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(54) **METHOD AND ARRANGEMENT FOR SMOOTH DEPLOYMENT OF DEVICES OF A LIGHTING SYSTEM**

(57) A lighting device for fixed installing at a dedicated site comprises a memory and a short-distance wireless communications transceiver. The lighting device comprises preconfigured location-related data stored in said memory prior to installing. Said location-related data is indicative of an intended installing location of the lighting device at said dedicated site. The lighting device is configured to reveal at least a part of said preconfigured location-related data through operation of said short-distance wireless communications transceiver.

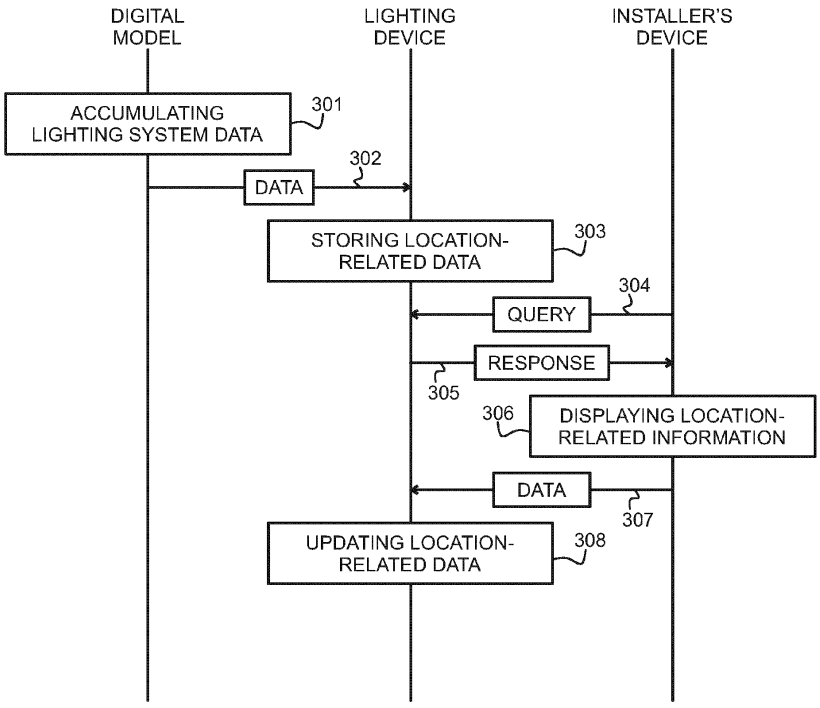

Fig. 3

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Description

FIELD OF THE INVENTION

[0001] The invention relates to the technology of coordinated installing of devices that are to constitute a lighting system. In particular, the invention concerns the task of ensuring that the lighting system will be installed and configured as planned.

BACKGROUND OF THE INVENTION

[0002] In a construction or renovation project, a lighting designer is tasked with designing a lighting system that typically comprises at least a large number of luminaires and may comprise numerous other devices such as controllers, sensors, power sources, and the like. In this text the term lighting system is used for short and concise reference, but the system meant here may also have other tasks related to a more generally defined field of building automation. Examples of such other tasks include but are not limited to collecting occupancy data, monitoring the usage of various spaces, controlling air conditioning, guiding users in finding their way, and many others.

[0003] Based on the planning work, the required devices are collected from depositories of manufacturers and/or wholesalers and delivered to the site, where they are installed and configured. In order to ensure proper service to the future users, it is important that each device is installed at its correct location according to the plan. For example, two luminaires may look the same but include led chips of different colour temperature, for which reason the lighting designer placed them in spaces of different nature in the plan. Even devices with exactly the same hardware may be programmed for location-specific operation: for example, luminaires close to windows may be configured for different kind of operation than those going to locations deeper inside the building, and luminaires in corridors, closets, office rooms, and meeting rooms may all have different, location-specific ways of operating configured into them.

[0004] Prior art methods for executing the installing and configuring phase typically involve large amounts of manual work such as checking codes, comparing to documents, and uploading configuration data to already installed devices. This makes the installing and configuring phase laborious and prone to human error.

SUMMARY

[0005] An objective of the invention is to enable easier and less error-prone installing of lighting devices at a dedicated site so that lighting devices become installed at correct locations and less configuring is needed on the site than in prior art solutions.

[0006] These and further advantageous objectives are achieved by preconfiguring the lighting devices with location-related data before installing.

[0007] According to a first aspect, there is provided a lighting device for fixed installing at a dedicated site. The lighting device comprises a memory and a short-distance wireless communications transceiver. The lighting device comprises preconfigured location-related data stored in said memory prior to installing. Said location-related data is indicative of an intended installing location of the lighting device at said dedicated site. The lighting device is configured to reveal at least a part of said preconfigured location-related data through operation of said short-distance wireless communications transceiver.

[0008] According to an embodiment, the lighting device comprises a processor configured to control operation of functional units in the lighting device. The lighting device may then be configured to perform said revealing of at least a part of said preconfigured location-related data without powering up said processor. This involves the advantage that for example an installing technician or other party may easily receive the information they need without having to connect the lighting device to any wired power source.

[0009] According to an embodiment, said short-distance wireless communications transceiver is an NFC transceiver conforming to the standard ISO/IEC 18092. This involves the advantage that the lighting device can be made compatible with a wide range of external partner devices for communications.

[0010] According to an embodiment, said location-related data is indicative of a particular part of a building that constitutes at least a part of said dedicated site. This involves the advantage that it makes the task of installing lighting devices at a site simpler, faster, and more straightforward.

