Abstract:

Lighting system provided with at least one lighting group wherein each lighting group is provided with at least one local control unit and multiple ballasts each provided with an electronic circuit for supplying at least one lamp which in use is connected with a ballast wherein each electronic circuit is provided with a ballast control unit which is communicatively connected with the local control unit, wherein each ballast control unit is arranged for obtaining parameters which characterize a status of the operation of the electronic circuit of the respective ballast, such as the magnitude of a voltage which is supplied to the at least one lamp and a magnitude of the current which runs through the at least one lamp, wherein each ballast is provided with an identification code and wherein the system is arranged such that, in use, each ballast control unit can supply at least one parameter determined by the ballast control unit together with an identification code of the respective ballast to which the at least one parameter relates, to the local control unit.
Title: Lighting system provided with multiple ballasts

The invention relates to a lighting system provided with at least one lighting group wherein each lighting group is provided with a local control unit and multiple ballasts which are each provided with an electronic circuit for supplying at least one lamp which in use is connected with a ballast wherein each electronic circuit is provided with a ballast control unit which is communicatively connected with the local control unit. Such a system is known per se. In this known system, the local control unit is used to control the ballasts for switching the lamps on or off and dimming the lamps. A disadvantage of the known systems is that the reliability, efficiency, monitorability, and controllability of the systems is not optimal. The object of the invention is to offer a solution to at least a part of these problems, more particularly, to each of the problems mentioned.

The lighting system according to the invention is accordingly characterized in that each ballast control unit is arranged for obtaining parameters which characterize a status of the operation of the electronic circuit of the respective ballast, such as the magnitude of a voltage which is supplied to the at least one lamp and a magnitude of the current which runs through the at least one lamp, wherein each ballast is provided with an identification code and wherein the system is arranged such that, in use, each ballast control unit can supply at least one parameter determined by the ballast control unit together with an identification code of the respective ballast to which the at least one parameter relates, to the local control unit. As the local control unit receives the respective parameter together with an identification code of the respective ballast, it is possible, if so desired, to obtain lighting systems with a number of further particular properties which solve one or more of the problems mentioned. Thus, it is possible that a parameter which is generated relates to diagnostic data of a ballast and/or diagnostic data of an at least one lamp belonging to the ballast. Thus, such a
diagnostic datum can comprise, for instance, a magnitude of the lamp current. This magnitude of the lamp current can for instance say something about the status of the lamp, for instance, about an ageing of the lamp. In this way, if so desired, it can be determined by the local control unit whether the respective lamp may have to be replaced. Also, it is possible that to a parameter which is generated by a ballast control unit, also information is coupled about a time at which the respective parameter has been determined. The local control unit then receives the respective parameter in combination with the identification code as well as with a time at which or period of time in which the respective parameter was determined. This makes it possible for the local control unit to determine a drift or a trend in such a parameter. If the respective parameter is, for instance, the lamp current at maximum power of the lamp, then, on the basis of the drift of the lamp current over time, again a particular conclusion may be drawn about the status of the lamp.

More generally, it holds that the local control unit may be arranged to process the received parameters per ballast or per lighting group in combination. As mentioned, the respective parameter can be a magnitude of the lamp current, the magnitude of a voltage which is supplied to the lamp, but also, for instance, the magnitude of the temperature of the ballast, more particularly, within a housing of the ballast and which can be measured with a temperature sensor, the magnitude of a temperature of a lamp which can be measured with a temperature sensor and a magnitude of a pressure in a housing of the ballast which is measured with a pressure sensor. All these parameters can then, if so desired, be processed per ballast so as to obtain an insight into the status of the respective ballast. Too high a temperature in the ballast may arise as a result of poor cooling or too high an ambient temperature. A too high temperature may be detrimental to the lamp, so that it can be important to measure this temperature. It is also possible that the respective parameters are processed per lighting group to
get an insight into the status of the respective lighting group. In addition, it is possible that a lighting group is provided with multiple sub lighting groups. A sub lighting group can consist, for instance, of the set of ballasts which are hung in a particular space. A building may then be provided with different spaces, the ballasts of each space forming a sub lighting group, while all ballasts of the respective spaces are communicatively connected with the respective local control unit. The local control unit may then be arranged to process the received parameters in combination per sub lighting group. This may in each case involve parameters relating to a single point in time. Thus, for instance, all parameters that are determined of a particular sub lighting group at a particular time can be processed in combination. This also holds, then, for all parameters of a lighting group. It is also possible, however, that per ballast more than one parameter is generated, such as the above-mentioned current, voltage and temperature. These parameters also, can then be processed per ballast, while these parameters may then belong to one and the same point in time or have been obtained at different times. Conversely, it is also possible that the local control unit is arranged to receive information of one and the same parameter spread in time. This can then be processed in combination per ballast, per sub lighting group or per lighting group. Thus, for instance, a change over time of the respective parameter can be determined. Such a change over time may be linked to, for instance, an ageing of a lamp. The drift of a temperature within a housing of the ballast may also, for instance, be linked to a leakage in the housing of the ballast, whereby cold outside air can penetrate into this housing. Leakage may be detrimental to the lamp, for instance when moisture enters. Also, too high a temperature may arise due to poor cooling or too high an ambient temperature. A too high temperature may be detrimental to the lamp. Of course, also other parameters may be used which relate to the respective ballast and lamp, such as, for instance, a measured pressure within the housing of the ballast, an air humidity within
the housing of the ballast, measured with an air humidity sensor, or parameters which have been obtained with the aid of a gas sensor arranged in the housing of the lamp. Such variants are each understood to fall within the framework of the invention.

It is also possible, however, that the parameter itself already comprises diagnostic data of a ballast and/or at least one lamp belonging to the ballast. It is possible, for instance, that the electronic circuit of a ballast itself is able to determine diagnostic parameters. Thus, it is possible that the electronic circuit, for instance on the basis of the received parameters, it is driven by the lamp current at full power, determines when a respective lamp should be replaced. The respective parameter can then indicate within what term the lamp is to be replaced. The parameter can then, for instance, fall off from three, to two, to one and to zero months.

According to a particular embodiment, it holds that the local control unit is provided with information about the identification codes of the ballasts and the associated positions of the ballasts. A position of a ballast can represent, for instance, a (relative) position of a ballast within a building or a geographical (absolute) position such as a GPS code. Thus, it is possible that at the local control unit it is not only known when a particular lamp has to be replaced but also where the respective lamp is situated. The diagnosis can be performed by the ballast itself.

It is also possible, however, that the local control unit itself draws conclusions on the basis of the received parameters, that is, itself performs a diagnosis or generates a maintenance advice. A diagnosis can be, for instance: the lamp is broken or aged; while a maintenance advice may be: replace the lamp or replace the lamp within a particular time. Thus, it is possible that the local control unit is arranged to generate on the basis of received parameters maintenance advices for the ballasts and/or the lamps, more particularly, that the local control unit is arranged to generate on the basis of the received parameters maintenance advices per ballast and/or per
lamp and/or that the local control unit is arranged to generate on the basis of the received parameters maintenance advices for the ballasts and/or lamps per lighting group and/or that a lighting group is provided with multiple sub lighting groups while the local control unit is arranged to generate on the basis of the received parameters maintenance advices for the ballasts and/or lamps per sub lighting group.

If, for instance, a parameter indicates that a lamp is ageing, the maintenance advice generated by the local control unit may be that all lamps of a sub lighting group should be replaced, or that all lamps of the lighting group should be replaced within a particular term and/or that the lamps of such ballasts should be replaced within a particular term. Also, it is possible that the control unit is arranged to diagnose the ballast and/or the lamp on the basis of the received parameters, more particularly that the control unit is arranged to perform a diagnosis, on the basis of the received parameters, per ballast and/or per lamp, and/or that the local control unit is arranged to perform a diagnosis, on the basis of the received parameters, of the ballasts and/or lamps per lighting group, and/or that a lighting group is provided with multiple sub lighting groups while the local control unit is arranged to perform a diagnosis, on the basis of the received parameters, of the ballasts and/or lamps per sub lighting group. Diagnosing can consist, for instance, in analyzing the magnitude of a parameter such as the earlier-mentioned magnitude of a lamp current or measured temperature within a housing of the ballast. For performing a diagnosis, for instance, by the local control unit a measured parameter may be compared with a predetermined reference value and/or a set of parameters may be compared with a set of reference values. Also, diagnosing can be performed on the basis of the drift over time of a parameter or of a set of parameters. The rate of the drift over time of a parameter can, for instance, be compared with a reference value for performing the diagnosis. Also, the rates of the drift over time of a set of...
parameters may be compared with a set of reference values for performing
the diagnosis.

