The application relates to dimming lighting devices. A component comprises an input for receiving input power and the primary side from a primary power supply, and transformer for transforming the input power on the primary side to the output power on the secondary side, a transformer electrically decoupling the primary side from the secondary side, a first circuit arranged at the primary side for receiving within the receive input power at least one light intensity information, and a second circuit at the secondary side for determining at least dimming component information and for driving the lighting device at least according to dimming color point information.
FIELD OF THE INVENTION

The present patent application relates to dimming lighting devices, for example LED lighting devices.

BACKGROUND OF THE INVENTION

Existing dimmers use the common power line to provide dimming information to the light source by cutting the phase of the mains voltage. These so-called phase cut dimmers can be used to dim existing halogen or incandescent light bulbs. With the rise of LEDs in general lighting, there exists the need to also allow dimming the light emitted by the LEDs. When dimming light, the color point, e.g. the color temperature of an incandescent lighting device, changes in accordance with changing intensity. This change of color temperature needs to be created with an LED as well, to obtain realistic dimming impressions.

From WO 2005/048658 A1, there is known a resonant power LED control circuit for the independent, simultaneous brightness and color or color temperature control of two LEDs. In order to provide for controlling the brightness and the color of the LEDs simultaneously, there is provided a single resonant converter, which is formed of a half or full bridge DC/AC converter. On the primary side, a transformer is fed with driving current depending on the intensity information received from the driving power, i.e. the mains power, which is controlled from a dimmer. On the secondary side, two inductances are connected to the primary side, where the two inductances drive respective LEDs. Depending on the phase of the primary current, the two LEDs driven by the inductances are driven with different driving currents. This is provided by connecting the LEDs to the respective inductances, such that one LED is driven at a high phase and one LED is driven at a low phase. When the phase changes, the respective other LED is activated. Depending on the phase ratio of the primary driving current, the LEDs receive respectively different input currents and thus have different bright intensity. When the LEDs have
different primary colors, the combined color point of both LEDs can change with
different light intensity of the respective LEDs.

However, the proposed solution lacks the possibility to adjust the color
point, e.g. the light temperature of the output light from both LEDs according to
different needs. Further, the proposed solution requires a transformer having three
taps on the secondary side. Also, the driver for driving the primary side of the
transformer is complex and not compatible with known dimming solutions for
incandescent light bulbs.

Therefore, there is a need for a compatible solution for setting the color
point of a lighting device in accordance with dimming the light intensity. There is
further the need for providing the possibility to provide dimming of light intensity
while also setting the color point information using the common driving voltage, i.e.
the power line. Still another need is to provide a solution compatible with dimming
incandescent light bulbs.

SUMMARY OF THE INVENTION

These and other objects are solved by a component comprising an input
for receiving input power from a primary power supply, at least one circuit, wherein
the circuit is arranged for receiving within the received input power at least light
intensity information, wherein the circuit is arranged for driving at least two lighting
devices at least according to the light intensity information, and wherein the circuit is
arranged for determining the driving ratio between the at least two lighting devices
according to the light intensity information.

Providing a circuit for both obtaining the light intensity information
and the driving ratio between the at least two lighting devices increases flexibility for
lighting devices. The present application improves component integration and reduces
manufacturing cost. The integration of determining and applying light intensity
information and driving ratio to lighting devices reduces the form factor of driving
circuits.

According to embodiments, there is provided a component comprising
an input for receiving input power at a primary side from a primary power supply, a
first circuit arranged at the primary side for receiving within the received input power
at least light intensity information, and a second circuit at the secondary side for
determining at least dimming color point information and for driving a lighting device at least according to the dimming color point information.

It has been found that providing two separate integrated circuits at the primary and the secondary side allows for providing dimming lighting devices, e.g. LEDs or OLEDs, with automatic color adjustment depending on the light intensity information. Further, the provision of two separate circuits, e.g. integrated or discrete circuits, allows for the usage of widely spread dimmers, for example R-type dimmers, R, L-type dimmers, or R, C-type dimmers. The R-type dimmers are leading edge phase cut dimmers. The R, L-type dimmers are also leading edge phase cut dimmers. The R, C-type dimmers are trailing edge phase cut dimmers. These dimmers provide for the mains voltage with a phase cut either at the leading edge or the trailing edge of the wave of the mains voltage.