[0011] According to an embodiment, said location-related data is indicative of at least one of the following: a named room of said building, a named external space of said building, a named doorway of said building, a named wall of said building. This involves the advantage that it makes the task of installing lighting devices at a site simpler, faster, and more straightforward.

[0012] According to an embodiment, said location-related data is indicative of a location in a coordinate system that covers said dedicated site. This involves the advantage that installing technician or other party may utilize various ways and/or auxiliary devices to find the appropriate location very accurately and unambiguously.

[0013] According to an embodiment, said location-related data is indicative of a group of similar locations within said dedicated site. This involves the advantage that there is no need to sort out the exact installing location of each individual lighting device separately, as long as the lighting device to be installed comes from the correct group.

[0014] According to an embodiment, said location-related data contains installing information indicative of a way in which the lighting device is to be installed. This

involves the advantage that such information can be conveyed to the installing technician in a very practical and reliable way.

[0015] According to an embodiment, said location-related data contains location-specific operating parameters for use by the lighting device during operation. This involves the advantage that there is no need to load such location-specific operating parameters to the lighting device after installing, which shortens the time needed to make the lighting system fully operational.

[0016] According to an embodiment, the lighting device is configured to store updated location-related data at or after installing in response to receiving such updated location-related data from an external device. This involves the advantage of added flexibility in cases where changes may have occurred after the location-related data were first stored in the lighting device.

[0017] According to an embodiment, the lighting device is configured to report the stored updated location-related data in response to a query from an external device. This involves the advantage that it becomes easier to maintain up-to-date data for example in controlling devices or locations of centralized information storage.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] The accompanying drawings, which are included to provide a further understanding of the invention and constitute a part of this specification, illustrate embodiments of the invention and together with the description help to explain the principles of the invention. In the drawings:

Figure 1 illustrates a site at which lighting devices are to be installed,
figure 2 is a block diagram of a lighting device,
figure 3 illustrates an example of a method for installing a lighting device, and
figure 4 illustrates another example of a method for installing a lighting device.

DETAILED DESCRIPTION

[0019] This description uses the term lighting device as a general designation of an electronic device that is destined for fixed installing at a dedicated site and that has, during its intended normal operation, at least one role related to the provision of artificial illumination at said site. Examples of lighting devices are luminaires, driver devices for light sources, sensors the output signals of which control lighting, light switch panels, and control devices such as lighting network routers and controllers. Lighting devices of the kind meant here may also be called nodes of a lighting network.

[0020] The fact that a lighting device is meant for fixed installing typically manifests itself in the form of screw holes, hooks, mechanical snap-on connectors, and/or other deliberately included installing means. The opposite of a device destined for fixed installing is a portable device. While many lighting devices destined for fixed installing are small and light enough to be easily carried before installing, for the skilled person the difference between portable devices and devices destined for fixed installing is clear.

[0021] The site may be for example a building or a part of a building, but it can also be an outdoor location such as a marketplace, a parking lot, or a park. A lighting device is destined for fixed installing at a dedicated site when it is allocated for delivery to and installing at some particular, individually identified site.

[0022] Fig. 1 illustrates an example of a simple site, which in this case is a relatively small office. In this example, the site comprises five named rooms: a hall (room #2), an open-plan office space (room #5), a meeting room (room #1), a lunchroom (room #4) and a toilet (room #3). Being "named" does not necessarily mean that the rooms have names that have a cleartext meaning to humans. They may have also other kinds of unambiguous identifiers. For conciseness, the following example discusses only luminaires as lighting devices that are to be installed at the site of fig. 1. Similar considerations will apply also to other kinds of lighting devices that appear in a lighting plan of the site.

[0023] In the lighting plan the artificial illumination of the site is implemented with luminaires of two basic types, shown as circles and ovals in fig. 1. There are 21 luminaires of the first type and seven luminaires of the second type altogether in the lighting plan. Of the luminaires of the first type, 18 are located in the open-plan office space, two in the hall, and one in the toilet. Of the luminaires of the second type, four are located in the meeting room and three in the lunchroom.

[0024] Of the 18 luminaires in the open-plan office space, 11 will be installed at locations close to windows. These are the 11 luminaires included in the first group 101. The other 8 luminaires in the open-plan office space constitute the second group 102. They will be installed at locations further away from the windows, so while they may have exactly the same hardware as the luminaires of the first group 101, they may need to be configured for different kind of operation regarding e.g. daylight harvesting.

[0025] The two luminaires of the first type that will be installed in the hall constitute a third group 103. Although not obligatory, they may differ from the luminaires of the first and second groups 101 and 102 with respect to both hardware and configuration.

[0026] The sole luminaire in the toilet constitutes a group 104 of its own, again because it may (although does not have to) be different from those of the other groups with respect to hardware, configuration, and/or the way in which it is to be installed.

[0027] There may be similar differences in hardware and/or configuration between those second-type luminaires that are destined for installing in the meeting room (group 105) and those destined for installing the lunch-

room (group 106).

[0028] When the installing technician comes to the site for installing the luminaires, they will find a delivery of 21 luminaires of the first type and seven luminaires of the second type from the luminaire manufacturer or wholesaler. At least some of the configuration differences may exist in the luminaires already: for example, there may be 11 luminaires of type 1 already configured for efficient daylight harvesting (see group 101 in fig. 1) and 7 luminaires of type 1 that look exactly the same from outside but that are configured to operate without the daylight harvesting functionality (see group 102 in fig. 1) . It remains the task of the installing technician to recognize, which luminaire should go where at the site.