In particular, it holds that multiple ballasts are each provided with a
motion detector, while at least one parameter which is generated by a
ballast control unit relates to detected movements detected with the motion
detector of the respective ballast. The respective motion detector of a ballast
may be arranged, for instance, to switch a lamp of the ballast on and off
and/or to adjust the dim level (light level) of the lamp in response to
movements detected by the motion detector. Thus, for instance, the lamp
can be switched on or the light level of the lamp can be reduced by dimming
it when a movement is detected. As mentioned, however, the respective
parameter can also relate to this detected movement. The local control unit
may be arranged, for instance, to process the received parameters from the
different ballasts that relate to detected movements in combination. Thus, it
can be determined, for instance, where, at any particular time, movements
are occurring within a particular building. This is because the local control
unit can also comprise information about a position of a ballast within a
building. For instance, when all positions of the ballasts within the building
are known, and per ballast movements can be detected with the aid of the
motion detector of the respective ballast, then it is possible, for instance, to
follow the movements of a person within a building. Also, it is possible to
determine where the most movements occur within a building. In particular,
it holds that, to the parameter which is generated by a ballast control unit
and relates to movements detected with the motion detector of the
respective ballast, also information is coupled about times at which the
respective movements have been detected. In this manner, it can also be
determined when (at what times) movements occur in a particular area, or
the intensity of particular movements within a particular area can be
determined (determining how much movement per unit time and as a
function of the place). In particular, it holds that the local control unit is
provided with a display while the local control unit is provided with
information for generating a map of the area while the local control unit is
arranged to generate on the display a map of the area while the local control
unit is furthermore arranged to visualize detected movements place-
dependency on the map which is depicted on the display. The map can
comprise, for instance, a plan of a building, while in this plan detected
movements are depicted. This can be done, for instance, with a color. The
color can indicate, for instance, that somewhere movements have been
detected at a particular time. Also, the intensity of the movements can be
determined by determining how many movements are being detected per
unit time. For this purpose, a single movement can be defined, for instance,
as a movement which from a particular time occurs uninterruptedly up to
another point in time at which the movement disappears again. The local
control unit may thus be arranged, for instance, to generate the map of the
area on the display whereby on the map the detected movements are
visualized place-dependently (that is, as a function of the place) in
combination with information about the times at which the movements have
been detected and/or wherein the local control unit is arranged to generate
the map of the area on the display whereby the motion intensity of detected
movements is visualized place-dependently (that is, as a function of the
place).

According to a practical variant, it holds that the local control unit is
provided with a local sub control unit which is connected with ballasts, and
a local server which is connected with the local sub control unit and the
display. The local sub control unit is arranged for receiving the parameters
from the ballasts and then functions in effect as a router. The local server is
arranged for processing parameters received by the local sub control unit as
discussed hereinabove. Also, the local sub control unit can send information
to the ballasts which, for instance, is generated by the local server, such as
control information to switch lamps on and off and/or to dim them. The local
control unit can thus, practically speaking, be formed by two or more loose devices. In that case, the local server may be arranged to generate the map on the display as discussed hereinabove. Of course, a map can relate to a complete lighting group or to a sub lighting group. Thus, for instance, on the display the total overview of the lighting group may be shown or, at will, a sub lighting group, if so desired.

The system may further be provided with a portable unit for, at the location of a ballast, reading out the identification code of the respective ballast and for storing in the portable unit this read-out identification code together with information about the location of the respective ballast and wherein the system is arranged to supply identification codes stored in the portable unit with associated positions to the local control unit. In this manner, the system can be built up in a simple manner. The ballasts can hence be placed together with the lamp and the local control unit can be installed. At that time, the local control unit does not know yet which ballasts are where. With the aid of the portable unit a person can determine a position and identification code of each of the ballasts and (temporarily) store them in the portable unit and subsequently store them in the local control unit by having the portable unit read out. What is involved here, then, is a handy tool to install the lighting system. For instance, the portable unit can consist of a smartphone provided with an application) or can consist of a tablet provided with an application) for installing a ballast, which means reading the identification code of the ballast, and for storing this identification code together with the information about the position of the respective ballast in the portable unit. This smartphone or tablet may then be read out also for supplying to the local control unit identification codes with associated positions stored in the portable unit. The identification code of a ballast may for instance be stored in the electronic circuit, with reading out taking place in a wireless manner. The identification code can be stored, for instance, in an RFID chip of the
electronic circuit of a ballast. It is also possible, however, that the identification code of a ballast, besides being provided in the electronic circuit, is also provided on an exterior of the ballast in the form of a visible code, such as a barcode or URL code, with the portable unit being arranged to read the visible code. In particular, it holds that the portable unit is provided with a receiver such as a GPS receiver, GSM receiver, UMTS receiver or a receiver for a GX network with X greater than 3 for determining the position of a ballast. The portable unit can hence determine its own position and with that the portable unit then determines the position of the ballast upon read-out of the identification code of the ballast. According to another important aspect of the invention, the lighting system may be so arranged that each ballast can be controlled individually or per lighting group by the local control unit, for instance for switching on, switching off and/or dimming the lamp. Also, it is possible that the lighting group is provided with multiple sub lighting groups as discussed before, the system then being so arranged that the ballasts can be controlled per sub lighting group by the local control unit. The local control unit may again be composed of a local sub control unit and a local server communicatively connected therewith. The local sub control unit may be arranged, for instance, for wireless communication with the ballasts via, for instance, WiFi and then functions, for instance, as a router. Also, the local sub control unit may be arranged, for instance, for wired communication with the ballasts (by means of wire or cable). The local sub control unit may further be connected with the local server, wirelessly (for instance, via WiFi) or wired (for instance, via a local network).

According to a highly advanced embodiment of the lighting system, it holds that the system is provided with multiple lighting groups wherein each local control unit of the lighting group is provided with a group identification code and wherein the system is further provided with a central control unit which is communicatively connected with each of the
local control units. The central control unit may be set up, for instance, in the main office of a particular company while the local control units are set up spread across the country at various branches of the company. This is only one example for a use of a central control unit. The local control unit may then be associated to a single building while the central control unit is set up centrally somewhere and is communicatively connected with each of the respective local control units. In particular, it holds here that the central control unit is provided with information about the group identification codes of the local control units and the associated positions of the local control units. In this manner, the central control unit knows where a local control unit is situated, from which it receives parameters together with an identification code of the local control unit. The parameters may be parameters which have been generated by the ballasts and received by the local control unit as discussed before. If a local control unit has performed a diagnosis or has generated a maintenance advice, as discussed before, this information can also be sent to the central control unit, possibly together with a group identification code of the local control unit.

In case a local control unit is added to the system which already comprises the central control unit, the system may be so arranged that the local control unit can send information stored in the local control unit about the group identification code of the respective local control unit, to the central control unit. In this manner, the central control unit knows that the respective local control unit has been added to the system. Also, the local control unit can then send along information about the location of the local control unit so that the central control unit is also familiar with the position of the additional local control unit. If, further, the additional local control unit already comprises information about the identification codes of ballasts which are communicatively connected with the local control unit, possibly coupled to information about the positions of these ballasts (for instance, entered in the local control unit by hand or with the aid of the portable
unit), the local control unit can send these identification codes possibly together with the associated positions of the ballasts to the central control unit for storage in the central control unit. Thus, in a simple manner, a lighting group can be added to the system.