Available integrated circuits on the market are already capable of receiving phase cut dimming information on the mains voltage and of driving an incandescent light bulb accordingly. However, the known solutions do not have output terminals for more than one lighting terminals, in particular, no output terminals for connecting at least two different LEDs and for driving these at least two different LEDs.

The problem when driving LEDs lies in that the color point does not change with changing light intensity. The spectral light information of the light emitted from an LED is always constant. However, incandescent light bulbs change with changing intensity also their color point. This provides for a realistic dimming impression.

In order to provide this realistic dimming impression also using LEDs, it is necessary, to adjust the color point emitted from a lighting device, e.g. consisting of more than one LED, in accordance with the change of light intensity information. In order to provide this change of color point, it is possible, to drive two different LEDs having different primary color with changing intensity. The intensity relation between the at least two LEDs allows for setting the color point.

According to embodiments, the circuit may be a first circuit arranged at a primary side. Further, according to embodiments, a second circuit may be arranged for driving the at least two lighting devices and for determining the driving ratio between the at least two lighting devices according to the light intensity information.
According to the embodiments, the circuit is capable of receiving the dimming information, in particular in form of phase cut mains voltage. This dimming information may, according to embodiments, be transferred to a secondary side together with color point information. On the secondary side, a particularly arranged circuit may be capable of receiving the light intensity information. From the received light intensity information, the second integrated circuit can determine the corresponding color point. The secondary circuit can be arranged for driving a set of LEDs, at least two LEDs, depending on both the light intensity information and the color point information.

According to embodiments, at least one bypass switch may be arranged across at least one of the lighting devices for applying the driving ratios of the at least two lighting devices. The bypass switch may be a transistor, i.e. a CMOS transistor, which can be turned on and off according to the driving ratio. The switches may be driven by the circuit obtaining the driving ratio information.

The first circuit may comprise a switching element, wherein different transfer functions between the switching element and the lighting devices are provided for determining the driving ratios.

At least one storing element may be coupled to each lighting device according to embodiments. The storing element may be at least one of a capacitance, or an inductance.

For example, according to embodiments, the second circuit may determine the driving ratio from a signal input to a dedicated input pin of the second circuit. In order to allow for setting the color point in accordance with the light intensity, the second integrated circuit may be arranged for calculating the required color point depending on this received information.

The primary and the secondary sides may be decoupled using a transformer for transforming the input power on the primary side to output power on the secondary side, the transformer electrically decoupling the primary side from the secondary side. The second integrated circuit can determine the driving ratio depending on the signal input and a pre-programmed color point curve, according to embodiments. For example, the pre-programmed curve can be similar to a black-body curve to mimic the dimming behavior of an incandescent light bulb. The pre-programmed curve may be a look-up table for mapping the dimming color point.
information onto LED driving currents for respective LEDs at output terminals of the second integrated circuit. The pre-programmed curve may be stored in an additional memory in the integrated circuit.

According to embodiments, the first integrated circuit may create a stable DC voltage on the secondary side depending on the light intensity information. For example, the dimming information entering the component on the primary side needs to be transferred to the second integrated circuit on the secondary side. When using an integrated circuit on the primary side, which is compatible with known dimming solutions, this integrated circuit may already be prepared to handle the special requirements of phase cut dimmers, for example, providing latch currents required to bring the device into conduction mode and providing hold currents required to keep it in conduction.

The latch current and the hold current provided at input terminals of the first integrated circuit on the primary side may be used as input for the integrated circuit on the secondary side. As the latch current and the hold current may represent the phase of the phase cut mains voltage input at the input terminals of the first integrated circuit, this information may represent the light intensity information. This light intensity information may be provided, according to embodiments, to the second integrated circuit on the secondary side via an opto-coupler, an analogue signal, or a pulse-width modulated (PWM) signal. Thus, the second integrated circuit on the secondary side already has information about the light intensity. Having this information, the second integrated circuit needs no further information for setting the light color point. Therefore, the integrated circuit on the primary side may drive the transformer such that it creates a stable DC supply voltage on the secondary side, input to the integrated circuit. This stable driver voltage may allow for driving the LEDs. From the light intensity information received on other pins, the integrated circuit on the secondary side may calculate both driving current and driving ratio for driving at least two LEDs.

