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(54) **Intelligent electrical devices**

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US-A- 5 418 433 US-A- 6 037 744
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Description

FIELD OF THE INVENTION

[0001] The present invention relates to new intelligent electrical current switching devices and more particularly, to microchip controlled electrical current switching devices. The invention further relates, in one embodiment, to intelligent batteries having embedded therein a microchip for use with a variety of electrical devices to add heretofore unknown functionality to existing electrical devices. The invention also relates, according to another embodiment, to intelligent hand-held electronic devices, and in a preferred embodiment to hand-held light sources, and more particularly, to flashlights. According to one embodiment of the present invention, the invention relates to intelligent hand-held flashlights having microchip controlled switches wherein said switches can be programmed to perform a variety of functions including, for example, turning the flashlight off after a pre-determined time interval, blinking, or dimming, etc. According to a still further embodiment, the invention relates to low current switches controlled by microchips of the present invention for use in building lighting systems.

BACKGROUND OF THE INVENTION

[0002] In conventional flashlights, manually-operated mechanical switches function to turn the flashlight "on" and "off." When turned "on," battery power is applied through the closed switch to a light bulb, the amount of power then consumed depends on how long the switch is closed. In the typical flashlight, the effective life of the battery is only a few hours at most. Should the operator, after using the flashlight to find his/her way in the dark or for any other purpose, then fail to turn it off, the batteries will, in a very short time, become exhausted. Should the flashlight be left in a turned-on and exhausted condition for a prolonged period, the batteries may then leak and exude corrosive electrolyte that is damaging to the contact which engages the battery terminal as well as the casing of the flashlight.

[0003] When the flashlight is designed for use by a young child the likelihood is greater that the flashlight will be mishandled, because a young child is prone to be careless and forgets to turn the flashlight "off" after it has served its purpose. Because of this, a flashlight may be left "on" for days, if not weeks, and as a result of internal corrosion may no longer be in working order when the exhausted batteries are replaced.

[0004] Flashlights designed for young children are sometimes in a lantern format, with a casing made of strong plastic material that is virtually unbreakable, the light bulb being mounted within a reflector at the front end of the casing and being covered by a lens from which a light beam is projected. A U-shaped handle is attached to the upper end of the casing, with mechanical

on-off slide switch being mounted on the handle, so that a child grasping the handle can readily manipulate the slide actuator with his/her thumb.

[0005] With a switch of this type on top of a flashlight handle, when the slide actuator is pushed forward by the thumb, the switch "mechanically" closes the circuit and the flashlight is turned "on" and remains "on" until the slide actuator is pulled back to the "off" position and the circuit is opened. It is this type of switch in the hands of a child that is most likely to be inadvertently left "on."

[0006] To avoid this problem, many flashlights include, in addition to a slide switch, a push button switch which keeps the flashlight turned on only when finger pressure is applied to the push button. It is difficult for a young child who wishes, say to illuminate a dark corner in the basement of his home for about 30 seconds, to keep a push button depressed for this period. It is therefore more likely that the child will actuate the slide switch to its permanently-on position, for this requires only a momentary finger motion.

[0007] It is known to provide a flashlight with a delayed action switch which automatically turns off after a pre-determined interval. The Mallory U.S. Patent No. 3,535,282 discloses a flashlight that is automatically turned off by a delayed action mechanical switch assembly that includes a compression spring housed in a bellows having a leaky valve, so that when a switch is turned on manually, this action serves to mechanically compress the bellows which after a pre-determined interval acts to turn off the switch.

[0008] A similar delayed action is obtained in a flashlight for children marketed by Playskool Company, this delayed action being realized by a resistance-capacitance timing network which applies a bias to a solid-state transistor switch after 30 seconds or so to cut off the transistor and shut off the flashlight. Also included in the prior art, is a flashlight previously sold by Fisher-Price using an electronic timing circuit to simply turn off the flashlight after about 20 minutes.

