(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
27 January 2011 (27.01.2011)

PCT

(10) International Publication Number
WO 2011/010326 A2

(51) International Patent Classification:
F21S 9/03 (2006.01)

(21) International Application Number:
PCT/IN2010/000483

(22) International Filing Date:
20 July 2010 (20.07.2010)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
1488/DEL/2009 21 July 2009 (21.07.2009) IN

(71) Applicant *(for all designated States except US)*: **ECCO ELECTRONICS PRIVATE LIMITED** [IN/IN]; 307, Aggarwal Complex, S-524, Shakarpur, Main Vikas Marg, Delhi 110 092 (IN).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **BAONI, Ramendra, S.** [IN/IN]; C-56/31 Sector 62, Noida 201 307 (IN). **BAONI, Dipendra** [IN/IN]; 102-Serene Manor, Serene Estate (Next to Sony World), Kondhwa Road, Pune 411 048 (IN).

(74) Agent: **GUPTA, Priyanka**; IPEngine Management (India) Pvt. Ltd., 208, Suryakiran Building, 19, Kasturba Gandhi Marg, New Delhi 110 001 (IN).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

— *of inventorship (Rule 4.17(iv))*

Published:

— *without international search report and to be republished upon receipt of that report (Rule 48.2(g))*

(54) Title: A PORTABLE LIGHTING DEVICE

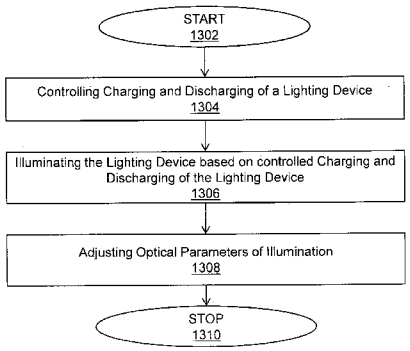

Fig. 13

(57) Abstract: The present invention may provide a solar powered portable lighting device configured to be separable mechanically and optically into two or more parts and a method for operating the lighting device. The lighting device may be equipped with at least a power management unit for at least one of controlled charging and discharging of the lighting device, a lighting unit for illumination that may be powered by the power management unit and an optical assembly for adjusting at least one of optical parameters of the illumination.

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A PORTABLE LIGHTING DEVICE

TECHNICAL FIELD

[0001] The present invention relates to the field of lighting devices and more particularly to portable lighting devices operated with solar energy.

BACKGROUND

[0002] Various types of portable solar lamps are designed to provide illumination by utilizing solar energy for several applications such as households, factories, streets, and other places. These lamps may be used as street lamps, table lamps, handheld lamps, wall lamps and the like. Adaptation of LEDs into these lamps provides additional advantages such as high efficiency, longer life and less power consumption which makes them suitable for portable lighting purposes.

[0003] Solar lamps depend on the availability of solar energy for efficient functioning and availability of solar energy may vary with time of day/year and latitude. This may lead to unavailability of solar energy for long periods at specific times of the year and locations resulting in complete power loss in the lamp.

[0004] Further, a solar lamp may be required to utilize other sources of power such as a rotating dynamo capable of being turned on by a mechanical motion of the hand, bicycle or the like, fuel cells, chemical energy, main electric supply, and other renewable and non-renewable sources of energy and the like. Therefore, intelligent and adaptive power utilization may be required based on the nature of power sources and the rate of power consumption.

[0005] In addition, there are several applications that require lamps to function with more intense illumination involving huge energy consumption which leads to discharging of the lamp within a short period of time. The optimal value of optical parameters such as intensity, irradiance, brightness, beam angle settings and the like may also vary for distinct applications, a proper control of which may reduce energy consumption substantially. It may be necessary to control these parameters to reduce energy consumption, mitigate cost and contribute to environmental factors. Further, different applications of the lamps require different physical settings for effective operations and a configuration suitable for one application may not apply to other applications. For example, a configuration suitable for table lamp may not fit a handheld lamp. There may be several applications in areas deficient in electric energy supply that require charging of external devices utilizing solar energy stored in lamps. Similarly,

various other utility functions may be required with the general design of lamps to make them more versatile.

[0006] Lamps generate a beam of light that directly impacts the eyes of a person, which may not be desirable for health reasons. The impact may intensify in cases of applications with sharp lighting requirements and particularly with Light Emitting Diodes (LEDs) since an LED is extremely bright.

[0007] There exist designs of solar lamps that target several specific applications with distinct requirements. Some designs are configured to produce a narrow and intense beam of light for close inspection while other designs are adapted to generate a distributed broad beam of light for lighting a large area. There are designs of lamps that include a separate electric port to connect the lamp with additional energy supply units. Similarly, the available designs allow charging of other re-chargeable devices with the power supplied from the lamp especially in areas that lack electric energy supply.

[0008] The existing designs of lamps provide several utility features that are used for distinct and specific applications. However, conventional designs of lamps do not combine the several utility features into a single lamp due to the increased cost associated with the design that makes the lamps unaffordable and unsupportable for portable use. Further, the conventional fixed-shape designs of lamps do not support application-specific multiple configurations of the lamps into a single unit.

[0009] Therefore, in light of the above discussion, there is need for a solar energy powered portable lamp that may address the above requirements.

SUMMARY

[0010] An objective of the present invention is to provide a portable lighting device that is solar powered and capable of controlled charging and discharging depending on requirements. Further, the lighting device should be capable of being charged from other power sources as well.

[0011] Another objective of the present invention is to provide a portable lighting device that may be configured to derive power intelligently from a plurality of power sources based on predefined characteristics to charge a storage unit.

[0012] Another objective of the present invention is to provide a portable lighting device that may be configured to derive power intelligently from a storage unit for illumination.

[0013] Another objective of the present invention is to provide a portable lighting device that may be configured into various physical shapes based on various requirements.

[0014] Yet another objective of the present invention is to provide a portable lighting device capable of charging external electronic devices.

[0015] Still another objective of the present invention is to provide a portable lighting device that may function as a media player.

[0016] Still another objective of the present invention is to provide a portable lighting device with adjustable optical parameters of illumination.

[0017] Still another objective of the present invention is to provide a portable lighting device with a measure to safeguard human eyes from direct exposure to light beams.

[0018] Still another objective of the present invention is to provide a lighting device that is low cost, multipurpose, portable, efficient and controlled by an automated and integrated controller to monitor and regulate various functions of the lighting device in real time.

[0019] Still another objective of the present invention is to provide a method for operating a portable lighting device.

[0020] The present invention provides a solar-powered portable lighting device configured to be separable mechanically and optically into two or more elements. The two or more elements may be adapted to form an electrical connection. Further, the present invention provides a method for operating the lighting device. The lighting device may be equipped with at least a power management unit for at least one of controlled charging and discharging of the lighting device, a lighting unit for illumination that may be powered by the power management unit and an optical assembly for adjusting at least one of optical parameters of the illumination. The power management unit may further be adapted to control the rate of charging of the lighting device based on a capability of a power source to deliver charge to the power management unit. The power management unit may control the rate of charging of the lighting device without overloading the power source. Further, the optical assembly may be configured to prevent direct exposure of light beams on human eyes.

[0021] Irradiance, brightness and intensity of light emitted by the lighting unit may be controlled by a controlling unit integrated within the power management unit. The lighting device may be connected with external electronic devices for charging and may also function as a media player.

[0022] The use of a low cost controlling unit integrated with the lighting device may form an interface with various elements and corresponding features to allow operation of the lighting device with multiple functionalities efficiently in real time within a portable setup.

BRIEF DESCRIPTION OF DRAWINGS

[0023] The features of the present invention, which are believed to be novel, are set forth with particularity in the appended claims. The invention may best be understood by reference to the following descriptions, taken in conjunction with the accompanying drawings, wherein:

[0024] Fig. 1 illustrates a block diagram of a portable lighting device in accordance with an embodiment of the present invention.

[0025] Fig. 2 depicts a perspective view of a portable lighting device in accordance with an embodiment of the present invention.

[0026] Fig. 3 depicts a perspective view of a portable lighting device in accordance with another embodiment of the present invention.

[0027] Fig. 4A and 4B depict rotary mechanism for engagement/disengagement of a portable lighting device in accordance with an embodiment of the present invention.

[0028] Fig. 5 depicts a first element and a second element of a portable lighting device separated from one another in accordance with an embodiment of the present invention.

[0029] Fig. 6 depicts a first element and a second element of a portable lighting device separated from one another in accordance with another embodiment of the present invention.

[0030] Fig. 7 depicts a portable lighting device in a wall hanging mode in accordance with an embodiment of the present invention.

[0031] Fig. 8 depicts a portable lighting device in a reading mode in accordance with an embodiment of the present invention.

[0032] Fig. 9 depicts a portable lighting device in an ambient mode in accordance with an embodiment of the present invention.

[0033] Fig. 10 depicts re-configurability of a portable lighting device along an axis of symmetry in accordance with various embodiments of the present invention.

[0034] Fig. 11 depicts an optical assembly in accordance with an embodiment of the present invention.

[0035] Figs. 12A-12D depicts exemplary angular adjustments with varied view angles based on positioning of a set of reflectors.

[0036] Fig. 13 depicts a method of operating a portable lighting device in accordance with an embodiment of the present invention.

[0037] Those with ordinary skill in the art will appreciate that the elements in the figures are illustrated for simplicity and clarity and are not necessarily drawn to scale. For example, the dimensions of some of the elements in the figures may be exaggerated, relative to other elements, in order to improve understanding of the present invention.

DETAILED DESCRIPTION:

[0038] While the specification concludes with the claims defining the features of the invention that are regarded as novel, it is believed that the invention will be better understood from a consideration of the following descriptions in conjunction with the drawings and figures, in which like reference numerals are carried forward.

[0039] As required, detailed embodiments of the present invention are disclosed herein; however, it is to be understood that the disclosed embodiments are merely exemplary of the invention, which can be embodied in various forms. Therefore, specific structural and functional details disclosed herein are not to be interpreted as limiting, but merely as a basis for the claims and as a representative basis for teaching one skilled in the art to variously employ the present invention in virtually any appropriately detailed structure. Further, the terms and phrases used herein are not intended to be limiting but rather to provide an understandable description of the present invention.

[0040] The terms "a" or "an" as used herein, are defined as one or more than one. The term "another," as used herein, is defined as at least a second or more. The terms "including" and / or "having" as used herein, are defined as comprising (open transition).

[0041] Fig. 1 illustrates a block diagram of a portable lighting device 100 in accordance with an embodiment of the present invention. The portable lighting device 100 may alternatively be referred to as a lighting device 100 hereinafter, merely for convenience and simplicity of the description. The lighting device 100 may include a first element 102 and a second element 104. The first element 102 may be equipped with a power management unit 106 for at least one of controlled charging and discharging of the lighting device 100. The second element 104 may be equipped with a lighting unit 114 for illumination powered by the power management unit 106, and an optical assembly 116 for adjusting at least one of view angles and beam patterns of illumination. In accordance with various embodiments of the present invention, the first element 102 and the second element 104 may be detachably attached with one another in a housing supporting the first element 102 and the second element 104.

[0042] The lighting device 100 as depicted in Fig. 1 may act as torches, emergency lights, flashlights, table lamps, street lights, wall mounted lamps, ceiling lights, handheld lamps and the like without limitations. The lighting device 100 as described in the present invention, in general, is powered by solar energy. However, it may be understood by a person ordinarily skilled in the art that various other energy sources or a combination of the energy sources such as electrical energy, mechanical energy, for example, through a rotating dynamo capable of being turned by a mechanical motion of the hand, bicycle or the like, fuel cells, chemical energy, other renewable and non-renewable sources of energy and the like, may be utilized for powering the lighting device 100. In addition, various elements and associated embodiments of the lighting device 100 as described in the present invention may be applicable to portable devices other than lighting devices.

[0043] The power management unit 106 as depicted in Fig. 1 may further include a power input unit 108 configured to receive power, storage unit 110 configured to store at least a portion of the power received by the power input unit 108, a controlling unit 112 configured to control at least one of the rate of charging and discharging of the lighting device 100, a first power drive unit 118 configured to drive power from the power input unit 108 to the storage unit 110, and a second power drive unit 120 configured to drive power from the storage unit 110 to the lighting unit 114.

[0044] The power management unit 106 may be adapted to receive an input power, regulate and store the received power, and control power supply and utilize the stored power to drive the lighting unit 114. In an embodiment of the present invention, the power management unit 106 may further include one or more DC-DC converters, input protection devices, output protection devices and the like. The power input unit 108 may be coupled to a solar panel or a set of solar panels. As stated earlier, the power input unit 108 may receive power from other external power sources in addition to solar power, and the electrical circuitry of the power management unit 106 may accordingly be modified in compliance with the external power source.

[0045] The power input unit 108 may convert power received at the solar panel into an equivalent DC power that may be suitable to be stored. The power input unit 108 may be adapted to receive regulated and unregulated, half-wave rectified and fully rectified power supplies. Alternatively, an unregulated power source may directly be coupled to the power input unit 108.

[0046] In an embodiment of the present invention, the power input unit 108 may be configured to draw a variable amount of power from a plurality of power sources based on predefined characteristics. For example, the power input unit 108 may include a voltage or a current regulator that may be controlled by the controlling unit 112. The maximum power that may be drawn from the plurality of power sources may be ascertained, and the controlling unit 112 may modulate the power drained by the input unit 108 according to the plurality of power sources, the power required by the lighting device 100, and the type of current (AC or DC current). The plurality of power sources may be similar or different. For example, the plurality of power sources may include solar power source, electrical power source, chemical power source, mechanical power source, or some other type of power source. The predefined characteristics may include a capability of the plurality of power sources to deliver charge for charging and re-charging.

[0047] In embodiments, DC power may be stored in the storage unit 110 through the first power drive unit 118. The first power drive unit 118 may allow adaptive and intelligent charging and re-charging of the storage unit 110 based on signals provided by the controlling unit 112. In an embodiment of the present invention, the first power drive unit 118 may be configured to drive power intelligently from the plurality of power sources to the storage unit 110. The intelligent operations may be governed by the controlling unit 112. The intelligently

driven power may allow flexibility in charging and re-charging of the lighting device 100 from the plurality of power sources.

[0048] In an embodiment of the present invention, the controlling unit 112 may send signals to the first power drive unit 118 to vary a duty cycle for controlling the rate of charging of the storage unit 110. The storage unit 110 may include any conventional or non-conventional power storage device such as, but not limited to, one or more batteries, super/ultra capacitors, fuel cells or any other source of rechargeable energy storage device. The one or more batteries may be a nickel cadmium battery, nickel hydrogen battery, nickel-metal hydride battery, lithium ion battery, lithium ion polymer battery, lithium sulfur battery, rechargeable alkaline battery, lithium iron phosphate battery, lead-acid battery, flow batteries, zinc-bromine and vanadium redox batteries, sodium-sulfur batteries, lithium-sulfur batteries, and the like.