[0029] Fig. 2 is a schematic block diagram of a lighting device 200, which may here represent e.g. any of the luminaires of first type or second type in fig. 1. The lighting device 200 of fig. 2 is meant for fixed installing at a dedicated site. It comprises a memory 201 and a short-distance wireless communications transceiver 202. The definition of a short distance for the purposes of this text is that a person holding the lighting device 200 in their hand or otherwise being at a touching distance may utilize an appropriate communications device to set up a communications connection with the lighting device 200. For the purposes of this text, the short-distance wireless communications transceiver 202 is assumed to be a piece of electronic circuitry; the definition does not cover e.g. solely visually readable, passive identifiers such as barcodes, QR codes, or character strings visible on the cover of the lighting device 200. According to an embodiment, the short-distance wireless communications transceiver 202 may be an NFC (Near-Field Communications) transceiver conforming to the standard ISO/IEC 18092.

[0030] In order to help the installing technician in finding the appropriate installing location, the lighting device 200 comprises preconfigured location-related data stored in the memory 201. Here we consider the lighting device 200 in the state it has prior to installing. The location-related data meant here is indicative of an intended installing location of the lighting device 200 at the dedicated site. The lighting device 200 is configured to reveal at least a part of the preconfigured location-related data through operation of the short-distance wireless communications transceiver 202.

[0031] Additionally or alternatively, a group-specific identifier of a group of luminaires may indicate a way in which the luminaires of a group are to be installed. For example, the delivery to the site may include some luminaires the intended installing height of which is 4 metres and some other luminaires the intended installing height of which is 2.5 metres. The site may be for example a parking garage, in which the parking halls are higher than the passageways. An indicator of the intended installing height may have been stored in a memory of each such luminaire prior to installing, so that it provides preconfigured location-related data.

[0032] There are several possibilities concerning how and at what stage the preconfigured location-related data may have become stored in the memory 201. Examples of these will be described in more detail later. Similarly, examples of what kind of location-related data the lighting device 200 may comprise in its memory 201 are described in more detail later.

[0033] The lighting device 200 is typically not connected to any kind of power grid or power bus at the time when the installing technician is still trying to find its correcting installing location. It may be advantageous for the preconfigured location-related data to be available for reading without a connection to a power grid or bus. For example, the lighting device 200 may comprise a processor 203 configured to control operation of functional units 204 in the lighting device. In such a case, the lighting device 200 may be configured to perform said revealing of at least a part of the preconfigured location-related data without powering up the processor 203. This may mean e.g. using the known ability of many near-field communications techniques to also convey sufficient power wirelessly to an interrogated device for it to respond.

[0034] The functions block 204 in fig. 2 is a general representation of functionalities that the lighting device 200 may utilize as a part of performing its intended function in the lighting system. For example, if the lighting device 200 is a luminaire, the functional units block 204 may contain the light sources as well as the controllable converters or other kinds of power-providing circuitry, the task of which is to provide electric power of desired voltage and current to the light sources. The functional units block 204 may also contain parts responsible for communications when the lighting device 200 operates as a node of a lighting network; for example, there may be a DALI transceiver (Digital Addressable Lighting Interface) or other communications unit capable of wired and/or wireless communications through a lighting control bus or in a wireless lighting control network. If the lighting device 200 is a sensor, the functional units block 204 may contain the actual sensor hardware as well as the possible associated circuitry for converting sensor readings into signals that are intelligible for other devices in the lighting system.

[0035] The lighting device 200 is also shown as comprising a power source block 205. This is a general representation of functionalities that may be present for receiving operating power and distributing it to the other parts of the lighting device during normal operation as a node of the lighting network. At the time prior to installing, there may be no power available yet for the power source block 205 to receive and distribute. In that case, as indicated above, the lighting device may be configured to perform said revealing of at least a part of said preconfigured location-related data without powering up e.g. the processor 203. According to an alternative embodiment, the power source block 205 may have a coupling easily accessible for the installing technician who may temporarily couple an external power source thereto for the time it takes for the lighting device 200 to reveal the in-

tended preconfigured location-related data.

[0036] According to an embodiment, the location-related data that was preconfigured to the memory 201 may be indicative of a particular part of a building that constitutes at least part of the dedicated site at which the lighting device 200 is to be installed. In the example of fig. 1, such an indicated particular part of the building could be e.g. one of the named rooms of the building, so that the location-related data could comprise for example the room number #4 or the verbal identifier "lunchroom". As not all lighting devices will be installed in rooms, alternatives to a named room include but are not limited to a named external space of the building, a named doorway of the building, a named wall of the building, and the like.

[0037] According to an embodiment, the location-related data may be indicative of a location in a coordinate system that covers the dedicated site. Such a coordinate system may be a universal coordinate system, like the GPS coordinate system for example. Additionally or alternatively, the coordinate system may be specific to the dedicated site. As an example, in many cases the installing locations of a plurality of lighting devices constitute a regular grid, such as a rectangular grid, in which an individual location can be indicated with a few numbers like the row and column numbers of a rectangular grid. The number of dimensions in the coordinate system can be selected as one, two, or three depending on the exact way in which the coordinate system is used to indicate locations at any dedicated site.

[0038] According to an embodiment, the location-related data may be indicative of a group of similar locations within the dedicated site. For example, if in fig. 1 all luminaires of the first group 101 are exactly similar and to be installed in the same way, it is not necessary to indicate an intended installing location any more accurately than belonging to the first group 101. Non-limiting examples of location-related data could in that case be "#5, group 1", or "open-plan office space, window row".

