elements are fixed to the rail, not all positions of the adaptor are possible. This can be easily solved by making slight horizontal movement of the interrupt unit 50 relative to the power contact part 52 of the adaptor. This is shown in Figure 6 by the arrows 62.

Figure 8 shows another example. The conductor elements are implemented as a series of conductive balls 70 and springs 72. The springs 72 are at the end of a series of balls 70 and ensure the balls are in galvanic contact with each other and thus form a closed circuit. An interrupt unit in the form of a pin 74 (with electrical contacts on each side)

can be inserted between two balls 70 in the same way as explained above. When inserting an adapter 36 the balls can roll or slide away resulting in some compression of the springs 72. The springs 72 subsequently ensure that the adapter is contacted at each side to its data-in and data-out port.

A ball shape is of course not essential. Any shape which allows an interrupt unit to enter between a pair of adjacent conductor elements may be used.

In example shown above, the conductor elements 32 and any required springs are installed at the top of the rail, and an interrupt unit is added to the adaptor. This has the advantage that conventional adaptors can still be installed in the new design of rail. However, other locations of the contacts and springs are possible.

Even when the location of the light source is known, this is not sufficient for determining the location of the light effect, since this also depends on the orientation of the lighting element. By adding extra sensors (such as a compass, accelerometer, distance meter), the location of a light beam can also be determined.

The invention is of interest for track lighting systems particularly where a plug and play behavior of the lighting is needed. This is of interest for shops or other commercial environments where an interior is changed frequently. In such cases, track lighting systems are frequently used. In combination with wired or wireless communication, the location of the inserted lamps in the track can easily be determined and this location can be used to show a representation of the lamp on the right location on a lighting management console.

The invention is of interest both for control of lighting and for commissioning of lighting systems.

The lighting system can be controlled depending on the determined positions of the lighting modules, in order to provide predefined light effects. For example, the overall controller 42 may be adapted such that a guiding light effect is provided dragging a person's eye to a certain position like the center of an installation. The determined position information can therefore be used by the controller to address the lighting modules depending on a predefined location sequence, which defines when light should be provided at which position. The controller can be adapted to provide dynamic effects, such as a chasing light effect depending on the determined positions of the lighting modules.

The control of the devices depending on the determined positions can also be regarded as being part of a commissioning process, in particular, as an automatic commissioning, of the lighting modules (or other devices) depending on their positions. For the commissioning aspect, an installation interface may be provided for assisting an installer

in installing an additional lighting module, by determining a preferred installation position on the track 2 for the additional lighting module (or other device) based on the determined positions of the lighting modules or other devices already attached to the track. Installation rules may be defined which ensure that the loads caused by the electrical devices should be evenly distributed among the power supply units, i.e. that the current flows should be distributed as evenly as possible.

The voltages provided by the conductors of the track may be directly suitable for the lighting modules, or the adapters may include converter circuits for generating the desired supply for the driven lighting module or other electrical device. There may be AC adaptors for connecting to AC conductors, or DC adaptors for connecting to DC conductors, or there may be adaptors including analog to digital conversion which connect to the AC conductors but are for powering a DC appliance.

The conductors are typically copper conductors although other metals may be used. Also the main body of the track may be conductive and earthed and thereby itself form one of the conductors. Thus, as a minimum there may simply be a pair of DC power lines of the track, one of which is an electrical conductor wire and the other of which (the earth line) is defined by the track housing.

Other variations to the disclosed embodiments can be understood and effected by those skilled in the art in practicing the claimed invention, from a study of the drawings, the disclosure, and the appended claims. In the claims, the word "comprising" does not exclude other elements or steps, and the indefinite article "a" or "an" does not exclude a plurality. The mere fact that certain measures are recited in mutually different dependent claims does not indicate that a combination of these measures cannot be used to advantage. Any reference signs in the claims should not be construed as limiting the scope.

CLAIMS:

1. A lighting unit adaptor (36), comprising:

a head (52) for insertion into a channel (8) of a lighting system rail;

a pair of power input terminals on the head for contacting a pair of power lines of the channel; and

a locator unit for identifying a location of the lighting unit adaptor within the channel, wherein the locator unit comprises an interrupt unit (50) for breaking a contact along a sense conductor (30) extending along the length of the channel, which sense conductor comprises a set of discrete conductor elements (32) and a biasing arrangement to urge the conductor elements together, wherein the interrupt unit comprises first and second locator terminals (38) for making electrical contact with the two sides of the broken contact of the sense conductor,

and wherein the first locator terminal (38) comprises a data-in port and the second locator terminal (38) comprises a data out-port, and the locator unit comprises a controller (40) for communicating with upstream and downstream lighting unit adaptors over the sense conductor, thereby to determine an ordering along the rail of the lighting unit adaptor relative to other lighting unit adaptors along the rail.

