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(54) Electrical device with connector protection

(57) A device (100) is normally plugged into a common household wall socket via electrical contact blades (508) which protrude from rear surface (504) of housing (202). In a preferred embodiment of device (100), a recess or cavity (510) is formed in rear surface (504) of housing (202) surrounding electrical contact blades (508). A protector (512) is disposed in cavity (510) and extends the length of blades (508). Protector (512) is collapsible such that it collapses into cavity (510) as blades (508) are inserted into the wall socket. When blades (508) are removed from the wall socket, protector (512) extends from cavity (510) to prevent contact with blades (508) until device (100) is completely removed from the wall socket.

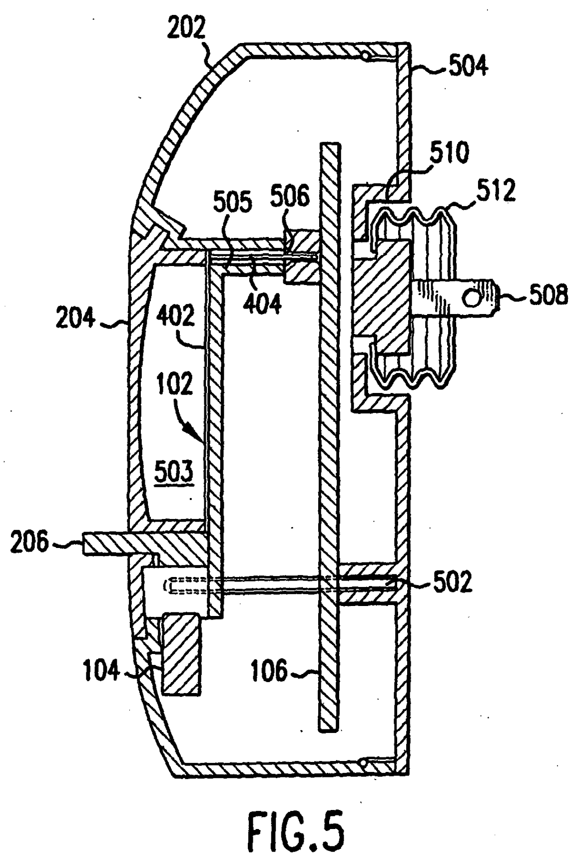

FIG.5

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Description

Background of the Invention

Field of the Invention

[0001] The present invention relates to supplementary lighting devices utilizing an electroluminescent lighting element and a control system. In particular, the present invention relates to an electronic and mechanical control system coupled to an electroluminescent lighting element in order to provide user-adjustable light intensity, automatic output compensation, and an automatic daytime shutoff feature.

Related Art

[0002] Supplementary lighting devices, such as night lights, are well known and commonly used for security and safety purposes. For example, supplementary lighting devices can be used to illuminate passageways and stairways to assist night travel or escape in an emergency. They are also commonly used to relieve night anxiety in children, decrease the probability of burglary, and may provide accent lighting.

[0003] Several different types of lighting elements can be used in supplementary lighting devices. For example, incandescent bulbs, fluorescent bulbs, neon-type gas discharge elements, and electroluminescent (EL) elements are possible lighting elements for supplementary lighting devices. When choosing a lighting element for a supplementary lighting device, several factors such as cost, safety, longevity, and illumination are generally taken into consideration.

[0004] Incandescent lighting elements offer low initial cost and are easily replaceable. Incandescent lighting elements also offer relatively bright light, which is preferable in security type applications. This bright light, however, is not desirable in night light type applications. Further, incandescent lights burn at very high temperatures. In a supplementary lighting type application, the bulbs are generally small such that the glass enclosure is close to the element. These supplementary lighting devices are generally located near the ground, withineasy reach of small children. Therefore, incandescent lights create a safety risk to children. The point source emission of an incandescent light is less preferable than wide area emissions.

[0005] Neon type lighting elements could also be used in supplementary lighting devices. Neon lights are low cost. However, they are generally not user-replaceable, therefore the entire device must be discarded when the lighting element fails. Neon light elements, however, can last several years, although they initially have a precipitous rate of decline of output. Hence, the light they emit for most of their life is only a small fraction of their initial output. Neon lights are also generally dim. Neon lights are cool, thereby presenting less of a safety hazard than incandescent lights.

[0006] Fluorescent lighting elements are also used in supplementary lighting devices. Fluorescent lighting elements have a high initial cost, but can generally be replaced. However, because fluorescent lighting elements are generally difficult to find, supplementary lighting devices using them are generally throw-away type units. Fluorescent lighting elements produce a wide range of colors, and are generally very bright, without being a point source emission. Fluorescent lights are also generally cool, reducing the safety risk associated with hot lighting elements. Fluorescent lighting elements have a relatively long life span, but toward the end of their useful life, they often experience flickering of the lighting element.

[0007] Recently, electroluminescent (EL) lighting elements have become increasingly popular for use in supplementary lighting devices. EL lighting elements provide wide-area emission, are cool (i.e., will not burn to the touch), and have a very long life. Most EL lighting elements used in supplementary lighting devices are connected directly across the 110 volt, AC power from a common household outlet. However, these EL lighting elements have the disadvantage that they are generally dim, are not replaceable, and their intensity fades gradually over their life span. Additionally, EL lighting elements utilized in supplementary lighting devices also generally remain activated even during the day, when their relatively dim light is not required.

[0008] There exist well-known techniques for increasing the light intensity of EL lighting elements above that which is generated by connecting them across 110 AC power lines. Methods for increasing the output of EL lighting elements include altering the voltage, altering the oscillation frequency of the alternating electricity, varying the duty cycle, and/or varying the waveform. However, these methods for increasing the output EL lighting elements still suffer from some of the same drawbacks as conventional EL lighting elements. For example, power boosted EL lighting elements still suffer illumination declines over the life of the light. Further, the amount of light cannot be controlled for specific applications.

[0009] U.S. Pat. No. 5,670,776 discloses an EL wall plate including a light sensor which detects the ambient light level and deactivates the EL panel when the ambient light reaches a certain pre-set level. The user can adjust the light intensity emitted from the EL panel by turning an adjusting stem of a variable resistor that regulates the current flowing through the drive circuit of the EL panel. U.S. Pat. No. 5,361,017 discloses an EL instrument panel with an anti-ageing feature, whereby the amount of light emitted EL lamp is maintained throughout the life of the lamp.

[0010] Supplementary lighting devices, regardless of the lighting element utilized, can also present a safety hazard to children due to their connection to a wall socket. These supplementary lighting devices are generally inserted into wall sockets located near the floor, within easy reach of small children. Children tend to play with the rear of the lighting device, where it is connected to the wall socket. Children can potentially burn themselves if they touch the blades of the supplementary lighting device while it is still connected to the wall socket.