As already mentioned, the first integrated circuit may transmit dimming information for example as phase information to the second integrated circuit, and the second integrated circuit may determine from the dimming information the driving ratio between the at least two lighting devices (e.g. dimming color point information), according to embodiments. This has the advantage that the dimming information, e.g. phase information may be provided by an integrated circuit
on the primary side being already capable of determining the latch and hold currents, which already carry the phase information. The embodiments, where the first integrated circuit creates a stable DC voltage on the secondary side, and utilizes latch and hold currents may have the advantage, that the dimming range may be broader and the color adjustment may be determined by the integrated circuit on the secondary side. The dimming range may be determined by the phase cut dimmer. The integrated circuit on the primary side needs to have intelligence to translate the phase information into a usable signal, for example a PWM signal, input to the second integrated circuit. Further, a decoupling capacitor might be required.

According to further embodiments, the integrated circuit on the primary side may create a pulsed DC voltage on the secondary side depending on the light intensity information. This may be done by driving the primary side of the transformer, such that the secondary side of the transformer creates a pulsed DC voltage. The pulsed DC voltage on the secondary side may have pulses of different width. This pulsed voltage may be regarded as phase cut DC voltage. The phase cut of the DC voltage may represent the light intensity information, already received within the mains power on the primary side. Therefore, according to embodiments, the first integrated circuit may create a phase cut DC voltage on the secondary side depending on the light intensity information.

The phase information of the secondary DC voltage may be input to a dedicated pin on the second integrated circuit. From this phase information, the second integrated circuit may determine dimming color point information. This may be done by tapping the secondary side of the transformer directly and analyzing the phase information of the pulsed DC voltage on the secondary side. Depending on this analysis, the second integrated circuit may determine a dimming color point for driving at least two LEDs. The stable DC voltage may also be used for driving the LEDs with respective driving power indicative of the light intensity in accordance with dimming information.

In order to convert the phase cut mains input power, i.e. an altering current, into a driving voltage for appropriately driving the primary side of the transformer, embodiments propose that the first integrated circuit comprises at least one transistor for converting the phase cut input voltage into a light intensity depending drive signal for transformer.
In order to set the color point using a light emitting diode, it is necessary that at least two different light emitting diodes with different basic colors, e.g. the wavelength of the light output by the LED, are driven with according driving currents. By changing the driving currents, and thus the intensity of each of the LEDs, the color point may be adjusted. In order to adjust the color point, embodiments provide the second integrated circuit driving at least two lighting devices.

In order to create a realistic dimming impression, embodiments provide the second integrated driving at least two lighting devices depending on the dimming color point information such that the color point of the combined light of the at least two lighting devices represents a color temperature corresponding to the light intensity. As has been previously described, an incandescent light changes with changing intensity also its color temperature. To create a same impression using LEDs, the combined light of at least two LEDs is may be adjusted such that the light temperature is adjusted accordingly. For example, the driving ratio between the at least two lighting devices may be selected such that the color temperature of the combined light of the at least two lighting devices increases with decreasing light intensity.

Another aspect is an integrated circuit with a component as described above.

A further aspect is a system with such a component and at least two lighting devices driven by such a component.

Further, embodiments provide the system with semiconductor lighting devices or organic lighting devices, e.g. LEDs or OLEDs.

Another aspect is a method comprising receiving input power from a primary power supply, receiving within at least one circuit at least light intensity information from the input power, determining at least driving ratio between the at least two lighting devices and driving a lighting device at least according to the light intensity information with the circuit.

Yet, another aspect is a computer program comprising instructions operable to cause a processor to configure a component as previously described to receive input power from a primary power supply, receive within a at least one circuit at least light intensity information from the input power, and determine at least driving ratio between the at least two lighting devices and driving a lighting device at least according to light intensity information with the circuit.
These and other aspects of the application will be apparent from and elucidates with reference to the following Figures. In the Figures show:

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 an arrangement of a mains voltage with leading and trailing edge phase cutting;
Fig. 2 a first embodiment according to the application;
Fig. 3 a pre-programmed curve for transferring light intensity information into dimming color point information;
Fig. 4 a second embodiment according to the application;
Fig. 5 a third embodiment according to the application;
Fig. 6 a fourth embodiment according to the application;