2. A lighting unit adaptor as claimed in claim 1, wherein the controller (40) is further adapted to measure a resistance between the lighting unit adaptor and one or both adjacent lighting unit adaptors along the rail, thereby to determine a position along the rail of the lighting unit adaptor relative to other lighting unit adaptors along the rail.

3. A lighting unit adaptor as claimed in claims 1 or 2, wherein the controller (40) is adapted to implement a daisy chain communication protocol between the lighting unit adaptors on the rail.

4. A lighting unit adaptor as claimed in any one of claims 1 to 3, wherein the locator unit has an adjustable position in the rail direction relative to the head (50).

5. A lighting system comprising a lighting system rail comprising:

- a channel (8) for receiving lighting unit adaptors;

- a pair of power lines (4,5,6,7) extending along the length of the channel for providing power to lighting unit adaptors received in the channel; and

- a sense conductor (30) extending along the length of the channel, wherein the sense conductor comprises a set of discrete conductor elements (32) and a biasing arrangement to urge the conductor elements together, wherein the discrete conductor elements are separable by an inserted lighting unit adaptor (36) thereby to interrupt the sense conductor;

the lighting system further comprising:

one or more lighting unit adaptors for fitting to the rail, and each as claimed in any one of claims 1 to 4; and

a respective lighting unit (54) for coupling to each lighting unit adaptor (36).

6. A lighting system as claimed in claim 5, wherein the sense conductor (30) comprises a sequence of spring contact pairs (32) which are biased together.

7. A lighting system as claimed in claim 6, wherein the spring contact pairs comprise V springs.

8. A lighting system as claimed in claim 6, wherein spring contact pairs comprise overlapping rocker arms (60).

9. A lighting system as claimed in claim 5, wherein the sense conductor comprises a sequence of conductor elements (70) which are biased together by springs (72) at one or both ends of a chain of the conductor elements.

10. A lighting system as claimed in claim 9, wherein the conductor elements (70) comprises balls.

11. A lighting system as claimed in any one of claims 5 to 10, wherein the lighting system rail further comprises a data line (9,10,11) for providing data communication with lighting unit adaptors received in the channel.

12. A lighting system as claimed in any one of claims 5 to 10, wherein the sense conductor (30) implements a data line for providing data communication with lighting unit adaptors received in the channel.

13. A lighting system as claimed in any one of claims 5 to 12, further comprising a controller (42) for communicating with the lighting unit adaptors using the sense conductor and based on a daisy chain communication protocol.