[0009] It is also known, *e.g.* as disclosed in U.S. Patent No. 4,875,147, to provide a mechanical switch assembly for a flashlight which includes a suction cup as a delayed action element whereby the flashlight, when momentarily actuated by an operator, functions to connect a battery power supply to a light bulb, and which maintains this connection for a pre-determined interval determined by the memory characteristics of the suction cup, after which the connection is automatically broken.

[0010] U.S. Patent No. 5,138,538 discloses a flashlight having the usual components of a battery, and on-off mechanical switch, a bulb, and a hand-held housing, to which there is added a timing means and a circuit-breaking means responsive to the timing means for cutting off the flow of current to the bulb, which further has a by-pass means, preferably child-proof, to direct electric current to the light bulb regardless of the state of the timing means. The patent also provides for the operation of the device may be further enhanced by making the

by-pass means a mechanical switch connected so as to leave it in series with the mechanical on-off switch. Furthermore, the patent discloses a lock or other "child-proofing" mechanism may be provided to ensure that the by-pass is disabled when the flashlight is switched off.

[0011] Most conventional flashlights, like those described above, are actuated by mechanical push or slide button-type switches requiring, of course, mechanical implementation by an operator. Over time, the switch suffers "wear and tear" which impairs operation of the flashlight as a result of, for example, repeated activations by the operator and/or due to the fact that the switch has been left "on" for a prolonged period of time. In addition, such mechanical switches are vulnerable to the effects of corrosion and oxidation and can cause said switches to deteriorate and to become non-functioning. In addition, these prior art devices having these mechanical switches are generally "dumb," *i.e.* they do not provide the user with convenient, reliable, and affordable functionalities which today's consumers now demand and expect.

[0012] The prior art switches typically provide two basic functions in prior art flashlights. First, the mechanical switches act as actual conductors for completing power circuits and providing current during operation of the devices. Depending upon the type of bulb and wiring employed, the intensity of electrical current which must be conducted by the switch is generally quite high leading to, after prolonged use, failure. Second, these mechanical switches must function as an interface between the device and its operator, *i.e.* the man-machine-interface ("MMI") and necessarily requires repeated mechanical activations of the switch which over time mechanically deteriorate.

[0013] Also, currently the electrical switches used in buildings/houses for control of lighting systems are of the conventional type of switches which must conduct, *i.e.* close the circuit, upon command, thus also providing the MMI. These prior art switches suffer from the same disadvantages as the switches described above in relation to portable electronic devices, like flashlights. Moreover, the switches are relatively dumb in most cases and do not provide the user with a variety of functions, *e.g.* but not limited to timing means to enable a user, for example, a shop owner or home owner to designate a pre-determined shut off or turn on point in time.

[0014] There is a need for inexpensive, reliable, and simple intelligent electronic devices which provide increased functionality and energy conservation.

SUMMARY OF THE INVENTION

[0015] According to one embodiment of the present invention, there is provided a microchip controlled switch to manage both the current conducting functions and the MMI functions in an electronic device, such as a flashlight, on a low current basis *i.e.* without the MMI

device having to conduct or switch high current. According to one aspect of the invention, the MMI functions are controlled by very low current signals, using touch pads, or carbon coated membrane type switches. These low current signal switches of the present invention can be smaller, more reliable, less costly, easier to seal and less vulnerable to the effects of corrosion and oxidation. Moreover, since the switch is a solid state component, it is, according to the present invention, possible to control the functions of the device in an intelligent manner by the same microchip which provides the MMI functions. Thus, by practicing the teachings of the present invention, more reliable, intelligent, and efficient electrical devices can be obtained which are cheaper and easier to manufacture than prior art devices.

[0016] According to another embodiment of the invention, there is provided a microchip which can be embedded in a battery that will lend intelligence to the battery and thus, the device it is inserted into, so that many functions, including but not limited to, delayed switching, dimming, automatic shut off, and intermittent activation may be inexpensively realized in an existing (nonintelligent) product, for example a prior art flashlight.