More particularly, it thus holds that the system may be so arranged that a local control unit can send information which is stored in the local control unit, such as the group identification code of the respective control unit and an associated position of the local control unit, to the central control unit. Accordingly, the local control unit itself then knows its position and reports it to the central control unit. It is also possible, however, that the central control unit itself already knows where a local control unit is situated (for instance, entered manually) and so, on the basis of a group identification code which it receives from the respective local control unit, also knows where this local control unit is situated. A position of the local control unit, as mentioned, may again be a position within a building or a geographical position such as GPS code or a position of a building in which the local control unit is situated. It is, of course, possible for the central control unit to be situated in the same building as where the local control units are situated. For instance, a building may be so large that multiple local control units have been introduced into it, for instance in mutually different areas of the building, with the central control unit situated at a central point of the respective building. Entirely analogously to what has been discussed for the local control units, a central control unit may then be provided with information about the identification codes of the ballasts and the associated positions of the ballasts of the multiple lighting groups. The system may be so arranged that a local control unit sends information which is stored in the local control unit about identification codes of the ballasts and the associated positions of the ballasts to a central control unit. The central control unit can then store the information about identification codes and associated positions in a memory for later use. The system may
furthermore be so arranged that information about parameters that has been generated by a ballast and is present in a local control unit is supplied to the central control unit. Also, it may be that the system is so arranged that, in use, the information about the time at which the respective parameter has been determined and which has been coupled to the respective parameter, is likewise in a manner coupled to the respective parameter supplied by the local control unit to the central control unit. The central control unit can then on the basis of the received parameters and possibly the times perform comparable operations to those discussed hereinabove for the local control unit, such as generating maintenance advices and/or diagnoses per lamp and/or per ballast, per sub lighting group, and/or per lighting group. It thus holds that the central control unit may be arranged to process the received parameters per ballast or per lighting group in combination and/or that the lighting group is provided with multiple sub lighting groups, wherein the central control unit is arranged to process the received parameters per sub lighting group in combination. Also, it is possible that the central control unit is arranged to process parameters received spread in time, per ballast, per sub lighting group or per lighting group, in combination, for instance for obtaining a change over time of the respective parameters as discussed before for the local control unit. Also, the central control unit may diagnose the local control units themselves on the basis of the received parameters. For instance, when the parameters received from a local control unit take values that cannot match a ballast and/or lamp, this can mean that the local control unit itself does not function properly. It is also possible, however, that a local control unit is arranged to generate parameters that relate to the operation of the local control unit itself, such as, for instance, error codes that are generated by a microprocessor of the respective local control unit. Then these error codes can also be supplied to a central control unit for further processing, for instance for generating an alert that a local control unit is broken. For that
matter, it also holds for the local control units that they can generate an alert upon detection of a ballast and/or lamp not functioning properly anymore, or upon detection of ballasts and/or lamps of a sub lighting group not functioning, or upon detection of ballasts and/or lamps of a lighting group not functioning properly. Such variants are also understood to fall within the framework of the invention.

Also, the central control unit may be arranged to control ballasts per ballast, per sub lighting group or per lighting group, for, for instance, switching lamps on or off and/or dimming lamps. According to a highly advanced embodiment, it holds that the system is arranged to execute the control of the ballasts and/or lamps in response to information from an electricity provider received by the system, in particular that the system is arranged to regulate the energy consumption of the ballasts in response to received information from the electricity provider, for instance, such that the energy consumption of ballasts selected by the system is reduced when the electricity provider is experiencing a peak of energy output. The information from the electricity provider may be received, for instance, by a local control unit. The local control unit may in response, for instance, dim and/or switch off lamps. It is also possible, however, that the central control unit receives the respective information from the electricity provider, for instance, information that the electricity provider is experiencing a national peak of energy output as a result of which an electricity network may be disturbed. The electricity provider can then ask the central control unit whether it is possible to save energy. The central control unit can then, for instance, control ballasts via the local control units, such that lamps are dimmed and/or switched off. Also, the central control unit can send a request for power reduction to selected local control units, whereby the local control units themselves analyze in an automatic manner whether lamps belonging to the respective local control unit can be switched off or dimmed.

In this application, ballast is understood to mean inter alia a supply or
circuit for supplying a gas discharge lamp. However, a ballast may also be understood to mean a supply or circuit for supplying other types of lamps such as LEDs, fluorescent tubes, Xenon lamps, halogen lamps, incandescent light bulbs, and the like.

The invention will presently be elucidated in more detail with reference to the drawings. In the drawings:

- Figure 1a shows a possible embodiment of a lighting system according to the invention;
- Figure 1b shows a ballast with lamp of the system according to Figure 1;
- Figure 2 shows information which can be depicted on a display of a local control unit and/or central control unit of the system of Figure 1;
- Figure 3 shows a map provided with ballasts and detected movements in an area, which can depicted on a display of a local control unit and/or display of a central control unit of the system according to Figure 1;
- Figure 4 shows the map of Figure 3 with selected information of a subgroup of a lighting group;
- Figure 5 shows a map with information about the positions of lighting groups which can be depicted on a display of a central control unit of the system of Figure 1;
- Figure 6 shows information about lighting groups which can be depicted on a display of a central control unit of the system of Figure 1; and
- Figure 7 shows information about lighting groups which can be depicted on a display of a central control unit of the system of Figure 1, showing further information of one selected lighting group.

In Fig. 1, reference numeral 1 designates a lighting system according to the invention. The lighting system is provided with three lighting groups 2.1, 2.2 and 2.3. In this example, the lighting system comprises three lighting groups. However, the invention is not limited thereto. The lighting system may be provided with one or more lighting groups. An example of
the make-up of a lighting group is shown in Fig. 1 for the lighting group 2.1. The lighting groups 2.2 and 2.3 may be made up similarly.

The lighting group 2.1 is provided with a local control unit 4 and multiple ballasts 6.i (i = 1, 2, 3, 4, 5). Each ballast 6.i in this example is provided with a lamp 8.i. Of course, it is also possible that a ballast 6.i is provided with multiple lamps. In this example, however, each ballast is provided with one lamp.

In Fig. 1b the ballast 6.i which is provided with the lamp 8.i is shown in more detail. For each ballast 6.i, it holds that it is provided with an electronic circuit 10.i for supplying the at least one lamp 8.i. The lamp 8.i is hence connected with the electronic circuit 10.i. The electronic circuit regulates *inter alia* the desired supply voltage and current for the lamp 8.i. The lamp 8.i in this example is a gas discharge lamp. The electronic circuit in this example is arranged for starting up the lamp 8.i, whereby in a heat-up phase the supply voltage and current are adjusted in a known manner. After heat-up, the lamp is provided by the electric circuit with a nominal supply voltage and current in a manner known per se. As can be seen in Fig. 1a, all ballasts are provided with energy via a supply line 12 which is connected with an energy source 14 such as an electricity network.

The energy source can deliver, for instance, an alternating voltage of 230V while this alternating voltage is converted by the electronic circuit to a direct voltage suitable for the lamp.

The local control unit 4 in this example is provided with a local sub control unit 16 and a local server 18 which is connected with a local sub control unit 16. The local sub control unit 16 is communicatively connected with each of the electronic circuits 10.i of the ballasts. To this end, each electronic circuit 10.i is provided with a ballast control unit 20.i which can communicate wirelessly with the local sub control unit 16. To this end, the local sub control unit may be provided, for instance, with a router which can communicate via WiFi with a ballast control unit 20.i (in this example by
two-way communication). The electromagnetic field that is used for WiFi is designated in Figs. 1a and 1b with reference numeral 21.

Each ballast control unit 20.i is arranged for obtaining parameters which characterize a status of the operation of the electronic circuit of the respective ballast. The ballast control unit 20.i is arranged to obtain parameters which characterize a status of the operation of the electronic circuit of the respective ballast. Such parameters can therefore relate to a status of the lamp 8.i. In this example, the parameters which characterize the status of the operation of the electronic circuit are the magnitude of the voltage that is supplied to the lamp 8.i and the magnitude of the current that runs through the at least one lamp 8.i. The parameters can be determined by the ballast control unit 20.i in a manner known per se. On the ground of these parameters, something can be said about the status of the operation of the lamp. If the current is, for instance, zero, while the voltage for the lamp is not, the lamp may be broken. If the voltage has a nominal value for the lamp while the current does not, this may indicate that the lamp has aged. The electronic circuit 10.i may be further provided with, for instance, a temperature sensor 22.i to measure a temperature of the lamp 8.i and/or to measure a temperature of a housing 24.i in which the lamp is situated. Such a temperature may also be one of the parameters which are obtained by the ballast control unit with the aid of the temperature sensor. Other parameters may also be obtained with the ballast control unit, such as, for instance, a pressure in the housing 24.i which is measured by the ballast control unit with the aid of a temperature of a pressure sensor 26.i. The parameters mentioned here are only examples; other parameters are also conceivable.

It holds furthermore that each ballast 6.i is provided with an identification code. In this example, the respective identification code is stored in the electronic circuit 10.i. It may be stored, for instance, in a memory 28.i of the electronic circuit. The system is furthermore arranged
such that, in use, each ballast control unit can supply at least one parameter determined by the ballast control unit together with an identification code of the respective ballast to which the at least one parameter relates, to the local control unit 4. Accordingly, it may be that, for instance, information about the voltage supplied to the lamp 8.i, the magnitude of the current running through the lamp 8.i, the measured temperature of the lamp 8.i, the measured pressure in the housing 24.i, along with the identification code of the ballast 6.i, is supplied via WiFi 21 to the local sub control unit 16.

After this information has been received by the local sub control unit 16 and hence by the local control unit 4, this information can be processed in different ways. Below, a number of examples of this will be given, without this being intended as a limitative enumeration of the possibilities.

