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(54) **SELECTIVE CONTROL OF LIGHTING DEVICES**

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See application file for complete search history.

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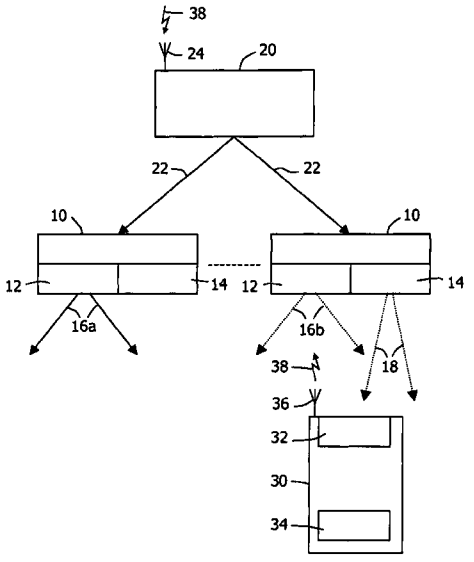
(57) **ABSTRACT**

In an arrangement of lighting devices (**10**), a remote control device (**30**) and a central control device (**20**), a particular lighting device to be controlled by means of the remote control device may be selected by a user transmitting a selecting command (**42**, **43**). When the central control device receives the selecting command (**44**), it carries out a selection sequence (**45**) during which it controls the lighting devices in one or the other sequence so as to have their output change temporarily (**45**, **46**, **47**). If the remote control device, which is directed to the particular lighting device (**41**), senses such an output change (**50**), it transmits data representing such an event (**51**) to the central control device. When the central control device receives such event data (**52**), it determines the particular lighting device as that to which the remote control device is directed (**53**) for subsequent control (**54**) of this particular lighting device.