[0039] According to an embodiment, the location-related data may contain installing information indicative of a way in which the lighting device is to be installed. Installing height is an example of a parameter that the lighting designer may decide beforehand for at least some luminaires, based on an evaluation of how the illumination pattern of each such luminaire should match the illumination requirements that may be location-specific. Installing information may be contained in the location-related data in addition to any or all of those mentioned above. As an alternative, installing information may substitute at least some other kind of location-related data. For example, if a feature characteristic to all luminaires in the first group 101 of fig. 1 is a common installing height that differs from a similarly characteristic installing height of the luminaires of the second group 102, installing height may take the place of a group identifier in the location-related data. As another example, a feature characteristic to all luminaires in a group may be their IP-classification, i.e. applicability in wet and/or dusty environments. In such a case, IP classification may take the place of a group identifier in the location-related data.

[0040] According to an embodiment, the location-related data may contain location-specific operating parameters for use by the lighting device during operation. A non-limiting example of a location-specific operating parameter is the length of a delay that a sensor-equipped luminaire should wait before starting to dim after the latest instant of detecting movement. The length of such a delay is typically shorter for corridor luminaires than for those to be installed in office rooms, because users can be expected to move in an easily detectable way in corridors. Users in office spaces may stay relatively still for long periods and they will consider it irritating if the sensor-equipped luminaires there are too eager to start dimming.

[0041] Another example of location-related operating parameters concerns the use of so-called scenes. For example, in the DALI standard it is possible to store into a lighting device a number of predefined settings, such as a light level as a percentage, as "scenes". When a controlling device sends a scene command to an addressed group, each lighting device performs the action stored into its memory corresponding to that scene command. For example, for a lecture hall there may be defined a presentation scene, in which the luminaires closest to the podium stay on at some reduced level while the other luminaires in the same space dim to a very low level. When the intended installing location of each lighting device is known beforehand (and location-related data indicative thereof is stored in the memory of the lighting device), also the appropriate reaction to each scene command can be preconfigured.

[0042] Yet another example of location-related operating parameters concerns the grouping of lighting devices. For example, luminaires that send wireless messages to each other may operate in groups so that message, such as a light-up or stay-on command or the like, is only relayed to (or at least only reacted upon by) the luminaires of the appropriate group. One or more group identifiers or other data that defines the grouping may be preconfigured to the lighting devices. This approach is equally applicable in luminaires that are controlled centrally, e.g. through a DALI bus or the like.

[0043] Similar to installing information, location-specific operating parameters may be contained in the location-related data in addition to any or all of those mentioned above, and/or in place of some other kind of location-related data. According to an embodiment, the location-specific operating parameters are not there to replace such location-related data that is more easily comprehensible to an installer, but to lessen the need for on-site configuring. In such an embodiment, the installer uses a room identifier or other, easily comprehensible location-related data (wirelessly read from the memory of the device to be installed) to find the appropriate installing location. The location-specific operating parameters just come along in the form in which they were preconfigured by e.g. the manufacturer or the wholesaler before deliv-

ery to the dedicated site. The only thing the installer needs to do may be to test the devices once installed, for example by testing that all luminaires of a completed room - but only the luminaires of that room! - react appropriately to a command.

[0044] Fig. 3 illustrates an example of a method. The entities involved are a digital model of what was called the dedicated site above, the lighting device, and an installer's device. The designation "installer" is used here for short, although the person in question might also be responsible for other tasks such as configuring of the lighting devices if any configuring need to be performed at the dedicated site.

[0045] The digital model may be a BIM (Building Information Modelling) model, but it may also be some kind of a simpler collection of digital data that becomes created when the lighting designer makes decisions about the devices and functionalities of a lighting system for the dedicated site. According to an embodiment, the lighting designer uses a piece of computer software from which it is possible to later export data such as the number and type of lighting devices included in the completed plan of the lighting system. Here it is suggested that also location-related data of the lighting devices is included in the lighting system data that becomes accumulated in the digital model according to step 301 in fig. 3. Since the plan of the lighting system will in any case bind each planned lighting device to a unique location at the dedicated site, it is relatively straightforward to write said piece of computer software so that such location-related data becomes available for exporting just like e.g. the lists of luminaires of each type.

[0046] At step 302 the appropriate location-related data is transferred from the digital model to the lighting device in question. This part of the method may be executed for example at the premises of the manufacturer or wholesaler of the lighting devices as a part of the process where the ordered lighting devices are collected and delivered to the dedicated site. The manufacturer may have different ways available for transferring the location-related data to the lighting devices. For example, in the case of a made-to-order delivery, the location-related data may become programmed into the lighting devices already at the same time when other software components such as operating firmware is programmed. Additionally or alternatively, the location-related data may be programmed into the lighting devices at a testing station where the otherwise completed lighting devices are tested for correct operation. Additionally or alternatively, either the manufacturer or the wholesaler may utilize a programming device, preferably a short-distance wireless programming device, at a depository where the load of ordered lighting devices is assembled for delivery. Step 303 in fig. 3 represents storing the location-related data in the memory of the lighting device.

[0047] The installer's device may be a suitable general-purpose computer device such as a smartphone, tablet, or laptop, equipped with suitable software. Alternatively, the installer's device may be a purpose-built device for aiding installers in their job. The installer's device must be equipped with means for short-distance wireless communications that are compatible with the short-distance wireless transceiver in the lighting device.

[0048] At step 304 the installer's device queries the lighting device for location-related data. This may happen for example as a response to the installer bringing their device close enough to the lighting device, so that short-distance wireless communications become possible. At step 305 in fig. 3 the lighting device responds by revealing at least a part of the preconfigured location-related data through operation of its short-distance wireless communications transceiver to the installer's device.

[0049] Step 306 represents generally all possible ways in which the installer's device may utilize the location-related data revealed by the lighting device to guide the installer in finding the proper installing location.

[0050] According to an embodiment, if the location-related data comprises one or more identifiers that are displayable in the form of characters or character strings, the installer's device may simply display the corresponding character or character string like "#1", "meeting room", or "open-plan office space, window row" at step 306.