In the example, it holds that the lighting group 2.1 comprises five ballasts 6.i. It holds furthermore in this example that the ballasts 6.1 and 6.2 belong to a first sub lighting group 30.1 while the ballasts 6.3 to 6.5 belong to a second sub lighting group 30.2. In this example, the ballasts of the first sub lighting group 30.1 hang in a first space while the ballasts of a second sub lighting group 30.2 hang in a second space, the first space and the second space belonging to one and the same building. The local control unit 4 in this example is set up in the same building. It may be that the local control unit 4 is arranged to process the received parameters per ballast. Also, it is possible that the received parameters are processed per lighting group 2.1, 2.2 or 2.3. Also, it is possible that the received parameters are processed per sub lighting group 30.1 or 30.2. In this example, it holds furthermore that the local control unit is arranged to process parameters received spread in time, per ballast, per sub lighting group and per lighting group in combination. In this manner, it is possible, for instance, to monitor a change over time of the respective parameters.

The parameters which are received by the local sub control unit 16, are
passed on through a local network 32 to the local server 18 which processes the respective parameters and processes the respective parameters in combination. This last is understood to mean that the parameters are combined for executing a processing operation. Thus, the voltage and current through the lamp may be processed in combination to determine a resistance of the lamp and hence a status of the lamp. Also, a drift of a single parameter over time may be determined, for instance the change of a parameter per unit time. Such operations can be executed with the local server.

The local control unit 4 is furthermore provided with a display 32 which is connected with the local server 18. The local server 18 can for instance generate an image on the display as shown in Fig. 2. In it, it is then indicated, for instance, that the lighting group 2.1 is provided with five lamps, one local control unit and two sub lighting groups. Because the parameters in this example comprise, per lamp, the voltage and current as well as the times at which these measurements were done, it can be determined how much the instantaneous power being consumed by the lamps concerned is. This can also be determined per lamp. Also, it can be determined by the server what the total power consumption of the five lamps during the past month has been. Also, it can be indicated how many hours per month the lamps have been on. Also, it can be indicated how many hours per lamp a lamp has been on in the past month. Also, per lamp, the change over time of g=power consumed can be determined. This is also a form of processing parameters in combination, more particularly, determining the drift over time of a set of parameters. If the current passing through one of the lamps is instantaneously equal to 0, it can also be concluded that one lamp is broken. To this end, the local control unit may for instance generate an alert for a user. Also, it may be indicated how many lamps were broken in the past month and what, as a result, the availability of lamps has been, on average, in the past month. In this example, this is
96%. In this example, a number of data of the past month are shown in Fig. 2. Of course, it is also possible to show data of other months. In addition, a number of data are shown that relate to the present, such as the fact that one lamp is broken. The fact that the local control unit can generate an alert implies in this example that the local control unit, in this example the local server, is arranged to generate maintenance advices for the ballasts and also lamps on the basis of the received parameters. It is then also possible that a maintenance advice is generated in that the system knows for how long a lamp has been burning overall. The advice can then be, for instance, that the lamp has to be replaced within a month. Such advices can be generated by the local control unit (in this example by the local server) on the basis of the received parameters per ballast and/or per lamp. It is also possible, however, that the respective advices are generated per lighting group. Thus, the advice may be, for instance, that all five lamps have to be replaced. It is also possible, however, that such advices are generated per sub lighting group. If, for instance, the lamps 6.3 and 6.5 of the sub lighting group 30.2 have been burning relatively long, the advice may that these lamps have to be replaced within a month whereas this advice is not generated for the lamps of the sub lighting group 30.1.

By comparing, for instance for a lamp or for each lamp, the voltage generated and the corresponding lamp current, also a diagnosis of a lamp can be performed by a local control unit. If the lamp current is, for instance, too high or too low, the diagnosis of the local server may be that the lamp is broken or is going to be broken. By looking at a pressure which has been measured in a housing of the ballast, it can be concluded that the housing of the ballast is no longer airtight. This is also a type of diagnosis that can be performed by a local control unit. Also on the basis of the measured temperature, a conclusion can be drawn about the status of the lamp. Accordingly, this is also a parameter that can be used to diagnose a lamp. Such diagnosis can be performed per ballast and/or per lamp. It is also
possible, however, that a local control unit is arranged to perform the respective diagnoses per lighting group. If, for instance, the sum of the currents running through the lamps deviates from what would be expected, it may be concluded that in this lighting group a lamp is broken, or imminently breaking down, and the advice may be that all lamps of the respective lighting group have to be replaced because all lamps of this group have the same life. Of course, such an analysis can also be performed for a sub lighting group. It thus holds that the local control unit is arranged to perform a diagnosis, on the basis of the received parameters, of the lamp and/or ballast per ballast and/or per lamp, and/or that the local control unit is arranged to diagnose the ballasts and/or lamps on the basis of received parameters, more particularly, that the control unit is arranged to perform a diagnosis, on the basis of the received parameters, of the lamps and/or ballasts per ballast and/or per lamp, and/or that the local control unit is arranged to perform a diagnosis, on the basis of the received parameters, of the ballasts and/or lamps per lighting group and/or that a lighting group is provided with multiple sub lighting groups while the local control unit is arranged to perform a diagnosis, on the basis of the received parameters, of the ballasts and/or lamps per sub lighting group.

One of the parameters which are generated by a ballast control unit can also relate to diagnostic data of the ballast and/or an at least one lamp belonging to the ballast. Such a diagnostic datum can consist, for instance, of the magnitude of the earlier-mentioned lamp current. In fact, it says something about the lamp if the lamp is supplied with a voltage which is known as such. It is also possible, however, that the ballast control unit itself performs a diagnosis. In this regard, consider, for instance, determining whether the magnitude of the lamp current is below or above a particular threshold. Thus, it may be concluded, for instance, that when the magnitude of the lamp current is below a particular threshold at a known voltage which is supplied to the lamp, the respective lamp is broken. In that
In the case, the ballast control unit can generate a parameter which indicates that the lamp is broken and supply this parameter to the local control unit. The diagnosis is then performed, at least partly, by the ballast control unit itself. However, as discussed above, a diagnosis can also be performed on the basis of the parameters by the local control unit.

According to a particular embodiment, it holds that the local control unit is furthermore provided with information about the identification codes of the ballasts and the associated positions of the ballasts. A position of a ballast can be, for instance, a position of the ballast within a building or a geographical position such as a GPS code. Because the local control unit, in this example the local server 18, knows, for instance, the position of the ballasts within the building as well as the associated identification codes of the ballasts, the local control unit, that is, the local server, can generate on a display 32 a map of the area where the ballasts of the lighting group are present. For instance, the map may indicate precisely where the ballasts are present within the area, as shown, for instance, in Fig. 3. It is noted that in Fig. 1a the lighting group is provided with five ballasts. Practically speaking, there will typically be many more ballasts, as shown in Fig. 3.

In Fig. 3 the ballasts are shown that belong to a practical embodiment of the lighting group 2.1, that is, with many ballasts. Per ballast, furthermore, information may be displayed which has been determined on the basis of parameters received by the local control unit. Thus, for instance, it is indicated for the ballasts 6.1-6.9 that these have been diagnosed to the effect that they have to be replaced. For the ballast 6.10 it is indicated with an exclamation mark that it needs to be checked, and for the ballast 6.11 it is indicated that it is not burning. Such information is obtained on the basis of parameters received by the local control unit 4 from the ballasts. In Fig. 4 it is shown that also per combination of ballast/lamp specific information may be depicted on the display, such as power of the lamp, identification code of the ballast (device ID), burning hours of lamp (Lamp hours), etc.
In this example, what holds for the ballasts of the lighting group 2.1 - which, of course, can also hold for the ballasts of the other lighting groups 2.2 and 2.3 - is that the ballasts are each provided with a motion detector 34 (designated in Fig. 1a with 34.1-34.5), while at least one parameter which is generated by a ballast control unit of the respective ballast relates to a movement detected by the motion detector of the respective ballast. Each ballast is hence provided with a motion detector and each ballast control unit of the respective ballast generates information in the form of parameters about the detected movements. This information is sent to the local control unit 4 in the form of these parameters. In this example, it holds for each ballast that the motion detector is also used to switch the respective lamp of the ballast on or off and/or to adjust the dim level in response to movements detected with the motion detector. Accordingly, if a movement is detected, the lamp will go on, or start to burn more intensely when it has been dimmed. In this example, to the parameters which are generated by the ballast control unit and which relate to detected movements in an area around or near the respective ballast, also information is coupled about times at which the respective movements have been detected. The local control unit 4 in this example is arranged to process received parameters of the different ballasts that relate to detected movements in combination.