DETAILED DESCRIPTION OF THE DRAWINGS

Fig. 1 illustrates a mains voltage 4 having a sinusoidal curve 2. This mains voltage 4 may be used for driving a device, i.e. an incandescent light bulb, using phase cutting. For phase cutting the mains voltage 4, devices, such as dimmers, are known, which provide for different types of phase cutting. For example there are R-type dimmers, which provide phase cutting at the leading edge of the curve 2, and are only intended for use with standard lightings and mains halogen lamps. Further, R, L-type dimmers are also leading edge phase cut dimmers, which are intended for use with standard lightings and halogen lamps. Eventually, R, C-type light dimmers are trailing edge phase cut dimmers, that are intended to be used also for halogen lamps using electronic ballast. As illustrated in Fig. 1, a usual curve 2 of a mains voltage 4 can be adjusted with a leading edge phase cut. The slope 6 of a leading edge phase cut is illustrated. As can be seen, each leading edge of a half wave of the curve 2 is put to zero, and the voltage is increased to the actual curve 2 at a certain time. The time, at which there is a rise in slope 6 may determine the light intensity. The longer the slope 6 is at a zero state, the lesser is the light intensity of the lighting device driven. Further shown is a slope 8 of a trailing edge phase cut dimmer. As can be seen, the first part of each half period of curve 2 is provided and the slope 8 is forced to zero at a certain time. The longer slope 8 is at zero, the lesser the light intensity.

Commonly known dimmers, such as wall mounted dimmers, provide such phase cut mains voltages to lighting devices. In order to utilize this kind of phase
cut mains voltage for other of lighting devices, such as LEDs, there is proposed a solution according to Fig. 2. Fig. 2 illustrates a driving component 10 with a mains power supply 10a and a dimming component 12. Further illustrated are two LEDs 14a, b, where LED 14a transmits light at a different wave length than LED 14b.

Within driving component 10, an AC mains power is adjusted using phase cutting, i.e. using a dimmer. The phase cut mains voltage is illustrated within component 10. Component 10 provides at its output terminals the phase cut mains voltage to the dimming component 12.

Within a dimming component 12, there is provided a first integrated circuit 16, a transformer 18, an opto-coupler 20 (optional) a second integrated circuit 22, a capacitor 24, and a diode 26.

Within first integrated circuit 16, there is provided a transistor 16a. Within second integrated circuit 22, there is provided transistors 22a, 22b, 22c, and diode 22d. The integrated circuit 22 may comprise a circuit for determining the duty cycle Transformer 18 may be comprised of two inductances electrically decoupled, dividing dimming component 12 into a primary side at which the first integrated circuit 16 is arranged, and a secondary side at which the second integrated circuit 22 is arranged.

Capacitor 24 may be used for filtering HF components on the secondary side.

The integrated circuit according to Fig. 2 operates as follows.

The phase cut AC voltage is provided from component 10 to component 12. The phase cut mains voltage carries information about lighting intensity, i.e. provided from a phase cut dimmer. The more the phase of the curve 2 is cut, the less light shall be emitted, e.g. the less the intensity/brightness of the light shall be.

At the integrated circuit 16, a latch current and a hold current are determined for transistor 16a. Depending on the phase cut information within phase cut mains voltage, transformer 18 is driven with more or less driving power. The dimming information, e.g. the drive ratio, may be provided to opto-coupler 20, transmitting this information to the secondary side, in particular to a dedicated pin 22c on the second integrated circuit 22. It may also be possible that the dimming information, e.g. the drive ratio, is obtained from circuit 23 illustrated in dashed lines. In that case, circuit 23 illustrated in dashed lines comprises functionality which may
also be incorporated within the second integrated circuit 22. The drive ratio is obtained either on the primary side using opto-coupler, or on the secondary side using circuit 23 as separate component or integrated within integrated circuit 22.

When using the opto-coupler 20, it may be possible to provide for on the secondary side a stable DC supply voltage, and the duty cycle is determined within the integrated circuit 22. When the circuit 23 is used, the secondary side may have phase cut DC voltage and current.

By means of transistor 16a, transformer 18 is driven, such that the secondary side is driven with a stable DC supply voltage. Diode 26 and conductance 24 provide for stabilizing the current and voltage within the secondary side. At dedicated input terminals, second integrated circuit 22 receives the stable DC supply voltage. Depending on the DC supply voltage, transistor 22a drives the output current for LEDs 14a, 14b.

Receiving on dedicated input pin 22c from opto-coupler 20 dimming information, transistor 22b, 22c may be driven, such that the currents through LEDs 14a, 14b are turned on and off. By turning on and off the currents within the LEDs 14a, 14b using transistor 22b, 22c, the ratio and light output at which the LEDs 14a, 14b emit light, can be adjusted. This ratio can be used for setting a dimming color point of the light output by both LEDs 14a, 14b.