Summary of the Invention

[0011] As can be seen from the description above, there exists a need for a supplementary lighting device which includes the advantages of EL lighting elements while accounting for the disadvantages of such systems.

[0012] The present invention addresses these disadvantages by providing a supplementary lighting device with a user-adjustable dimmer that works in conjunction with a control system to vary the intensity of an EL lighting element.

[0013] The dimmer, preferably mechanically or optically, adjusts the amount of light detected by a light sensor from the EL lighting element. Therefore, by adjusting the dimmer, the amount of light actually detected by the light sensor is artificially varied, and the information from the light sensor is inputted into the control system, which then adjusts the amount of power provided to the EL lighting element in a closed loop feedback system. This arrangement simultaneously allows the control system to adjust for ageing of the EL lighting element.

[0014] Furthermore, the light sensor, or an additional one, may simultaneously detect ambient light, and depending on the amount of ambient light detected, the control system can completely shut off the EL lighting element. This provides a "daytime off' feature which conserves the EL lighting element and improves longevity of the device.

[0015] The EL lighting element is also replaceable. The device is designed such that a guide-way aligns the EL lighting element into mechanical and electrical contact with the control system. The guide-way is the only path from the user-accessible area of the device to the control system electronics. In addition, the device may be designed such that the EL lighting element is not accessible until the device is disconnected from a power source. In particular, the window covering the EL lighting element is coupled to the housing of the supplementary lighting device via a fastener which cannot be uncoupled without first disconnecting the device from the power source. This allows for safe replacement of the EL lighting element.

[0016] Another feature of the present invention is a safety device to prevent electrocution on electrical connection blades of the device while the device is still connected to a power source. In particular, a protector covers the electrical connection blades when the blades are removed from a power source. The protector retracts as the connection blades are inserted into a power source, and extends to cover the connection blades as the connection blades are removed from the power source.

Brief Description of the Figures

[0017] The present invention is described with reference to the accompanying drawings, wherein:

Figure 1 is a functional block diagram of a supplementary lighting device of the present invention;
Figure 2 is an isometric view of a supplementary lighting device of the present invention;
Figure 3A is a front elevation view of a supplementary lighting device of the present invention;
Figure 3B is a front elevation view of a supplementary lighting device of the present invention with the window removed;
Figure 4 is an elevation view of an electroluminescent lighting element;
Figure 5 is a cross-section of the supplementary lighting device of the present invention taken along lines 5-5 of Figure 3A;
Figure 6 is a rear elevation view of a supplementary lighting device of the present invention;
Figure 7 is a side elevation of a supplementary lighting device of the present invention and a conventional wall socket;
Figures 8A and 8B are cross-section views of an embodiment of a dimmer of the present invention;
Figures 9A-9C are isometric views of an alternative embodiment of a dimmer of the present invention;
Figures 10A and 10B are a second alternative embodiment of a dimmer of the present invention; and
Figure 11 is a block diagram of an embodiment of the control system of the present invention.

Detailed Description of the Preferred Embodiments

[0018] A preferred embodiment of the present invention is now described with reference to the figures where like reference numbers indicate identical or functionally similar elements. Also in the figures, the left most digit of each reference number corresponds to the figure in which the reference number is first used. While specific configurations and arrangements are discussed, it should be understood that this is done for illustrative purposes only. A person skilled in the relevant art will recognize that other configurations and arrangements can be used without departing from the spirit and scope of the invention.

[0019] A preferred embodiment of a supplementary lighting device **100** is shown in block form in FIG. 1. FIG. 1 shows that device **100** includes an illumination element **102,** light sensor **104,** a control system **106** and a dimmer **110.** Light sensor **104** and illumination element 102 are both coupled to control system **106.** Control system **106** is preferably an electronic system which receives input from light sensor **104** and controls illumination element **102.** Dimmer **110** is user controlled and varies the output intensity of illumination element **102** working in conjunction with light sensor **104,** illumination element **102** and/or control system **106,** as will be more fully explained below.

[0020] Illumination element **102** is an electroluminescent (EL) lighting element which will be described in more detail below. Light sensor **104** is preferably a light detecting resistor (LDR) and is disposed in device **100** so as to receive input both from illumination element **102** and any ambient light 108. Light sensor **104** can also be configured as two light sensors, one for detecting light emitted from illumination element 102 and one for detecting ambient light **108.** Light sensor **104** can also be a photo-diode, photo-resistor, photo-transistor, or other similar devices which can detect light intensity.

[0021] Control system **106** is designed to generate an adjustable intensity of brightness of illumination element **102.** A preferred method of generating an adjustable intensity ofbrightness uses a combination of an astable oscillating circuit and a voltage multiplying circuit. The frequency of the oscillator is controlled by a pre-set signal as well as input received from light sensor **104.** In the example where light sensor **104** is an LDR, the resistance of the LDR is a function of the amount of light it receives. As the light intensity of ambient light 108 or illumination element **102** increases, the resistance of the LDR increases, thereby slowing the oscillator of control system **106.** As the oscillator slows, the intensity of illumination element **102** decreases. As would be apparent to one skilled in the relevant art, depending on the preset levels of control system **106,** illumination element **102** can be controlled such that when ambient light **108** is detected by light sensor **104** which is consistent with daylight or artificially lighted conditions, the oscillator is slowed such that illumination element **102** is turned "off."

[0022] It can be appreciated that because light sensor **104** also receives light emitting from illumination element **102,** control system **106** acts as an intensity regulator to compensate for the decreased output of EL lighting elements due to ageing. Therefore, with a preset intensity for illumination element **102,** as illumination element ages and its light intensity diminishes, light sensor **104** detects less light emitting from illumination element **102.** This information is transmitted to control system **106,** which increases the power to illumination element **102.** This provides an automatic intensity regulation feature which compensates for the effects of ageing in illumination element **102.**

[0023] FIG. 2 shows a preferred embodiment of supplementary lighting device **100.** Device **100** includes a housing **202,** a window **204,** and a dimmer control **206.** Dimmer control **206** allows the user to vary the pre-set intensity of illumination element **102.** Dimmer control **206** can allow user selection in a variety of ways, as will be more fully described below. FIG. 3A shows a front elevation view of device **100**, showing housing **202,** window **204,** and dimmer control **206.** Light sensor **104** is also shown in phantom. FIG. 3B shows a front elevation of device **100** with window **204** removed. It can be seen that illumination element **102** is located behind window **204.** Light sensor **104** can also been seen in FIG. 3B. Further, aperture 302 is located near light sensor 104 to allow detection of ambient light 108.

[0024] A preferred embodiment of illumination element **102** is shown in FIG. 4. Illumination element **102** includes a substantially planar illumination area **402** and an elongated connection tail **404** extending from illumination area **402.** Conductor strips **406** are disposed on connection tail **404.** Conductor strips **406** connect to control system 106 to provide power to illumination element 102, as will be explained in more detail below.

