

Description

Activation of an emergency light unit

The invention relates to a method of activating an emergency light unit, which is arranged in a lift cage with a lift door, of a lift installation having at least one control unit.

In the case of power failure or a disturbance it could happen in a lift installation that the passengers in a lift cage have to wait in darkness for help. In order that this does not occur an emergency light unit, which guarantees to the passengers a minimum amount of light, is installed in the lift cage. This emergency light unit comprises, for example, batteries, capacitors, etc., and is thus in the case of need independent of the power supply of the lift cage. It is activated in that a drop in voltage or current is detected. For this purpose the emergency light unit usually comprises a corresponding switching or control unit which detects voltage or current drop and activates the emergency light unit.

It is an object of the invention to propose an alternative and improved possibility for activation of an emergency light unit.

The invention is fulfilled on the basis of the features of the independent patent claims. Developments are indicated in the dependent claims.

A core of the invention consists in activating an emergency light unit by the control unit in dependence on at least one light intensity value which is detected by a light sensor unit, for example a photodetector, a radiation detector, a thermal detector, etc., in a lift cage of an lift installation and which is transmitted to a control unit. In that case the emergency light unit is arranged in the lift cage. The lift cage comprises a lighting unit, for example illuminating means, a bulb, an LED lamp, a fluorescent tube, etc., for illumination of the lift cage interior and has on at least one side of the cage a lift door which can be of single-part or multi-part construction, for example a telescopic door.

Detection of the at least one light intensity value by the light sensor unit is in that case carried out when the lift door is closed. However, it is also conceivable that detection of the at least one light intensity value takes place when the lift door is open.

According to the invention the emergency light unit is activated by the control unit when at least one light intensity value of a second light intensity curve, which is generated by the control unit, is smaller than at least one light intensity value of a first light intensity curve generated by the control unit.

For that purpose, at least two first light intensity values are determined, ideally at a spacing in time, when the lighting unit is deactivated and are transmitted to the control unit. The control unit adds to each first light intensity value, for example, a tolerance value and generates a first light intensity curve. The first light intensity curve when the lighting unit is deactivated, thus at the residual light level in the lift cage, can in that case be stored by the control unit in a memory unit connected with the control unit.

In addition, at least two light intensity values are determined, ideally at a spacing in time, by the light sensor unit when the lighting unit is activated and are transmitted to the control unit. The control unit generates therefrom a second light intensity curve. A tolerance value can be subtracted by the control unit from each second light intensity value. The second light intensity curve less the tolerance value can represent the current light intensity within the lift cage.

In that case the detection of the at least two first and second light intensity values can respectively take place within a time interval.

The time interval can be as desired. In addition, the spacing in time of the measurement between the at least two first or second light intensity values can be selected to be as desired. The spacing in time can, for example, lie in the millisecond, second or minute range, etc. The tolerance value is a freely selectable light intensity value, a percentage value of a light intensity, a value ascertained by means of a mathematical process, etc.

The control unit activates, for example when the lift door is closed and the lighting unit switched on, the emergency light unit if at least one light intensity value of the second light intensity curve is smaller than at least one light intensity value of the first light intensity curve. For that purpose the control unit compares the first light intensity curve with the second light intensity curve or the light intensity values of the two light intensity curves.

The first, but also the second, light intensity curve can be stored in a memory unit by the

control unit. The first light intensity curve and the second light intensity curve can, for example, be ascertained in a learning process and stored in the memory unit. In that case the memory unit can be a unit integrated in the control unit or a unit connected with the control unit by way of a communications network.

The light sensor unit can be integrated in a lift operating unit which is arranged in a lift cage. In addition, the control unit and the emergency light unit can be integrated in the lift operating unit.

However, the control unit can also represent a separate unit or can also be designed as a sub-function of the lift control unit controlling the lift installation. As control unit use can be made of any unit which can process the light intensity values, for example a processor, a computer, a commercially available computer or a server with commercially available components.

The emergency light unit can be screened from extraneous light by means of laterally arranged light barriers. In that case the laterally arranged light barriers ideally represent a housing open towards the lift interior. By "open side" of the housing is meant that the side is permeable by light. For example, the open side of the housing could be covered by a transparent pane for protection of the light sensor unit. Designated as extraneous light is that light which can impair the measurement results in the determination of the first and second light intensity curves. That can be, for example, light which originates from the lighting unit of the lift operating unit or light directly incident in the light sensor unit. The keeping away of extraneous light could alternatively or cumulatively also take place by the control unit, for example in that for the time of determination of the light intensity values all light sources in the lift control unit or other units, for example a switch, display screen, lighting unit, etc., in the lift cage or in the entire lift installation are switched off.