20 Claims, 2 Drawing Sheets



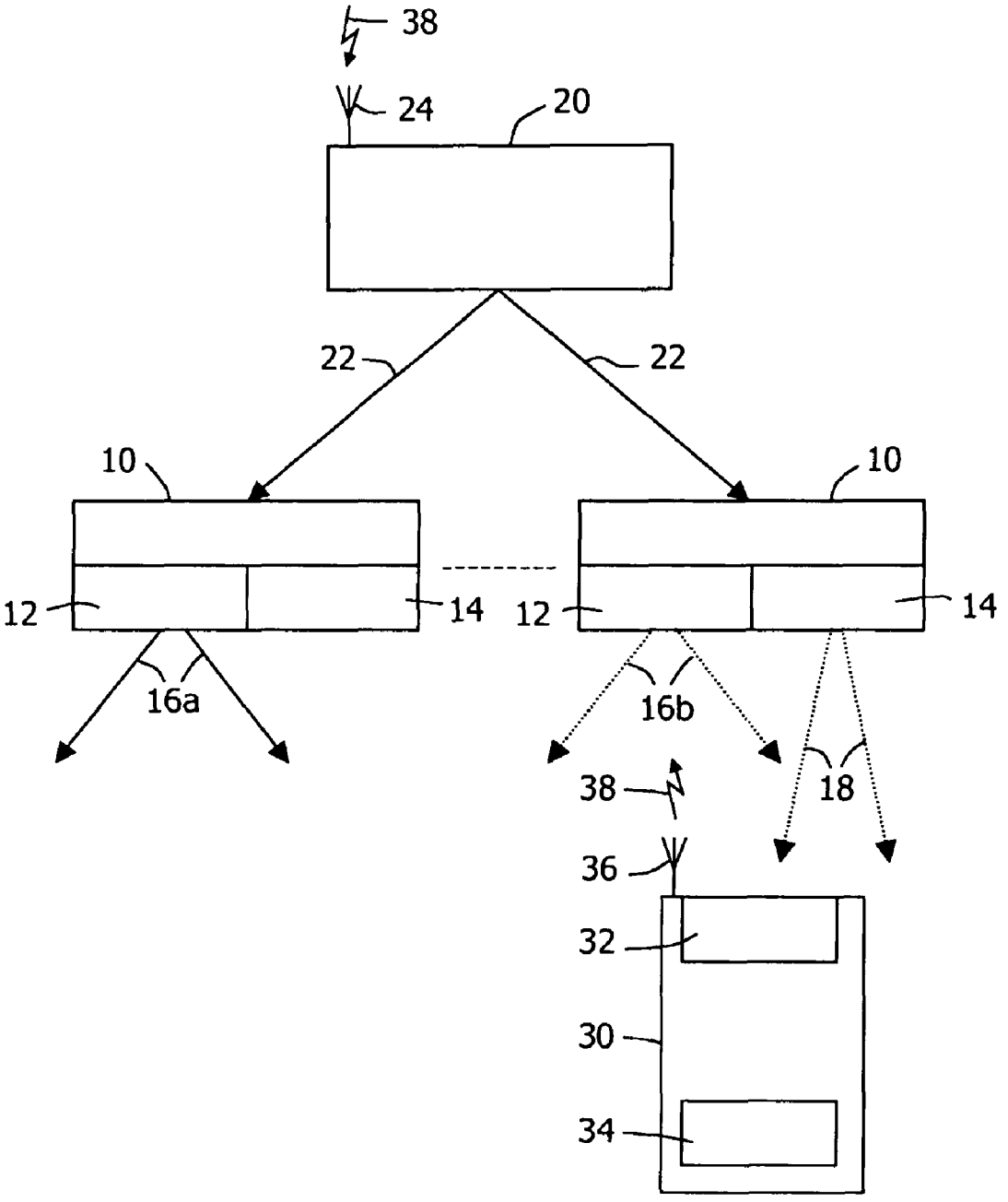


FIG. 1

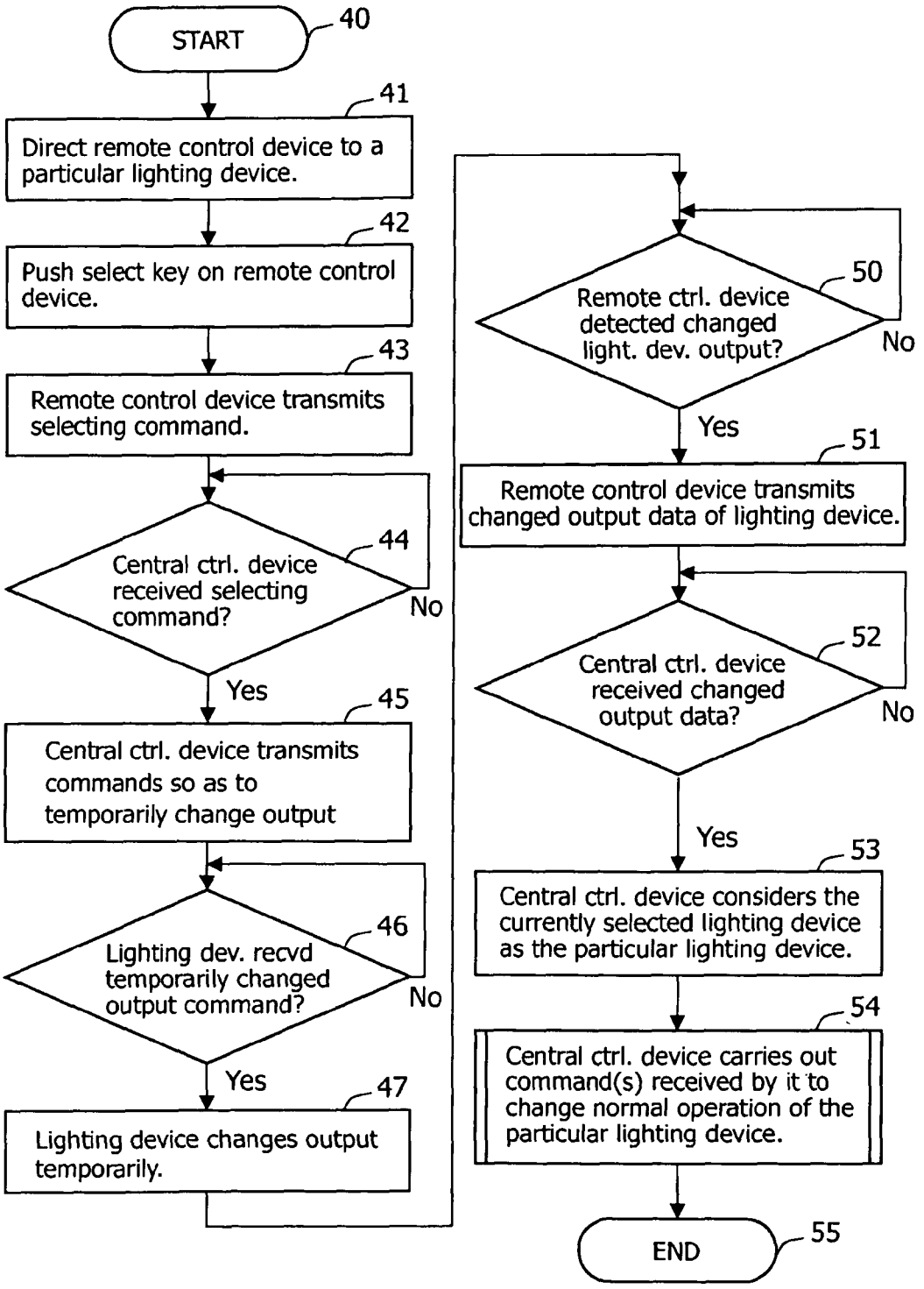

START
40
41
Direct remote control device to a particular lighting device.
42
Push select key on remote control device.
43
Remote control device transmits selecting command.
44
Central ctrl. device received selecting command?
No
Yes
45
Central ctrl. device transmits commands so as to temporarily change output
46
Lighting dev. recvd temporarily changed output command?
No
Yes
47
Lighting device changes output temporarily.
50
Remote ctrl. device detected changed light. dev. output?
No
Yes
51
Remote control device transmits changed output data of lighting device.
52
Central ctrl. device received changed output data?
No
Yes
53
Central ctrl. device considers the currently selected lighting device as the particular lighting device.
54
Central ctrl. device carries out command(s) received by it to change normal operation of the particular lighting device.
END
55

FIG. 2

SELECTIVE CONTROL OF LIGHTING DEVICES

FIELD OF THE INVENTION

The invention relates to a method of controlling a particular lighting device in an arrangement of lighting devices.

BACKGROUND OF THE INVENTION

US2004/0032226 discloses a method and a system for automatic configuration of devices, such as lighting devices. The system comprises a remote unit for receiving information from a lighting device, which information uniquely identifies the lighting device. A central controller of the system is capable of assigning an address to the lighting device. A communication link of the system is intended for transmitting said unique information to the controller. To start said configuration, the central controller puts the lighting devices in a program mode, such that all lighting devices transmit their unique hardware serial numbers at the same time by modulating a light output supplied with the respective serial numbers. The remote unit is directed to a particular lighting device so as to receive the modulated light output from this device. The remote unit transmits the