[0051] According to an embodiment, if the installer's device comprises a 2-D or 3-D model of the dedicated site stored in its memory, the installer's device may display an image of the model at step 306 and highlight the appropriate location in the image at which the installer is expected to install the lighting device.

[0052] According to an embodiment, if the location-related data is in a form that is understandable to a positioning software in the installer's device, the installer's device may guide the installer towards the correct installing location by displaying e.g. an arrow and distance, a heatmap-style indication that becomes "hotter" the closer the installer is to the appropriate installing location, or some other position-based guiding information at step 306.

[0053] According to an embodiment, if the location-related data contains installing information indicative of a way in which the lighting device is to be installed, the installer's device may display corresponding installing information at step 306.

[0054] The method of fig. 3 may end at step 306. As a possible addition, it is here assumed that the lighting device is configured to store updated location-related data at or after installing in response to receiving such updated location-related data from an external device. At step 307 the installer's device transmits such updated location-related data (or instructions to perform the appropriate updating of the existing location-related data) to the lighting device, and at step 308 the updating takes place in the lighting device.

[0055] An example of a situation where updating the location-related data at or after installing may become actual is one where it would be difficult, impossible, or

somehow disadvantageous to perform the installing in exact conformity with the location-related data originally preconfigured in the lighting device. In such a case the installer could e.g. mark the updated installing location in a 2-D or 3-D model of the dedicated site displayed by the installer's device, which would then communicate the marked location in a suitably formatted way to the lighting device. If the installer's device is capable of positioning at sufficient accuracy, the installer could simply command their device to "update to present location", at which point the installer' s device could transmit its own current position to the lighting device.

[0056] Another example of a situation where updating the location-related data at or after installing may become actual is one where the original, preconfigured location-related data is only approximate, and a more accurate location only becomes known at the time of installing. This is the case for example when the original, preconfigured location-related data is indicative of a group of similar locations within said dedicated site (like group 101 or group 102 in fig. 1), and for later use it would be useful to know, which luminaire of that group became installed at which location. Also here various exact ways of implementing are possible, such as marking the location in a 2-D or 3-D model or allowing the installer's device to communicate its own location. In all cases there is also the possibility that the installer types or otherwise enters some kind of a character string such as "third from the corner" or "X5 Y7" (marking a point (5,7) in a rectangular X-Y grid) and makes their device transmit that as updated location-specific data to the lighting device.

[0057] Another example of a situation where updating the location-related data at or after installing may become actual is one where the update comprises location-specific operating parameters. Thus, steps 307 and 308 in fig. 3 may represent a configuration phase where the installing technician finalizes the configuring of lighting devices after installing. As an example, the exact location of a lighting-controlling sensor in a larger space equipped with a plurality of such sensors may require setting some detection thresholds accordingly for each individual sensor. The original, preconfigured location-specific data in the memory of the sensors may indicate their intended installing location by only naming said space. After the installer has taken that into account and installed a sensor in the appropriate space, they may complete the configuring by setting the detection thresholds before moving on to install the next sensor.

[0058] Fig. 4 illustrates another example of a method. The entities involved here are the digital model, the lighting device, the installer's device, and a cloud service. Steps 301, 302, and 303 may be similar to the correspondingly numbered steps in fig. 3 above. At step 401, at least some of the digital data that originally existed in the digital model is transmitted to the cloud service. It becomes stored in the cloud service at step 402.

[0059] Storing at least some of the location-related data in the cloud service opens a large variety of possibilities. One class of embodiments is such where the location-related data stored in the lighting device at step 303 comprises preliminary data, or data that had accumulated in the digital model up to the moment when the programming of lighting devices takes place at the premises of the manufacturer or wholesaler prior to delivery. Changes may occur in the digital model after that, so updated versions of the same data (and/or additions to the previously created data) that didn't make it to the programming of the lighting devices may be sent to the cloud service. Another class of embodiments is such where there is a clear division between a first kind of data that is used for preconfiguring the lighting devices and a second kind of data that is only sent to the cloud service. In a kind of an extreme embodiment, the lighting devices could only be preconfigured with some unique identifiers, and all other location-related data could be stored in the cloud service from which it can later be retrieved using the unique identifier of the lighting device as a key.

[0060] The query at step 304 and the response at step 305 may be similar to the correspondingly numbered steps in fig. 3 above, although the content of the data that the installer's device receives in the response at step 305 may be different as outlined above in the discussion of the possibilities of using the cloud service. In fig. 4, it is assumed that the installer's device also queries the cloud service for additional location-related data. This query takes place at step 403, and the cloud service provides a response at step 404. If the order in time of the steps is as schematically illustrated in fig. 4, the query to the cloud service at step 403 may contain some information that the installer's device obtained from the lighting device at step 305. For example, if the installer's device obtained a unique identifier of the lighting device in the response at step 305, it may query the cloud service at step 403 for possible altered or augmented location-related data pertinent to that lighting device.

[0061] Another possibility of utilizing the cloud service is one where the query of step 403 and response at step 404 take place before the installer's device queries the lighting device for location-related data. As an example, the data transmitted to the cloud service at step 401 may have included a 2-D or 3-D model of the dedicated site, possibly even without the exact intended installing locations of the lighting devices. In that case, the installer's device could receive the 2-D or 3-D model of the dedicated site first. When it then queries the lighting device for location-related data, it could use the response of the lighting device to find the appropriate location in the 2-D or 3-D model and display the corresponding instructions to the installer at step 405.

[0062] Irrespective of which embodiment of utilizing the cloud service is used, the displaying of location-related information to the installer at step 405 may utilize any or all of the data that the installer's device received at steps 305 and 404.