[0049] In an embodiment, the battery may also utilize dry cells. In accordance with this embodiment, the power input unit 108 may not be required in the power management unit 106 since there is no possibility to charge dry cells. Similarly, the first power drive unit 118 may not be required while utilizing dry cells. The selection and design of the storage unit 110 and its specifications may be performed based on predetermined factors such as, but not limited to, economic factors, environmental factors, technical factors, and the like. In an exemplary scenario, a manufacturer may select a battery that has a short life span but is inexpensive and affordable. In another scenario, the manufacturer may select a battery that lasts for a longer period irrespective of its cost. Similarly, various combinations may be used to select the battery according to environmental factors such as availability of a specific type and amount of solar energy at a location or the power characteristics of the power source used to charge the storage unit 110, or the temperature at which the lighting device 100 operates, and the like. Moreover, government regulations and schemes to promote the harnessing of renewable sources of energy and recyclability of consumed parts may have a strong impact on the selection and design of the storage unit. Certain technical factors like compatibility of all electrical/electronic components may also form the basis of selection for the manufacturer. In extremely chilly conditions, or in places where power is available for very short durations, ultra capacitors may be employed.

[0050] The storage unit 110 may be adapted to be charged by the power input unit 108 through the first power drive unit 118 that may regulate the current flow across circuitry of the lighting device 100. In accordance with various embodiments of the present invention, the first power drive unit 118 along with an inductive circuit and a solid state switching assembly

may implement a DC-DC converter. The solid state switching assembly may be implemented using various switching devices such as MOSFETs, transistors, and the like. Switching frequency may be selected based on the level of compactness and the overall system efficiency required in the lighting device 100. In accordance with various embodiments of the present invention, the lighting device 100 may use frequencies greater than 40 kHz so that there is no audible noise or interference. The DC-DC converter may be implemented using the first power drive unit 118 and signal conditioning blocks, in an exemplary embodiment. The signal conditioning blocks may use simple discrete devices like transistors, resistors capacitors, operational amplifiers and the like. The DC-DC converter may perform monitoring of duty cycles.

[0051] In addition, one or more input protection units and output protection units may be employed in the power management unit 106 to detect and control supply of current beyond a threshold limit as set according to the design of the circuitry of the lighting device 100 and various elements embedded therein. Some examples of these input and output protection devices may include, without limitations, over-current sensing devices, over-voltage sensing devices, fuses, and the like. These devices may be capable of continued protection of the circuitry and the elements therein against sudden variance in current and voltage.

[0052] The first element 102 may also include the controlling unit 112 integrated within the power management unit 106. The controlling unit 112 may further include a microcontroller and a memory. The controlling unit 112 may be adapted to control operations of the power management unit 106, the lighting unit 114 and the optical assembly 116. In case of incorrect or faulty operations performed by any of the components embedded in the lighting device 100, the controlling unit 112 may send signals and accordingly rectify faulty or inaccurate operations. In an embodiment of the present invention, the controlling unit 112 may control the status, health and operations of the lighting device 100 resulting in a decreased and optimized consumption of power in real time. For example, in an exemplary embodiment of the present invention, the controlling unit 112 may recognize utility contexts through context driven sensing elements and accordingly decide and regulate operational parameters by transmitting real time signals to the power management unit 106 or the concerned devices disposed within the lighting device 100.

[0053] In embodiments, the second power drive unit 120 may facilitate in adaptive consumption of power stored in the storage unit 110 based on signals received from the

controlling unit 112. For example, the controlling unit 112 may ensure that the current provided to the lighting unit 114 through the second power drive unit 120 remains constant for constant brightness. In embodiments, the controlling unit 112 may send signals to the second power drive unit 120 to ensure that sufficient current is drawn for various types of LED loads. For example, the controlling unit 112 may ensure that the second power drive unit 120 provides sufficient current to strings of LEDs in series and parallel combination for constant brightness. In accordance with various embodiments of the present invention, the second power drive unit 120, along with the inductive circuit and the solid state switching assembly, may also implement a DC-DC converter.

[0054] In an embodiment of the present invention, the second power drive unit 120 may be configured to drive power intelligently from the storage unit 110 for illumination. The intelligent operations may be governed by the controlling unit 112. The intelligently driven power may allow adaptive power consumption based on signals received from the controlling unit 112 thereby achieving variable intensity of illumination depending on the requirements.

[0055] The controlling unit 112 may intelligently control the power drive units 118 and 120 and the input/output protection devices to control the rate of charging, discharging or re-charging of the storage unit 110 through adaptive control. For example, if an external electronic device is plugged into the portable lighting device 100, the controlling unit 112 may detect that an external device is connected to the lighting device 100. This external device may require constant voltage. The controlling unit 112 may enable the second power drive unit 120 to adapt to a constant voltage mode.

[0056] The controlling unit 112 may include components capable of exhibiting intelligence to detect the capability of the power source to deliver a particular amount of power. Further, the controlling unit 112 may accordingly configure the power drive units 118 and 120 and DC-DC converters to adapt to the power delivery capability of the power source. In accordance with various embodiments, the adaptability and configurability may be achieved on a continuous basis so that the lighting device 100 may adapt to sudden environmental changes even when the lighting device 100 is in use.

[0057] Adaptively controlled charging of the storage unit 110 based on set and predefined parameters may be governed by the controlling unit 112 to optimize power consumption. For example, one of the set and predefined parameters may be the chemistry of

the storage unit 110 or the battery included therein. The required voltage and current may be maintained by controlling the power drive unit 118, consequently regulating the rate of charging/recharging of the storage unit 110. As an example, during broad day light when there is enough solar power available, the power input unit 108 in conjunction with the first power drive unit 118 may allow receipt of higher power (instantaneous voltage and current product) to the storage unit 110 which ensures a higher rate of charging/re-charging of the storage unit 110. As another example of set and predefined parameters, the controlling unit 112 may control charging based on an existing level of charge in the storage unit 110. The power drive units 118 and 120 may receive instructions/signals from the controlling unit 112 to vary the rate of charging or re-charging by regulating the rate of flow of current based on the existing level of charge stored in the storage unit 110.

[0058] In accordance with an embodiment of the present invention, the controlling unit 112 may send signals to the first power drive unit 118 to control the rate of charging/re-charging of the storage unit 110 in the minimum or optimized time. In yet another embodiment, the controlling unit 112 may instruct the first power drive unit 118 to charge the storage unit in a user defined time. The power management unit 106 may thus be configured to sense a time restriction imposed by the user through a timer or similar counter arrangements disposed within the power management unit 106. The timer connected with the controlling unit 112 may detect allowed time limits for charging the storage unit 110 while the controlling unit 112 may send instructions in real time to the first power drive unit 118 and the power input unit 108 to vary the flow of the current accordingly.

[0059] In embodiments, the lighting device 100 may be capable of extracting required power for charging and re-charging through an external charging device such as an adapter without overloading it even when the external charging device is incapable of delivering an optimal charging current. Likewise, rate of discharging may also be adaptively controlled by the controlling unit 112. This may allow consumption of only limited power, as set by the requirements, and accordingly adjusting intensity of illumination. In accordance with an embodiment of the present invention, the second power drive unit 120 implementing a second DC-DC converter may be provided at an output end to govern output currents and voltages based on commands signaled by the controlling unit 112. Further, the second power drive unit 120 and the second DC-DC converter may also be utilized to govern power delivered to external devices such as a portable media player and the like plugged in with the lighting device 100.

[0060] The controlling unit 112 may also perform tasks such as health monitoring of the storage unit 110, monitoring intensity/irradiance of the lighting source, usage data, charge/discharge cycle information, and the like. The controlling unit 112 may keep a log in an inbuilt memory that may be monitored by authorized personnel for maintenance, subscription or authentication purposes. For example, various parameters associated with the storage unit 110 and the usage patterns such as charge/discharge characteristics may be stored in the memory. This may enable a user to maintain the storage unit of the portable lighting device 100 accordingly. This may also enable a user to be informed of servicing and maintenance requirements of certain components of the lighting device 100.

[0061] The lighting unit 114 may include one or more light emitting diodes (LEDs) that may receive power from the storage unit 110 of the power management unit 106 and convert the received power into an equivalent light beam. The one or more LEDs may be secured on the periphery of a fixed arc shaped and curved support that forms a front wall of the lighting device 100. In another embodiment, however, the support securing the one or more LEDs may be rotatable along an axis substantially perpendicular to the axial direction of the lighting device 100. The rotatable support may ensure directional arrangements of the light beam emitted by the one or more LEDs. Therefore, the portable lighting device 100 may embody methods, procedures and elements that may produce a more focused and directed beam of light along a wide range of angles. This is further described in the subsequent text. Further, the support holding the one or more LEDs may be movably engaged with housing of the lighting device 100 to offer a translatory motion to the one or more LEDs substantially along the axial direction of the lighting device 100 to produce a back and forth motion. In accordance with an embodiment of the present invention, the rotational motion of the movable support, which holds the LEDs, may be adjusted automatically by the controlling unit 112. Similarly, the translatory motion of the movable support holding the LEDs may also be adjusted automatically by the controlling unit 112. For example, the controlling unit 112 may recognize environmental and contextual patterns to identify the most appropriate position of the movable support through sensors. The controlling unit 112 may accordingly transmit signals to actuators that may be embedded within the movable support allowing it to rotate or move back and forth for view angle and beam pattern settings without any manual intervention. The one or more LEDs may be secured to the support through any conventional arrangements such as lock fitting, threading, and the like. The arrangement of the support and the one or more LEDs described herein is merely exemplary and any modifications or changes thereof must be considered falling within

the scope of the present invention. Similarly, the one or more LEDs may be disposed in parallel, series, a combination of parallel and series and the like arrangements. In addition, the lighting unit 114 may include elements that emit light other than the LEDs such as incandescent lamps and the like. These individual elements may be referred to as load since they draw current from the circuitry.

[0062] In accordance with various embodiments of the present invention, irradiance, intensity and brightness of the light emitted by the lighting unit 114 may be automatically controlled by the controlling unit 112. In an embodiment, the intensity of the lighting unit 114 may be reduced so that it draws less power from the battery and eventually helps the battery to last for a longer time frame. In other words, the dimmer the intensity of the lighting unit 114, the longer it may last. The controlling unit 112 may send signals to the second power drive unit 120 to draw more current from the storage unit 110 when a user requires more brightness from the lighting unit 114. This may cause the battery to discharge rapidly. In a similar fashion, the controlling unit 112 may send signals to the second power drive unit 120 to draw less current from the storage unit 110 when the user requires less brightness from the lighting unit 114. This may cause the battery to discharge slowly. The intensity variation of the lighting unit 114 may be achieved by using the Pulse Width Modulation (PWM) technology. This may allow rapid switching on and off of the lighting unit 114 so that the average current consumption may be reduced. At the same time, the user may not be sentient to on/off owing to the rapidity of the mode; as a result, the constant on/off may not be noticeable to the user.

[0063] In an embodiment, the controlling unit 112 may ensure that the current provided to the lighting unit 114 remains constant for constant brightness for a given intensity setting selected by the user. For example, the second power drive unit 120 may ensure that the average current provided to the lighting unit 114 remains constant in order to get a uniform beam of light irrespective of the voltage being delivered by the storage unit 110.

[0064] The optical assembly 116 may be attached in a rotatable manner to the front panel of the housing of the lighting device 100 substantially in front of the lighting unit 114. The optical assembly 116 may include a centrally located transparent portion made of polycarbonate, acrylic or other suitable material, which may allow the light beam emitted by the lighting unit 114 to pass through with minimal loss of light. The centrally located transparent portion may be surrounded by a metallic or a plastic frame. The metallic or plastic frame may be attached to the front panel of the housing of the lighting device 100 such that it may be

rotated with respect to the front panel of the housing. This may allow rotational capability to the optical assembly 116 and the rotation of the optical assembly 116 may allow adjustment of beam patterns and view angles. In accordance with other embodiments, various other mechanisms may be utilized for providing a rotational capability to the optical assembly 116 fitted on the front panel of the lighting device 100. The rotatable optical assembly 116 may allow adjustment of a view angle formed by spreading of the light beam emitted from the lighting unit 114. The rotation of the optical assembly 116 relative to the front panel of the housing may be automatically adjusted in real time by the controlling unit 112 or adjusted manually by the user mechanically. In addition, various beam patterns may be obtained by the rotatable adjustment of the optical assembly 116. The optical assembly 116 is further described in conjunction with Fig. 9.

[0065] It may be clearly understood by a person ordinarily skilled in the art that various other combinations of units such as the power management unit 106, optical assembly 116, lighting unit 114 and the like, may be deployed in the first element 102 and the second element 104. For example, in an embodiment of the present invention, the controlling unit 112 may be fitted inside the second element 104 along with the lighting unit 114 and the optical assembly 116. Similarly, various other designs may also be possible within the scope of the present invention.

[0066] In accordance with various embodiments of the present invention, multiple second elements such as 104 may be connected with a single first element 102. This is further described in the subsequent text.

[0067] Therefore, as discussed above, the present invention provides a lighting device 100 configured to be separated mechanically and optically into the first element 102 and the second element 104. The optical separation indicates that the optical assembly 116 and the lighting unit 114 may be separated from the power management unit 106. In accordance with other embodiments of the present invention, the first element 102 and the second element 104 may form a single, integrated unit and the elements 102 and 104 may not be separable mechanically and/or optically.

[0068] Fig. 2 depicts a perspective view of a portable lighting device 100 in accordance with an embodiment of the present invention. As shown, the portable lighting device 100 may include a housing 200 that may support an illuminated panel 202, an

ergonomically designed handle 204 for a stable and secure grip, one or more charging ports 206 for charging external electronic devices, one or more air vents 208 for efficient dissipation of heat, a button 210, an optical assembly 116 attached to the front panel of the housing 200 in a rotatable manner, one or more screws 212 to dismantle the lighting device 100 during maintenance and the like.

[0069] The button 210 may be used to switch on or off the flow of power from a storage unit 110 inside a power management unit 106 to a lighting unit 114. The switched on or off status of the power may be indicated at the illuminated panel 202 that may include a small sized blinking LED. Blinking of the LED at the illuminated panel 202 may indicate a switched on state of the lighting device 100. In other embodiments, the blinking LED may be used to indicate various functionalities of the lighting device 100 such as the status of the battery, health of the battery, requirements for servicing and maintenance and the like. In embodiments, the LED may be replaced with other display devices such as an LCD, OLED and the like.

[0070] The button 210 may be utilized for various other purposes as well such as intensity control and the like. In accordance with various other embodiments of the present invention, multiple buttons including such as the button 210 may be utilized for controlling several distinct functions such as power on/off, intensity control and the like. In embodiments, the button 210 may be an analog button or a digital button.

[0071] The handle 204 may be attached to the housing 200 for a stable and secure grip to allow easy handling of the lighting device 100. The handle 204 may include a gripper spaced from a periphery of the housing 200 to allow easy gripping of the lighting device 100. A pad formed of plastic, leather, cotton, or the like material may be positioned around the gripper and the periphery of the housing 200 that is in direct contact of the hand for an ergonomic and comfortable effect. The handle 204 may be mounted with rigid protrusions around an outer periphery or a portion of the outer periphery with which the lighting device 100 may rest on a support such as a floor or a table. The design of the handle 204 may be adjustable to allow tilting of the lighting device 100 while resting on the floor or ground, without allowing a direct contact between the floor or the ground and the housing 200. Further, the handle 204 may be designed in an extendible form that allows extension of length of the handle 204 to an extent that may be comfortably fixed over the chest of a user or around the head. Such an arrangement may allow easy usage in applications such as petroleum drilling, mining, constructions, deep water diving and the like. In an embodiment of the present invention, the power on/off button 210

may be located close to the handle 204 so that the power control is accessible to the user with a hand even while holding the handle 204.