More particularly, it holds that the local control unit is arranged to determine, on the basis of the information about the movements detected by the ballasts and the information about the positions of the respective ballasts, where in an area where the ballasts of the lighting groups are situated, movements have been detected. A parameter of a detected movement, accompanied by the identification code of the ballast that has detected the respective movement and possibly along with the time at which the movement has been detected, is sent to the local control unit. The local control unit knows where in an area the respective ballast is situated and on the basis thereof a movement which is detected by a ballast can be displayed
place-dependently, that is, as a function of the place, on the map of, for instance, Fig. 3. Thus, for instance, with a circle, as shown for ballast 6.13, it can be indicated that currently a movement is being detected by the ballast 6.13. Because the position of the ballast 6.13 on the map corresponds to an actual position, it can thus be determined where in a particular area a movement is being detected. If, as in this example, the moment at which movements are detected by a particular ballast are also sent along as a parameter, it can also be determined by the local control unit what the motion intensity around a particular ballast is. If, for instance, on average during a day there has been little movement, the respective area around the ballast 6.13 may be colored, for instance, light grey. If in the respective area covered by the motion detector of the ballast 6.14, for instance during the last 24 hours, a lot of movement has been detected, the area around the ballast 6.14 can be colored a darker shade of grey. Thus, it is possible to color the whole map with shades of grey corresponding to a particular motion intensity. As a measure of motion intensity, for instance, the percentage of the last 24 hours during which movements have been detected can be used. Another measure is counting the number of movements in the past hour, a single movement being defined as a continuous movement beginning at a particular time and stopping again at a later time. The local control unit is hence arranged to visualize detected movements place-dependently on the map which is depicted on the display. This means that it can be seen per place whether and/or how many movements have been detected. In particular, it holds that the local control unit is arranged to visualize, on the map which is depicted on the display, information based on the received parameters relating to detected movements, in particular per ballast and/or lamp, per lighting group and/or per sub lighting group when the lighting group is provided with multiple sub lighting groups which are each provided with at least one ballast. Thus, for instance, it can be indicated per sub lighting group that a movement in the area covered by
this sub lighting group has been detected. Also, it can be indicated per lighting group that within the area covered by the ballasts of the lighting group a movement has been detected. In the example above, however, it holds that a movement is depicted per ballast and/or per lamp.

It thus holds here that the local control unit is arranged to determine, on the basis of the information about movements detected by the ballast and the information about the positions of the respective ballasts, where in an area where the ballasts of the lighting group are present the movements have been detected. This information can subsequently be depicted in a map of the area as discussed before. It holds furthermore, as discussed before, that the local control unit is arranged to generate the map of the area on the display whereby on the map the detected movements are visualized place-dependently in combination with information about the times at which the movements have been detected. Thus, for instance, it can be specified at ballast 6.13 that the time at which a movement was last detected by the ballast 6.13 is 11.30 hrs of the respective day to which the map relates. It is also possible, however, as discussed before, to determine a motion intensity on the basis of the times at which movements have been detected, whereby this motion intensity is depicted place-dependently, as discussed before with reference to the shades of grey. In this example, processing the respective parameters in combination and generating the map are executed by the local server. The local sub control unit is hence arranged for communication with the respective ballasts only.

In the foregoing, the assumption has been that the local control unit knows the identification codes of the ballasts of a lighting group together with the associated positions of the ballasts. This information is stored in a memory of the local control unit, in this case of the local server.

According to a particular embodiment of the invention, this information can be stored in the respective memory of the local server in a particularly elegant manner. To this end, the system is further provided
with a portable unit 40. This portable unit 40 is arranged for, at the location of the ballast, reading out the identification code of the respective ballast. Thus, this involves, for instance, the situation where in a particular area ballasts are pre-installed and, for instance, are suspended from a ceiling. At that time, it is then not known what the exact positions of the respective ballasts are, nor what the identification codes of the ballasts are. The portable unit, however, is arranged to read out the identification code of the respective ballast. As discussed before, the identification code of the respective ballast is in the electronic circuit of the respective ballast. It may be that the respective ballast is additionally provided with, for instance, a barcode or any other readable code such as a QR code which can be scanned using the portable unit. This is then done at the time when the ballast is in the position where it will be suspended or when it has already been suspended. Also, the portable unit is additionally arranged to determine the location of the portable unit. The location of the portable unit 40 then corresponds to the location of the respective ballast. The identification code of the respective ballast is then stored in the portable unit together with the location of the respective ballast. This operation can be reiterated by a user for each of the ballasts. After this has been done, the portable unit can be read out whereby all this information is supplied to the local control unit 4 and, in this example, is stored in the local server 18. The portable unit can consist, for instance, of a smartphone provided with an application or a tablet provided with an application for reading, at the location of a ballast, the identification code of the respective ballast, and for storing this identification code in the portable unit, together with information about the position of the respective ballast. The portable unit may be provided with a receiver such as a GPS receiver, GPRS receiver, GSM receiver, UMTS receiver and/or a receiver for a Gx network for determining the position of the ballast. It is noted that the electronic circuit of a ballast may also be provided with an RFID chip in which the identification code of the ballast is
stored. The portable unit may then be arranged to read out the identification code from the RFID chip. In that case, additionally providing the identification code as a visible code on the ballast may be omitted.

In this example, it holds furthermore that the system is so arranged that each ballast can be controlled individually and/or per lighting group by the local control unit, for instance for switching on, switching off and/or dimming a lamp. In this example, it holds furthermore that it is possible to control the ballasts per sub lighting group, for instance, for switching the ballasts of a sub lighting group on and off and/or for dimming the ballasts of a sub lighting group.

In this example, it holds furthermore that the local sub control unit 16 is communicatively connected with an electricity provider 42 via internet. The internet connection in this example is designated with reference numeral 44. The system in this example is arranged to execute the above-mentioned control of the ballasts in response to information from the electricity provider 42 received by the system. Thus, the electricity provider 42 can communicate via the internet connection 44 to the local sub control unit 16 that it is desired that the energy consumption of the lighting group 2.1 be reduced. On the basis of this request, the local server can decide, for instance, to dim the lamps of the sub lighting group 30.2. The command to this effect is transmitted via the local sub control unit 16 via wireless communication (for instance with WiFi) or wired communication (for instance with a line or cable) to the respective ballasts 6.3, 6.4 and 6.5. The energy consumption of the electricity provider may, for instance, temporarily have a peak, in response to which the electricity provider submits the request mentioned to reduce the energy consumption of the lighting group 2.1. In this example, the electricity provider 42 is connected with the local sub control unit via internet. It is also possible, of course, that the electricity provider 42 is connected with the local server 18 directly for
passing on the above-mentioned request. Such variants are each understood to fall within the framework of the invention.

In the foregoing, it has been indicated that the system, besides comprising the lighting group 2.1, is additionally provided with a lighting group 2.2, and a lighting group 2.3. The make-up of the lighting groups 2.2 and 2.3 is entirely analogous to that discussed with reference to lighting group 2.1. The lighting group 2.2 is hence also provided with a local control unit which is communicatively connected with multiple ballasts. The number of ballasts of the different lighting groups, however, may vary mutually.

The lighting group 2.1 may be situated, for instance, in a different city than a lighting group 2.2. This holds equally for the lighting group 2.3. To be considered here, for example, is a chain of stores comprising a multiplicity $n$ ($n=2, 3, 4, \ldots$) of stores, with a store $W_i$ ($i=1,2,3,\ldots,n$) corresponding to a lighting group 2.i. The system of Fig. 1 in this example is hence provided with a multiplicity of lighting groups 2.i with $n=3$. Each local control unit 4 of a lighting group is additionally provided with a group identification code. The system is further provided with a central control unit 50 which is communicatively connected with each of the local control units 4 of the respective lighting groups 2.1, 2.2 and 2.3. In this example, it holds that the central control unit is provided with a central server 52 and a central sub control unit 54. The central sub control unit is communicatively connected with the local control units 4 of the lighting groups 2.1-2.3, for instance via internet 44. The central server in turn is communicatively connected with the central sub control unit 54. The central sub control unit hence has a comparable function to that of the local sub control units and can hence comprise a router and modem as described for the local sub control unit 16. The central server stores and processes data and so has a function comparable to that of a local server. The central control unit further comprises a terminal 56 with a display 58, the terminal 56 being
communicatively connected with the central server via a communication line 60. The display has a function comparable to the display of a local control unit, but in this example is set up remotely from the central server. This may involve a wired connection. It is also possible, however, that the terminal 56 is connected via internet with the central sub control unit, so that in this way the terminal is communicatively connected with the central server 52. The central control unit 50 (here the central server) is provided with information about the group identification codes of the local control units and the associated positions of the local control units. A local control unit can supply information which is stored in the local control unit about the group identification code of the respective local control unit to the central control unit. In this manner, the central control unit knows from which local control unit it is receiving information. For setting up the system, it may be so that the system is arranged such that a local control unit supplies information which is stored in a local control unit about the group identification code of the respective local control unit, and an associated position of the local control unit, to the central control unit. The central control unit then stores information about the various identification codes with associated positions of the local control units in its memory (in this example a memory of the central server). A position of a local control unit can again be expressed as a position of the local control units within a building or a geographical position of the local control unit such as a GPS code, as discussed before. Also, a position of a local control unit can be a position of a building in which the respective local control unit is situated.