An advantage of the invention is to be seen in that the emergency light is activated only when it is actually necessary. On the one hand, the method according to the invention is performed only when the lift door is closed and on the other hand only when, with the lighting unit activated, at least one light intensity value from the second light intensity curve is smaller than a light intensity value of the first light intensity curve. Thus, for example, it is not necessary for the emergency light unit to be activated in the rest mode (standby operation) of the lift installation.

A further advantage is to be seen in that the course over time or dynamic course of the light intensity can be determined in simple mode and manner. Thus, for example, it could be established if illumination means, bulbs, LED lamps, fluorescent tubes, etc., fail and an exchange of this illumination means is necessary.

The invention is explained in more detail on the basis of an exemplifying embodiment illustrated in the figures, in which:

Fig. 1 shows a simplified illustration of a lift cage with a lift operating unit according to the invention,

Fig. 2 shows a possible learning process for determination of the light intensity curves,

Fig. 3 shows a possible flow chart for activation of the emergency light unit,

Fig. 4 shows an example of a diagram with a first and a second light intensity curve and

Fig. 5 shows a simplified illustration of a lift installation.

Figure 1 shows a simplified illustration of a lift cage AK with a lift operating unit ABE according to the invention. The interior of a lift cage AK with a lift door AT, a lighting unit BE and a lift operating unit ABE is shown.

The lift operating unit ABE is used, inter alia, for input of a destination storey and for that purpose contains switches, buttons, touch-sensitive operating elements, etc., which are not shown. A lift operating lighting unit DBE, which is not explained further, is used for illumination of the lift operating unit or the switches, buttons, touch-sensitive operating elements, etc. A light sensor unit LS is arranged in the lift operating unit ABE behind a transparent pane GP. Light barriers LB are arranged laterally adjacent to the light sensor unit LS for protection from extraneous light which could emanate from, for example, the lift operating lighting unit DBE. These light barriers LB can form, together with a base plate (not illustrated), on which the light sensor unit LS is mounted, a housing which is permeable towards the lift cage interior by light such as is shown in this example by means of the transparent pane GP. The housing can obviously also consist of a part which can

be shaped as desired. It is only important in that case that extraneous light which could impair determination of the light intensity values can be effectively kept away from the light sensor unit LS.

The lift operating unit ABE further comprises a control unit SE and an emergency light unit NL. In that case the control unit SE is connected together with the light sensor unit LS and the emergency light unit NL by way of a suitable communications network, for example a wire-bound, a wire-free or a radio communications network, etc. Obviously it is equally conceivable for the control unit SE, light sensor unit LS and emergency light unit NL to be combined in one unit and, for example, to be arranged on a circuitboard.

Light intensity values, whether with activated or deactivated lighting unit BE, in the interior of the lift cage AK are in this example ascertained by the light sensor unit LS when the lift door AT is closed and are communicated to the control unit SE. The determination of these light intensity values could obviously also be carried out with the lift door open, wherein then the effects of light outside the lift cage are relevant. The control unit SE generates, with the lighting unit BE deactivated, a first light intensity curve from the at least two first light intensity values, which are transmitted by the light sensor unit LS, less a tolerance value and stores this curve in, for example, a memory unit (not illustrated). Moreover, with the lighting unit BE activated the control unit SE generates or creates, in certain circumstances less a tolerance value, a second light intensity curve from the at least two second light intensity values transmitted by the light sensor unit LS. This curve can similarly be stored in a memory unit.

In order to activate the emergency light unit NL the control unit SE compares the light intensity values of the light intensity curve with light intensity values of the second light intensity curve. If at least one light intensity value of the second light intensity curve is smaller than at least one light intensity value of the first light intensity curve the emergency light unit NL is activated by the control unit SE when the lift door AT is closed and the lighting unit BE is activated.

Figure 2 shows a possible learning process for determination of light intensity curves L_1 and L_2 . The determination of the light intensity curves L_1 and L_2 begins at the start. Thereafter, in step A the minimum (with deactivated lighting unit BE) and maximum (with activated lighting unit BE) light intensity values $L_{\min}$ and $L_{\max}$ are determined by the light

sensor unit LS and transmitted to the control unit SE. Moreover, the tolerance values T_1 and T_2 are determined and stored in the control unit SE or in a memory unit connected with the control unit SE. Finally, the status of the lighting unit BE, i.e. activated or deactivated, is ascertained by the control unit SE. The tolerance values T_1 and T_2 can be constant or variable. In that case, T_1 can be equal to T_2 .

In step B the closed state of the lift door AT is determined by the control unit SE and the light sensor unit LS transmits to the control unit SE at least one determined light intensity value L with respect to the time t .