[0063] Fig. 4 shows some possible ways in which the method may continue from step 405. Steps 307 and 308

may be similar to the correspondingly numbered steps in fig. 3 above. Steps 406 and 407 show how some updated data may be transmitted from the installer's device to the cloud service. For example, if there were changes in the actual installing location compared to the intended one, and/or if some more accurate configuring became actual only after installing, the installer's device may transmit the corresponding data to the cloud service. It is advantageous to maintain also the digital model as up to date as possible, so fig. 4 shows also the possibility of forwarding updated data from the cloud service to the digital model at step 408 and updating that part of the digital model that pertains to the lighting system at step 409.

[0064] For updating the data stored in the cloud service it is not necessary for the installer's device to send any updated data to the cloud service. There may be cases where the installer is not capable of providing any more exact information about which luminaire was installed where at the site. In that case the cloud may utilize any information that it received concerning a luminaire to conclude or guess the eventual installing location and maintain the result of such concluding or guessing as updated location-related data.

[0065] If any updated location-related data became stored in the lighting device, it is advantageous it the lighting device is configured to report the stored updated location-related data in response to a query from an external device. As an example, in a completed lighting system a controller device may need to know the exact location of each lighting device. As explained above, one possibility is that the exact location and/or some operating parameter values were only stored in the memory of the lighting device by the installer after installing. In the installed lighting system, when operating power and a lighting control bus or the like all coupled and operative, the controller device may utilize the two-directional communications capability of the lighting system to interrogate the installed lighting devices for their updated location-related data and this way complete its own knowledge about the system.

[0066] It is obvious to a person skilled in the art that with the advancement of technology, the basic idea of the invention may be implemented in various ways. The invention and its embodiments are thus not limited to the examples described above, instead they may vary within the scope of the claims.

Claims

1. Lighting device for fixed installing at a dedicated site, comprising:

- a memory and
- a short-distance wireless communications transceiver;

characterized in that

- the lighting device comprises preconfigured location-related data stored in said memory prior to installing, said location-related data being indicative of an intended installing location of the lighting device at said dedicated site, and
- the lighting device is configured to reveal at least a part of said preconfigured location-related data through operation of said short-distance wireless communications transceiver.

2. A lighting device according to claim 1, wherein:

- the lighting device comprises a processor configured to control operation of functional units in the lighting device, and
- the lighting device is configured to perform said revealing of at least a part of said preconfigured location-related data without powering up said processor.

3. A lighting device according to claim 1 or 2, wherein said short-distance wireless communications transceiver is an NFC transceiver conforming to the standard ISO/IEC 18092.

4. A lighting device according to any of the preceding claims, wherein said location-related data is indicative of a particular part of a building that constitutes at least a part of said dedicated site.

5. A lighting device according to claim 4, wherein said location-related data is indicative of at least one of the following: a named room of said building, a named external space of said building, a named doorway of said building, a named wall of said building.

6. A lighting device according to any of the preceding claims, wherein said location-related data is indicative of a location in a coordinate system that covers said dedicated site.

7. A lighting device according to any of the preceding claims, wherein said location-related data is indicative of a group of similar locations within said dedicated site.

8. A lighting device according to any of the preceding claims, wherein said location-related data contains installing information indicative of a way in which the lighting device is to be installed.

9. A lighting device according to any of the preceding claims, wherein said location-related data contains location-specific operating parameters for use by the lighting device during operation.

10. A lighting device according to any of the preceding

claims, wherein the lighting device is configured to store updated location-related data at or after installing in response to receiving such updated location-related data from an external device.

11. A lighting device according to claim 10, wherein the lighting device is configured to report the stored updated location-related data in response to a query from an external device.