[0025] FIG. 5 shows a side cross-section view of device **100,** taken along line 5-5 of FIG. 3A. As can be seen, housing **202** and window **204** serve as an enclosure for device **100.** Window **204** is preferably coupled to housing **202** by a fastener 502 located at a rear surface 504 of housing 202. Fastener 502 can be a screw or other similar type of fastening device. Window 204 may also be press fit into housing 202. However, a fastener is a preferred attachment device. In particular, it is preferable that the fastener be located at rear surface **504** of housing **202,** because it requires removal of device **100** from the power source (wall socket) before window **204** can be removed. This safety precaution prevents one from attempting to replace illumination element 102 while device 100 is connected to the power source.

[0026] Window **204** preferably press fits illumination area **402** of illumination element **102** against a flat interior cavity **503** of housing **202.** Elongated tail **404** of illumination element **102** fits into a guide-way **505.** Guide-way **505** leads to connector 506 which connects to control system 106. When elongated tail 404 is inserted through guide-way 505 and into connector 506, conductor strips 406 make contact with connector **506,** such that control system **106** provides power to illumination element **102.** Guide-way **505** is the only path from the user-accessible area behind window **204** to control system **106.**

[0027] Also shown in FIG. 5 is an additional safety feature to prevent minor electrical shocks or bums to small children attracted to supplementary lighting device 100 due to its proximity to the ground and attractive light. Device 100 is normally plugged into a common household wall socket via electrical contact blades 508 which protrude from rear surface 504 of housing 202. In a preferred embodiment of device 100, a recess or cavity 510 is formed in rear surface 504 of housing **202** surrounding electrical contact blades **508.** A protector **512** is disposed in cavity 510 and extends the length of blades **508**. Protector **512** is collapsible such that it collapses into cavity **510** as blades **508** are inserted into the wall socket. When blades **508** are removed from the wall socket, protector **512** extends from cavity **510** to prevent contact with blades **508** until device **100** is completely removed from the wall socket. Protector **512** therefore prevents fingers, screwdrivers, toys, etc., from contacting blades **508** while blades are still in contact with the electrical power source. Protector 512 is preferably made of nonconductive and resilient material such as rubber, and is preferably constructed in the form of bellows, as shown, for easy expansion and contraction.

[0028] FIG. 6 shows an elevation view of rear surface **504** of device **100,** including cavity **510,** electrical connection blades **508,** and fasteners **502.** FIG. 7 shows a side elevation of device 100 coupled to a standard household outlet 702 as a power source.

[0029] Explanation will now be provided for various embodiments of dimmer **110**. Dimmer **110** can vary the illumination intensity of illumination element **102** by directly acting with control system 106, as shown in Figure 1. Preferably, however, dimmer 110 works in conjunction with light sensor 104 to mechanically and/or optically adjust the intensity of light output from illumination element 102 which is detected by light sensor 104. As discussed above, the intensity of light outputted from illumination element 102 is increased or decreased by control system 106 depending on the amount of light detected from light sensor 104. Therefore, dimmer **110** is constructed such that the amount of light detected by light sensor **104** can be artificially adjusted by the user.

[0030] One embodiment of a dimmer **110** is shown in FIGs. 8A and 8B. In this preferred embodiment, dimmer 110 comprises dimmer control 206 constructed as a small wheel which can be adjusted by the user. Light sensor 104 is disposed within wheel dimmer control 206 such that when dimmer control 206 is moved, light sensor **104** is angled towards or away from illumination element **102.** When light sensor **104** is angled away from illumination element **102,** as shown in Fig. 8B, it detects less light from illumination element **102,** thereby causing control system 106 to increase power to illumination element 102, to make increase the intensity of illumination element 102 until the system regulates itself. Conversely, when dimmer control 206 is moved in the other direction, as shown in FIG. 8A, light sensor **104** is angled towards illumination element **102,** thereby detecting more light from illumination element **102.** Consequently, control system **106** reduces power to illumination element **102** which dims the output. It would be apparent to one skilled in the relevant art from this description that light sensor **104** also moves slightly closer to and away from illumination element **102** when dimmer control **206** is moved. This further increases or decreases the amount of light detected by light sensor **104.** It can further be appreciated that if light sensor **104** is moved away from the center of dimmer control **206,** turning dimmer control **206** towards or away from illumination element 102 has a greater effect on the distance that light sensor **104** moves towards or away from illumination element **102.**

[0031] Another embodiment of dimmer **110** is shown in FIGs. 9A-9C. In this embodiment, dimmer **110** comprises dimmer control **206** and a mechanical dimmer element constructed as a sloped section **904.** Dimmer control **206** allows the user to slide sloped section **904** such that light sensor is progressively unblocked (FIG. 9A), partially blocked (FIG. 9B), or completely blocked (FIG. 9C). The amount of sloped section **904** blocking light sensor **104** adjusts the quantity of light detected by light sensor 104. Therefore, if dimmer control 206 is moved such that sloped section 904 completely blocks light sensor 104, light sensor 104 detects no light from illumination element 102, thereby causing control system 106 to increase power to illumination element 102. Similarly, as dimmer control 206 is moved such that sloped section **904** begins to uncover light sensor **104,** light sensor **104** detects more light from illumination element **102.** This causes control system **106** to decrease power to illumination element **102,** thereby decreasing the intensity of light emitted from illumination element **102.**

[0032] FIGs. 10A and 10B show another alternative embodiment of dimmer **110.** In this embodiment, dimmer **110** comprise a dimmer control **206** and a partially mirrored reflective section **1002.** Reflective section **1002** has a sloped reflective surface across its face. Dimmer control **206** allows the user to slide reflective section **1002** such that light emitted from illumination element **102** is variably reflected as a function of the amount of reflective material on the part of reflective section **1002** which is positioned so as to conduct light to light sensor **104** via aperture **1004.** The sliding position of dimmer control **206** therefore adjusts the quantity of light detected by light sensor **104.** As described above, if dimmer control **206** is moved such that reflective section **1002** reflects effectively no illumination from illumination element **102,** light sensor **104** detects no light from illumination element **102,** thereby causing control system **106** to increase power to illumination element **102.** Similarly, as dimmer control **206** is moved such that reflective section **1002** reflects a greater amount oflight from illumination element **102,** light sensor **104** detects more light from illumination element **102.** This causes control system **106** to decrease power to illumination element **102,** thereby decreasing the intensity of light emitted from illumination element **102.**