serial number which was supplied with the received modulated light. When the central controller has received the serial number, it associates a system address with this serial number and transmits the system address to the lighting device having said hardware serial number. The lighting device stores the received system address. During normal operation of the system, i.e. not in the configuration mode, the lighting devices, if addressed by their system address, will respond to commands from the central controller.

The remote unit of the prior-art system is not suitable for transmitting commands controlling a particular lighting device during normal operation of the system. If they do not operate in the configuration mode, the lighting devices do not supply an output which is modulated by any information.

OBJECT OF THE INVENTION

It is an object of the invention to alter the prior-art method and system in such a way that, after the system has been configured, a user can choose and control a particular lighting device without the need for obtaining an identifier, which identifies the particular lighting device, from the particular lighting system.

SUMMARY OF THE INVENTION

The above object of the invention is achieved by providing a method that provides the possibility of using the remote control device for selectively controlling all lighting devices of the arrangement without the requirement of gaining, holding, and transmitting identifiers of the lighting devices.

In accordance with said method, the object of the invention is also achieved by providing a lighting arrangement, a lighting device, a remote control device and a central control device.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other aspects of the invention are apparent from and will be elucidated with reference to the embodiments described hereinafter.

In the drawings:

FIG. **1** is a diagram of a lighting arrangement according to the invention;

FIG. **2** is a flow chart of user operation steps of controlling a lighting device of the arrangement shown in FIG. **1**.