As mentioned, a building may be, for instance, a store of a chain of stores.

Entirely analogously to what has been discussed before, the central control unit may further be provided with information about the identification codes of the ballasts and the associated positions of the ballasts of the multiple lighting groups. This information can be received by the central control unit from the local control units, since this information is
stored in them as well. It holds, therefore, that the system is so arranged that a local control unit can send information which is stored in the local control unit about the identification codes of the ballasts and associated positions of the ballasts, to the central control unit. The central control unit stores this information upon receipt. The system in this example is so arranged that information about parameters which has been generated by a ballast control unit and is present in a local control unit can also be supplied to the central control unit. Such supply can then be done in combination with the identification codes of the respective ballasts to which the parameters relate. Coupled to this information, also the group identification code of the respective local control unit can be supplied to the central control unit so that the central control unit also knows from which local control unit the respective information has been received. Also, information about the time at which the respective parameters of a ballast have been determined can be supplied by the local control unit to the central control unit. Accordingly, the central control unit can receive the aforementioned parameters, determined by the various ballasts and received by the local control unit, from the local control unit also in combination with the associated identification codes of the ballast and possibly the time to which the respective parameters relate. Also, it is conceivable that the information (such as diagnostic information and maintenance advices) which, on the basis of the parameters of the various ballasts, is generated by the local control unit as discussed before, is supplied to the central control unit.

The central control unit is arranged to process the received parameters per ballast or per lighting group in combination. This is entirely analogous to what has been described above for the processing of parameters by the local control unit. Also, it is possible that the central control unit is arranged to process the received parameters per sub lighting group of a lighting group in combination. Also, the central control unit is
arranged to process parameters received spread in time, per ballast, per sub lighting group and/or per lighting group in combination, for instance, for obtaining a change over time of the respective parameters, all this entirely analogously to what has been described with reference to the local control units. Entirely analogously to what has been described hereinabove, the central control unit can generate maintenance advices for the ballasts and/or lamps on the basis of the parameters. It is also possible, however, that one of the parameters which the central control unit receives is an error code which has been generated by the local control unit. In that case, the central control unit may also be arranged to generate maintenance advice for local control units, for instance when a local control unit proves not to function. The central control unit may be arranged to generate on the basis of the parameters, per lighting group, maintenance advices for the ballasts and/or lamps of the respective lighting group. Entirely analogously to what has been discussed above for the local control unit, the central control unit (in this example the central server) may be arranged to diagnose the ballasts, lamps and/or local control unit on the basis of the parameters.

It holds here that the central control unit may be arranged to diagnose on the basis of the parameters the ballasts and/or lamps per ballast and/or per lamp, and/or that the central control unit is arranged to diagnose on the basis of the parameters the ballasts, lamps and/or local control units per lighting group. Also, it is possible that a lighting group is provided with multiple sub lighting groups while the central control unit is arranged to diagnose on the basis of the received parameters the ballasts, lamps and/or local control units per sub lighting group.

It thus holds that the central control unit can process the parameters of the ballasts per lighting group, per ballast or per sub lighting group entirely analogously to what has been outlined above for the local control units. It thus holds that the central server can execute the same operations
as discussed for the local server. The central sub control unit 54 likewise has a
same function as the local sub control unit.

It is also possible, however, that the local control units themselves have already processed the parameters and forward the result of this processing to the central control unit. Thus, for instance, on the basis of the magnitude of a lamp current, it can be concluded by the local control unit (here, by the local server) that the respective lamp is broken. The result of this operation, viz., that the lamp is broken, can be forwarded to the central control unit, for instance together with the identification code of the lamp.

Also, the central control unit in this example is arranged to process the parameters of the different ballasts that relate to detected movements in combination. This processing can be performed, for instance, per lighting group. Entirely analogously to what has been discussed hereinabove, the central control unit can, on the basis of the information about the movements detected by the ballasts and the information about the positions of the respective ballasts, determine where in an area where the ballasts of a lighting group are present, movements have been detected. The central control unit in this example is provided with the display 58 while the central control unit is provided with information for generating maps of the area, and the central control unit is arranged to generate a map on the display 58. Such map can again have an appearance as described with reference to Fig. 3. Entirely analogously to what has been discussed hereinabove, the central control unit may be arranged to depict, on the map which is depicted on the central display 58, positions where the ballasts of a particular lighting group are situated, together with information about parameters which have been received from the ballasts and/or information which has been generated by the local or central control unit on the basis of the parameters received from the ballast.

Entirely analogously to what has been discussed hereinabove, the central control unit may further be arranged to make detected movements
place-dependently visible on the map which is depicted on the central
display 58. Entirely analogously to what has been discussed hereinabove,
this map can also show information about the times at which the
movements have been detected and/or it is possible that on the map a
motion intensity of the detected movements is made visible. This motion
intensity can be calculated by the central control unit (here, by the central
server) itself. It is also possible, however, that the motion intensities which
have already been calculated by the local control unit (here, by the local
server) of one of the lighting groups are supplied to the central server via
internet, so that the central server does not need to perform this calculation
anew. Thus, it is also conceivable that a map which is generated by the
respective local server is supplied to the central server for depiction on the
central display 56. In that case, it is therefore not necessary for the central
server to perform the calculations for generating the respective map. It is
possible, however, that all calculations that the local server makes, are
performed by the central server itself (once again) on the basis of
parameters of the respective ballasts received by the local server.

As shown, the central server in this example can also depict the map
of Fig. 5, on which the positions of the different lighting groups are depicted
by means of balloons 64, together with a list 66 of names of these lighting
groups. Also, the central server may depict information as shown in Fig. 6
per lighting group. Represented here in the first column is a list of names or
positions of the lighting groups. In each row a multiplicity of information
and parameters are specified per lighting group, such as the number of
lamps, sensors, errors, average availability of the lamps, etc. Through entry
of a selection of a specific lighting group 2, at the terminal 56, more specific
information can be depicted by the central server in a block 62 on the
display 58 as shown in Fig. 7. The central control unit may be arranged to
generate a map per lighting group and/or, when a lighting group is provided
with multiple sub lighting groups, to generate a map per sub lighting group.
If, for instance, referring to Fig. 3, the ballasts 6.1-6.9 were located in a separate space which is separated from the space where the other ballasts are, the ballasts 6.1-6.9 can be regarded as a sub lighting group, for which solely a map is depicted of the area where the ballasts 6.1-6.9 are located. Such variants are each within the framework of the invention.

The system in this example is also arranged such that each ballast can be controlled individually and per lighting group by the central control unit. To this end, the central control unit can send commands via the central sub control unit 54 to a local control unit 16, for instance the local control unit of the lighting group 2.1. In this manner, for instance, the lamps 6.1-6.5 can be switched on, switched off and/or dimmed per lamp. Of course, this can also be carried out per lighting group and/or per sub lighting group, as well as for other lighting groups of the system. In the example above, the electricity provider 42 was communicatively connected with the local control unit 16 of the lighting group 2.1. Entirely analogously, the electricity provider 42 may be connected with the local control unit 16 of the lighting group 2.1. Entirely analogously, the electricity provider 42 may be connected with the local control unit of the lighting group 2.2 or 2.3. It is also possible, however, that the electricity provider 42 is connected with the central control unit 50, for instance via internet. If the electricity provider, for instance, is experiencing a peak load, it can send the central control unit a request asking whether it is possible to reduce the energy consumption of the lighting groups which are controlled by the central control unit 50. In response to this, the central control unit can for instance send a command to the local control unit 4 of the lighting group 2.1 to dim or switch off lamps that belong to the lighting group 2.1. Such variants are each within the framework of the invention. In this example, it holds that the terminal 56 is connected with the central server 52 via a local network 60. Of course, it is also possible that the terminal is connected with the central server via internet. The terminal 56 may thus be set up, for instance, in a boardroom,
while the central server is set up in a different building than the building where the boardroom is. It is noted that the processing of the parameters which is executed by the local control unit and/or the central control unit may also consist in obtaining statistical data about the energy consumption of individual ballasts, lighting groups and sub lighting groups. This can be executed, for instance, by calculating an energy consumption per month, per year, per day and the like. Also, statistical data can be monitored about the life of the ballasts and/or lamps and/or local control units. Such variants are also understood to fall within the framework of the invention. In this example, the ballast is arranged for generating a supply voltage and current for a gas discharge lamp. A ballast, however, may also be understood to be a supply or circuit for supplying other types of lamps, such as LEDs, fluorescent tubes, Xenon lamps, halogen lamps, incandescent light bulbs, and the like.
CLAIMS

1. A lighting system provided with at least one lighting group wherein each lighting group is provided with at least one local control unit and multiple ballasts which are each provided with an electronic circuit for supplying at least one lamp which in use is connected with a ballast wherein each electronic circuit is provided with a ballast control unit which is communicatively connected with the local control unit, characterized in that each ballast control unit is arranged for obtaining parameters which characterize a status of the operation of the electronic circuit of the respective ballast, such as the magnitude of a voltage which is supplied to the at least one lamp, a magnitude of the current which runs through the at least one lamp and a pressure and/or temperature within a housing of the ballast, wherein each ballast is provided with an identification code and wherein the system is arranged such that, in use, each ballast control unit can supply at least one parameter determined by the ballast control unit together with an identification code of the respective ballast to which the at least one parameter relates, to the local control unit.