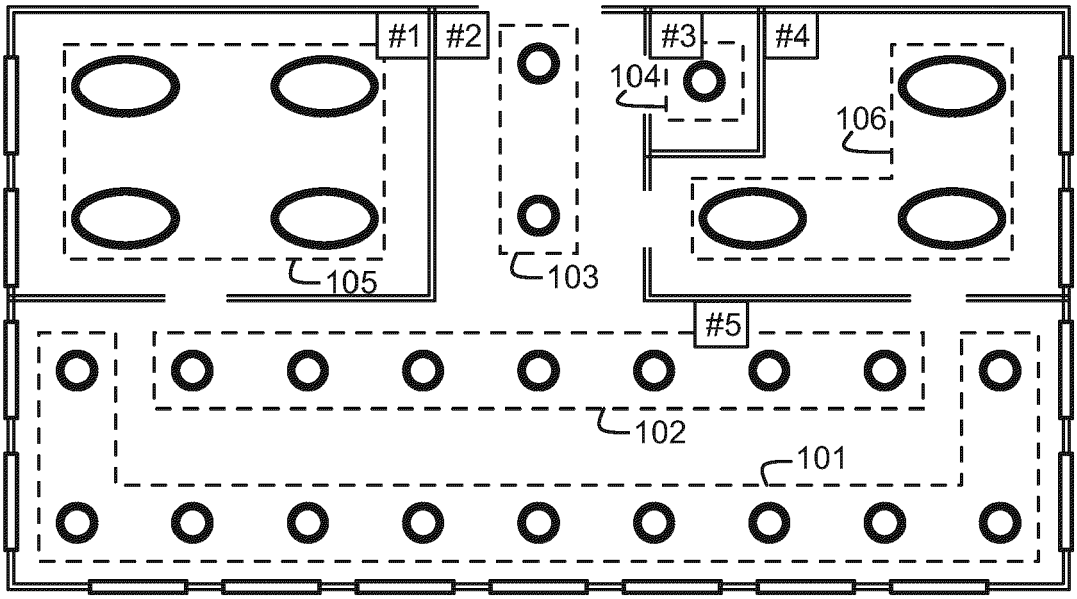
#1
#2
#3
#4
#5
104
106
105
103
102
101

Fig. 1

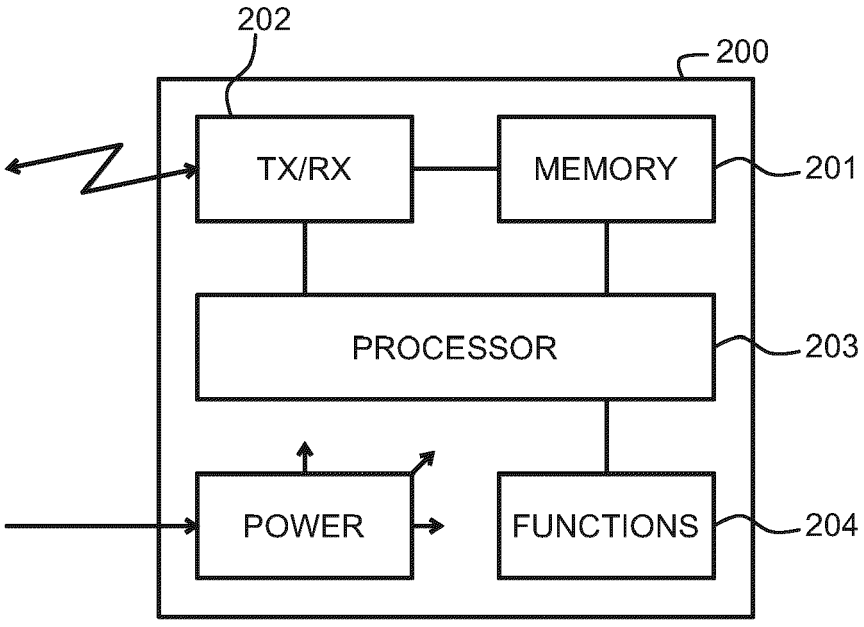
202
200
TX/RX
MEMORY
201
PROCESSOR
203
POWER
FUNCTIONS
204

Fig. 2

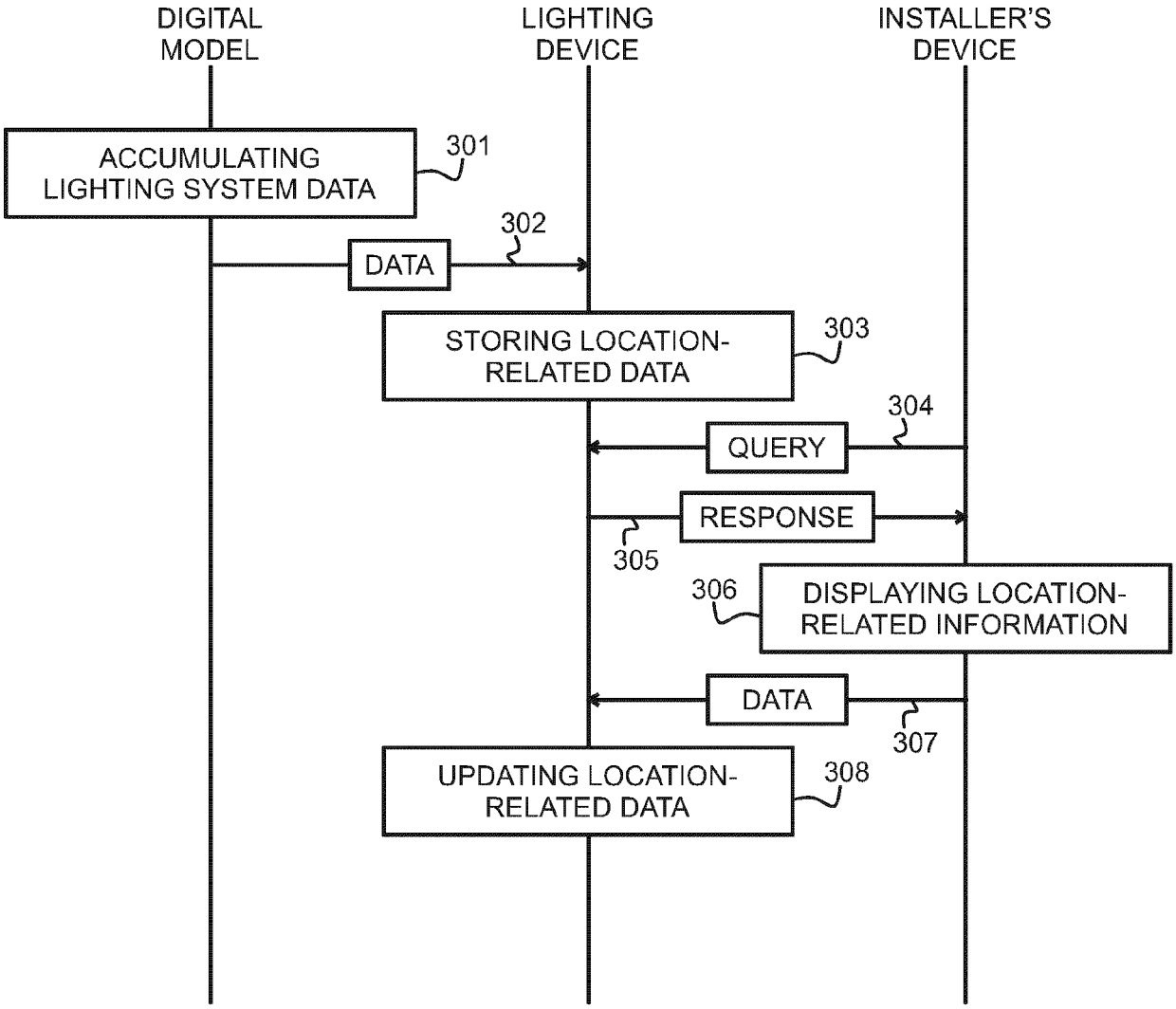
DIGITAL MODEL
LIGHTING DEVICE
INSTALLER'S DEVICE
ACCUMULATING LIGHTING SYSTEM DATA
301
DATA
302
STORING LOCATION-RELATED DATA
303
QUERY
304
RESPONSE
305
306
DISPLAYING LOCATION-RELATED INFORMATION
DATA
307
UPDATING LOCATION-RELATED DATA
308