[0033] Several other possible embodiments of dimmer **110** exist. For example, dimmer control **206** could be coupled to illumination element **102** such that moving dimmer control 206 moves illumination element **102** towards or away from light sensor **104.** This has the same effect as moving light sensor **104** towards or away from illumination element **102,** as described above with respect to FIGs. 8A and 8B. Similarly, an adjustable reflecting device could be positioned between illumination source **102** and light sensor **104.** Dimmer control **206** adjusts the angle or position of the reflecting device such that light sensor **104** detects more or less light from illumination element **102.** Several other similar devices could be designed that increase or decrease the amount of light detected by light sensor **104** from illumination element **102.**

[0034] Note that dimmer **110** can be designed to completely shut off light from illumination source **102** to light detector **104,** as discussed above. This would allow maximum light output from illumination source **102,** and also provides for the greatest amount of variability in output power (i.e., from 0% to 100%). It is also possible to design dimmer **110** such that it cannot completely prevent light from illumination source **102** from reaching light detector **104.** In this embodiment, the system could not produce maximum output of the illumination source, however, it could provide automatic decay adjustment over a longer period of the illumination element's life span. For example, the system could be designed such that when dimmer **110** is adjusted for maximum output, control system **106** would only provide 30% of its maximum power supplying capability to illumination element **102.** Although the maximum light output of such a system is initially less than if 100% of the power supplying capability were utilized, as illumination element **102** ages, the remaining 70% of control system's **106** power supplying capability would steadily come into effect. This would allow illumination element **102** to keep is artificial "maximum" output for a longer period of time.

[0035] An exemplary embodiment of control system **106** is shown in block diagram form in FIG. 11. As would be apparent to one of ordinary skill in the relevant art, this is only a particular embodiment of control system **106.** Several other designs could be utilized to achieve the same or similar result. Control system **106** receives input from AC power source **1102** and from light sensor **104**. AC power is then treated through a rectifier **1104** and a power conditioner **1106.** Rectifier **1104** can be a full wave rectifier, a half wave rectifier, a voltage doubler, or several other common design alternatives. Power conditioner **1106** can be comprised of capacitors, or resistors and capacitors, or inductors and capacitors, or various other common implementations. The purpose of power conditioner **1106** is to provide some amount of stabilization for the rectified power source. An oscillator **1108** receives the rectified and conditioned A/C power. Oscillator **1108** can generate a sinusoidal wave via an RC shift network, a Wien bridge, or an inductor-capacitor arrangement. Alternatively, oscillator **1108** can could generate a modified square wave or a composite wave-form via flip-flops, or an astable network, or via a free-running multi-vibrator, or via several other common circuit implementations, as would be apparent to one of ordinary skill in the relevant art. Oscillator 1108 could also use crystal or ceramic oscillators, or even the output of a microprocessor. Oscillator **1108** can be designed as either a fixed- or variable-controlled oscillator. If the design is a variable-controlled oscillator, then the conditioned signal from light sensor **104** can vary the rate of oscillation as a function of the amount of light sensed, and thus it would affect the intensity of the EL element.

[0036] The output of the oscillator **1108** is then sent to a power adjuster **1110** which conditions the output so that it is within the operating norms of illumination element **102.** The resulting power is then output from control system **106** and applied to the contacts of the EL lighting element, producing an appropriate glow. Power adjuster **1110** can be either a fixed- or variable-controlled regulator design, configured so as to adjust either the voltage or the current (or both). If the design is a variable-controlled regulator, then the conditioned signal from light sensor **104** varies the amount of power output during each oscillation as a function of the amount of light sensed, and thus it would affect the intensity of illumination element **102.**

[0037] The second input into control system **106** is from light sensor **104.** The input from light sensor **104** is conditioned by conditioner **1112** to adjust it to the needs of the other circuitry in control system 106. The output from conditioner **1112** is then applied as a controlling signal for either oscillator **1108** or power adjuster **1110,** or both. Thus, the signal from light sensor **104** affects the intensity of illumination element **102**.

[0038] As the intensity of illumination element **102** varies, the changed intensity from illumination element **102** is detected by light sensor **104** transferred to control system **106,** as described above. This allows for constant adjustment of the intensity of illumination element **102** to a desired setting, even when illumination element **102** begins to fade. As fading begins to occur, light sensor **104** will detect less light from illumination element **102,** and power adjuster **1110** or oscillator **1108** of control system **106** will thereby increase the intensity of illumination element **102** until it reaches the intensity preset by the user using dimmer control **206.** Similarly, as dimmer control **206** is adjusted, light sensor **104** detects less or more light from illumination element **102.** Control system **106** automatically adjusts for this change, and power adjuster **1110** provides more or less power to illumination element **102.** This allows for user control of the intensity of illumination element **102** simply by adjusting dimmer control **206.**

[0039] In addition, when light sensor 104 is designed to detect ambient light **108** from the area surrounding device **100,** an increase in ambient light **108** will cause control system **106** to decrease the intensity of illumination element **102.** Therefore, control system **106** can be designed such that the amount of ambient light **108** detected by light sensor **104** will be sufficient to completely shut off illumination element **102** in daylight type conditions. This provides a "daytime off" feature which extends the serviceable life of illumination element **102.** Similarly, light sensor **104** can be designed such that it receives both ambient light and light emitted from illumination element **102.** Control system 106 can be designed such that the amount of ambient light **108** detected by light sensor **104** exceeds the amount of light detected from illumination element **102.** Further, dimmer **110** can be designed to affect only that amount of light detected by light sensor **104** which is emitted by illumination element **102.** This combination of design element allows the anti-ageing feature, the daytime-off feature, and the adjustable dimmer feature to be efficiently incorporated into a supplementary lighting device.

[0040] While the invention has been particularly shown and described with reference to preferred embodiments thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the invention.

Claims

1. A device comprising:

a housing;
electrical connection blades projecting from a rear surface of said housing; and
an protector surrounding said electrical blades, said protector retracting as said electrical connection blades are inserted into an electrical outlet and extending to surround said electrical connection blades as said electrical connection blades are removed from the electrical outlet.

2. The device of claim 1, wherein said protector is formed as collapsible bellows.

3. The device of claim 1, further comprising a cavity formed in said rear surface of said housing, wherein said protector collapses into said cavity when said electrical connection blades are inserted into the electrical outlet.

4. A device according to any one of claims 1 to 3 in the form of a supplementary lighting device.

5. A supplementary lighting device comprising:

a housing;
a user replaceable electroluminescent lighting element disposed within said housing;
a control system disposed within said housing and coupled to said electroluminescent light element, wherein said control system varies the light intensity of said electroluminescent lighting element; and
a guide-way disposed within said housing, wherein said guide-way aligns and guides said user replaceable electroluminescent lighting element into mechanical and electrical contract with said control system.

6. The supplementary light device of claim 5, further comprising a window coupled to said housing by a fastener, wherein said electroluminescent lighting element is disposed behind said window and said fastener cannot be uncoupled without first remove the device from a power source.