In step C it is checked by the control unit SE whether the ascertained closed state of the lift door AT signifies that the lift door is closed. If the lift door AT is open, the method is interrupted at this point and begins again at step B. The control unit SE can then transmit to the lift door AT or to the lift control unit a request for closing the lift door AT.

If the lift door AT is closed, it is checked in step D whether the lighting unit BE is activated.

If not only the lift door AT is closed, but also the lighting unit BE activated, it is checked in step E whether the at least one light intensity value L , which was ascertained in step B and transmitted to the control unit SE, with activated lighting unit BE represents the maximum measured light intensity value $L_{\max}$ according to step A. If this is so, then according to step F the (second) light intensity value less a tolerance value T_2 is set as a new maximum light intensity value $L_{\max}$ and used for generation of the second light intensity curve L_2 . Otherwise, the method is interrupted at this point and begins again at step B.

If it results from the check according to step D that the light unit BE is deactivated, the method is continued by step G. For this purpose it is investigated whether the (first) light intensity value L , which was ascertained by the light sensor unit LS and transmitted to the control unit SE, with deactivated lighting BE is greater than the minimum light intensity value $L_{\min}$ ascertained in step A. If this is so, then according to step H the (first) light intensity value plus a tolerance value T_1 is set as new minimum light intensity value $L_{\min}$ and used for generation of the first light intensity curve L_1 . Otherwise, the method is interrupted at this point and begins again at step B.

The generation of the light intensity curves L_1 and L_2 can be as desired. Thus, a

mathematical method, for example an interpolation, can be used so that, for example, polynomial functions can be created from the light intensity values as light intensity curves L_1 and L_2 . In addition, the light intensity curves L_1 and L_2 could merely form numbers or a series of values.

The method can be continued until all ascertained light intensity values L , whether with activated or deactivated lighting unit BE, were used within a freely selectable time period for generation of the two light intensity curves L_1 and L_2 . In that case, the light intensity values L are ascertained by the light sensor unit LS at a spacing dt in time.

With the help of this learning process or method it is possible to determine the dynamic course or the course over time of the light intensity values not only when the lighting unit BE is activated, but also when it is deactivated. Fluctuations in the light intensity which, for example, are due to opening of the lift door, partial covering of the light sensor LS, partial absorption of the light by the lighting unit BE by person or users in the lift cage, etc., can be detected and are taken into consideration in the determination of the light intensity curves. It is thus possible for the emergency light unit NL to be activated only when this is actually needed.

Figure 3 shows a possible flow chart for activation of the emergency light unit NL. The method again begins with the start.

In step I it is checked whether at least one (second) light intensity value L or $L_{\max}$ of the second light intensity curve L_2 , which is the curve of the light intensity values L when the lighting unit BE is activated, is smaller than at least one (first) light intensity value L , $L_{\min}$ of the first light intensity curve L_1 , which is the curve when the lighting unit BE is deactivated. The two light intensity curves L_1 and L_2 were generated in accordance with the preceding Figure 2.

If the check according to step I gives a positive statement, if thus at least one light intensity value L or $L_{\max}$ of the second light intensity curve L_2 is smaller than a light intensity value L or $L_{\min}$ of the first light intensity curve L_1 , the emergency light unit NL is activated by the control unit SE in step J.

If, however, the check in step I has the result that the light intensity values L or $L_{\max}$ of the

second light intensity curve L_2 are always greater than the light intensity values L or $L_{\min}$ of the light intensity curve L_1 , thus whether $L_2 > L_1$, it is checked in step K whether the emergency light unit NL is already activated and the lighting unit BE deactivated. If this is so, i.e. the emergency light unit NL is activated and the lighting unit BE is deactivated, the emergency light unit NL is deactivated in step L and in certain circumstances the stored light intensity curves L_1 and/or L_2 are erased, and the method is, for example, reset and begins anew. If, on the other hand, this is not so, the method is interrupted in step K and begins again at step I.

Figure 4 shows an example of a diagram with a first light intensity curve L_1 and a second light intensity curve L_2 , wherein the light intensity curves L_1 and L_2 are each a function $L(t)$ of time t and were ascertained or generated in accordance with the preceding Figures 2 and 3.

When the lift door AT is closed and the lighting unit BE deactivated at least two (first) light intensity values L or $L_{\min}$ are determined within a time period by a light sensor unit LS and transmitted to a control unit SE. The control unit SE generates or sets up, plus a tolerance value T_1 , a first light intensity curve L_1 . The second light intensity curve L_2 is similarly set up or generated from at least two (second) light intensity values L or $L_{\max}$ within the or another time period, but with activated lighting unit BE and less a tolerance value T_2 .

If, as illustrated in this diagram, at least one light intensity value L or $L_{\max}$ of the second light intensity curve L_2 is smaller than at least one light intensity value L or $L_{\min}$ of the first light intensity curve L_1 at the time t_1 then the emergency light NL is activated.