[0017] According to a further embodiment, the invention provides a power saving microchip which, when operatively associated with an electronic device, will adjust the average electric current through a current switch, provide an on and off sequence which, for example, but not limited to, in the case of a flashlight, can be determined by an operator and may represent either a flash code sequence or a simple on/off oscillation, provide an indication of battery strength, and/or provide a gradual oscillating current flow to lengthen the life of the operating switch and the power source.

[0018] According to one embodiment of the invention, an intelligent flashlight, having a microchip controlled switch is provided comprising a microchip for controlling the on/off function and at least one other function of the flashlight. According to a further embodiment of the invention, an intelligent flashlight having a microchip controlled switch is provided comprising an input means for sending activating/deactivating signals to the microchip, and a microchip for controlling the on/off function and at least one other function of the flashlight. According to a further embodiment of the invention, there is provided an intelligent flashlight having a microchip controlled switch comprising an input means for selecting one function of the flashlight, a microchip for controlling at least the on/off function and one other function of the flashlight, wherein the microchip control circuit may further comprise a control-reset means, a clock means, a current switch, and/or any one or combination of the same.

[0019] According to another embodiment of the invention, there is provided a battery for use with an electrical device comprising a microchip embedded in the battery. According to still a further embodiment of the invention, a battery for use with an electronic device is provided

comprising a microchip embedded in the battery wherein said microchip is adapted such that an input means external to the microchip can select the on/off function and at least one other function of the electronic device.

[0020] According to one embodiment of the present invention, there is provided an intelligent battery for use with an electronic device, the battery having positive and negative terminal ends and comprising a microchip embedded in the battery, preferably in the positive terminal end, for controlling on/off functions and at least one other function of the electronic device.

[0021] According to another embodiment of the invention, there is provided a portable microchip device for use in serial connection with a power source, *e.g.* an exhaustible power source, and an electronic device powered by said source wherein said electronic device has an input means for activating and deactivating said power source, and said microchip comprising a means for controlling the on/off function and at least one other function of the electronic device upon receipt of a signal from said input means through said power source.

[0022] According to a still further embodiment of the invention, there is provided a microchip adapted to control lighting in buildings. According to this embodiment, the normal switch on the wall that currently functions as both a power-switch, *i.e.* conduction of electricity, and MMI can be eliminated, thus eliminating the normal high voltage and high current dangerous wiring to the switch and from the switch to the load or light. Utilizing the present invention, these switches can be replaced with connecting means suitable for low current DC requirements.

[0023] According to another embodiment, the present invention is directed to a battery comprising an energy storage section, a processor, *e.g.* a microchip and first and second terminal ends. The first terminal end being connected to the energy storage section, the second terminal end being connected to the processor, and the processor being connected to the second terminal end and the energy storage section. The processor controls the connection of the second terminal end to the energy storage section.

[0024] According to another embodiment, the present invention provides an electronic apparatus which includes an electrical device, comprising a power supply, an activating/deactivating means, and a processor. The activating/deactivating means is connected to the processor and the processor is connected to the power supply. The processor controls the on/off function of the device and at least one other function of the device in response to signals received from the activation/deactivation means

[0025] The present invention, according to a still further embodiment, provides a flashlight comprising a light source, an energy storage means, a switch means, and a processor means. The switch means being in communication with the processor means and the processor means being in communication with the energy

storage means which is ultimately in communication with the light source. The processor controls the activation/deactivation of the light source and, in some embodiments, further functions of the flashlight, in response to signals received from the switch means.

BRIEF DESCRIPTION OF THE DRAWINGS

[0026]

Figure 1 is a schematic of a device having a microchip controlled push button or sliding type input activation/deactivation switch according to one embodiment of the present invention;

Figure 2 is a block diagram of a microchip for use in association with a push button or sliding input activation/deactivation switch according to one embodiment of the invention;

Figure 3 is a schematic of a second type of intelligent device having a microchip controlled push button or sliding type input activation/deactivation switch according to another embodiment of the invention;

Figure 4 is a schematic of a device having a microchip controlled touch pad or carbon coated membrane activation/deactivation switch according to a still further embodiment of the invention;