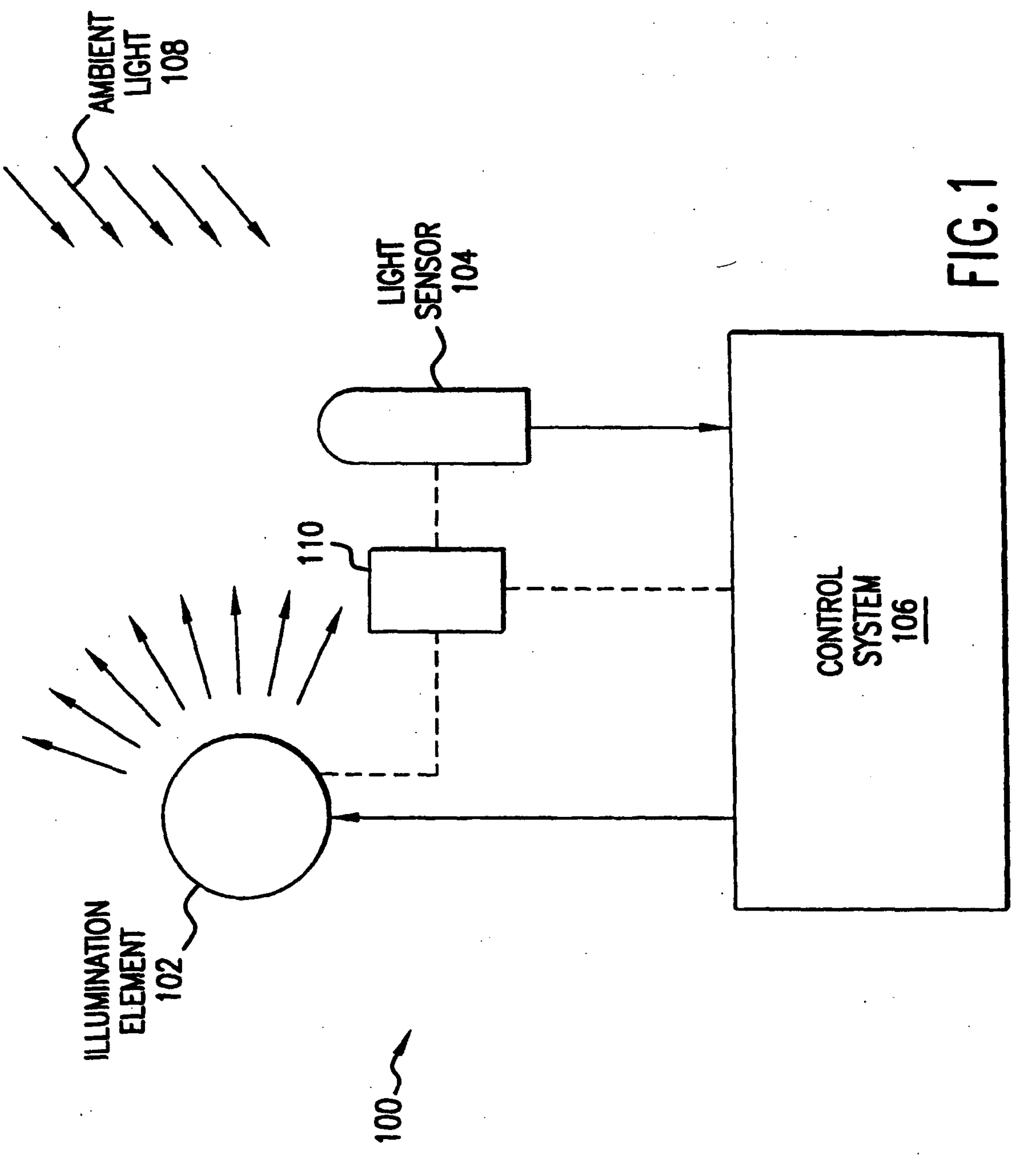

AMBIENT LIGHT 108
LIGHT SENSOR 104
110
ILLUMINATION ELEMENT 102
CONTROL SYSTEM 106
100

FIG.1

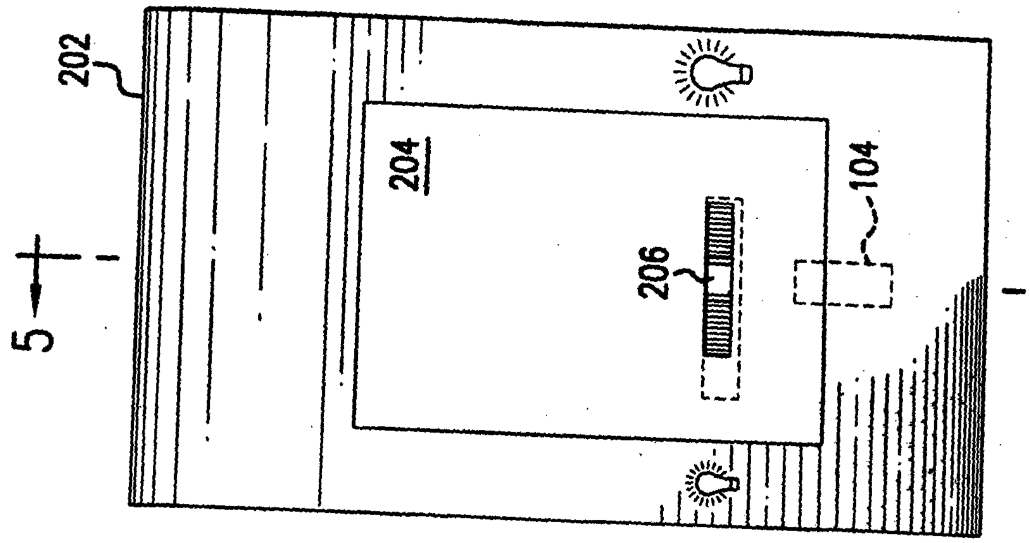


FIG. 3A

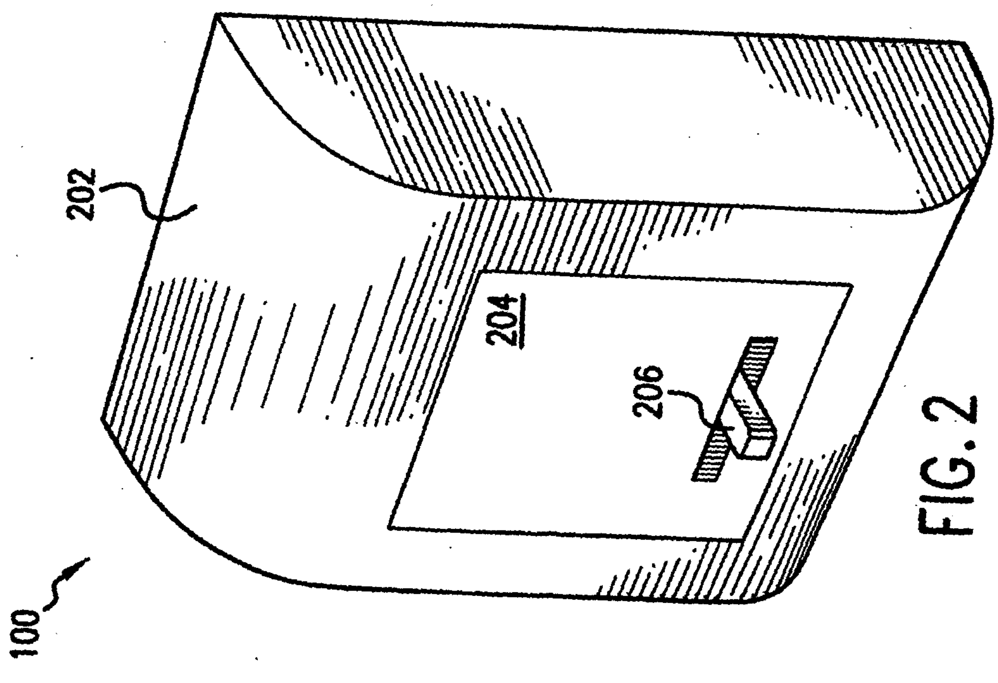


FIG. 2

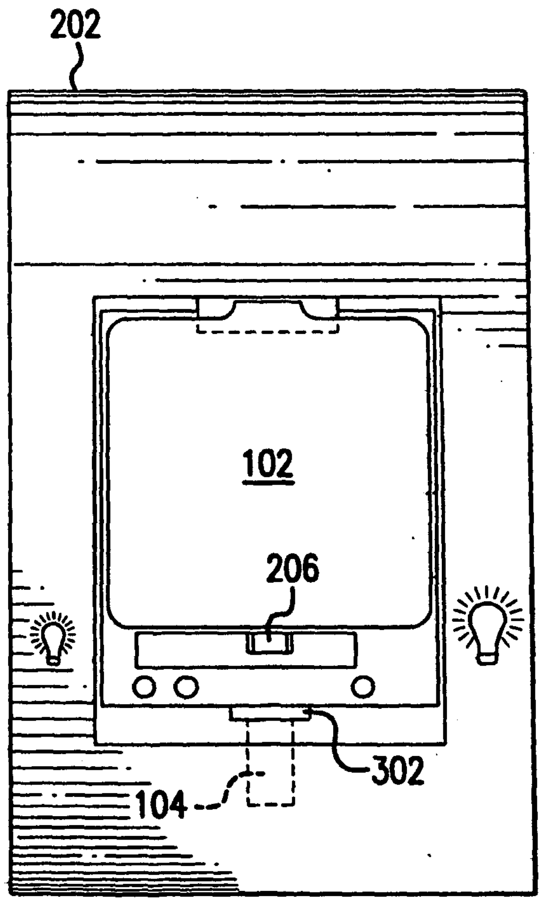