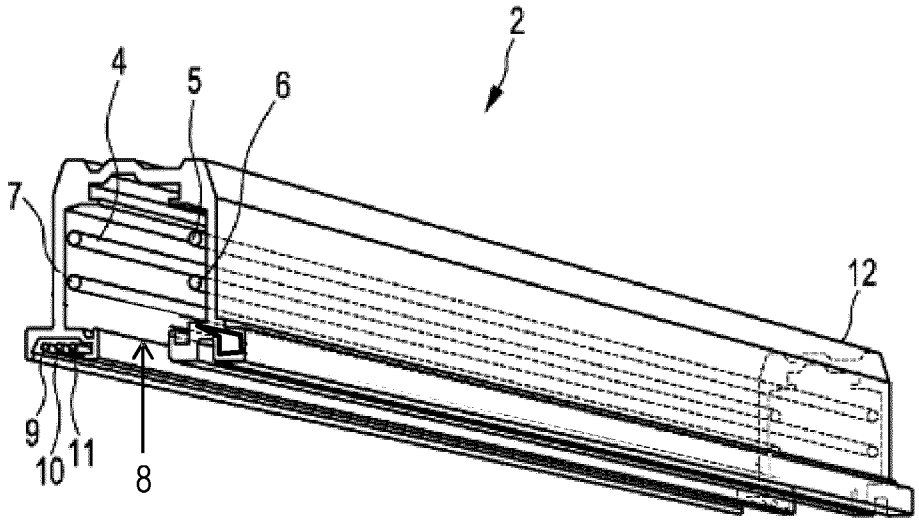

FIG. 1

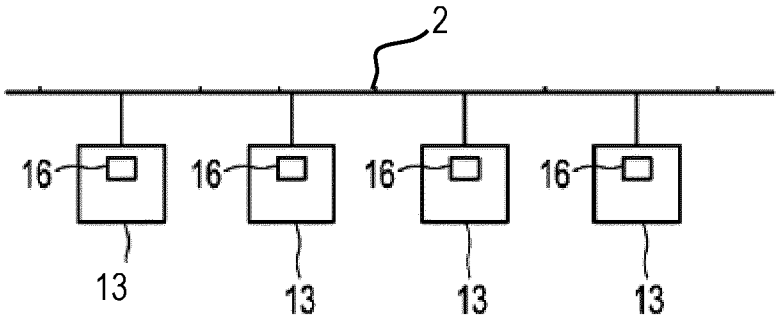

FIG. 2

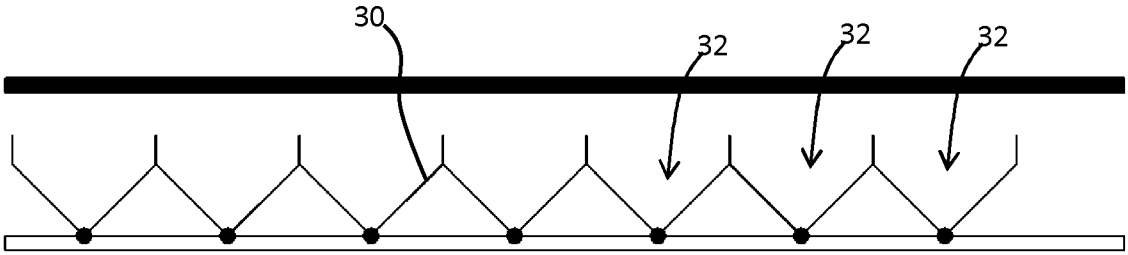

FIG. 3A

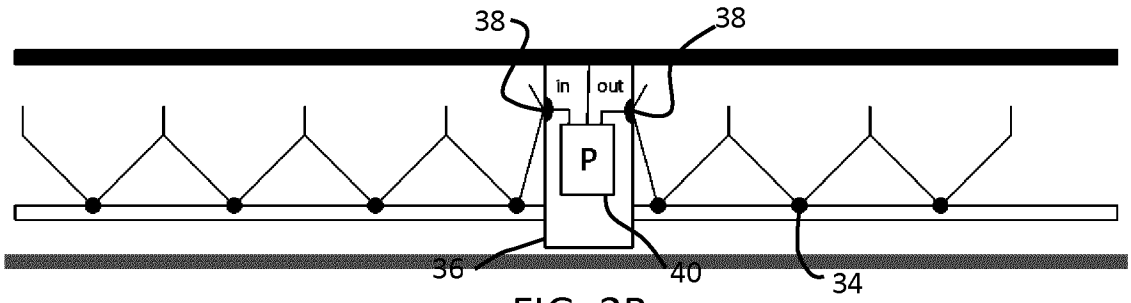

FIG. 3B

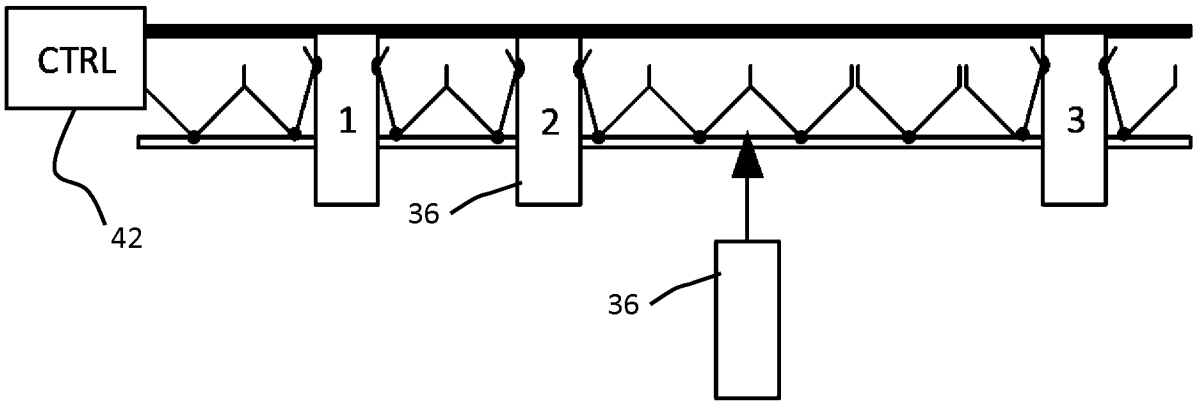

FIG. 4A

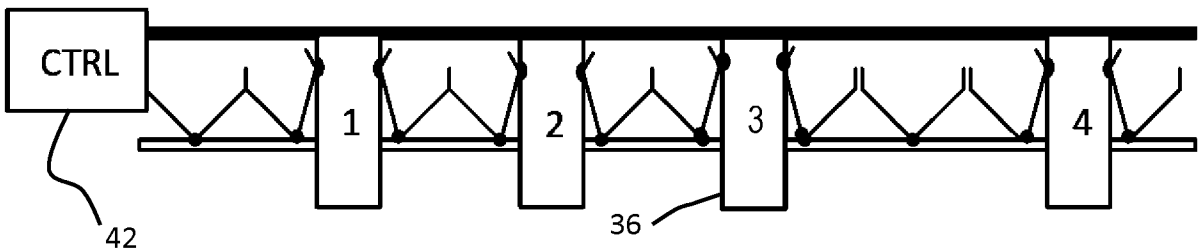

FIG. 4B

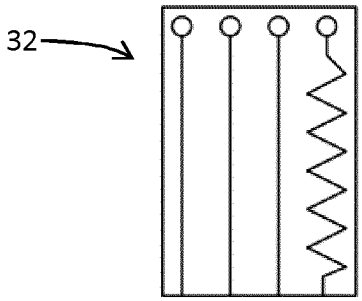

FIG. 5A

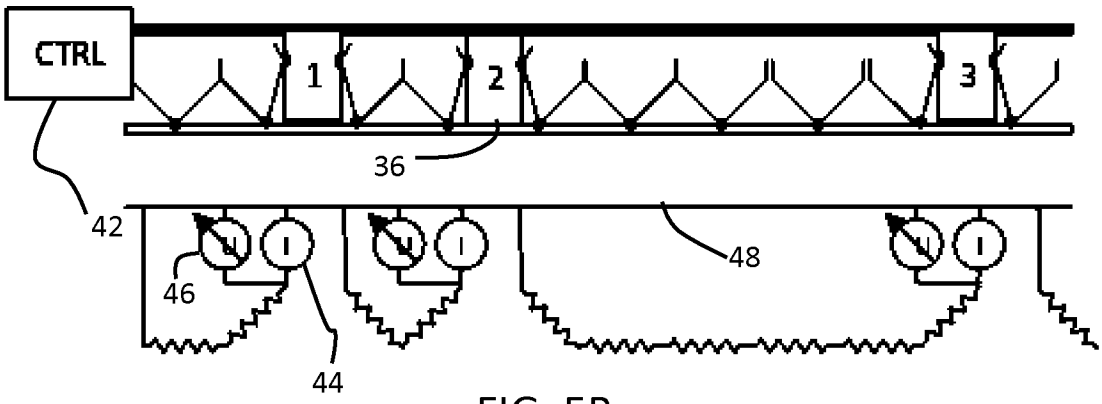

FIG. 5B

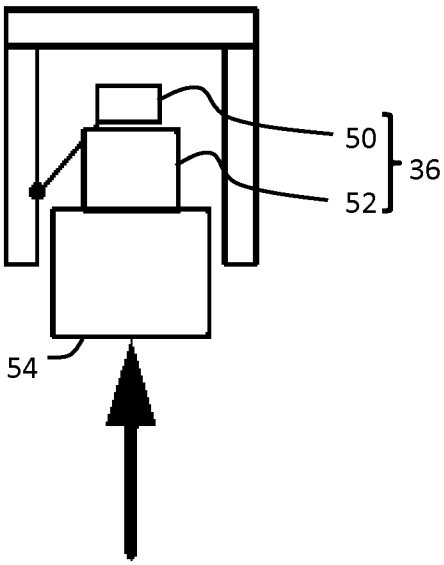

FIG. 6

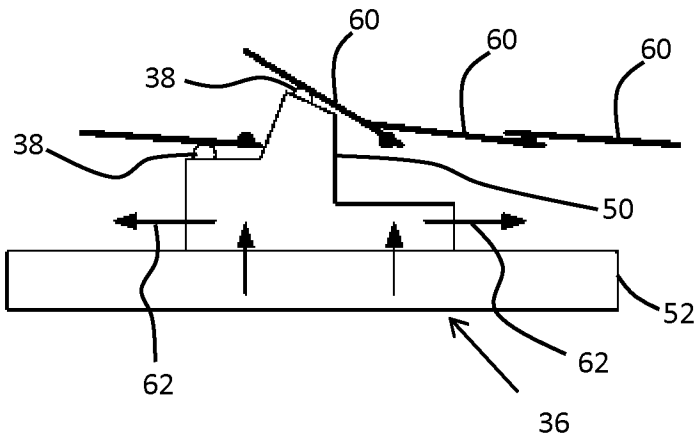

FIG. 7

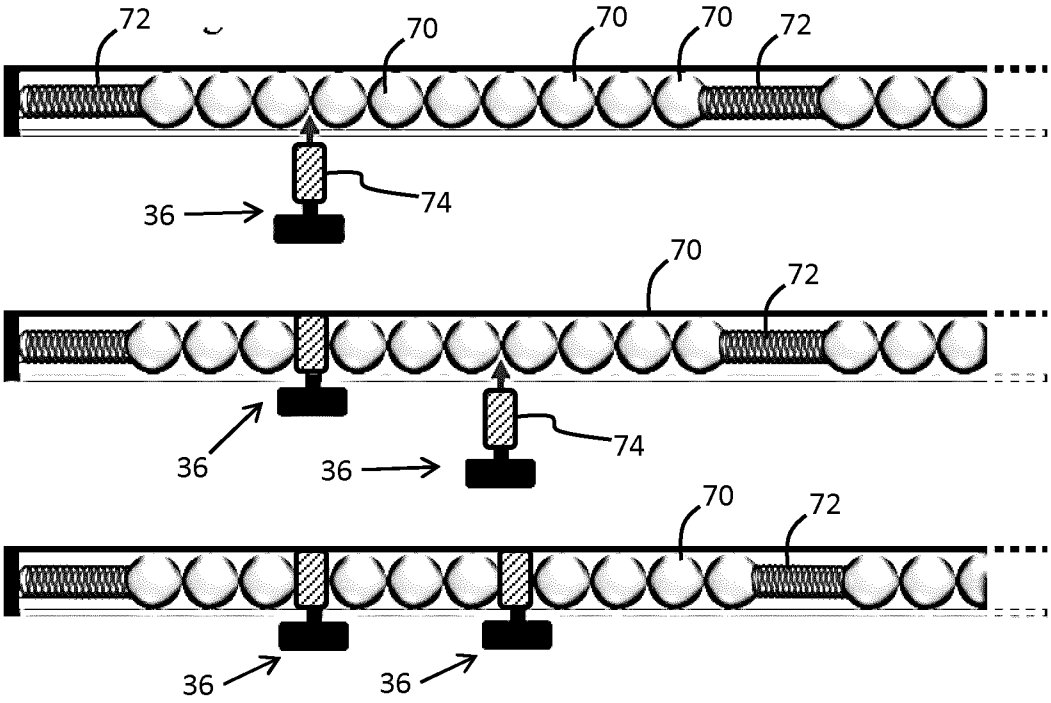

FIG. 8

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2017/059938

A. CLASSIFICATION OF SUBJECT MATTER
INV. H05B37/02 F21V21/002 H01R13/703 H01R25/16 F21S4/10
ADD.

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)
H05B F21V H01R F21S

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 practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2007/013003 A1 (PHILIPS INTELLECTUAL PROPERTY [DE]; KONINKL PHILIPS ELECTRONICS NV [NL) 1 February 2007 (2007-02-01) page 12, line 7 - page 14, line 7; figures 3-9	1-13
X	GB 2 275 835 A (MK ELECTRIC LTD [GB]) 7 September 1994 (1994-09-07) page 14, line 8 - page 15, line 25; figures 6-10	1-13
X	GB 2 286 925 A (CARADON MK ELECTRIC LTD [GB]) 30 August 1995 (1995-08-30) page 5, line 18 - page 9, line 19; figures 1-4	1-13

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

[X] See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
7 July 2017	17/07/2017

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, Fax: (+31-70) 340-3016	João Carlos Silva

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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A	US 2003/057886 A1 (LYS IHOR A [US] ET AL) 27 March 2003 (2003-03-27) paragraphs [0138] - [0155]; figures 12-17b	1-13
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INTERNATIONAL SEARCH REPORT

Information on patent family members

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