Fig. 3

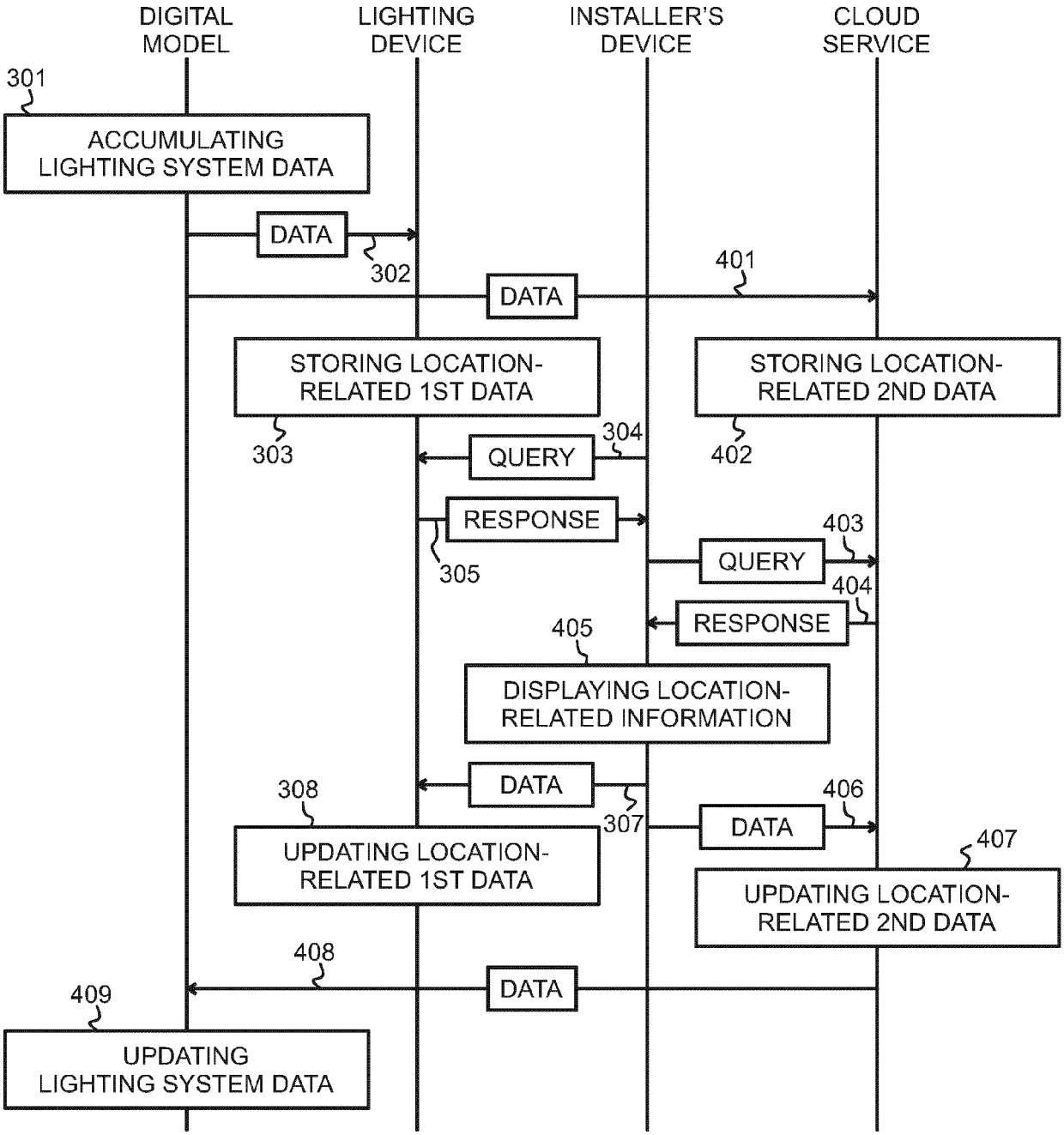
DIGITAL MODEL
LIGHTING DEVICE
INSTALLER'S DEVICE
CLOUD SERVICE
301
ACCUMULATING LIGHTING SYSTEM DATA
DATA
302
401
DATA
STORING LOCATION-RELATED 1ST DATA
303
STORING LOCATION-RELATED 2ND DATA
402
304
QUERY
RESPONSE
305
403
QUERY
404
RESPONSE
405
DISPLAYING LOCATION-RELATED INFORMATION
308
DATA
307
406
DATA
407
UPDATING LOCATION-RELATED 1ST DATA
UPDATING LOCATION-RELATED 2ND DATA
408
DATA
409
UPDATING LIGHTING SYSTEM DATA

Fig. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 21 19 1756

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1 The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	21 January 2022	Brosa, Anna-Maria

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EUROPEAN SEARCH REPORT

Application Number
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1 The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	21 January 2022	Brosa, Anna-Maria

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