Figure 5 shows a simplified illustration of a lift installation. A lift cage AK moves vertically in a shaft S and in that case travels to the storeys 0. F to 4. F. The lift installation can, according to the respective lift type, here, for example, a drive pulley lift, have a counterweight G which is connected with the lift cage AK by way of support means TM. The lift type can, for the method according to the invention, be of any kind. Thus, a hydraulic lift or another lift type could also be used. The lift cage AK is moved by means of a drive M, in this example a drive pulley drive. In addition, the lift installation comprises a lift control unit ASE which can also be used for the method according to the invention in accordance with Figures 1 to 4. A lighting unit BE, an emergency light unit NL and a light sensor unit LS are arranged in the lift cage AK, which are connected by way of a suitable

communications network, be it a wire-bound or a radio-operated communications network, with the lift control unit ASE. For reasons of clarity the lift operating unit ABE according to Figure 2 is not illustrated.

The method according to Figures 1 to 4 is used in the lift installation for activation of the emergency light unit NL.

Patent claims

1. Method of activating an emergency light unit (NL), which is arranged in a lift cage (AK) with a lift door (AT), of a lift installation having at least one control unit (SE), wherein a light sensor unit (LS) and a lighting unit (BE) are arranged in the lift cage (AK), characterised in that the emergency light unit (NL) is activated by the control unit (SE) in dependence on at least one light intensity value (L , $L_{\max}$, $L_{\min}$) which is detected by the light sensor unit (LS) when the lift door (AT) is closed and which is transmitted to the control unit (SE).
2. Method according to claim 1, characterised in that the emergency light unit (NL) is activated by the control unit (SE) when at least one light intensity value (L or $L_{\max}$) of a second light intensity curve (L_2) generated by the control unit (SE) is smaller than at least one light intensity value (L or $L_{\min}$) of a first light intensity curve (L_1) generated by the control unit (SE).
3. Method according to claim 2, characterised in that the first light intensity curve (L_1) is generated by the control unit (SE) from at least two first light intensity values (L or $L_{\min}$) detected by the light sensor unit (LS) when the lighting unit (BE) is deactivated and transmitted to the control unit (SE).
4. Method according to claim 3, characterised in that a tolerance value (T_1) is added by the control unit (SE) to each first light intensity value (L or $L_{\min}$).
5. Method according to claim 2, characterised in that the second light intensity curve (L_2) is generated by the control unit (SE) from at least two second light intensity values (L or $L_{\max}$) detected by the light sensor unit (LS) when the lighting unit (BE) is activated and transmitted to the control unit (SE).
6. Method according to claim 5, characterised in that a tolerance value (T_2) is subtracted by the control unit (SE) from each second light intensity value (L or $L_{\max}$).
7. Method according to any one of claims 2 to 6, characterised in that the first light intensity curve (L_1) and/or the second light intensity curve (L_2) is or are stored in a memory unit by the control unit (SE).

8. Method according to one of claims 3 and 5, characterised in that the at least two first light intensity values (L or $L_{\min}$) and the at least two second light intensity values (L or $L_{\max}$) are detected within a time period.
9. Lift operating unit (ABE) in a lift cage (AK), which has a lift door (AT), of a lift installation with at least one light sensor unit (LS), and a control unit (SE), characterised in that the light sensor unit (LS) detects at least one light intensity value (L , $L_{\max}$, $L_{\min}$) when the lift door (AT) is closed and transmits it to the control unit (SE) and that the control unit (SE) activates an emergency light unit (NL) in the lift cage (AK) in dependence on the transmitted light intensity value (L , $L_{\max}$, $L_{\min}$).
10. Lift operating unit according to claim 9, characterised in that the emergency light unit (NL) is integrated in the lift operating unit (ABE) or in the lighting unit (BE).
11. Lift operating unit according to claim 9 or 10, characterised in that the light sensor unit (LS) is screened from extraneous light by means of light barriers (LB).
12. Lift operating unit according to claim 11, characterised in that the light barriers (LB) represent a housing open towards the lift cage interior.
13. Emergency light activation system in a lift installation with an emergency light unit (NL), which is arranged in a lift cage (AK) with a lift door (AT), a light sensor unit (LS) and a lighting unit (BE), wherein the lift installation comprises a control unit (SE), characterised in that the light sensor unit (LS) detects at least one light intensity value (L , $L_{\max}$, $L_{\min}$) when the lift door (AT) is closed and transmits it to the control unit (SE) and that the control unit (SE) activates the emergency light unit (NL) in the lift cage (AK) in dependence on the transmitted light intensity value (L , $L_{\max}$, $L_{\min}$).