Figure 5 is a block diagram of a microchip for use in association with a touch pad or carbon coated membrane activation/deactivation switch according to one embodiment of the invention;

Figure 6 is a schematic of a second type of device having a microchip controlled touch pad or carbon coated membrane activation/deactivation switch according to one embodiment of the invention;

Figure 7 is a schematic of a battery having embedded therein a microchip according to a further embodiment of the invention;

Figure 8A is a block diagram of a microchip for use in a battery according to one embodiment of the present invention;

Figure 8B is a block diagram of a second type of microchip for use in a battery according to another embodiment of the present invention;

Figure 9 is a schematic of a device having a microchip controlled switch according to one embodiment of the invention;

Figure 10 is a schematic of a device having a microchip controlled switch according to one embodiment of the invention;

Figure 11 is a schematic of a device having a microchip controlled switch according to one embodiment of the present invention;

Figure 12 is a schematic of a flashlight having therein a microchip controlled switch according to one embodiment of the present invention;

Figure 13 illustrates a possible position, according to one embodiment of the present invention of a mi-

crochip in a battery;

Figure 14 is a schematic of one embodiment of the present invention of a low current switching device suitable for lighting systems in buildings;

Figure 15 is a block diagram of one embodiment of the present invention, *i.e.* microchip 1403 of Figure 14;

Figure 16 is a flow diagram for a microchip as shown in Figures 4 and 5 for a delayed shut off function embodiment of one embodiment of the present invention; and

Figure 17 is a flow diagram for a microchip as shown in Figures 7 and 8a for a delayed shut off function embodiment of one embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0027] According to one embodiment or aspect of the present invention, and referring to Figure 1, a schematic depiction of main circuit 100 of an electronic device, for example, a flashlight, is provided, wherein the device has a microchip 103 and a microchip controlled input activator/deactivator 102, for example, a push button or sliding switch. Main circuit 100 of the device is powered by a current supplied by power source 101. Power source 101 may be any power source, *e.g.* a DC battery, as is well known to those of ordinary skill in the art. While the following discussion is limited to specific electronic devices, that is flashlights, it is to be understood that the following description is equally applicable to other electronic devices including portable radios, toys, for example but not limited to battery operated cars, boats, planes, and/or other electrically powered toys.

[0028] Referring to Figure 1, when an operator activates input push button or sliding command switch 102 to the "on" position, the microchip 103 receives a signal. Switch 102 is a direct electrical input to microchip 103. Microchip 103 is grounded by grounding means 104. Microchip 103 is in series between power source 101 and load 105. Microchip 103 also transfers sufficient power through means of a current switch (not shown in Figure 1) to load 105 which can be, for example, a resistor-type bulb in the case of a flashlight to provide illumination.

[0029] The microchip 103, and other microchips of the present invention, can have its/their intelligence embedded in combinational or sequential logic, a PLA or ROM type structure feeding into a state machine or a true microcontroller type structure. The memory for the above will normally be non-volatile, but should there be a need for selectable options, EE or flash memory structures may be used.

[0030] The structure and operational parameters of such a microchip 103 are explained in greater detail below with respect to Figure 2. As shown in Figure 1, power is supplied to microchip 103 by power source 101. When an operator activates input switch 102 to the "on" position it represents a command which is communicated to

microchip 103. Input means 102 requires very low current in preferred embodiments. In one embodiment of the invention, microchip control/reset means 201 simply allows the current switch 202 to pass current provided from power source 101 to load 105 in an unimpeded manner when the MMI switch 102 is activated, and, in the case of a flashlight, illumination is obtained. It is important to recognize, however, that it is control circuit 201 which activates current switch 202 upon acting on an input from MMI switch 102. Unlike heretofore known prior art devices, activating switch 102 does not conduct current to load 105, but is only a command input mechanism which can, according to the invention, operate on very low current. For example, according to the invention, touch sensor input or carbon coated membrane type switch devices are preferred.