FIG. 3B

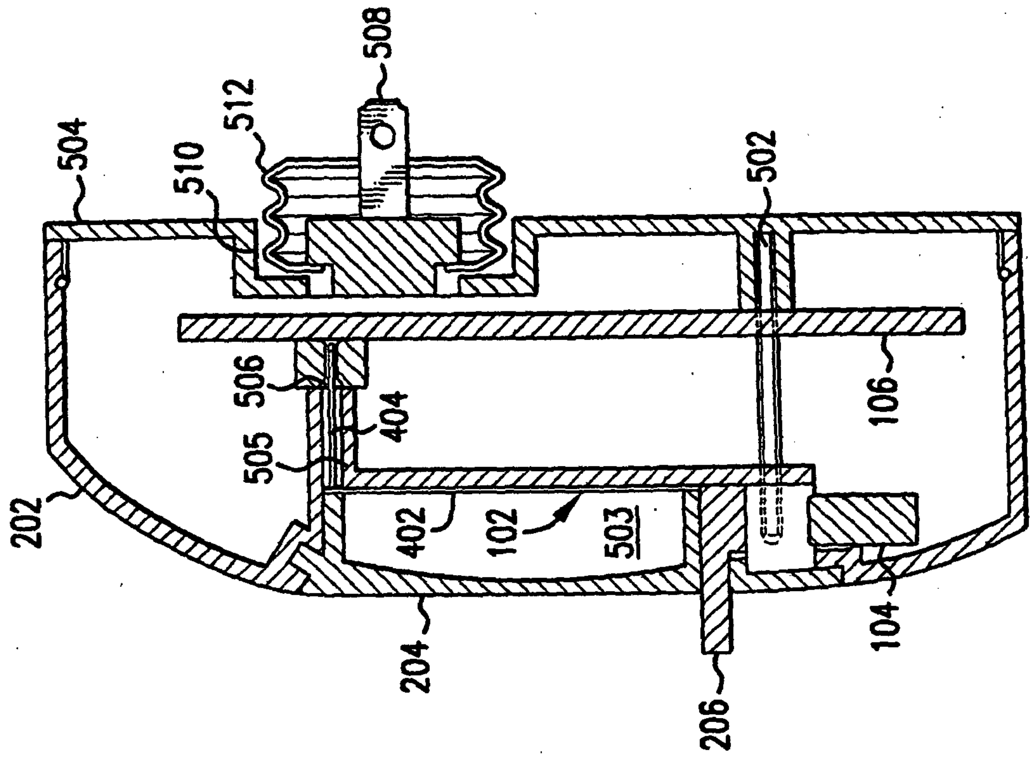

504
510
512
508
502
506
404
505
202
402
102
503
106
204
206
104

FIG.5

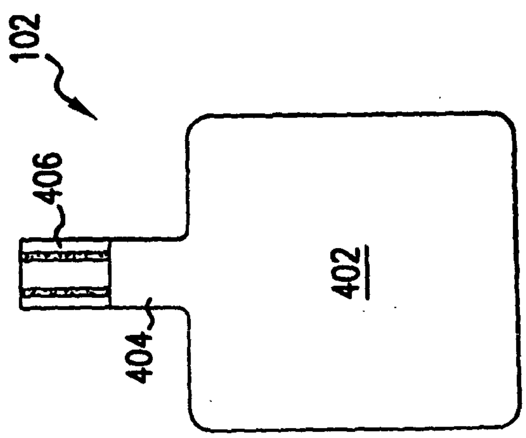

102
406
404
402

FIG.4

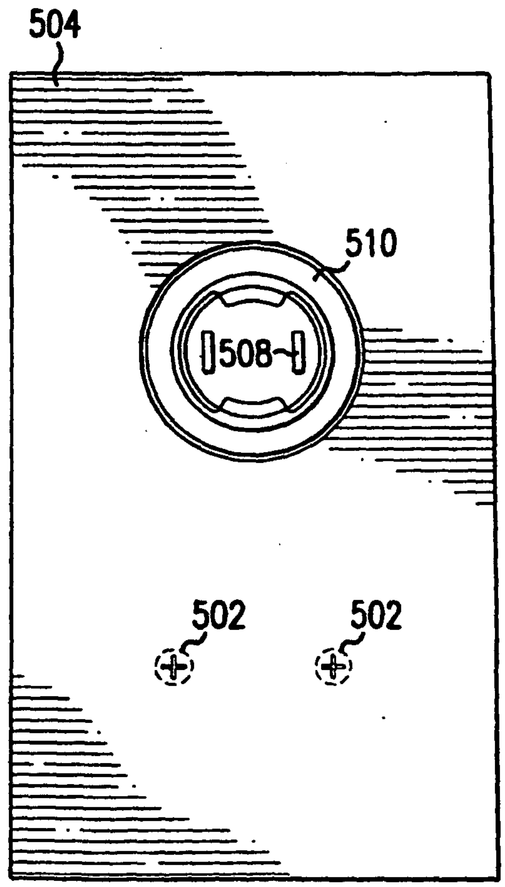


FIG.6

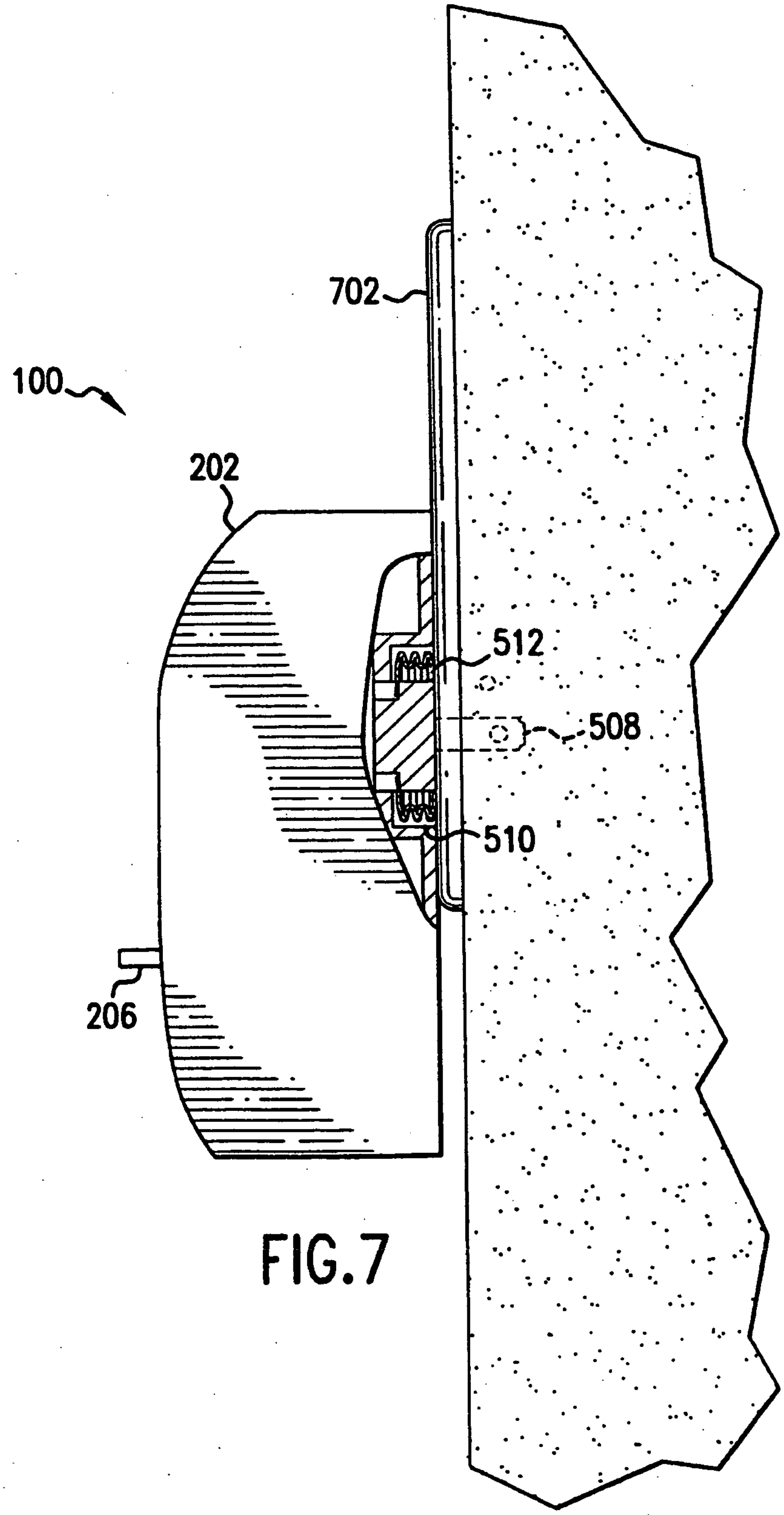