[0072] The one or more air vents 208 provided on an outer surface of the housing 200 may facilitate effective heat dissipation. The one or more air vents 208 spaced at regular distance from one another may allow heat dissipation by thermal conduction, thermal convection or any other known heat transfer techniques. In an embodiment, the one or more air vents 208 may be designed in a special way such that they may allow flow of air without allowing insects to get in. In an embodiment of the present invention, the one or more charging ports 206 may be provided to receive power from an external source to the lighting device 100 such as from a solar panel or a mains adapter connected with the lighting device 100. In another embodiment of the present invention, the one or more charging ports 206 may be provided to charge external electronic devices such as, but not limited to, a cellular phone, a portable media player or other utility and entertainment devices, and delivering power to the optical assembly 116. In still another embodiment of the present invention, the one or more charging ports 206 may be utilized for multiple distinct applications and functions such as multiple ports may be utilized for driving multiple lighting units such as the lighting unit 114 in cases where more than one light is required. In accordance with various embodiments of the present invention, plugging of the external electronic device inside the one or more charging ports 206 may trigger the controlling unit 112 to transmit signals/instructions to the power management unit 106 to shift to a constant voltage mode. Load sensing by the controlling unit 112 may be achieved algorithmically through software that may be implemented within the controlling unit 112. This may allow intelligent detection of the type of load and accordingly switch the lighting device 100 to a constant voltage or a constant current mode from one another. This may, therefore, allow the user to charge the external electronic device in case of an emergency. In accordance with various embodiments of the present invention, the external electronic device may be charged simultaneously while the lighting device 100 is switched on for lighting purposes. In order to implement this embodiment, the storage unit 110 may supply a first portion of the stored energy to the lighting unit 114 at constant current for lighting purposes. Simultaneously, a second portion of the stored energy may be supplied to the external electronic device at a constant voltage for charging the external electronic device. However, in other embodiments the entire supply of the stored energy may be diverted to either the external device or the lighting unit 114 according to necessity. It must be appreciated by a person ordinarily skilled in the art that the controlling unit 112 may control detection and monitoring of power supply for a required mode

(constant current/constant voltage mode) thereby facilitating easy and optimized management of power in real time. The controlling unit 112, along with its operation, has been described in conjunction with Fig. 1.

[0073] The optical assembly 116 may include a centrally located transparent portion made of polycarbonate, acrylic, and the like to allow the light beam emitted by the lighting unit 114 to pass through without loss of light. However, in accordance with various other embodiments, the centrally located transparent portion may be formed of other types of materials without limitations. The centrally located transparent portion may be surrounded by a metallic or plastic frame. The optical assembly 116 may be attached to the front panel of the housing 200 of the lighting device 100 substantially in front of the lighting unit 114 such that it may be rotated relative to the front panel of the lighting device 100. The rotation of the optical assembly 116 may allow adjustment of a view angle formed by spread of the light beam emitted from the lighting unit 114. In an embodiment of the present invention, the rotation of the optical assembly 116 may allow adjustment of beam patterns too. In accordance with various embodiments of the present invention, rotation of the optical assembly 116 relative to the front panel of the housing 200 may be adjusted automatically by the controlling unit 112. This may allow automated view angle and beam pattern settings based on requirements and usage without requiring a user to adjust view angles and beam patterns manually. The optical assembly 116 and its rotatable adjustment are further described in conjunction with Fig. 9 in detail.

[0074] The one or more screws 212 may be provided peripherally along an edge of the lighting device 100. The one or more screws 212 may be used to dismantle the lighting device 100 for repairing and maintenance operations. The LEDs or reflectors may also be replaced simply by unscrewing the one or more screws 212. Various fastening elements other than the screws may be adapted to dismantle the lighting device 100 for repair and maintenance purposes.

[0075] In an embodiment of the present invention, the lighting device 100 as shown in Fig. 2 may be sealed in a transparent and flexible casing that may provide a waterproof and watertight effect to the lighting device 100. A waterproofing gasket may also be employed to ensure complete waterproofing. The waterproof lighting device such as the lighting device 100 may find application in, for example, deep water diving, and other similar activities. The lighting device 100 in accordance with this embodiment may find special applications in fish tanks as an aquarium lighting system in which lighting unit 114 may be positioned fully or

partially dipped in water, while the power management unit 106 may be detachably attached with the lighting device 100 and fitted at the top of a building to receive solar power directly. Various connecting elements such as wires or cords may be used to supply power to the lighting unit 114. Further, multiple color lights may be emitted by utilizing various LEDs to provide a colorful impact in the fish tank.

[0076] Decorative designs with a stylized and colorful impact may be added to the lighting device 100 shown in Fig. 2. Various shapes and designs such as that of a Christmas tree, toys, and the like may be used. Such customized designs may be used in festive decorations, parties, holiday gatherings and the like places since these are light weight and portable. In accordance with various embodiments of the present invention, the lighting device 100 may be installed on a support or a structure in permanent, removable or semi-permanent manner. In other embodiments, some parts of the lighting device 100 may be permanently fixed while others may be removable or semi-permanent.

[0077] In addition, the lighting device 100 may be folded along a substantially longitudinal or any other axis of the lighting device 100. Since the lighting device 100 is compact and light weight, therefore, the folded design may allow the lighting device 100 to be kept in a pocket.

[0078] Fig. 3 depicts a perspective view of a portable lighting device 100 in accordance with another embodiment of the present invention. The figure shows rear end of the portable lighting device 100. As shown, the rear end of the lighting device 100 may support a rod 302 for allowing hanging of the lighting device 100 to an elevated location such as a ceiling. The rod 302 may be formed of a solid metallic body or a flexible material such as a plastic, rubber, fiber, metal, woven rope, chain or the like. The rod 302 may be hinged to a protruded part 304 at its two ends formed at the rear end of a housing 200 of the lighting device 100. The protruded part 304 may include a guiding pass-through hole that may allow receipt of the rod 302 within. Similar rods such as the rod 302 and protruded parts such as the protruded part 304 may be disposed at other ends such as the sides of the housing 200 for allowing hanging of the portable lighting device 100 along multiple directions. In addition, simple hooks or bars attached at one end with the housing 200 and the other end freely allowing hanging of the hook with a rigid support of such as a wall or a ceiling may be used instead of the protruded parts such as the protruded part 304 and the rods such as the rod 302. The complete hanging

assembly may be detachably attached to the rear end of the housing 200 with a magnetic impact that may hold the hanging assembly capable of being lifted by pulling.

[0079] Figs. 4A and 4B depict rotary mechanism for engagement/disengagement of a portable lighting device 100 in accordance with an embodiment of the present invention. As shown, the lighting device 100 may include a first element 102 that may be suitably positioned on a second element 104 in a detachable manner. The first element 102 and the second element 104 have been described in conjunction with Fig. 1 in detail.

[0080] The detachability of the first element 102 and the second element 104 may be achieved with the rotary mechanism that may form an interface over a portion of the peripheries of the first element 102 and the second element 104 through a common area of contact. The rotary mechanism may be configured to generate a rotational motion as indicated by pointer 402 along an axis substantially perpendicular to the area of contact between the first element 102 and the second element 104 on an application of an external push or pull. The first element 102 and the second element 104 are together hereinafter referred to as elements 102 and 104 for the purpose of simplicity of description. The rotational motion for a predetermined range over the peripheries of the elements 102 and 104 based on the design of a channel 404 on a portion of the periphery of the first element 102 may engage or disengage the elements 102 and 104. The channel 404 may be mould designed, along with a housing 200, along the portion of the periphery of the first element 102. The channel 404 may extend along the portion of the periphery of the first element 102 in a curved shape in confirmation to a trajectory traced by the rotational motion either clockwise or anticlockwise. Similarly, a complementary protrusion 406 may be provided along a portion of the periphery of the second element 104. The protrusion 406 may extend along the portion of the periphery of the second element 104 in a curved shape in conformation with the trajectory traced by the rotational motion either clockwise or anticlockwise. The protrusion 406 may substantially fit on to the channel 404 on the application of a rotational force thereby allowing engagement or may substantially dislodge the channel 404 to allow disengagement. The length of the channel 404 in the design may determine the extent of rotation for engaging or disengaging the elements 102 and 104. The channel 404 and the protrusion 406 are shown in an exploded view in Fig. 4B. In an embodiment of the present invention, a simple groove may be designed instead of the channel 404 and a simple twist of one of the elements 102 and 104 may engage or disengage the elements 102 and 104. The rotational pull or push may be applied clockwise or anti clockwise to engage and disengage the elements

102 and 104. Similarly, in accordance with various embodiments of the present invention, several other designs of mechanism for engaging and disengaging the elements 102 and 104 may be employed without any limitations. The rotary mechanism or any other mechanism designed on the interfaces of the elements 102 and 104 as described above may allow separation of the elements 102 and 104 from one another into two individual elements. Fig. 5 depicts a first element 102 and a second element 104 of a lighting device 100 separated from one another in accordance with an embodiment of the present invention. The first element 102 and the second element 104 are together referred to as elements 102 and 104 or merely elements hereinafter for the purpose of simplicity of description. The first element 102 may include a key shaped slot 502 to accommodate a nail. The elements 102 and 104 may include one or more locks such as a lock 504 to lock the elements 102 and 104 against rotation while engaged together, one or more channels such as a channel 404, one or more protrusions such as a protrusion 406, one or more guiders such as a guider 506 to align the elements 102 and 104 together before locking, and copper contact 508 for allowing flow of electric current across the two elements 102 and 104. The dotted lines X-X and Y-Y show axes of symmetries that may aid in alignment while engaging the elements 102 and 104.

[0081] The second element 104 may house an elevated part which may fit into a complementary designed hollow part in the first element 102 to receive the second element 104. The elevated part and the hollow part are indicated by pointers 510 and 512 respectively in Fig. 5. It must be appreciated by a person ordinarily skilled in the art that various other designs may also be possible for the fixation of the first element 102 with the second element 104 that may allow engagement or disengagement of the elements 102 and 104. After the second element 104 is fitted and housed within the first element 102, the one or more locks such as the lock 504 may be automatically adjusted and the elements 102 and 104 may be locked and engaged against rotation unless an oppositely directed rotational motion to disengage the elements 102 and 104 is applied externally. Prior to engagement and fitting, the elements 102 and 104 may be aligned in accordance with a predefined design of interfaces of the elements 102 and 104 that may remain in substantial contact with one another. The alignment may be obtained through an axis of symmetry such as X-X and Y-Y as shown in Fig. 5. The axis of symmetry may define a symmetrical design of each of the elements 102 and 104 across the two halves. The symmetrical design across the axis of symmetry may allow configurability of the lighting device 100 into various designs and shapes achieved through distinct orientations of the plane of contact between the first element 102 and the second element 104. The configurability may be achieved

by a combination of several design features such as the axis of symmetry and the rotary mechanism. In accordance with an embodiment of the present invention, the configurability may be achieved by using a controlling unit 112 that may automatically configure several possible designs by pressing a user operated button to shift from one mode of operation to another. The modes of operations of the lighting device 100 are further described in conjunction with Figs. 6-8. The user may align the elements 102 and 104 along the axis of symmetry through guiders such as the guider 506 positioned adjacent to the axis of symmetry along its two ends, as shown in Fig. 5. There may be one or more axes of symmetry depending on the shape and design of the lighting device 100. It may also be noted that the lighting device 100 has a square footprint and a rhombus cross section in an exemplary embodiment as described above. However, those skilled in the art would appreciate that other shapes and cross sections may also be possible.

[0082] In general, one of the elements 102 and 104 may house a power management unit 106 and the power may be transferred to another element of the elements 102 and 104 while in the engaged position through the copper contacts 508. The copper contacts 508 may provide an electrically conductive contacting interface either through a copper metal plate or a spring pressed as a result of the engagement of the elements 102 and 104. Various other electricity conducting materials in addition to copper may also be used to form a conductive contacting interface.

[0083] In accordance with various embodiments of the present invention, the lighting device 100 may be detached into more than two elements. The elements as described herein may alternatively be referred to with other similar terms such as fragments, parts, and the like. In yet other embodiments of the present invention, the elements may be permanently coupled together while still allowing configurability of the lighting device 100 through rotation.

[0084] Fig. 6 depicts elements 102 and 104 of a lighting device 100 separated from one another in accordance with another embodiment of the present invention. The first element 102 may include a key shaped slot 502 to accommodate a nail. The elements 102 and 104 may further include one or more channels such as a channel 404, one or more protrusions such as a protrusion 406, and copper contact 508 for allowing flow of electric current across the two elements 102 and 104. The second element 104 may be provided with a convex surface 604. The first element 102 may be provided with a concave surface 602 that may be substantially designed complementary to the convex surface 604. The concave surface 602 may include slots 606 and the convex surface 604 may include complementary projections 608 that may fit into

the slots 606 for engaging the elements 102 and 104. The slots 606 are designed to receive the projections 608 such that the projections 608 are locked and fitted within the slots 606 on receipt. In accordance with various embodiments of the present invention, the design and profile of the projections 608 and the slots 606 may vary without limiting the spirit and scope of the present invention. For example, in an embodiment, the slots 606 may be designed as extended portions from the surface of the housing of the lighting device 100, and the projections 608 may simply provide a hollow design to receive the slots 606. In another embodiment, the slots 606 may be designed in the form of rectangular, spherical or hemispherical shaped extended portions. The profile of the projections 608 may be designed as extended portions with variable width from the surface of the lighting device 100 such that the projections 608 have thin profile at one end of the projections 608 and a wider profile at the other end of the projections 608 as depicted in Fig. 6. The first element 102 and the second element 104 are locked when the slots 606 fit into the wider end of the projections 608 that have a wider profile. The wider end of the projections 608 allow the slots 606 to be guided and snapped into a correct and fixed position to assist in locking. This may also ensure that the elements 102 and 104 do not disengage easily. In order to unlock the first element 102 from the second element 104, a force is applied on the projections 608 to overcome the resistance of the wider end. The design of the projections 608 and the slots 606 may allow locking and fitting of the elements 102 and 104 together on an application of an external rotational force. Similarly, a rotational force in a reverse direction may unlock and disengage the elements 102 and 104 from one another. Once disengaged, the projections 608 may easily slide out of the slots 606 and the elements 102 and 104 may get separated.

[0085] It must be appreciated by a person ordinarily skilled in the art that various other designs may also be possible for the fixation and locking of the first element 102 with the second element 104 that may allow engagement or disengagement of the elements 102 and 104. After the second element 104 is fitted and housed within the first element 102, locks may be automatically adjusted and the elements 102 and 104 may be engaged and locked against rotation unless a reverse rotational motion is applied externally to disengage the elements 102 and 104. Prior to engaging and fitting, the elements 102 and 104 may be aligned in accordance with a predefined design of interfaces of the elements 102 and 104 that may remain in substantial contact with one another. The alignment may be obtained through an axis of symmetry such as X-X and Y-Y. The axis of symmetry may define a symmetrical design of each of the elements 102

[0086] The rotational mechanism to engage and/or disengage the elements 102 and 104 (as described above) is merely exemplary. Various other mechanisms that may possibly engage and/or disengage the elements 102 and 104 may also be utilized without limiting the spirit and scope of the present invention. In an embodiment of the present invention, sliding and translatory movement may be utilized to engage/disengage the elements 102 and 104. In yet another embodiment of the present invention, a simple push-pull mechanism with a lock fitting technique may be utilized for engaging/disengaging the elements 102 and 104. In yet another embodiment of the present invention, various clamping and fastening devices may be utilized to engage and disengage the elements 102 and 104. Similarly, various designs for engagement and disengagement of the elements 102 and 104 may be provided on the contacting interfaces of the elements 102 and 104 in addition to those described above in conjunction with Figs. 5 and 6.