2. A lighting system according to any one of the preceding claims, characterized in that the local control unit is provided with information about the identification codes of the ballasts and associated positions of the ballasts.

3. A lighting system according to claim 2, characterized in that a position of a ballast represents a position within a building and/or a geographical position such as a GPS code.
4. A lighting system according to any one of the preceding claims, characterized in that to a parameter which is generated by a ballast control unit, also information is coupled about a time at which the respective parameter has been determined.

5. A lighting system according to any one of the preceding claims, characterized in that the parameters relate to diagnostic data of a ballast and/or an at least one lamp belonging to the ballast.

6. A lighting system according to any one of the preceding claims, characterized in that the local control unit is arranged to process the received parameters per ballast and/or per lighting group in combination and/or that a lighting group is provided with multiple sub lighting groups while the local control unit is arranged to process the received parameters per sub lighting group in combination.

7. A lighting system according to claims 4 and 6, characterized in that the local control unit is arranged to process parameters received spread in time per ballast, per sub lighting group and/or per lighting group in combination, for instance for obtaining a change over time of the respective parameters.

8. A lighting system according to any one of the preceding claims, characterized in that the local control unit is arranged to generate on the basis of the received parameters maintenance advices for the ballasts and/or the lamps, more particularly, that the local control unit is arranged to generate on the basis of the received parameters maintenance advices per ballast and/or per lamp, and/or that the local control unit is arranged to generate on the basis of the received parameters maintenance advices for
9. A lighting system according to any one of the preceding claims, characterized in that the local control unit is arranged to diagnose, on the basis of the received parameters, the ballasts and/or lamps, more particularly, that the control unit is arranged to perform a diagnosis, on the basis of the received parameters, of the lamps and/or ballasts per ballast and/or per lamp, and/or that the local control unit is arranged to perform a diagnosis, on the basis of the received parameters, of the ballasts and/or lamps per lighting group, and/or that a lighting group is provided with multiple sub lighting groups while the local control unit is arranged to perform a diagnosis, on the basis of the received parameters, of the ballasts and lamps per sub lighting group.

10. A lighting system according to any one of the preceding claims, characterized in that a multiplicity of the ballasts are each provided with a motion detector whereby at least one parameter which is generated by a ballast control unit relates to detected movements detected with the motion detector of the respective ballast.

11. A lighting system according to claim 10, characterized in that a motion detector of a ballast is arranged to switch a lamp of a ballast on and/or off and/or to adjust the dim level of the lamp in response to the movements detected by the motion detector.

12. A lighting system according to claim 10 or 11, characterized in that the parameter which is generated by a ballast control unit and relates to
detected movements detected with the motion detector of the respective ballast, also information is coupled about times at which the respective movements have been detected.

13. A lighting system according to any one of the preceding claims 10-12, characterized in that the local control unit is arranged to process the received parameters of the different ballasts that relate to detected movements in combination.

14. A lighting system according to claims 2 and 13, characterized in that the local control unit is arranged to determine, on the basis of the information about the movements detected by the ballasts and the information about the positions of the respective ballasts, where in an area where the ballasts of the lighting group are present, movements have been detected.

15. A lighting system according to any one of the preceding claims, characterized in that the local control unit is provided with a display, wherein the local control unit is provided with information for generating a map of the area, wherein the local control unit is arranged to generate a map of the area on the display.

16. A lighting system according to claim 15, wherein the local control unit is furthermore arranged to depict on the map which is depicted on the display the position where ballasts are situated together with information about parameters received from the ballasts and/or information which has been generated by the local control unit on the basis of parameters received from the ballasts.
17. A lighting system according to claims 14 and 15, characterized in that the local control unit is arranged to visualize detected movements place-dependently and/or wherein the local control unit is furthermore arranged to visualize, on the map which is depicted on the display, detected movements per ballast and/or per lamp, per lighting group and/or per sub lighting group when the lighting group is provided with multiple sub lighting groups which are each provided with at least one ballast.

18. A lighting system according to claims 12 and 17, characterized in that the local control unit is arranged to generate the map of the area on the display whereby on the map the detected movements are visualized place-dependently in combination with information about the times at which the movements have been detected and/or wherein the local control unit is arranged to generate the map of the area on the display whereby on the depicted map motion intensity of detected movements is visualized place-dependently.

19. A lighting system according to any one of claims 15-18, characterized in that the local control unit is provided with a local sub control unit which is connected with the ballasts, and a local server which is connected with the local sub control unit and the display, wherein the local sub control unit is arranged for receiving the parameters of the ballasts and the local server is arranged for processing the parameters received by the local sub control unit.

20. A lighting system according to any one of claims 15-18 and according to claim 19, characterized in that the local server is provided with the information for generating the map of the area, wherein the local server is arranged to generate the map of the area on the display, wherein the local server is arranged to visualize, on the map which is depicted on the display,
detected movements place-dependently (as a function of the place) and/or wherein the local server is arranged to generate the map of the area on the display whereby on the map the detected movements are visualized place-dependently in combination with information about the times at which the movements have been detected and/or wherein the local server is arranged to generate the map of the area on the display whereby on the depicted map motion intensity of detected movements is visualized place-dependently.

21. A lighting system according to any one of the preceding claims 15-20, characterized in that a lighting group is provided with multiple sub lighting groups which are each provided with at least one ballast and wherein the local control unit is arranged to generate the map per sub lighting group.

22. A lighting system according to claim 2, characterized in that the system is further provided with a portable unit for, at the location of a ballast, reading out the identification code of the respective ballast and for storing this identification code in the portable unit together with information about the location of the respective ballast and wherein the system is arranged to supply identification codes with associated positions stored in the portable unit to the local control unit.

23. A lighting system according to claim 22, characterized in that the portable unit consists of a smartphone provided with an application or a tablet provided with an application for, at the location of a ballast, reading the identification code of the ballast and for storing this identification code in the portable unit together with information about the position of the respective ballast and for supplying identification codes with associated positions stored in the portable unit to the local control unit.
24. A lighting system according to claim 22 or 23, characterized in that the identification code of a ballast is additionally provided on the ballast in the form of visible code such as a barcode or QR code and wherein the portable unit is arranged to read the visible code.

25. A lighting system according to any one of the preceding claims 22-24, characterized in that the portable unit is provided with a receiver such as a GPS receiver, GPRS receiver, GSM receiver, UMTS receiver and/or a receiver for a Gx network with $x > 3$ for determining the position of a ballast.

26. A lighting system according to any one of the preceding claims, characterized in that the system is so arranged that each ballast can be controlled individually and/or per lighting group by the local control unit, for instance, for switching on, switching off and/or dimming a lamp and/or that a lighting group is provided with multiple sub lighting groups while the system is so arranged that the ballasts can be controlled by the local control unit per sub lighting group.

27. A lighting system according to any one of the preceding claims, characterized in that the system is provided with multiple lighting groups, wherein each local control unit of a lighting group is provided with a group identification code and wherein the system is further provided with a central control unit which is communicatively connected with each of the local control units.

28. A lighting system according to claim 27, characterized in that the central control unit is provided with information about the group identification codes of the local control units and associated positions of the local control units.
29. A lighting system according to claim 27 or 28, characterized in that the system is so arranged that a local control unit can send information which is stored in the local control unit about the identification code of the respective local control unit.

30. A lighting system according to claim 29, characterized in that the system is so arranged that a local control unit can send information which is stored in the local control unit about the identification code of the respective local control unit and an associated position of the local control unit.

31. A lighting system according to claim 28, 29 or 30, characterized in that a position of a local control unit represents a position within a building and/or a geographical position such as a GPS code, or a position of a building in which the local control unit is situated.