[0031] If, for example, an emergency notification function is desired, the flashlight may be designed to alternately flash on and off every second. First, the operator activates input 102 into the appropriate position to indicate such a function is desired. During the "on" segment of the flashing routine, control/reset means 201 commands current switch 202 to close and let current flow through to load 105, thereby causing, in the case of a flashlight, the bulb to illuminate. Simultaneously, control/reset means 201 uses the timing means 203 as a clock for timing. After control/reset means 201 determines one second has elapsed, control/reset means 201 instructs current switch 202 to open and interrupt the current flow through to load 105, and bulb illumination is discontinued. It is important to note that both control/reset means 201 and current switch 202 are still active and fully powered; however, current delivery is now latent with respect to load 105. When another second has elapsed, a command is passed from control/reset means 201 which again allows current to be delivered through current switch 202 to load 105, and in the case of a flashlight, bulb illumination is immediately resumed. The device continues an alternating current delivery routine until either the operator switches the setting of the activating input switch 102 to the "off" position, or until the conditions pre-programmed into the microchip, *e.g.* into the control/reset means 201, are satisfied and current delivery is permanently discontinued.

[0032] Similar operating routines can be employed to generate other conspicuous flashing functions such as the generation of the universal distress signal S.O.S. in Morse code. Again, such a function would require that the microchip, *e.g.* control/reset means 201, be pre-programmed with the appropriate code for creating such a signal, and to permit current transmission from switch 202 to load 105 in accordance with the code with the assistance of timing means 203. For example, it may be desirable to have an S.O.S. sequence wherein flashes representing each individual letter are separated by time intervals ranging from one-half (1/2) second to one (1) full second, while the interval between each letter in the code comprises two (2) full seconds. After a certain

number of repetitions of the routine, again determined by the operator or as pre-programmed within the microchip, *e.g.* within the control/reset means 201, the signal is discontinued.

[0033] As shown in Figure 3, it is possible to remove grounding means 104 from main circuit 100. However, it is then necessary to intermittently provide an alternative power source for microchip 103 and to create a virtual ground reference level. A suitable microchip 103 for this configuration is described in greater detail below with respect to Figures 8A and 8B.

[0034] Referring now to Figure 4, utilizing the circuits in the microchip of some embodiments of the present invention, carbon coated membrane or touch pad type switches are preferred. Carbon coated membrane switches and touch pad switches have many advantages over conventional high current switches, such as those currently used in flashlights. According to the present invention, carbon coated membrane type switches, low current type switches, and touch pad type switches can be used which may be smaller, less costly, easier to seal, and less vulnerable to corrosion and oxidation than conventional switches which also transfer energy or current to the load. Moreover, according to one embodiment of the present invention, carbon coated membrane type switches, touch pad switches, or low current type switches can be formed structurally integral with the product, for example, with the casing of a flashlight.

[0035] A block diagram showing microchip 103 for use, in accordance with one embodiment of the present invention, in association with a carbon coated membrane, a touch pad switch, or a low current type switch 106 is now explained in greater detail in respect to Figure 5. According to this one embodiment of the present invention, current switch 202 is powered directly by grounded power source 101. However, output of current from current switch 202 to load 105 is dependent on control/reset means 201. When an operator depresses touch pad 106, carbon coated membrane switch 106 or low current type switch 106, control/reset means 201 allows current switch 202 to flow current through to load 105. However, in more intelligent applications according to certain embodiments of the present invention, control/reset means 201 will coordinate, based on clock and/or timing means 203, to execute timing routines similar to those described above such as, but not limited to, intermittent flashing, the flashing of a conspicuous pattern such as Morse code, dimming functions, battery maintenance, battery strength/level, etc.

[0036] Figure 16 is a flow diagram for a microchip 103 as shown in Figures 4 and 5 and provides a delayed shutoff function. The flow sequence commences at START when the power source 101 is connected to the microchip 103, as shown in Figure 4. The sequence of operation is substantially self-explanatory and is not further elaborated herein.