[0087] Fig. 7 depicts a portable lighting device 100 in a wall hanging mode in accordance with an embodiment of the present invention. Configurability of the lighting device 100 by the application of a rotational force applied on a rotary mechanism as shown in Fig. 4 and achievable by the symmetrical design of elements 102 and 104 in one orientation may result in transformation of the lighting device 100 in a first shape. The first shape that may be possibly achieved by the disengagement of the elements 102 and 104 into separated elements may facilitate the wall hanging mode as shown in Fig. 7. The lighting device 100 in the wall hanging mode may be termed as a wall hanging light, wall hanging lamp, wall mounted light, wall mounted lamp and the like. Hanging portable lighting devices such as the lighting device 100 as shown in Fig. 7 may find applications for such as, but not limited to, lighting tables, specific portions of rooms and the like. The hanging portable lighting device 100 or simply a hanging lighting device 100 may be mounted on a ceiling, wall, door, window and the like by a cord or a wire 702 such as shown in Fig. 7. A second element 104 may be mounted on the wall while a first element 102 may be supported on the floor or a table. The cord or wire 702 may be connected with the first element 102 through a plug-in port and the second element 104 through another plug-in port mounted either on the second element 104 or on the wall that may house an electric circuitry connecting the wall with the first element 102. Therefore, the first element 102 and the second element 104 may be connected either directly or indirectly through the wall circuitry.

[0088] In accordance with an embodiment of the present invention, the second element 104 may be permanently fixed at an elevated height inside a room, and the first element

102 may be portably transferred to connect with the second element 104. The second element 102 may be inserted inside a plug fitted in the wall, and the electric circuitry through the wall may form a connection between the elements 102 and 104. In order to enhance cost and energy savings, all the major components of the lighting device 100 except a lighting unit 114 and the second power drive unit 120 may be equipped in the first element 102, and the second element 104 may merely house a lighting unit 114 and a second power drive unit 120. In accordance with this scenario, multiple second elements such as the second element 104 may be fitted at several locations in a room or rooms of a house and a single first element such as the first element 102 may be utilized to connect with any of the first elements such as the first element 102, wherever required. This may avoid investment for multiple lighting devices such as the lighting device 100. In another embodiment, a controlling unit 112 fitted inside the first element 102 may be utilized to control operations of several second elements such as the second element 104 fitted at different locations of a room or house based on requirements and needs. Further, a remotely controlled first element such as the first element 102 and a remotely controlled second element such as the second element 104 may be embodied to enhance functionality of the lighting device 100 through the use of the controlling unit 112.

[0089] In accordance with an embodiment of the present invention, the portable lighting device 100 in a wall hanging mode may be utilized as a miner's lamp. In this case, the second element 104 may be mounted on the helmet of the miner and the first element 102 powering the lighting device 100 may be carried separately or clipped with the body of the miner.

[0090] In accordance with various embodiments of the present invention, the second element 104 may be a fan, a media player, multiple lights with different intensities, and the like, that may be connected to a single first element 102.

[0091] An interface of the second element 104 in the wall hanging mode that may form a connection substantially with the wall may be insulated to avoid any conduction of the current from the lighting device 100 to the wall or any connected surface. The insulation may be imparted using any conventionally designed insulating medium.

[0092] Fig. 8 depicts a portable lighting device 100 in a reading mode in accordance with an embodiment of the present invention. Configurability of the lighting device 100 by the application of a rotational motion applied on a rotary mechanism as shown in Fig. 4 and

achievable by the symmetrical design of elements 102 and 104 in a second orientation may result in transformation of the lighting device 100 in a second shape. The second shape that may be possibly achieved by the engagement of the elements 102 and 104 into a single assembly hereinafter referred to as assembled or engaged elements 102 and 104 may facilitate the reading mode as shown in Fig. 8.

[0093] The lighting device 100 in the reading mode may be termed as a table light, table lamp and the like. The lighting device 100 in accordance with reading mode as shown in Fig. 8 may find applications for such as, but not limited to, lighting tables, reading desks, or to enhance lighting in an area where the light may be weak and the like. The lighting device 100 may be detached into two separate elements such as a first element 102 and a second element 104. The detachability of the lighting device 100 has been previously described in detail. The first element 102 may form a base to be supported on such as a desk or a table or a floor while the second element 104 pivotally connected to the first element 102 through a connecting interface may house a lighting unit 114 that emits light. The pivotal design of the second element 104 with the first element 102 may achieve flexibility of rotational motion along an axis substantially perpendicular to the longitudinal axis of the portable lighting device 100 to rotate the second element 104 with a zero to slightly lesser than 180 degree angle relative to the first element 102. However, based on merely a change of the design of the portable lighting device 100, the range of angular rotation may be increased or decreased to as much as zero to 360 degrees which should be considered as falling within the scope of the present invention. The design of the pivotal arrangement may also allow the first element 102 to be removed from the second element 104. In another embodiment, a flexible goose-neck shaped arrangement may be provided that may connect the first element 102 to the second element 104 such that the position of the LEDs scattering the light may be adjusted based on requirements.

[0094] In accordance with various embodiments of the present invention, an interface of the first element 102, in the reading mode, that may form a connection substantially with the support such as a table, floor and the like, may be insulated to avoid any conduction of the current from the portable lighting device 100 to the floor or any connected surface. The insulation may be imparted using any conventionally designed insulating medium.

[0095] In a similar manner as described in conjunction with Fig. 7 in detail, a single first element such as the first element 102 may be used to support multiple second elements such as the second element 104 either through a cord, a wire; or through a remotely controlled

mechanism. Further, a controlling unit 112 fitted inside the first element 102 may be utilized to control operations of several second elements such as the second element 104 fitted at different locations based on requirements and needs. In accordance with this embodiment, all the major components of the lighting device 100 except a lighting unit 114 and the second power drive unit 120 may be equipped in the first element 102, and the second element 104 may merely house a lighting unit 114 and a second power drive unit 120. This embodiment may find applications in such as, but not limited to, classrooms where the desk of each student may be supported with a table lamp to be controlled and powered by a single unit.

[0096] Fig. 9 depicts a portable lighting device 100 in an ambient mode in accordance with an embodiment of the present invention. Configurability of the portable lighting device 100 by the application of a rotational force applied on a rotary mechanism as shown in Fig. 4 and achievable by the symmetrical design of elements 102 and 104 in a third orientation may result in transformation of the lighting device 100 in a third shape. The third shape may be possibly achieved by the engagement of the elements 102 and 104 into a single assembly hereinafter referred to as assembled or engaged elements 102 and 104 with an orientation distinct for obtaining the second shape as described in conjunction with Fig. 8. The third shape may facilitate the ambient mode as is shown in Fig. 9.

[0097] The lighting device 100 in the ambient mode may be termed as a ceiling light, ambient light, ceiling lamp and the like. The lighting device 100 in accordance with ambient mode as shown in Fig. 9 may find applications for such as but not limited to lighting rooms, halls and other such places.

[0098] In accordance with the third shape, the lighting device 100 may be provided with a ceiling mountable fixture including a rod 302 and a protruded part 304. The rod 302 may facilitate hanging of the portable lighting device 100 with an elevated location such as a ceiling, roof and the like. The rod 302 may be hinged with the protruded part 304 at its two ends. The protruded part 304 may include a guiding pass-through hole that may allow receipt of the rod 302 within. Similar rods such as the rod 302 and protruded parts such as the protruded part 304 may be disposed at other ends such as the sides for allowing hanging of the portable lighting device 100 along multiple directions. In addition, simple hooks or bars attached at one end with the lighting device 100 and the other end freely allowing hanging of the hook with a rigid support of such as a wall or a ceiling may be used instead of the protruding parts such as the protruded part 304 and the rods such as the rod 302. The complete hanging assembly may be

detachably attached to the rear end of the lighting device 100 with a magnetic impact that may hold the hanging assembly and that may be lifted merely by pulling.

[0099] In a similar manner as described in conjunction with Figs. 7 and 8, a single first element such as the first element 102 may be used to support multiple second elements such as the second element 104 either through a cord, a wire; or through a remotely controlled mechanism. Further, a controlling unit 112 fitted inside the first element 102 may be utilized to control operations of several second elements such as the second element 104 fitted at different locations based on the requirements and needs. In accordance with this embodiment, all the major components of the lighting device 100 except a lighting unit 114 and the second power drive unit 120 may be equipped in the first element 102, and the second element 104 may merely house a lighting unit 114 and a second power drive unit 120. This embodiment may find applications in such as but not limited to large halls, conference rooms and the like places where several lights are deployed and merely by switching on a plug to activate power supply, all the lamps may be lighted. Moreover, the first element 102 that may be configured to receive solar power from external sources may be detached and fitted on the top of the building to directly receive solar power.

[00100] In accordance with various embodiments of the present invention, the lighting device 100, in the ambient mode may be used as a handheld lamp or a torch to be carried by a user into a dark area.

[00101] The lighting device 100 of the present invention may be embodied in several other modes of operations based on various axes of symmetries and configurations in addition to those described above. For example, the portable lighting device 100 may be used as a vehicle mounted light such as a headlight, a tail light, an indicator light, a stop light and the like. The housing 200 of the lighting device 100 may be designed to fit a respective fixture of the vehicle. Similarly, the lighting device 100 may accept various other shapes such as rectangular, dome-shaped and the like depending on requirements and ease of use.

[00102] In accordance with various embodiments of the present invention, the first element 102 and the second element 104, as described in Figs. 4-9, may house any of the devices such as a power management unit 106, lighting unit 114 and optical assembly 116. In an embodiment, each of the elements 102 and 104 may house the power management unit 106, optical assembly 116 and lighting unit 114. Therefore, each of the elements 102 and 104 may

act as independent lighting devices such as the lighting device 100 that may be adapted to work independently without being aided by the other. In this scenario, one of the elements 102 and 104 may be charged by the other of the elements 102 and 104 and vice versa in case the stored charge is consumed and may act as a backup storage unit.

[00103] Fig. 10 depicts re-configurability of a lighting device 100 along an axis of symmetry in accordance with various embodiments of the present invention. The re-configurability of the lighting device 100 into various shapes such as those described in conjunction with Figs. 7, 8 and 9 may be achieved by the utilization of the axis of symmetry provided in the interface between a first element 102 and a second element 104 of the lighting device 100. Referring to Fig. 10, the axes of symmetries are indicated with dotted lines. Different shapes of the cross section 1002 may result in one or more axes of symmetry, which may allow multiple orientations of the lighting device 100 along the cross section 1002, as is shown in Fig. 10. It may be noted that that there may be one or more axes of symmetry which may depend on the shape of the cross section. Various components of the lighting device 100 may be rearranged to implement various usage scenarios by taking advantage of the axis of symmetry in the lighting device 100. It may also be noted that the lighting device 100 as shown has a square footprint 1004 and a rhombus cross section 1006. However, those skilled in the art would appreciate that any other lighting device having a different shape and cross section may be reconfigured by using axis of symmetries in a similar manner.

[00104] Fig. 11 depicts an optical assembly 116 in accordance with an embodiment of the present invention. The optical assembly 116 may be attached to the front panel of housing 200 of the lighting device 100 substantially in front of a lighting unit 114 through a fixture that may allow rotatable motion of the optical assembly 116 relative to the front panel. The rotatable optical assembly 116 may include a centrally located transparent portion made of polycarbonate or acrylic and the like to allow the light beam emitted by the lighting unit 114 to pass through significantly without loss of light. However, in accordance with various other embodiments, the centrally located transparent portion may be made of materials other than polycarbonate or acrylic. The centrally located transparent portion may be surrounded by a metallic or a plastic frame that may form a base attachable to the front panel of the housing 200.

[00105] The optical assembly 116 may provide a wide range of view angle or beam angle adjustments ranging from as low as 2 degrees to as much as 180 degrees simply by rotating the optical assembly 116 by hand relative to the front panel. The wide angle or short

angle beam patterns may be achieved by using a set of reflectors and/or lenses disposed at an interface of the rotatable fixture of the optical assembly 116 that may be substantially in front of the lighting unit 114. The rotation of the optical assembly 116 may adjust position of focal point thereby varying focal length which in turn may regulate the view angle. In order to vary the focal length, the lighting unit 114 may, in general, be positioned in a fixed manner and a change in the position of the set of reflectors and varying the shape of cone of illumination may adjust the view angle. This may permit light rays passing through the set of reflectors to converge or diverge based on adjustments. Figs. 12A-12D depicts exemplary angular adjustments with varied view angles based on positioning of the set of reflectors.

[00106] Similarly, the optical assembly 116 may be configured to adjust the patterns of light beams emitted by the lighting unit 114. Beam patterns may include variations in intensity, brightness of light beams for various parts of cone of illumination and the like. For example, in an embodiment of the present invention, beam patterns may include sharp illumination in the central part of the beam and dull illumination with lesser brightness at a surrounding loop. Beam patterns may be adjusted simply by rotating the optical assembly 116 by hand. In yet another embodiment of the present invention, default beam patterns may be set merely by selecting buttons disposed on the lighting device 100 representing standard beam patterns.

[00107] In accordance with various embodiments of the present invention, different view angles and beam patterns for illuminating an area may be required in different modes of operations of the lighting device 100 such as reading mode, ambient mode, wall hanging mode and the like. The various modes of operations of the lighting device 100 have been discussed in conjunction with Figs 7-9. For example, a wide view angle setting may be recommended in an ambient mode while a narrow view angle setting may be recommended in a reading mode. Similarly, various other recommended beam angle settings may be set according to necessity. It may be appreciated by a person ordinarily skilled in the art that a controlling unit 112 may monitor view angle settings and beam patterns adjusted by a user for various modes of operations and accordingly a record may be kept in a file stored in an inbuilt memory of the controlling unit 112. This may allow an automated view angle and beam pattern setting achieved by the controlling unit 112 as soon as the user configures the lighting device 100 for a specific mode of operation, thereby focusing light rays on the intended area of darkness only and with a defined pattern.

[00108] Additionally, a set of lenses or patterned plastic attachments may be mounted on either the optical assembly 116 or the lighting unit 114 directly or indirectly to scatter the light rays without reducing brightness or efficiency in order to not hurt eyes of the user. This may ensure that the light source is not directly visible to the user, since an LED is extremely bright and may be unhealthy for the eyes if the user's eyes are in direct contact with the light source for an extended period of time.

[00109] In another embodiment of the present invention, a concave mirror may be provided in front of the LEDs to reflect light on the reflector which in turn may send the light out. In still another embodiment, a region that may be directly in front of the LED may be frosted so that it diffuses the light and keeps the rest of the area clear.