In order to drive the transistors 22b, 22c accordingly, integrated circuit 22 provides a pre-programmed curve for mapping the input phase information from opto-coupler 20 into drive information for transistor 22b, 22b, such that the light emitted by both LEDs 14a, 14b is a representation of the dimming color point, which a usual incandescent light bulb would emit. This curve may be a representation of a black-body to mimic incandescent dimming behavior.

By driving the transistors 22b, 22c with the color point information, the active/inactive periods of LEDs 14a, 14b can be adjusted such that the overall color point is in accordance with a dimming color point according to the set light intensity.

Fig. 3 illustrates a pre-programmed curve 30, representing the ratio between the LEDs 14a, 14b depending on the dimming information received via opto-coupler 20.

The dimming information received the opto-coupler 20 may be face information, for example a face cut angle. Using this face cut angle the light output of
LEDs 14a, 14b may be controlled, such that the overall light output and the color point are adjusted. As can be seen, with increasing face cut angle, the light output of LED 14b decreases faster than the light output of LED 14a. This results in that with a small face cut angle, the ratio between light output by LED 14b and LED 14a is higher to LED 14b. For an increased face cut angle, LED 14a puts out more light than 14b creating a different color point.

Fig. 4 illustrates a further embodiment. Again, the dimming component 12 comprises a first integrated circuit 16, and a second integrated circuit 22.

Different to the embodiment illustrated in Fig. 2, the embodiment illustrated in Fig. 4 provides via integrated circuit 16 transformer 18 with a driving power, such that on the secondary side, a phase cut DC voltage is applied. This phase cut DC voltage is a representation of the phase cut AC mains voltage. The duration of the phases represents the light intensity, which the LEDs 14a, 14b shall emit light. The phase cut DC voltage is a representation of the light intensity information received from driving component 10.

Via a dedicated pin 22c, integrated circuit 22 receives information about the phase cut DC voltage within the secondary side circuit. This information is, as previously described, a light intensity information. Receiving this light intensity information on dedicated pin 22c, allows integrated circuit 22 to determine the on/off times of transistor 22b, 22c, in order to drive LEDs 14a, 14b such that they mimic the light color point in accordance with the light intensity state. The phase cut information is thus used within the second integrated circuit to determine the color point at which LEDs 14a, 14b output a combined light.

Another embodiment is to have signal paths from the primary side to the LED’s 14a and 14b, without the need for integrated circuit at the secondary side. Such signal paths may have different transfer functions such that the light output of the LED’s behave in a different way with respect to transferred power, therefore varying the light output ratio.

Fig. 5 illustrates a further embodiment according to the application.

What differs from the embodiment of Fig. 4 is, that on the secondary side, two integrated circuits 22, 22’, are provided. The transformer 18 is driven, such that light intensity information provides for on both secondary inductances the same output power. However, the phases of the secondary inductances are shifted by 180°. That is, when the diode 26a is conductive, diode 26b is not conductive and vice versa. The
phase information is provided to each of the circuits 22, 22. Depending on this phase information, the LEDs 14a, 14b are turned on and off for a longer or a shorter period. This allows for adjusting the brightness of the LEDs independent of each other. The overall brightness of the LEDs 14a, 14b is, however, adjusted by the phase cut DC voltage on the secondary side.

Fig. 6 illustrates another embodiment. According to Fig. 6 the circuit 23 is arranged at the output of component 10. Circuit 23 may obtain both light intensity information as well as the dimming information for driving the lighting devices 14a, b. This information may be provided to circuit 22, within which the drive ratio is obtained and the lighting devices 14 are driven accordingly.

The proposed component allows for translating the phase information into useful color adjustments for LEDs. This allows simple architecture for providing complaints with already known phase cut dimmers. Lighting applications using phase cut dimmers, like residential lighting and commercial lighting may thus be propagated to use LED lighting devices.
CLAIMS:

1. A component comprising:
   - an input for receiving input power from a primary power supply (10),
   - at least one circuit (16, 22),
   - wherein the circuit (16, 22) is arranged for receiving within the received input power at least light intensity information,
   - wherein the circuit (16, 22) is arranged for driving at least two lighting devices (14) at least according to the light intensity information, and
   - wherein the circuit (16, 22) is arranged for determining the driving ratio between the at least two lighting devices (14) according to the light intensity information.