DESCRIPTION OF EMBODIMENTS

The lighting arrangement as illustrated in FIG. **1** comprises a plurality of lighting devices **10**, a central control device **20** and a remote control device **30**.

The lighting devices **10** do not need to be identical. They may accommodate lamps **12** of different types, such as gas discharge lamps, LED lamps or incandescent lamps. The lighting devices **10** may also be equipped with signaling members **14**, such as LEDs and sound generators. For simplicity of the drawing, the signaling member **14** in FIG. **1** is indicated as a LED.

If ignited, a lamp **12** may output light, as indicated by arrows **16** (**16***a* and **16***b*). A continuous light output from a lamp **12** is indicated by solid arrows **16***a*. A modulated, possibly discontinuous, light output from a lamp **12** is indicated by dotted arrows **16***b*. No output or no detectable output from a LED **14** is not indicated. A detectable output, possibly modulated or discontinuous, from a LED **14** is indicated by dotted arrows **18**.

The central control device **20** may communicate selectively with each lighting device **10** (or a group of lighting devices at a time) through a communication channel **22**. The communication channel **22** may be of any type, such as a wireless connection, a modulation of a mains voltage for the lighting devices **10**, or a special wire data link. The central control device **20** may send commands through the communication channels **22** to selectively control states of the lighting devices, for example, the intensity of the output provided by their lamps **12** and/or their signaling members **14** (if applied).

The central control device **20** further comprises a radio frequency (RF) receiver (not shown), which is connected to an antenna **24**, the use of which will be described hereinafter.

The remote control device **30** may be a handheld device. It has at least one sensor **32** which, when properly oriented with respect to outputs **16**, **18**, is suitable for sensing said outputs **16**, **18** from a lighting device **10**.

The remote control device **30** further comprises means which may be operated by a user and are indicated for simplicity as keys **34**.

The remote control device **30** also comprises a RF transmitter (not shown), which is connected to an antenna **36** for possibly transmitting a RF signal **38**, which conveys data generated by the remote control device **30**. The RF signal **38** is suitable to be received and processed by the antenna **24** and receiver of the central control device **20**.

Instead of a RF link for a RF signal **38**, a different type of communication or any combination of different types of communication may be used. For example, a room in which the remote control device **30** is to be used has an infrared receiver attached to one of its walls or its ceiling, which receiver is capable of receiving an infrared signal instead of RF signal **38** from the remote control device **30**. Said infrared receiver may be connected by wire to the central control device **20**.

The operation of the arrangement in the case of user control of a particular lighting device **10** (or group of lighting devices including said particular lighting device **10**) will now be described with reference to the flow chart of FIG. **2**.

From a state of normal operation of the arrangement (indicated by step **40**), the user directs the remote control device **30**

to a particular lighting device **10**, i.e. a lighting device **10** which the user wants to control (step **41**). More specifically, the user must orient the sensor **32** of the remote control device **30**, such that the sensor **32** may sense an output from the particular lighting device. Dependent on the specific construction of the lighting device, said output is an output **16** from a lamp **12** and/or an output **18** from a signaling member **14**.

Subsequently, the user operates one of the keys **34** of the remote control device **30** (step **42**) by which the remote control device **30** will transmit the RF signal **38** conveying data, i.e. a selecting command, indicating upon its reception that a user of a remote control device **30** wants to control one or the other lighting device **10** (step **43**).

When the central control device **20** receives a selection command (step **44**), it starts a selection sequence during which it transmits commands through channels **22** to all lighting devices **10** so as to temporarily change their output **16**, **18** (step **45**).

The central control device **20** transmits the temporarily changed output commands to one lighting device **10** at a time or to different groups of lighting devices **10** at a time.

When a lighting device **10** receives a temporarily changed output command (step **46**), it temporarily changes its output (from no output or a continuous output (**16***a*) to a modulated, possibly discontinuous output (**16***b*, **18**)) (step **47**).

When the remote control device **30** detects such a change of output from the lighting device **10** to which its sensor **32** is directed (step **50**), it transmits the RF signal **38**, which now conveys data indicating upon its reception that a remote control device **30** has detected a change of output from a lighting device **10** (step **51**).