FIG.7

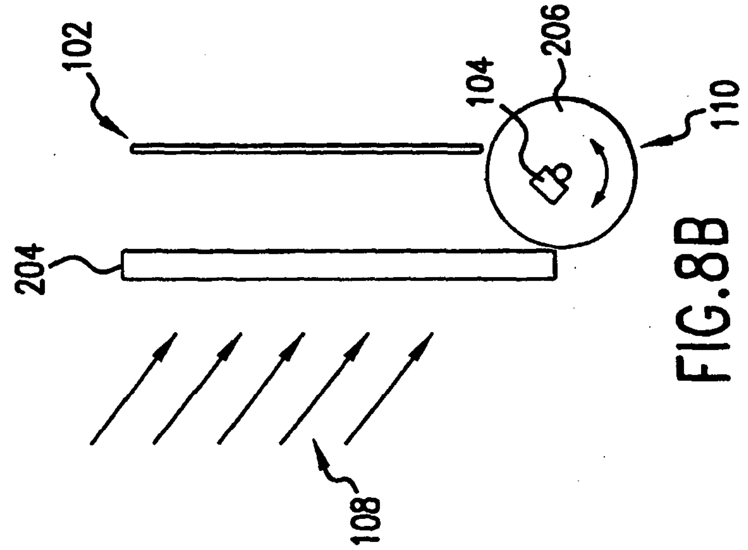


FIG.8B

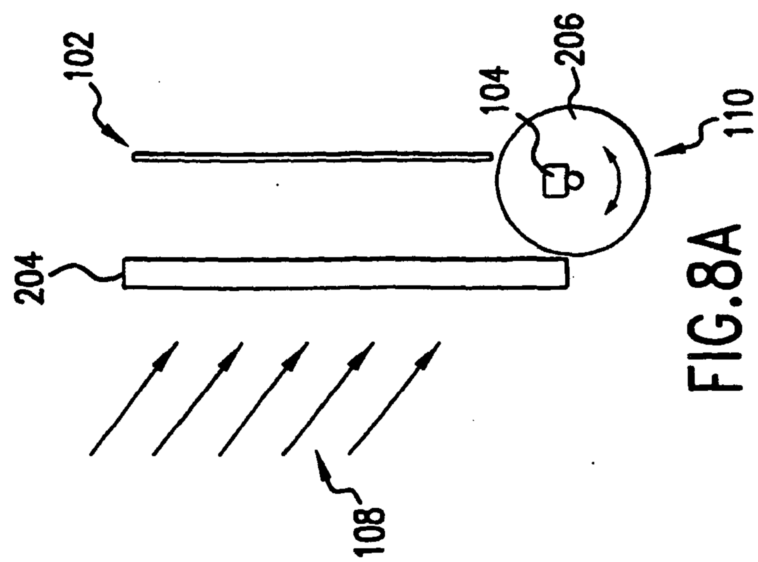


FIG.8A

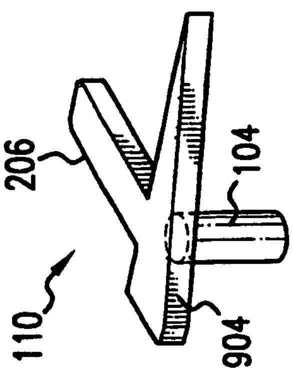


FIG.9C

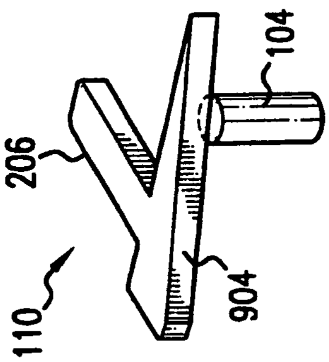


FIG.9B

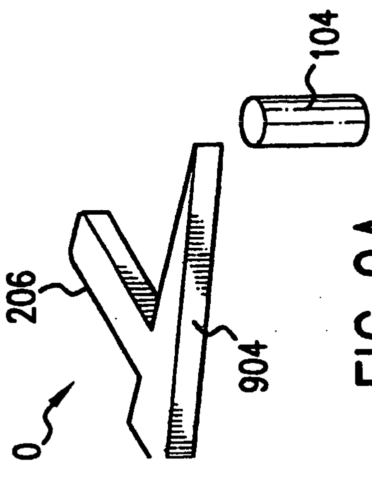