2. The component of claim 1, wherein the circuit is a first circuit (16) arranged at a primary side.

3. The component of claim 1, wherein a second circuit (22) is arranged for driving at least two lighting devices (14) and for determining the driving ratio between the at least two lighting devices according to the light intensity information.

4. The component of claim 3, further comprising at least one bypass switch arranged across at least one of the lighting devices (14) for applying the driving ratios of the at least two lighting devices (14).

5. The component of claim 2, wherein the first circuit (16) comprises a switching element (16a), wherein different transfer functions between the switching element (16a) and the lighting devices (14) are provided for determining the driving ratios.

6. The component of claim 5, further comprising at least one storing element coupled to each lighting device (14).
7. The component of claim 6, wherein the storing element is at least one of:
   A) capacitor,
   B) inductor.

8. The component of claim 1, further comprising a transformer (18) for transforming the input power on a primary side to output power on a secondary side, the transformer (18) electrically decoupling the primary side from the secondary side.

9. The component of claim 3, wherein the first and/or the second circuit (16, 22) comprises either an integrated circuit or a discrete circuit.

10. The component of claim 3, wherein the second circuit (22) determines the driving ratio from a signal input to a dedicated input pin (22e) of the second circuit.

11. The component of claim 10, wherein the second circuit (22) determines a driving ratio depending on a pre-programmed color point curve.

12. The component of claim 2, wherein the first circuit (16) creates a stable DC voltage on the secondary side depending on the light intensity information.

13. The component of claim 12, wherein the first circuit transmits dimming information to the second circuit (22) and wherein the second circuit (22) determines from the dimming information the driving ratio between the at least two lighting devices (14).

14. The component of claim 12, wherein an opto-coupler (20) transmits the dimming information from the first circuit (16) to the second integrated circuit (22).

15. The component of claim 12, wherein the first circuit (16) transmits an analogue signal or a pulse-width modulated signal carrying the dimming information to the second circuit (22).
16. The component of claim 2, wherein the first circuit (16) creates a pulsed DC voltage on the secondary side depending on the light intensity information.

17. The component of claim 16, wherein the first circuit (16) creates a phase cut DC voltage on the secondary side depending on the light intensity information.

18. The component of claim 16, wherein the second circuit (22) determines the driving ratio between the at least two lighting devices (14) from the pulsed DC voltage.

19. The component of claim 17, wherein the first circuit (16) is arranged for determining at least light intensity information from a phase cut input voltage.

20. The component of claim 19, wherein the first circuit (16) comprises the at least one switching element (16a) for converting the phase cut input voltage into a light intensity depending drive signal for the transformer (18).

21. The component of claim 1, wherein the driving ratio between the at least two lighting devices (14) is such that the color temperature of the combined light of the at least two lighting devices (14) decreases with decreasing light intensity.

22. The component of claim 1, wherein the lighting device (14) is an LED.

23. Integrated circuit with a component of claim 1.

24. System with a component of claim 1, and at least two lighting devices (14) driven by the component of claim 1.

25. The system of claim 24, wherein the lighting devices (14) are semiconductor lighting devices or organic lighting devices.
26. The system of claim 24, further comprising a phase cut dimmer arranged for providing the input power from the primary power supply (10).

27. Method comprising:
- receiving input power from a primary power supply,
- receiving within at least one circuit (16, 22) at least light intensity information from the input power,
- determining at least driving ratio between the at least two lighting devices (14) and driving a lighting device (14) at least according to the light intensity information with the circuit (16, 22).

28. Computer program comprising instructions operable to cause a processor to configure a component of claim 1 to
- receive input power from a primary power supply,
- receive within a at least one circuit (16, 22) at least light intensity information from the input power,
- determine at least driving ratio between the at least two lighting devices (14) and driving a lighting device at least according to light intensity information with the circuit (16, 22).
Fig.1
Fig. 4.
A. CLASSIFICATION OF SUBJECT MATTER

INV: H05B33/08

According to International Patent Classification (IPC) or to both national classification and IPC.

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

H05B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Further documents are listed in the continuation of Box C. See patent family annex.

Date of the actual completion of the international search: 17 December 2009

Date of mailing of the international search report: 23/12/2009

Name and mailing address of the ISA/European Patent Office, P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk Tel: (+31-70) 340-2040, Fax: (+31-70) 340-3016

Authorized officer: Morri sh, Ian

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