Since steps **42** to **51** occur almost simultaneously, a response to a temporarily changed output command transmitted to a particular lighting device indicates that the user directed the remote control device to this particular lighting device **10**.

Therefore, when the central control device **20** receives data indicating a change of lighting device output **16**, **18** (step **52**), it considers the lighting device **10** to which it has just transmitted the changed output command as the particular lighting device **10** that the user wants to control (step **53**).

Subsequently, the central control device **20** may abort the selection sequence and, until it receives the next selection command, may handle any command from the remote control device **30** as a command for controlling said particular lighting device **10** accordingly, such as a command for turning on or off, dimming, panning, rotating and changing color (step **54**). In fact, the user-operated key by which the remote control device **30** transmitted a selecting command may itself be a command for controlling the particular lighting device **10**. Alternatively, any operation of a key of the remote control device **30** may initiate a selection sequence by the central control device **20** so as to first find or select the particular lighting device **10** to which the user directs the remote control device **30** before actually executing a lighting device control command associated with the operated key.

In the arrangement according to the invention, communication between a lighting device **10** and the remote control device is to the remote control device **30** only. Furthermore, the central control device **20** does not require the remote control device **30** to acquire an address of a particular lighting device **10** so as to control this device. Consequently, the arrangement may be manufactured, installed and maintained at relatively low cost, while it has a high capacity for selectively controlling lighting devices **10**. In fact, if all lighting devices **10** are connected through individual mains cables to respective (electronic) drivers of the central control device **20**, the arrangement will not need addressing of the lighting devices **10** through communication channels **22** at all, but the method according to the invention can still be applied.

It is to be noted that the use of a signaling member **14**, such as a LED, and the response of such a signaling member to only a changed output command from the central control device **20** may be advantageous, because the output of the signaling member **14** may have much shorter rise and fall times than an output of a lamp **12**. In that case, a change of output from a lighting device **10** may be minimally annoying to persons in a room in which the particular lighting device **10** is arranged, and the selection sequence may be carried out in a short time, in which the central control device **20** almost instantaneously detects the particular lighting device **10** when a (selection) key on the remote control device **30** is operated. It is also to be noted that the particular lighting device **10** can be detected by the central control device **20** within a shorter time by applying a binary method of transmitting a changed output command to different groups of lighting devices **10** in the sequence. For example, in an arrangement of 1024 lighting devices **10**, the central control device **20** needs to transmit a changed output command only ten times so as to detect the particular lighting device.

It is further to be noted that a change of output from a lighting device **10** may be anything that is detectable by the remote control device **30**, such as a single event or a sequence of events of turning on/off (or off/on) the lamp **12** and/or the signaling member **14**.

The invention claimed is:

1. A method of controlling a particular lighting device in a lighting arrangement comprising a plurality of lighting devices, a central control device and a remote control device, the method comprising the steps of:

directing the remote control device to the particular lighting device, such that the remote control device can detect an output supplied by said particular lighting device;

transmitting changed output data of the lighting device by the remote control device, when said remote control device has detected a change of the output from the lighting device;

transmitting operation-determinative data by the central control device when said central control device has received changed output data of the lighting device;

changing a state of the particular lighting device when said particular lighting device has received operation-determinative data;

wherein the user transmits a selecting command by the remote control device when the user wants to control the particular lighting device, the central control device enters a selection sequence when it has received said selecting command, during which sequence said central control device transmits operation-determinative data to lighting devices selected in a sequence by the central control device so as to temporarily change their output, and the central control device determines the particular lighting device from changed output data of the lighting device, which data has been received during the selection sequence for subsequently controlling said particular lighting device.

2. A method according to claim **1**, wherein the selection sequence is of the binary type, such that different combinations of lighting devices are selected and not selected at different times during execution of the sequence, and the central control device determines the particular lighting

device from changed output data of the lighting device, which data has been received at said different times during the selection sequence.

3. A method according to claim **1**, wherein, if the particular lighting device is determined in the selection sequence, the central control device carries out a normal operation change command received from the remote control device for controlling the particular lighting device so as to change its normal operation.

4. A method according to claim **3**, wherein the remote control device transmits the normal operation change command together with the selecting command.