FIG.9A

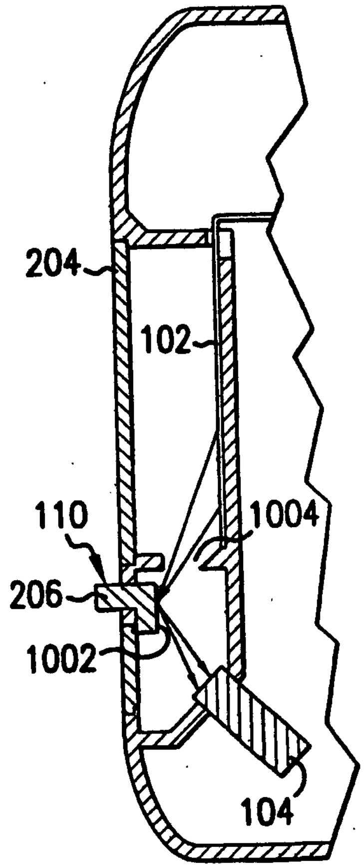
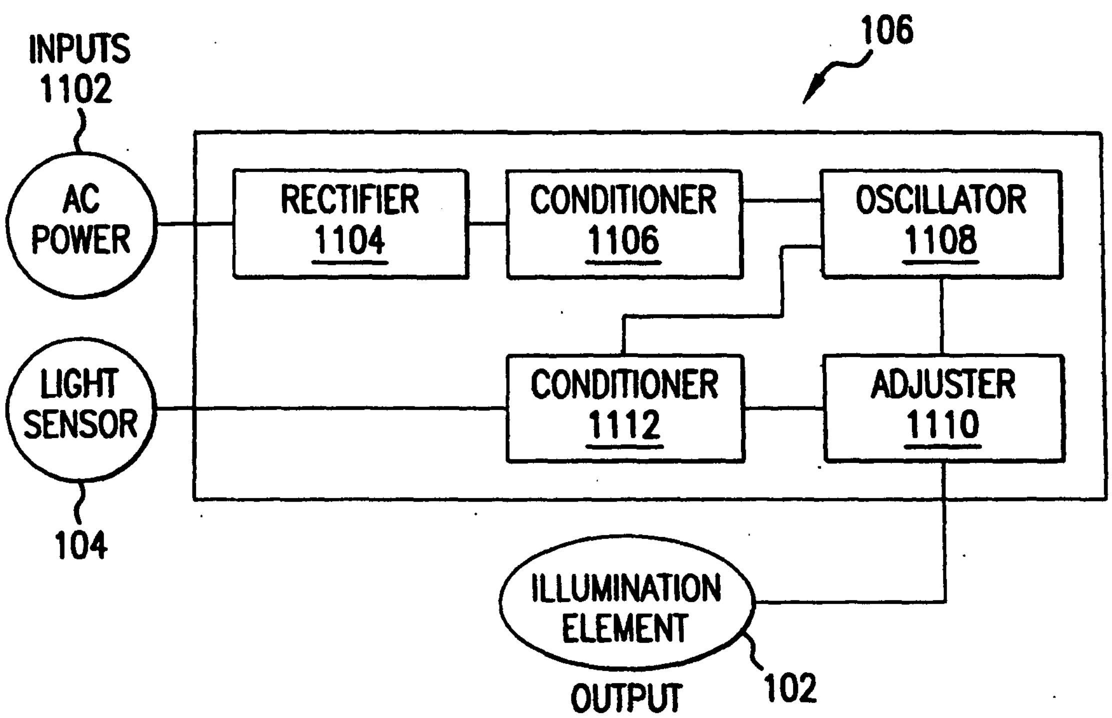


FIG.10A

FIG.10B



INPUTS
1102
AC
POWER
LIGHT
SENSOR
104
106
RECTIFIER
1104
CONDITIONER
1106
OSCILLATOR
1108
CONDITIONER
1112
ADJUSTER
1110
ILLUMINATION
ELEMENT
OUTPUT
102

FIG. 11