32. A lighting system according to any one of claims 27-31, characterized in that the central control unit is provided with information about the identification codes of the ballasts and associated positions of the ballasts of the multiple lighting groups.

33. A lighting system according to any one of claims 27-32, characterized in that the system is so arranged that a local control unit can send information which is stored in the local control unit about identification codes of the ballasts and associated positions of the ballasts to the central control unit.

34. A lighting system according to any one of the preceding claims 27-33, characterized in that the system is so arranged that information about parameters which has been generated by a ballast control unit and is present in a local control unit is supplied to the central control unit and/or
that the system is so arranged that a local control unit sends information about the result of a processing of parameters by the respective local control unit to the central control unit.

35. A lighting system according to any one of claims 27-34 and according to claim 4, characterized in that the system is so arranged that, in use, the information about a time at which the respective parameter was determined and which is coupled to the respective parameter, is also sent in a manner coupled to the respective parameter by the local control unit to the central control unit.

36. A lighting system according to any one of the preceding claims 27-35, characterized in that the central control unit is arranged to process the received parameters per ballast or per lighting group in combination and/or that a lighting group is provided with multiple sub lighting groups while the central control unit is arranged to process the received parameters per sub lighting group in combination.

37. A lighting system according to claims 35 and 36, characterized in that the central control unit is arranged to process parameters received spread in time, per ballast, per sub lighting group or per lighting group in combination, for instance for obtaining a change over time of the respective parameters.

38. A lighting system according to any one of the preceding claims 27-37, characterized in that the central control unit is arranged to generate on the basis of the parameters maintenance advices for the ballasts, lamps and/or local control units.
39. A lighting system according to claim 38, characterized in that the central control unit is arranged to generate on the basis of the parameters maintenance advices per lighting group for the ballasts and/or lamps of the respective lighting group and/or that the central control unit is arranged to generate on the basis of the parameters maintenance advices per ballast and/or per lamp and/or that a lighting group is provided with multiple sub lighting groups while the central control unit is arranged to generate on the basis of the received parameters maintenance advices for the ballasts and/or lamps per sub lighting group.

40. A lighting system according to any one of the preceding claims 27-39, characterized in that the central control unit is arranged to diagnose on the basis of the parameters the ballasts, lamps and/or local control units.

41. A lighting system according to claim 40, characterized in that the central control unit is arranged to diagnose on the basis of the parameters the ballasts and/or lamps per ballast and/or per lamp, and/or that the central control unit is arranged to diagnose on the basis of the parameters the ballasts, lamps and/or local control units per lighting group, and/or that a lighting group is provided with multiple sub lighting groups while the central control unit is arranged to diagnose on the basis of the received parameters the ballasts, lamps and/or local control units per sub lighting group.

42. A lighting system according to any one of the preceding claims 27-41 and according to any one of the preceding claims 10-21, characterized in that the central control unit is arranged to process the parameters of the different ballasts that relate to detected movements in combination.
43. A lighting system according to claim 42, characterized in that the central control unit is arranged to process the parameters of the different ballasts that relate to detected movements per lighting group in combination.

44. A lighting system according to claim 32 and according to claim 42 or 43, characterized in that the central control unit is arranged to determine, on the basis of the information about the movements detected by the ballasts and the information about the positions of the respective ballasts, where in an area where the ballasts of a lighting group are present, movements have been detected.

45. A lighting system according to any one of the preceding claims 27-44, characterized in that the central control unit is provided with a central display, wherein the central control unit is provided with information for generating a map of the area, wherein the central control unit is arranged to generate a map of the area on the central display.

46. A lighting system according to claim 45, wherein the central control unit is furthermore arranged to depict, on the map which is depicted on the display, the position where ballasts are situated together with information about parameters received from the ballasts and/or information which has been generated by the local control unit or central control unit on the basis of parameters received from the ballasts.

47. A lighting system according to claims 44 and 45, characterized in that the central control unit is furthermore arranged to visualize detected movements place-dependently on the map which is depicted on the central display.
48. A lighting system according to claims 12, 35 and 47, characterized in that the central control unit is arranged to generate a map of the area on the central display whereby on the map the detected movements are visualized place-dependently in combination with information about the times at which the movements have been detected and/or wherein the central control unit is arranged to generate the map of the area on the central display whereby on the map the motion intensity of detected movements is visualized place-dependently.

49. A lighting system according to any one of claims 45-48, characterized in that the central control unit is provided with a central sub control unit which is communicatively connected with the local control unit, and a central server which is connected with the central sub control unit and the central display, wherein the central sub control unit is arranged for receiving the parameters from the local control unit ballasts and the central server is arranged for processing the parameters received by the central sub control unit.

50. A lighting system according to any one of claims 45-48 and according to claim 49, characterized in that the central server is provided with the information for generating the map of the area, wherein the central server is arranged to generate the map of the area on the display, wherein the central server is arranged to visualize, on the map which is depicted on the central display, detected movements place-dependently and/or wherein the central server is arranged to generate the map of the area on the central display whereby on the map the detected movements are visualized place-dependently in combination with information about the times at which the movements have been detected and/or wherein the central server is arranged to generate the map of the area on the central display whereby on
the depicted map motion intensity of detected movements is visualized place-dependently.

51. A lighting system according to any one of claims 45-50, characterized in that the central control unit is arranged to generate a map per lighting group and/or that a lighting group is provided with multiple sub lighting groups while the central control unit is arranged to generate the map per sub lighting group.

52. A lighting system according to any one of the preceding claims 27-51, characterized in that the system is so arranged that each ballast can be controlled individually and/or per lighting group by the central control unit, for instance for switching on, switching off and/or dimming a lamp, and/or that a lighting group is provided with multiple sub lighting groups while the system is so arranged that the ballasts can be controlled by the central control unit per sub lighting group.

53. A lighting system according to any one of the preceding claims 27-52, characterized in that a local control unit is communicatively connected with the central control unit via internet.

54. A lighting system according to any one of the preceding claims, characterized in that within a lighting group the communicative connection between the ballast control unit of a ballast and a local control unit is of wireless or wired design.

55. A lighting system according to claim 26 or 52, characterized in that the system is arranged to execute the control in response to information from an electricity provider received by the system, more particularly, that the system is arranged to regulate the energy consumption of the ballasts in
response to received information from the electricity provider, for instance, such that the energy consumption of ballasts selected by the system is reduced when the electricity provider experiences a peak of energy output.

56. A lighting system according to claim 55, characterized in that the electricity provider is communicatively connected with a local control unit and/or central control unit for sending the information from the electricity provider to the lighting system.

57. A lighting system according to any one of the preceding claims 27-56, characterized in that the central control unit is arranged to execute information about received parameters and/or about results of the processing of the received parameters by the local control unit and/or the central control unit, for instance on a display.

58. A lighting system according to any one of the preceding claims 27-57, characterized in that a central control unit is arranged to generate an alert when on the basis of the received parameters it is established by the local control unit and/or the central control unit that a ballast and/or lamp is faulty.

59. A lighting system according to any one of the preceding claims, characterized in that a local control unit is arranged to execute information about received parameters and/or about results of the processing of the received parameters, for instance on a display.

60. A lighting system according to any one of the preceding claims, characterized in that a local control unit is arranged to generate an alert when on the basis of the received parameters it is established by the local control unit that a ballast and/or lamp is faulty.
Management Summary
August 2012 compared with August 2011

My Site
Costco Wholesale 506 - Anjou
Costco Wholesale Canada
7373 Rue Bombardier
Anjou QC
Warehouse #506

My installation

- 5 Lamps
- 1 LLC
- 2 Sub Groups

- 5 Motion Sensors
- 2 Light Sensors
- 2 Switches

Lamp Hours

- 14,232 Aug 2012
- 17,672 Aug 2011

System Availability

- 96% Aug 2012
- 86% Aug 2011

Lamp & Ballast Mortality This Month

- 1 Lamps broken

Update View

1 lamp broken

15,883 hrs/month
328 hrs/lamp
126,658 hrs in 2012

Fig. 2
Fig. 4
<table>
<thead>
<tr>
<th>Name</th>
<th>Lamps</th>
<th>Sensors</th>
<th>LLC's</th>
<th>Errors</th>
<th>Availability</th>
<th>Savings</th>
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<tr>
<td>All Installations</td>
<td>2236</td>
<td>75</td>
<td>26</td>
<td>10</td>
<td>99%</td>
<td>35%</td>
</tr>
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<td>116th St Manhattan Warehouse</td>
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<td>3</td>
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<td>15%</td>
</tr>
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<td>Clifton Warehouse</td>
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<td>3</td>
<td>0</td>
<td>100%</td>
<td>56%</td>
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<td>12%</td>
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<td>100%</td>
<td>12%</td>
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