5. A method according to claim **1**, wherein the output from a lighting device to be detected by the remote control device is a light output from a lamp of the lighting device.

6. A method according to claim **1**, wherein the output from a lighting device to be detected by the remote control device is an output from a signaling member of the lighting device.

7. A method according to claim **2**, wherein the output from a lighting device to be detected by the remote control device is an output from a signaling member of the lighting device.

8. A method according to claim **3**, wherein the output from a lighting device to be detected by the remote control device is an output from a signaling member of the lighting device.

9. A method according to claim **4**, wherein the output from a lighting device to be detected by the remote control device is an output from a signaling member of the lighting device.

10. A method according to claim **5**, wherein the output from a lighting device to be detected by the remote control device is an output from a signaling member of the lighting device.

11. A method according to claim **2**, wherein, if the particular lighting device is determined in the selection sequence, the central control device carries out a normal operation change command received from the remote control device for controlling the particular lighting device so as to change its normal operation.

12. A method according to claim **11**, wherein the remote control device transmits the normal operation change command together with the selecting command.

13. A method according to claim **12**, wherein the output from a lighting device to be detected by the remote control device is a light output from a lamp of the lighting device.

14. A method according to claim **2**, wherein the output from a lighting device to be detected by the remote control device is a light output from a lamp of the lighting device.

15. A method according to claim **3**, wherein the output from a lighting device to be detected by the remote control device is a light output from a lamp of the lighting device.

16. A method according to claim **4**, wherein the output from a lighting device to be detected by the remote control device is a light output from a lamp of the lighting device.

17. A lighting arrangement comprising a plurality of lighting devices, a central control device and a remote control device, the remote control device having a sensor for sensing an output supplied by a particular lighting device, user-operable elements for transmitting data about a change of said output, said central control device being configured to transmit operation-determinative data when it has received changed output data from the lighting device, and said particular lighting device being configured to change its state when it has received operation-determinative data, wherein the remote control device is suitable for transmitting a selecting command by proper operation of the user-operable means, the central control device is suitable for carrying out a selection sequence when it has received said selecting command, during which sequence said central control device transmits operation-determinative data to lighting devices selected in a sequence by the central control device so as to temporarily change their output, and the central control device is suitable for determining the particular lighting device from changed output data of the lighting device, which data has been received during the selection sequence for subsequently controlling said particular lighting device.

18. A lighting device of a lighting arrangement comprising a plurality of lighting devices, a central control device and a remote control device, the remote control device having a sensor for sensing an output supplied by a particular lighting device, user-operable elements for transmitting data about a change of said output, said central control device being configured to transmit operation-determinative data when it has received changed output data from the lighting device, and said particular lighting device being configured to change its state when it has received operation-determinative data, wherein, apart from a lamp, the lighting device comprises a signaling member that is arranged to supply the output to be sensed by the remote control device and to change its output when it has received operation-determinative data from the central control device.

19. A remote control device of a lighting arrangement, comprising a plurality of lighting devices and a central control device, the remote control device having a sensor for sensing an output supplied by a particular lighting device, user-operable elements for transmitting data about a change of said output, said central control device being configured to transmit operation-determinative data when it has received changed output data from the lighting device, and said particular lighting device being configured to change its state when it has received operation-determinative data, wherein the user-operable elements are suitable for transmitting a selecting command to the central control device that causes the central control device to initiate a sequence that facilitates selection of the particular lighting device from among other lighting devices controlled by the central control device.

20. A central control device of a lighting arrangement, comprising a plurality of lighting devices and a remote control device, the remote control device having a sensor for sensing an output supplied by a particular lighting device, user-operable elements for transmitting data about a change of said output, said central control device being configured to transmit operation-determinative data when it has received changed output data from the lighting device, and said particular lighting device being configured to change its state when it has received operation-determinative data, wherein the central control device is suitable for carrying out a selection sequence when it has received a selecting command from the remote control device, during which sequence said central control device transmits operation-determinative data to lighting devices selected in a sequence by the central control device so as to temporarily change their output, and the central control device is suitable for determining the particular lighting device from changed output data of the lighting device, which data has been received during the selection sequence for subsequently controlling said particular lighting device.

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