[00110] In accordance with various embodiments of the present invention, a user interface may be provided to enable settings of view angles of the lighting device 100 by a user. The user may also select automatic or manual mode of view angle settings through the user interface. The user may further adjust intensity/irradiance/brightness of the lighting unit 114 from the user interface. In general, the user interface may be connected with the controlling unit 112 that may receive instructions as indicated by user preferences from selection of menu from the user interface. The controlling unit 112 may then instruct the concerned units and devices to act accordingly. For example, the user may adjust brightness/irradiance from the menu which the controlling unit 112 may implement in real time.

[00111] In accordance with various embodiments of the present invention, the lighting device 100 may be configured to act as a media player. The user may for example play songs, watch videos, listen to radio, store information and data and the like through the media player. The media player may be powered by the same functions which are used to power the lighting device 100. In other words, the media player may be powered by a power management unit 106 that may support the lighting device 100. The user may listen to songs stored in the inbuilt memory of the media player or by plugging in an external memory device such as a memory card (such as SD card, MMC Card and the like) or a USB flash drive containing music in various digital formats such as MP3, WMA, AAC, WAV, OGG Vorbis and the like. The controls of the media player may be provided on the user interface. For example, the user may increase/decrease the volume, change the frequency in case of radio, skip to previous/next song in the media player, and the like, from the various buttons provided on the user interface. It may be noted that the present invention has been explained by integrating the media player in the

lighting device 100. However, those skilled in the art would appreciate that other electronic devices may be integrated with the lighting device 100.

[00112] In accordance with an embodiment of the present invention, the external electronic devices may be utilized as insect repellers such as to repel mosquitoes. It is well known that insects may be repelled by certain noises that are beyond the audible frequency range of human beings such as ultrasonic ranges. Therefore, the external electronic device such as in the form of an MP3 player may be utilized to emit sound in ranges that are capable of repelling insects. In another embodiment of the present invention, the lighting device 100 may also act as an insect repeller when configured as a media player. In such as scenario, the lighting device 100 may be utilized to emit sound in ranges that are capable of repelling insects.

[00113] A display unit may be fitted, along with the media player, to display instructions, connection of external devices, status of the battery, play list, play menu and the like. A blinking indicator may also be attached with the display unit that may reflect existing charge stored in a storage unit 110. In another embodiment, the display unit may include multiple indicators to reflect the health status of the storage unit 110. For example, a green/blue color indicator may represent fully charged batteries. Similarly, other indicators may represent partially charged, empty, or other levels of stored charge. In an embodiment, blink codes may be utilized with LEDs to indicate the battery health status.

[00114] Fig 13 depicts a method of operating a portable lighting device 100 in accordance with an embodiment of the present invention. The method of operating the lighting device 100 may begin at step 1302. At step 1304, the charging and/or discharging of the lighting device 100 may be controlled. At step 1306, the lighting device 100 may be illuminated based on at least controlled charging and discharging. At step 1308, at least one of the optical parameters of illumination may be adjusted. The method of operating the lighting device 100 may end at step 1310.

[00115] The step 1304 for controlling charging and/or discharging of the lighting device 100 may be based on predefined criteria. The predefined criteria may include existing charge in the storage unit 110, chemistry of the storage unit 110, user defined time restrictions, environmental factors such as availability of solar energy on particular days and time periods of days and the like. Similarly, predefined criteria may also include various context based patterns such as current rate and type of usage. In accordance with an embodiment of the present

invention, historical data related to usage patterns stored in a memory of the lighting device 100 may also serve as predefined criteria. In accordance with another embodiment, the capability of the power source to deliver power may be another predefined criterion. In still another embodiment, in case of solar power source, the maximum power point to deliver maximum power that may be a combination of voltage and current may be regarded as a predefined criterion. The maximum power point may change with a change in the intensity of the sun.

[00116] The lighting unit 114 may receive power from the power management unit 106 for illumination purposes based on the at least one of controlled charging and discharging at step 1306. This means that the lighting unit 114 may consume only limited power as set by the predefined criteria described above. Therefore, the lighting intensity of the lighting unit 114 may increase or decrease based on the rate of charging and discharging to optimize functionalities of the lighting device 100.

[00117] At step 1308, at least one of the optical parameters of illumination may be adjusted. Optical parameters may include, without limitations, view angle settings, beam patterns and the like. Optical parameters and their adjustments have been described in conjunction with Figs. 1, 11 and 12.

[00118] It must be appreciated by a person ordinarily skilled in the art that the sequence of method steps described above may be changed. Similarly, one or more of the method steps may overlap with one another partially or completely and may occur simultaneously. The method steps may be performed automatically by the controlling unit 112 or manually by a user based on requirements.

[00119] The present invention described above has several applications and advantages some of which are stated below without limitations.

[00120] The lighting device 100 may be powered by solar energy which is freely and abundantly available in nature; and as a result, non-renewable sources of energy that are on the verge of exhaustion may be saved. This may avoid pollution indirectly which may be caused by burning non-renewable sources of energy such as kerosene used for lighting lamps or electricity (most of which is produced by burning of Gas/Petroleum products or Coal) that powers conventional electric lamps. Further, the solar powered lighting devices of the present invention may be fully in compliance with the latest norms and regulations prescribed by the government of various states and countries that have established recyclability laws and rules to avoid

pollution. The storage units of the solar powered lighting devices of the present invention may be recyclable unlike batteries of the conventional battery operated lamps and torches.

[00121] Lighting devices of the present invention may utilize an integrated controlling unit that may adaptively control various operations of charging/discharging of the storage units depending on necessity. Accordingly, an automated and integrated monitoring and regulating element may exist that may intelligently adapt power management unit to charging/discharging operations without a manual effort to externally control the storage units. Further, in case of shortage of solar power such as on rainy days, the integrated controlling unit may switch the power management unit to electric power to offer better, efficient and smooth operations. Further, the controlling unit may also instruct the power management unit to receive power from more than one source such as a dynamo, car charger, ac adapter, and the like to charge/re-charge at a speedy rate in case of emergencies. This may enhance charging/re-charging operations and avoid unnecessary delay in an emergency condition.

[00122] The lighting device of the present invention may include components that may provide capability to extract maximum power from an external power source intelligently without overloading the power source based on requirements. This enables availability of wide ranges of input voltages and currents.

[00123] The lighting device of the present invention may be configured into varied shapes which may be used for distinct applications. This may ease the task of using/ purchasing multiple lamps or torches for multiple uses such as a table lamp, wall mounted lamp, handheld torch and the like. The lighting device of the present invention may generate easily configurable shapes through inbuilt design and mechanism without adding any external component or element or device to the lighting device as an attachment. The lighting device may be used as a wall mounted lighting device in a wall hanging mode. The lighting device may also be used as a table lamp in a reading mode. The lighting device may further be used as a ceiling light in an ambient mode. Therefore, the lighting device of the present invention may serve as a multipurpose lamp which may be used for example as a table lamp, wall mounted lamp, handheld torch, ceiling lamp, street light, vehicle light and the like.

[00124] The lighting device of the present invention may be disengaged into two or more separate elements, and each of the elements may act as an independent lighting device that

may supplement operations of the other element when required. This may enhance the capabilities of the lighting device within a single design.

[00125] An advantage of the present invention is the use of a single lighting device to drive multiple lighting units, fans, chargers for external devices such as media players and the like.

[00126] Another advantage of the lighting device of the present invention may be the capability of charging external electronic devices such as mobile phones, media players, radios, and the like by the power management unit of the lighting device.

[00127] Yet another advantage of the lighting device of the present invention may be the capability of functioning as a media player.

[00128] Still another advantage of the lighting device of the present invention may be the capability of functioning as an insect repeller.

[00129] Still another advantage of the lighting device of the present invention may be adaptively varying intensity/irradiance of lighting units such as LEDs. Further, the lighting device may allow modifications of view angles of the light with the help of an attached optical assembly. The optical assembly may allow wide view angle settings, medium view angle settings, narrow view angle settings and various other angle settings depending on requirement, thereby focussing on the intended area of illumination and avoiding wastage of energy. Similarly, various beam patterns may also be obtained based on requirement and nature of use. Further, the optical assembly may safeguard eyes by preventing direct exposure to the emitted beam of light.

[00130] Still another advantage of the present invention may be the use of a low cost integrated controller to form a connected interface physically or through remote methods among various elements and respective features; whether electrical, mechanical or design-related to operate the lighting device with multiple functionalities efficiently in real time within a portable setup. For example, the integrated controller of the present invention may provide automated control of various modes of operations by simply pressing a manually operated button located at a user interface.

[00131] The overall design of the lighting device may be low cost, portable and efficient with the use of the controller thereby enabling a multi advantageous and multipurpose portable lighting device.

CLAIMS

1. A lighting device configured to be separated into two or more parts, the lighting device comprising:

a power management unit for at least one of controlled charging and discharging of the lighting device;

a lighting unit for illumination, wherein the lighting unit is powered by the power management unit; and

an optical assembly for adjusting at least one of optical parameters of the illumination.

2. The lighting device of claim 1, wherein the lighting device is powered by solar energy.

3. The lighting device of claim 1, wherein the lighting device is powered by a plurality of power sources.

4. The lighting device of claim 3, wherein the plurality of power sources is a combination of one or more of a solar power source, an electrical power source, a chemical power source and a mechanical power source.

5. The lighting device of claim 1, wherein the two or more parts are electrically attachable.

6. The lighting device of claim 1, wherein the power management unit comprises a power input unit, the power input unit being configured to receive power.

7. The lighting device of claim 6, wherein the power input unit is adapted to receive one or more of regulated, unregulated, half-wave rectified and fully rectified power.

8. The lighting device of claim 1, wherein the power management unit further comprises a storage unit, the storage unit being configured to store at least a portion of the power received by the power input unit.

9. The lighting device of claim 1, wherein the power management unit further comprises one or more power drive units, the one or more power drive units configured to drive power within the power management unit.

10. The lighting device of claim 1, wherein the power management unit further comprises a controlling unit, the controlling unit being configured to control at least one of the rate of charging and discharging of the lighting device.

11. The lighting device of claim 10, wherein the controlling unit is adapted to control the rate of charging of the lighting device based on a capability of a power source to deliver charge to the power management unit.

12. The lighting device of claim 10, wherein the controlling unit is adapted to control the rate of charging of the lighting device without overloading a power source.

13. The lighting device of claim 1, wherein the lighting unit comprises one or more Light Emitting Diodes.

14. The lighting device of claim 1, wherein the optical assembly comprises one or more reflectors and optical lenses.

15. The lighting device of claim 1, wherein the optical assembly further comprises one or more safety lenses and patterned plastic arrangements for safeguarding eyes.

16. The lighting device of claim 1, wherein the optical parameters are view angles.

17. The lighting device of claim 1, wherein the optical parameters are beam patterns.

18. The lighting device of claim 1, wherein the lighting device further comprises one or more charging ports, the one or more charging ports being adapted to supply power from the lighting device to an external device for charging the external device.

19. The lighting device of claim 1, wherein the lighting device further comprises a media player.

20. The lighting device of claim 1, wherein the lighting device further comprises a mechanism configured to at least engage and disengage the two or more parts.

21. The lighting device of claim 20, wherein the mechanism comprises one or more axis of symmetries, the one or more axis of symmetries allowing one or more physical configurations of the lighting device.

22. The lighting device of claim 20, wherein the mechanism is a rotary mechanism.

23. A solar powered lighting device configured to be separated into two or more parts, wherein the two or more parts are adapted to form an electrical connection, the lighting device comprising:

a power management unit for at least one of controlled charging and discharging of the lighting device;

a lighting unit for illumination, wherein the lighting unit is powered by the power management unit; and

an optical assembly for adjusting at least one of view angles and beam patterns of the illumination, wherein the optical assembly is adapted to rotate for adjusting the at least one of the view angles and the beam patterns.

24. The lighting device of claim 23, wherein the power management unit comprises a power input unit, the power input unit being configured to receive power.

25. The lighting device of claim 23, wherein the power management unit further comprises a storage unit, the storage unit being configured to store at least a portion of the power received by the power input unit.

26. The lighting device of claim 23, wherein the power management unit further comprises one or more power drive units, the one or more power drive units being configured to drive power within the power management unit.

27. The lighting device of claim 23, wherein the power management unit further comprises a controlling unit, the controlling unit being configured to control at least one of the rate of charging and discharging of the lighting device.

28. The lighting device of claim 27, wherein the controlling unit is adapted to control the rate of charging of the lighting device based on a capability of a power source to deliver charge to the power management unit.

29. The lighting device of claim 27, wherein the controlling unit is adapted to control the rate of charging of the lighting device without overloading a power source.

30. The lighting device of claim 23, wherein the lighting unit comprises one or more Light Emitting Diodes.

31. The lighting device of claim 23, wherein the optical assembly comprises one or more reflectors and optical lenses.

32. The lighting device of claim 23, wherein the optical assembly further comprises one or more safety lenses and patterned plastic arrangements for safeguarding eyes.

33. The lighting device of claim 23, wherein the lighting device further comprises one or more charging ports, the one or more charging ports being adapted to supply power from the lighting device to an external device for charging the external device.

34. The lighting device of claim 23, wherein the lighting device further comprises a media player.

35. The lighting device of claim 23, wherein the lighting device further comprises a mechanism configured to at least engage and disengage the two or more parts.

36. The lighting device of claim 35, wherein the mechanism comprises one or more axis of symmetries, the one or more axis of symmetries allowing one or more physical configurations of the lighting device.

37. The lighting device of claim 35, wherein the mechanism is a rotary mechanism.

38. A solar powered lighting device configured to be separated into two or more parts, wherein the two or more parts are adapted to form an electrical connection, the lighting device comprising:

a power management unit for at least one of controlled charging and discharging of the lighting device, wherein the power management unit comprises:

a power input unit configured to receive power;

a storage unit configured to store at least a portion of the power received by the power input unit;

one or more power drive units, the one or more power drive units configured to drive power within the power management unit; and

a controlling unit configured to control at least one of the rate of charging and discharging of the lighting device;

a lighting unit for illumination, wherein the lighting unit is powered by the power management unit; and

an optical assembly for adjusting at least one of view angles and beam patterns of the illumination, wherein the optical assembly is adapted to rotate for adjusting the at least one of the view angles and the beam patterns.

39. The lighting device of claim 38, wherein the lighting unit comprises one or more Light Emitting Diodes.

40. The lighting device of claim 38, wherein the optical assembly comprises one or more reflectors and optical lenses.

41. The lighting device of claim 38, wherein the optical assembly further comprises one or more safety lenses and patterned plastic arrangements for safeguarding eyes.

42. The lighting device of claim 38, wherein the lighting device further comprises one or more charging ports, the one or more charging ports being adapted to supply power from the lighting device to an external device for charging the external device.

43. The lighting device of claim 38, wherein the lighting device further comprises a media player.

44. The lighting device of claim 38, wherein the lighting device further comprises a mechanism configured to at least engage and disengage the two or more parts.

45. The lighting device of claim 44, wherein the mechanism comprises one or more axis of symmetries, the one or more axis of symmetries allowing one or more physical configurations of the lighting device.