[0037] As shown in Figure 6, grounding means 104

can be removed from the system as a matter of design choice. A more detailed description of a suitable microchip 103 for this type of configuration is provided below with respect to Figures 8A and 8B.

5 **[0038]** Referring to Figure 7, certain embodiments of the present invention also provide for a battery having a microchip embedded for use in association with an electronic device. As shown, direct current is provided to microchip 103 by power source 101. When activating
10 input switch 102 is closed, current is complete and power is transferred to load 105 at the direction of microchip 103. Microchip 103 embedded in the battery can have any number of intelligent functions pre-programmed therein, such as, for example but not limited to, battery
15 strength monitoring, recharging, adjustment of average current through a current switch, intermittent power delivery sequences, and so on. Examples of suitable microchips 103 for this type of application are discussed below with reference to Figures 8A and 8B.

20 **[0039]** Figures 8A and 8B are block diagrams of two different further embodiments of the present invention. Microchip 803 is especially suitable for applications wherein microchip 803 is not grounded through the body of the electrical device or where a ground cannot otherwise
25 be established because of design considerations. This embodiment is useful to provide sufficient operating power to the microchip and can be achieved by periodically opening and dosing current switch 202 when activation input switch 102 is closed. For example, referring to Figure 8A, when input switch 102 is closed but
30 current switch 202 does not conduct (that is, the switch is open and does not allow current to flow to load 105), then voltage drop over load 105 is zero and in the case of a flashlight, no illumination is provided from the bulb.
35 Instead, the full voltage drop is over current switch 202 and in parallel with the diode 204 and capacitor 205. Once capacitor 205 becomes fully charged, current switch 202 can dose and circuit 803 will be powered by capacitor 205. When circuit 803 is adequately powered,
40 it functions in a manner identical to the circuits described previously with respect to the functions provided by control/reset means 201 and timing means 203.

[0040] When the charging capacitor 205 starts to become depleted, control/reset means 201 will recognize
45 this state and reopen the current switch 202, thus briefly prohibiting the flow of current to load 105, in order to remove the voltage drop from load 105 and allow capacitor 205 to recharge and begin a new cycle. In a flashlight application, the time period wherein current
50 flow from current switch 202 is discontinued can be such that the dead period of the light is not easily or not at all detectable by the human eye. In the case of a high current usage load, such as a flashlight, it means the ratio of the capacitance of the capacitor having to power the
55 microchip and the current consumption of the microchip, must be such that the capacitor can power the microchip for a long time relative to the charging time (202 open). This will enable the flashlight's "off" time to be short and

the "on" time to be long, thus not creating a detectable or intrusive switching of the flashlight to the user.

[0041] Figure 17 is a flow diagram for a microchip as shown in Figures 7 and 8 which also provides a delayed shutoff function. The flow diagram is substantially self-explanatory and the flow sequence commences at START when closure of the switch 102 takes place from an open position.

[0042] According to another embodiment of the present invention, *e.g.* in relation to another product of low current consumption such as a FM radio, the designer may opt for a capacitive (reservoir) device externally to the microchip (see FIG. 11). In this case, the electrical device may function for a time longer than the time required for charging the capacitor (205, 207) which is when the current switch (202) is open and not conducting current.

[0043] According to another embodiment of the present invention, an output may be provided to indicate a condition, *e.g.* a battery is in good or bad condition. It may also be suitable to assist in locating a device, *e.g.* but not limited to a flashlight, in the dark. This may be a separate output pin or may be, according to another embodiment, shared with the MMI switch input. (See FIG. 11) This output or indicator may be a LED. Referring to Figure 11, indicator/output device 1104 may, for example, be an LED. When microchip 1113 pulls the line 1114 to high, the LED 1104 shines. LED 1104 may also shine when switch 1111 is closed by the user. However, since that is only a momentary closure, this should not create a problem.