46. The lighting device of claim 44, wherein the mechanism is a rotary mechanism.

47. A lighting device comprising:

a first element, wherein the first element is equipped with a power management unit for at least one of controlled charging and discharging of the lighting device;

a second element attachable to the first element, wherein the second element is equipped with at least one of a lighting unit for illumination and an optical assembly for adjusting at least one of optical parameters of the illumination; and

a mechanism configured to at least engage and disengage the first element and the second element, wherein the mechanism comprises one or more axis of symmetries, the one or more axis of symmetries allowing one or more physical configurations of the lighting device.

48. The lighting device of claim 47, wherein the first element and the second element are electrically attachable.

49. The lighting device of claim 47, wherein the power management unit comprises a power input unit, the power input unit being configured to receive power.

50. The lighting device of claim 47, wherein the power management unit further comprises a storage unit, the storage unit being configured to store at least a portion of the power received by the power input unit.

51. The lighting device of claim 47, wherein the power management unit further comprises one or more power drive units, the one or more power drive units configured to drive power within the power management unit.

52. The lighting device of claim 47, wherein the power management unit further comprises a controlling unit, the controlling unit being configured to control at least one of the rate of charging and discharging of the lighting device.

53. The lighting device of claim 47, wherein the lighting unit comprises one or more Light Emitting Diodes.

54. The lighting device of claim 47, wherein the optical assembly comprises one or more reflectors and optical lenses.

55. The lighting device of claim 47 wherein the optical assembly further comprises one or more safety lenses and patterned plastic arrangements for safeguarding eyes.

56. The lighting device of claim 47, wherein the mechanism is a rotary mechanism.

57. The lighting device of claim 47, wherein the lighting device further comprises a media player.

58. The lighting device of claim 47, wherein the lighting device further comprises one or more charging ports, the one or more charging ports being adapted to supply power from the lighting device to an external device for charging the external device.

59. A lighting device capable of drawing power from a plurality of power sources for illumination, the lighting device comprising:

a power input unit configured to draw a variable amount of power based on predefined characteristics of the plurality of power sources, wherein the variable amount of power is drawn without overloading the plurality of power sources;

a storage unit configured to store at least a portion of the power drawn by the power input unit;

a first power drive unit configured to drive power intelligently from the plurality of power sources to the storage unit;

a second power drive unit configured to drive power intelligently from the storage unit for illumination, wherein the intelligently driven power allows variable intensity of illumination; and

a controlling unit configured to control intelligent operations of the power input unit, the first power drive unit and the second power drive unit.

60. The lighting device of claim 59, wherein at least one of the plurality of power sources is a solar power source.

61. The lighting device of claim 59, wherein at least one of the plurality of power sources is an electrical power source.

62. The lighting device of claim 59, wherein at least one of the plurality of power sources is a chemical power source.

63. The lighting device of claim 59, wherein at least one of the plurality of power sources is a mechanical power source.

64. The lighting device of claim 59, wherein the plurality of power sources is a combination of one or more of a solar power source, an electrical power source, a chemical power source and a mechanical power source.

65. The lighting device of claim 59, wherein the predefined characteristics include a capability of the plurality of power sources to deliver charge.

66. A method of operating a lighting device, the method comprising:

controlling at least one of charging and discharging of the lighting device based on a predefined criteria;

illuminating the lighting device based on at least one of controlled charging and discharging of the lighting device;

adjusting at least one of optical parameters of illumination for allowing at least one of multiple view angle settings and beam patterns.

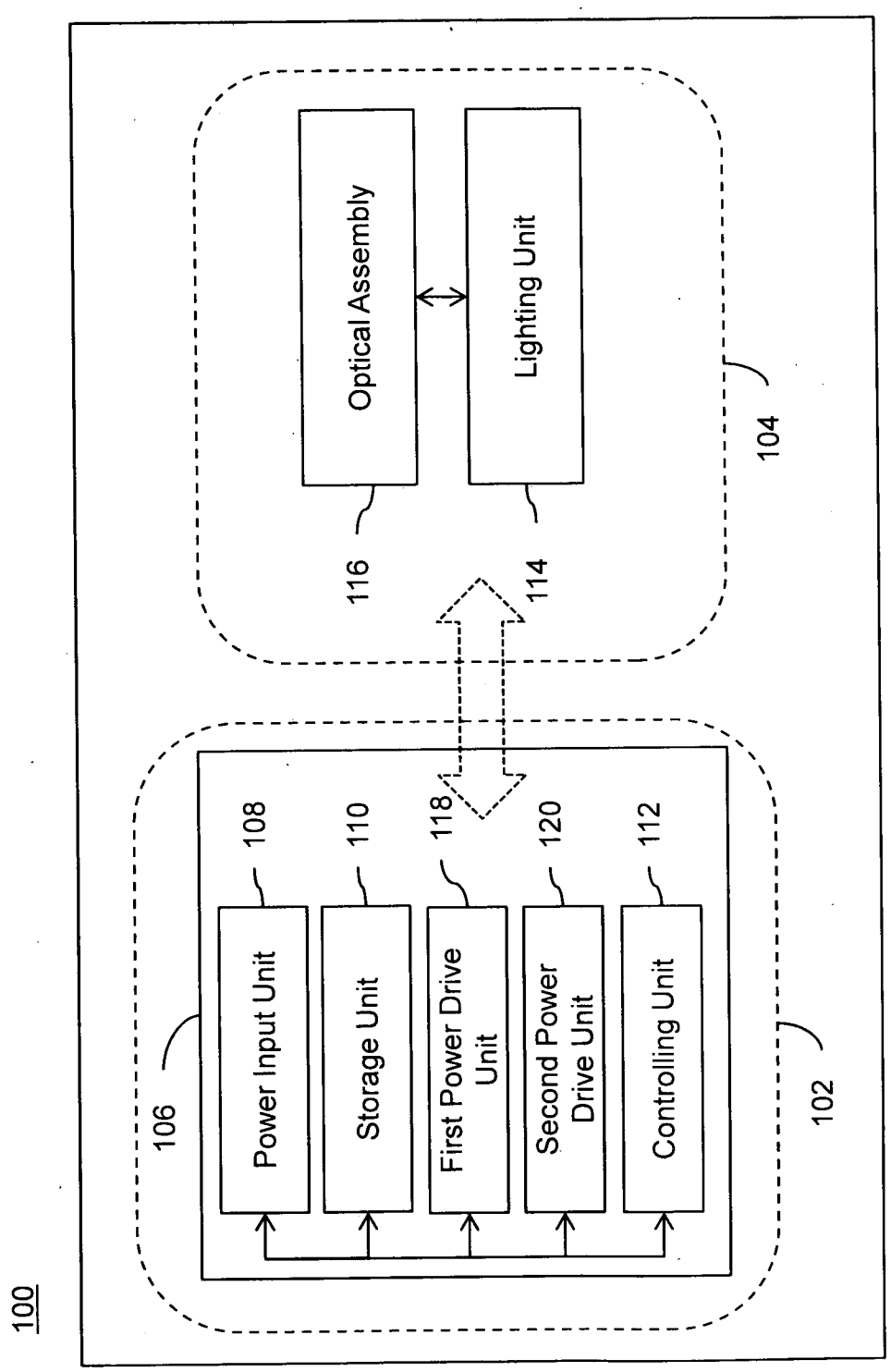
100
102
104
106
108
110
112
114
116
118
120
Optical Assembly
Lighting Unit
Power Input Unit
Storage Unit
First Power Drive Unit
Second Power Drive Unit
Controlling Unit

Fig. 1

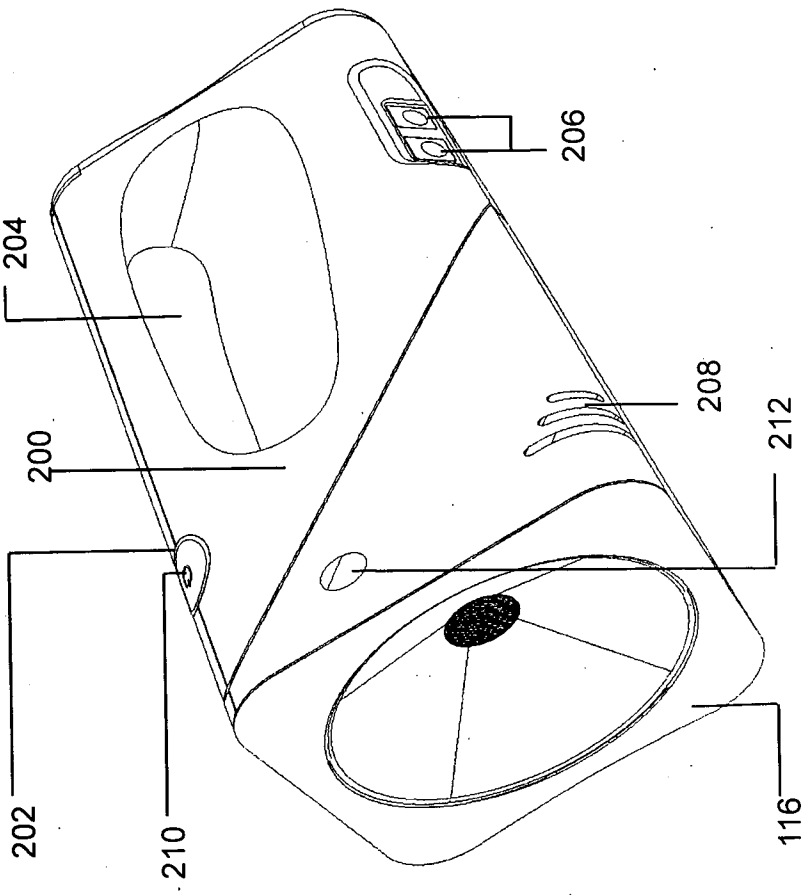

Fig. 2

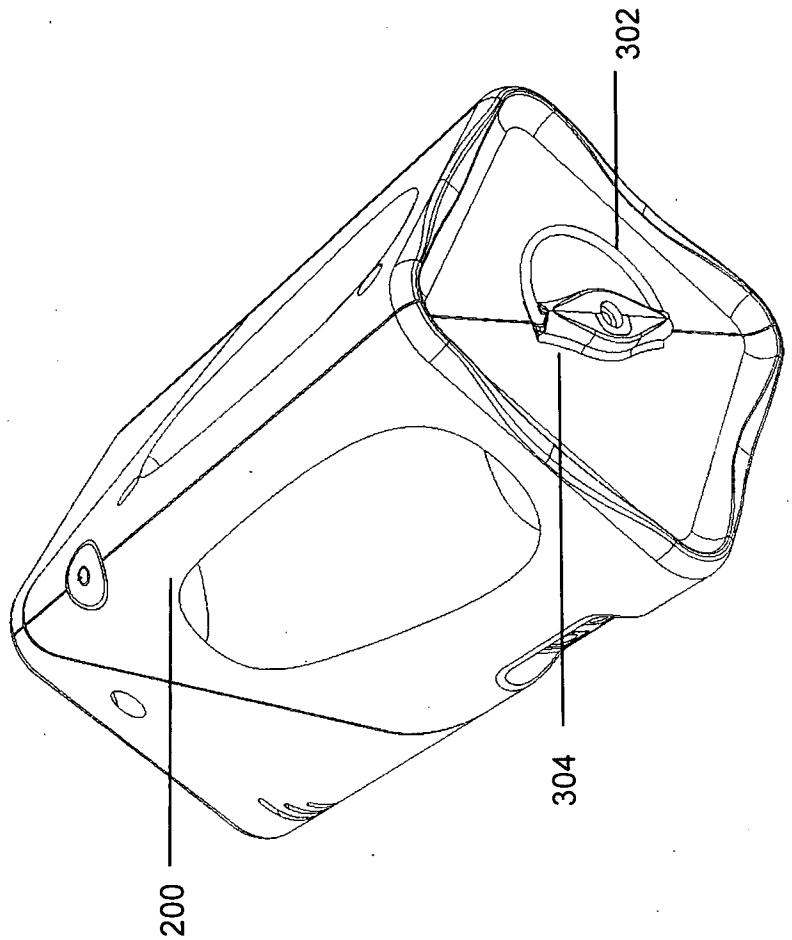

Fig. 3

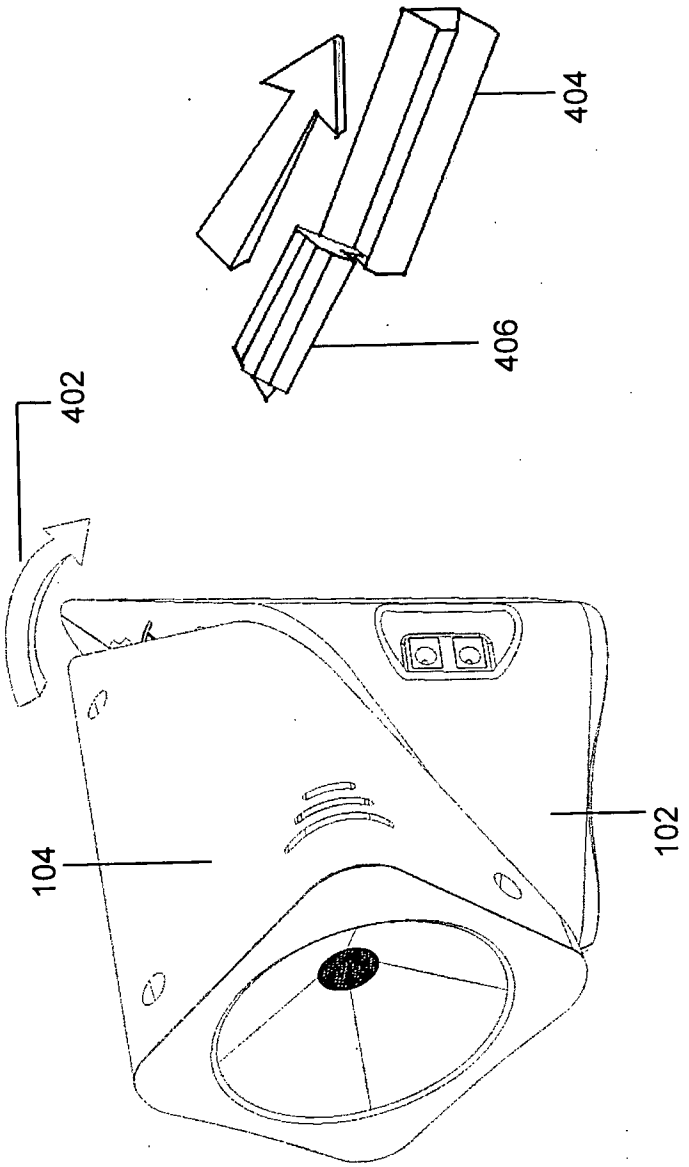

Fig. 4B

Fig. 4A

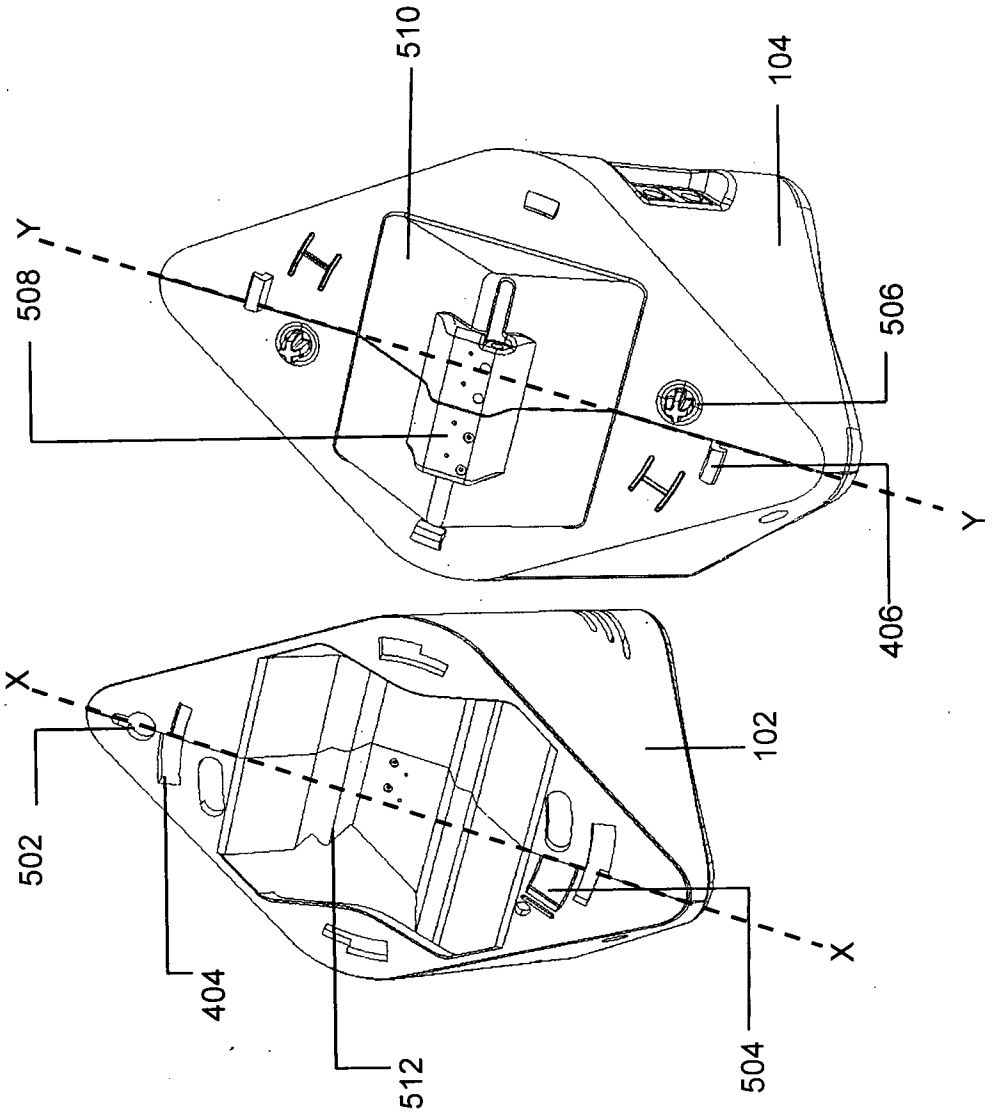

Fig. 5

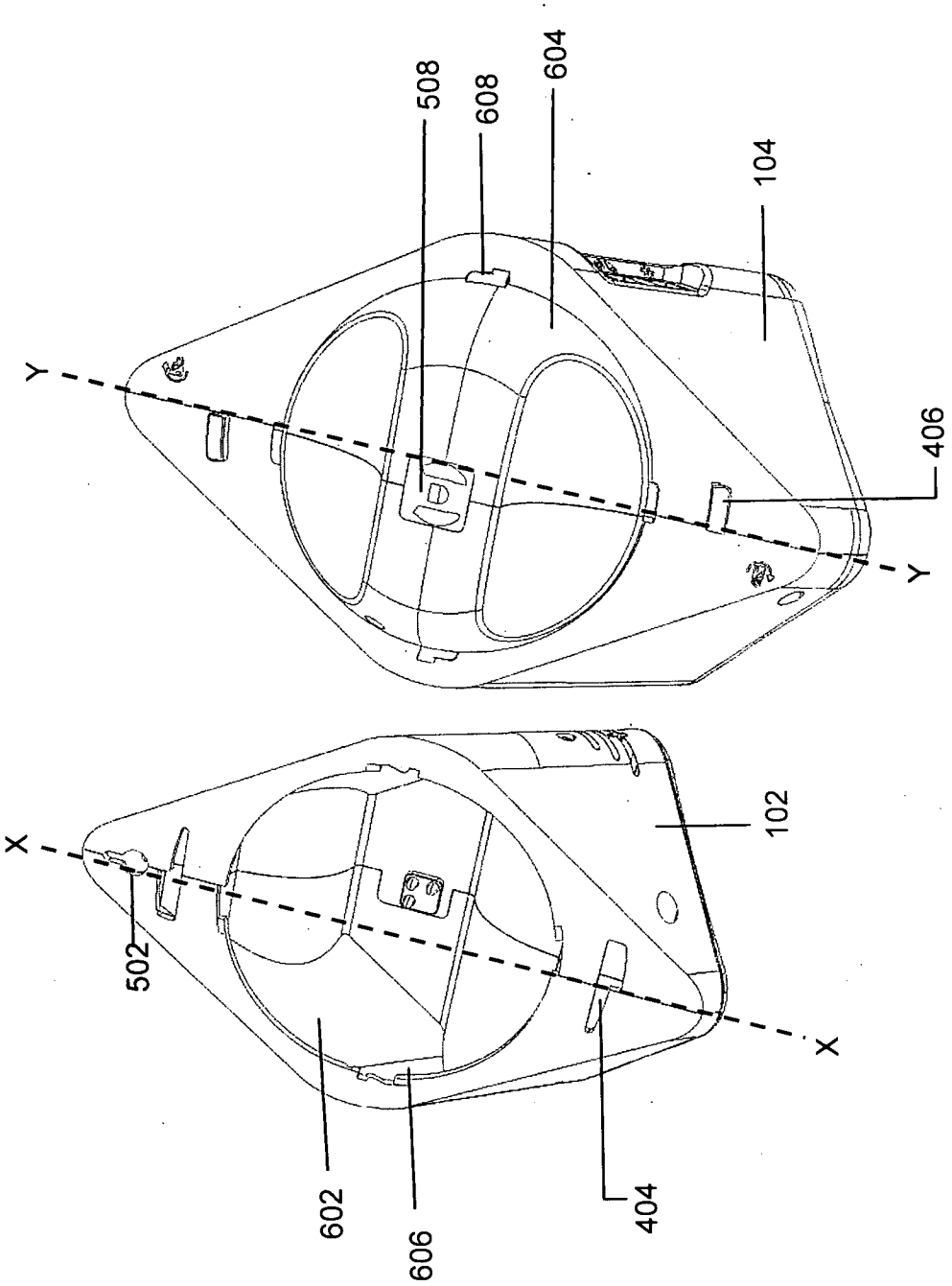

Fig. 6

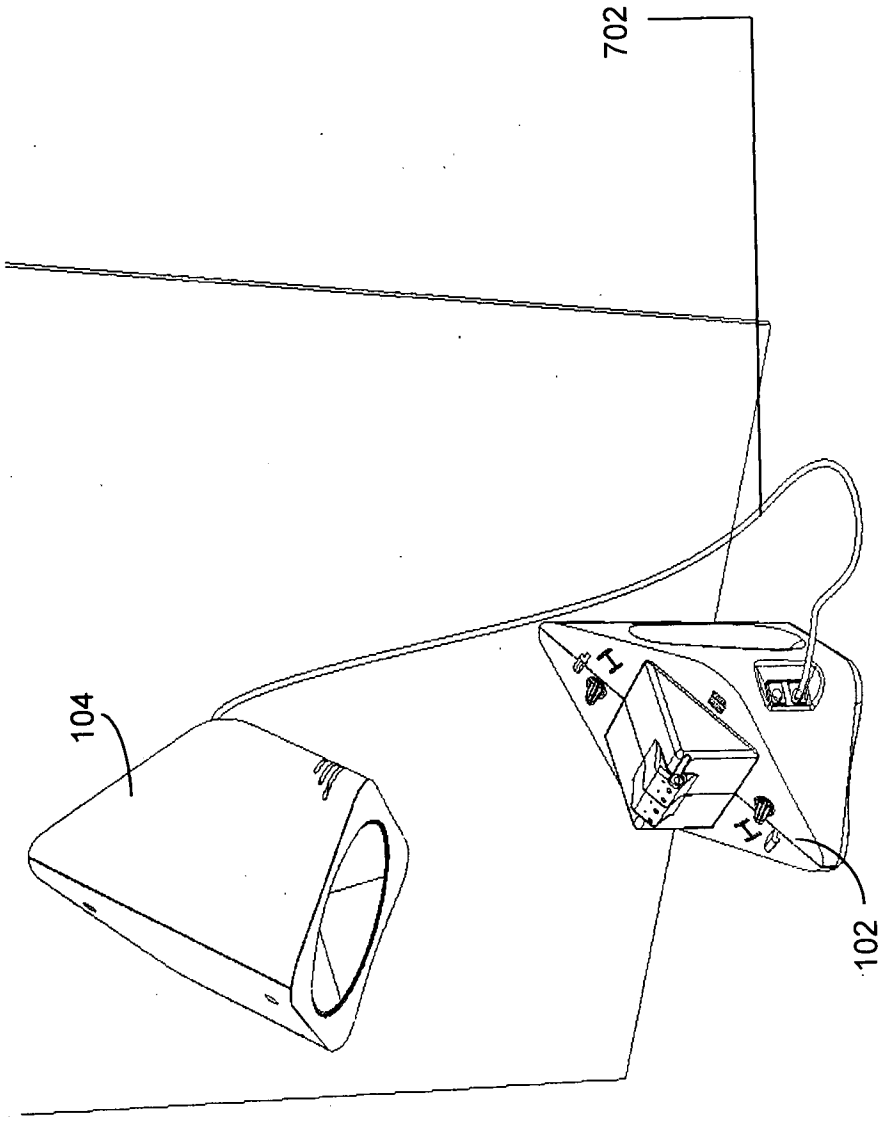

Fig. 7

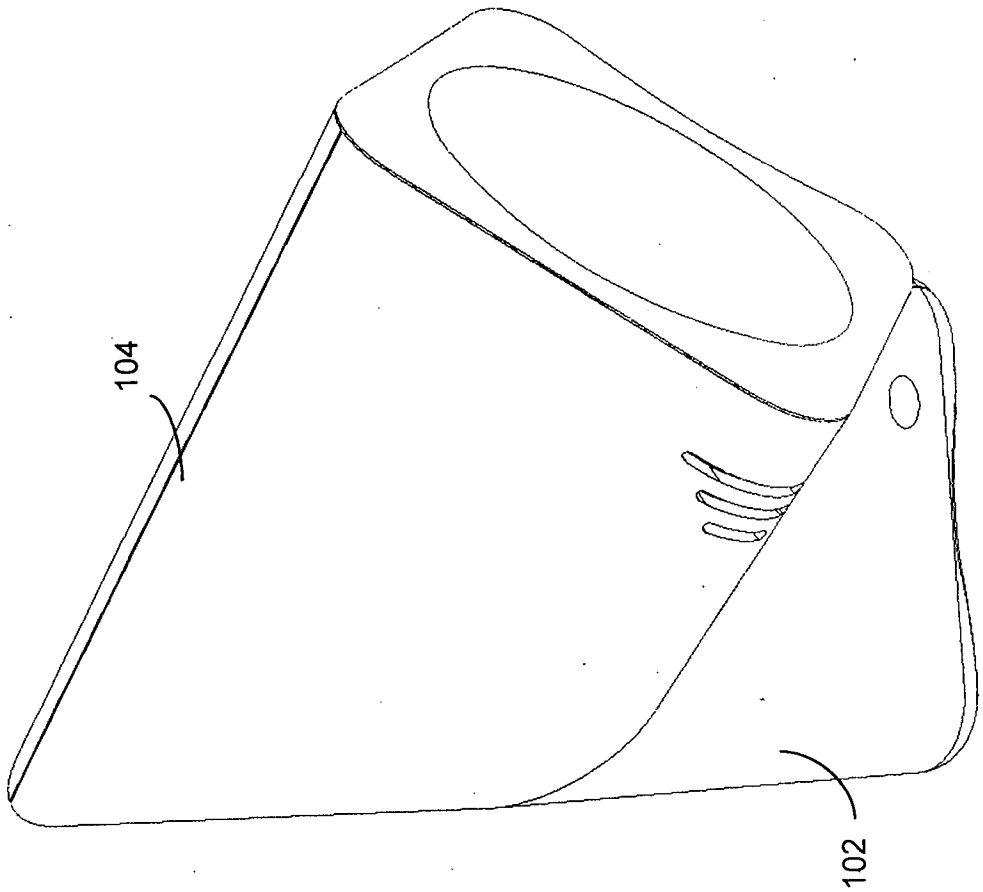

Fig. 8

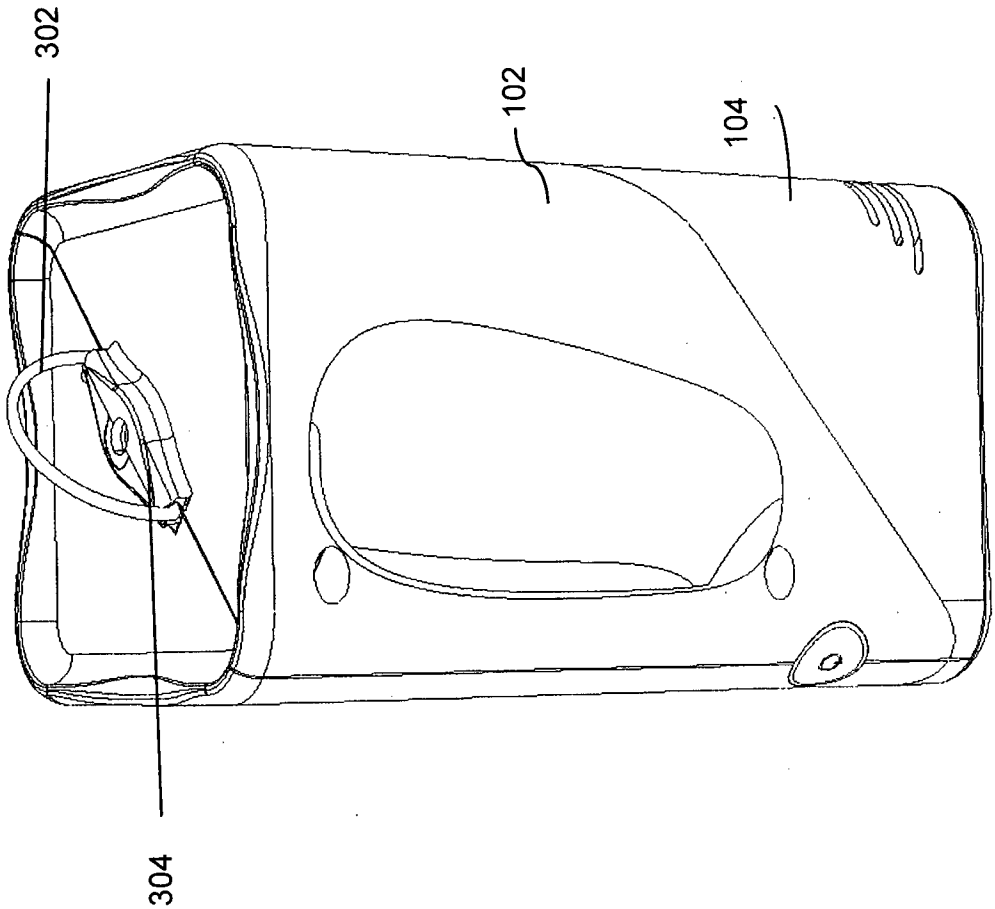

Fig. 9

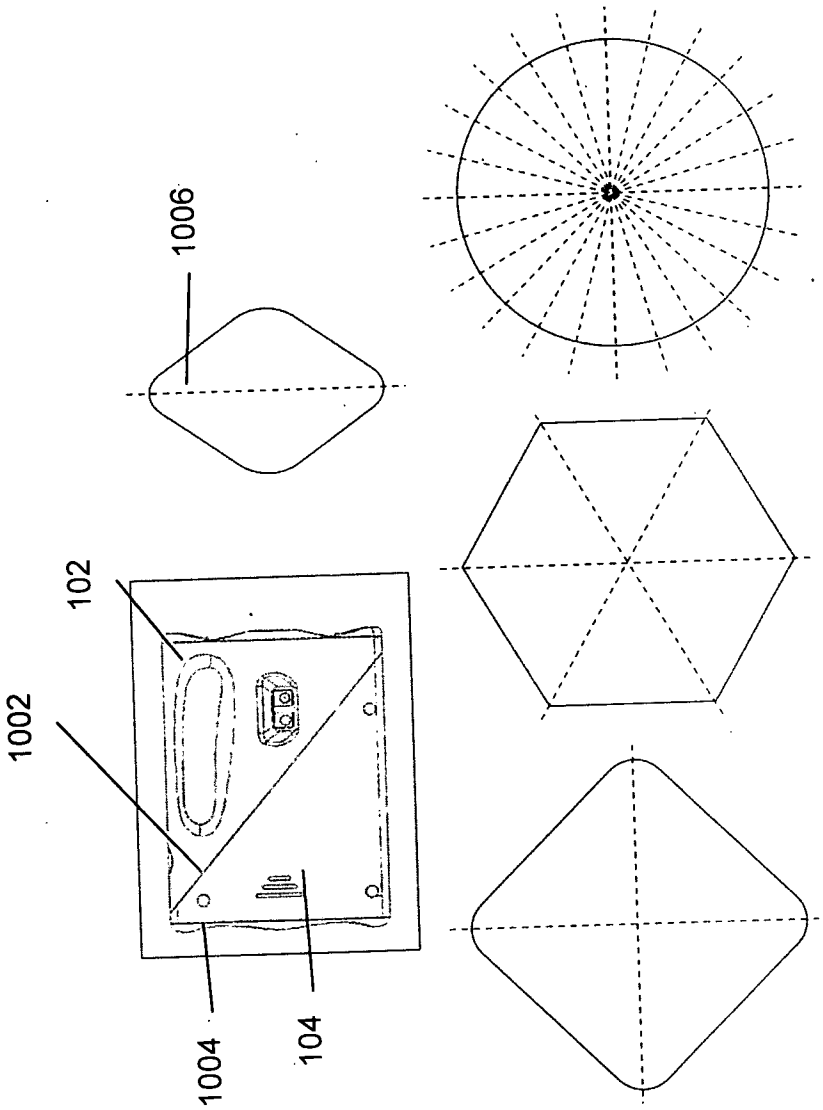

Fig. 10

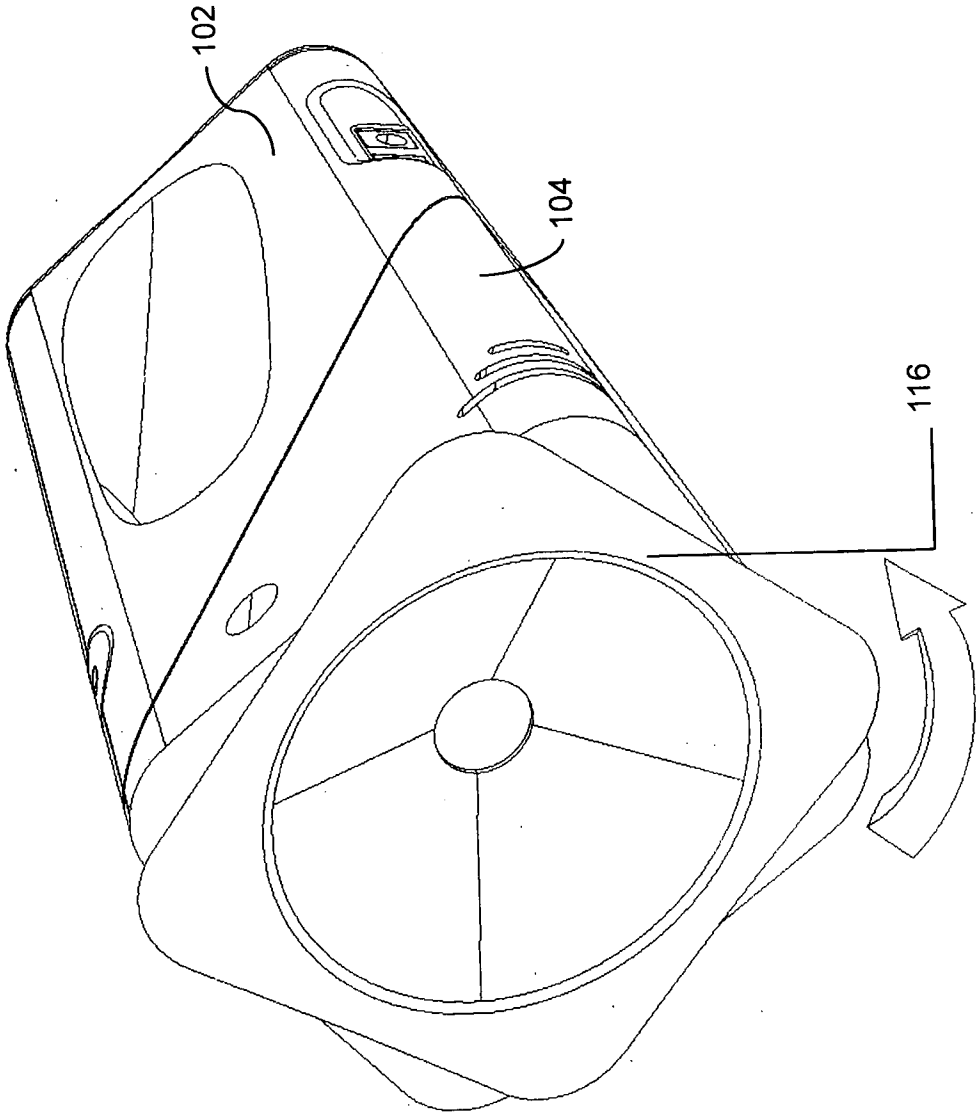

Fig. 11

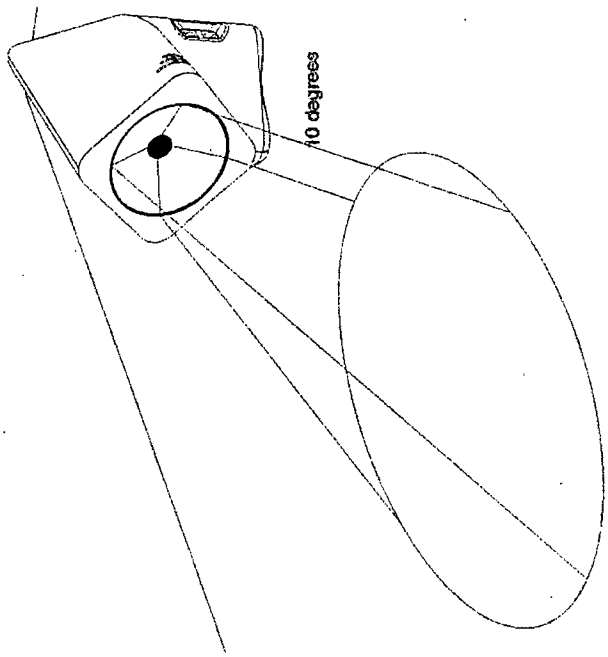

Fig. 12B

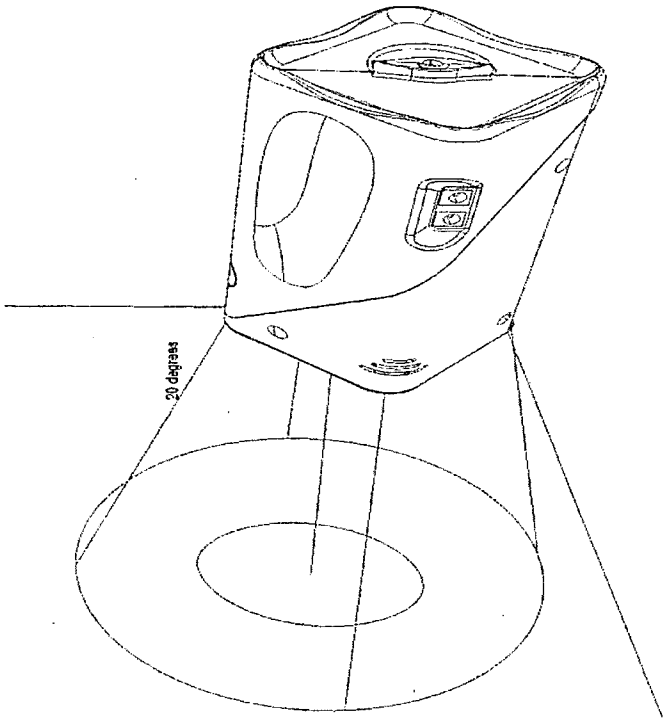

Fig. 12A

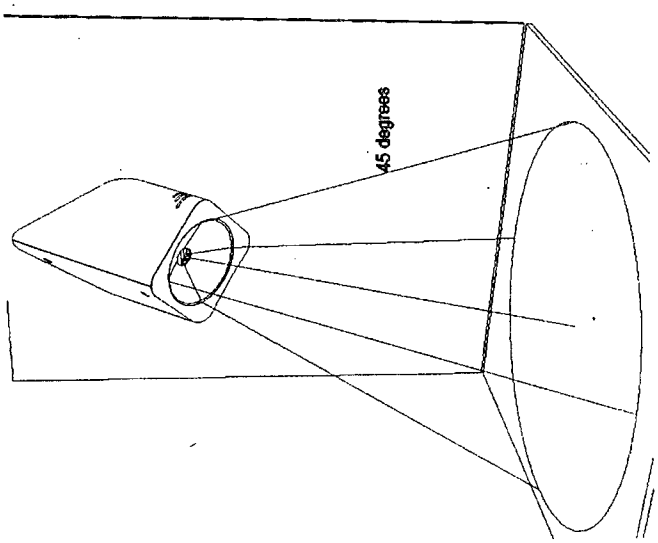

Fig. 12D

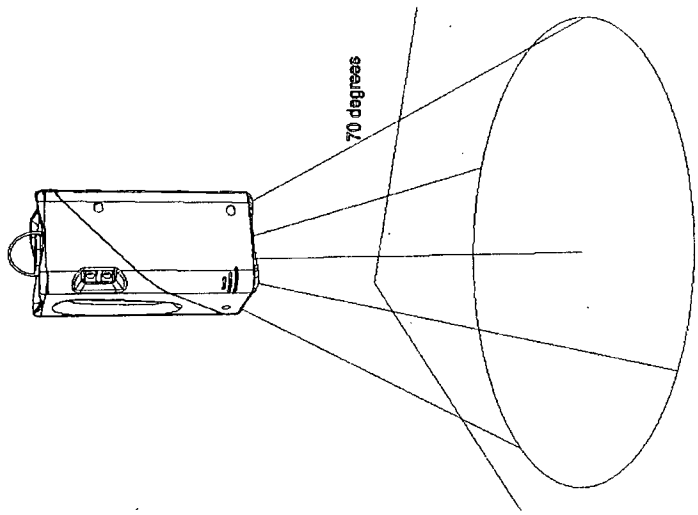

Fig. 12C

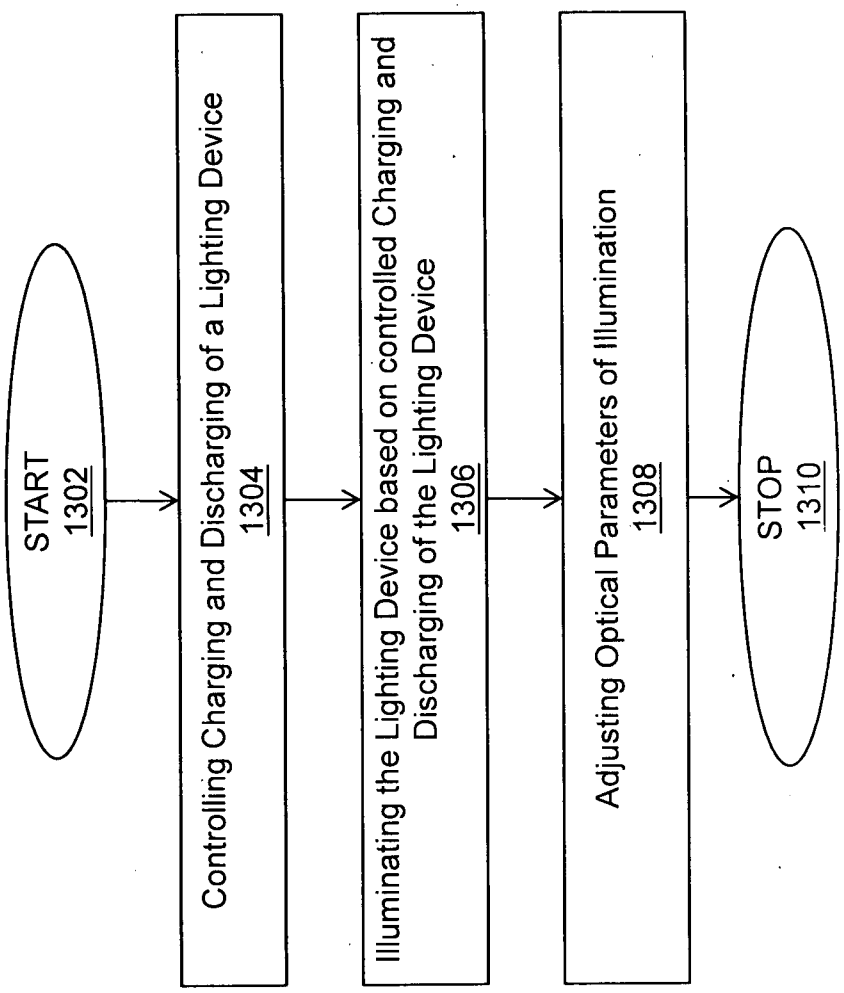
START
1302
Controlling Charging and Discharging of a Lighting Device
1304
Illuminating the Lighting Device based on controlled Charging and Discharging of the Lighting Device
1306
Adjusting Optical Parameters of Illumination
1308
STOP
1310

Fig. 13