[0044] According to a further specific embodiment of the invention, referring to Figure 11, microchip 1113 can activate the LED 1104 for a short time, *e.g.* for 100 milliseconds, every 10 seconds. This indication will let potential users know the device is in a good state of functionality and will enable fast location of the device in the dark, *e.g.* in times of emergency. The low duty cycle will also prevent unnecessary battery depletion. With an alternative embodiment of the present invention, Figure 8B illustrates the charging and discharging of capacitor 207 to provide power to circuit 803, wherein the diode and capacitor structure establishes a ground reference for circuit 803.

[0045] Each of the embodiments explained with respect to Figures 8A and 8B are suitable for use, according to the present invention, depending upon the application. Indeed, the embodiments shown in Figures 8A and 8B can be directly embedded into a battery and/or can be separately constructed in another portable structure, *e.g.* but not limited to, in the shape of a disc, about the size of a quarter, to be inserted at the end of the battery between the output means or positive terminal of the battery and the current receiving structure of the electronic device. As described, the embodiments shown in Figures 8A and 8B can be utilized with the prior art high current switches currently being utilized in simple non-intelligent electronic devices, for example flash-

lights, radios and toys. For example, in the case of a portable simple radio without any intelligence, an automatic shut "off" may be achieved by using the intelligent battery or portable microchip of the present invention having a timing function to automatically shut off the radio after a given period of time, *i.e.* after the user is asleep.

[0046] The architecture of the two embodiments of the present invention shown in Figures 8A and 8B provide certain advantages over the simple dumb architecture in current simple electrical devices, for example, flashlights. Due to the unique design of the microchips, as shown in Figures 8A and 8B, after the device (into which the microchip is incorporated) is shut off the microchip remains powered for an additional period of time which allows for said microchip to thus receive additional commands, for example, a second "on" activation within a given period after a first "on" and "off" activation, may be programmed into the microchip (control/reset means) to indicate a power reduction or dimming function or any other function as desired by the designer of said device. This is accomplished by the inventive designs of the present invention without having to utilize substantial energy from what are typically small exhaustible power sources, *e.g.* DC batteries in the case of flashlights.

[0047] According to some embodiments of the present invention, more intelligent devices include many other useful functions pre-programmed within the microchip, *e.g.* in control/reset means 201 and may, *e.g.* be assisted by a timing means 203. Referring to Figure 2, commands can be entered through switch 102 in several different ways. First, various time sequences of closed and open activations may represent different commands. For example, but not limited to, a single closure may instruct microchip 103 to activate current switch 202 continuously for a pre-determined length of time. Alternatively, two successive closures may instruct the microchip 103 to intermittently activate current switch 202 for a pre-determined length of time and sequence, for example, a S.O.S. sequence.

[0048] Secondly, referring to Figure 9, commands may be communicated to microchip 903 through the use of various voltages recognizable by microchip 903 to represent various commands. For example, but not limited to, according to one embodiment of the present invention, it may include multiple activating switches 901 and 902 connecting different voltages to the command input structure of microchip 903.

[0049] Thirdly, referring to Figure 10, commands may be communicated to microchip 1003 through the use of multiple specific switches (1004, 1005, 1006, 1007) which when activated either singularly or in combination is/are recognizable by microchip 1003 as representing various different commands.

[0050] As can be seen by Figure 9, switch 901 and 902 and in Figure 10, switches 1004, 1005, 1006, and 1007, power or ground may be used as a command ref-

erence voltage level. For example, the switches in Figure 10 may be connected to another ground instead of point 1008 depending on the internal structure of the microchip.

[0051] The control/reset means included in the inventive microchips of the present invention may and in some instances, depending upon the application, should in addition to the many possible user functions described above, include means for adjusting the average current over a switch and/or a means for providing a gradual "on"/"off" current flow, so that the operator does not appreciably perceive the increase and decrease in light provided by the device. These features allow for an ongoing variable level of lighting as desired by an operator, and may also lengthen the life span of the activation switch, the bulb, and the power source. Moreover, several functions can now be added to an existing device, like a flashlight, through the use of a battery having embedded therein a microchip according to the present invention.

[0052] In another embodiment of the invention, the microchip is adapted to control lighting in buildings. The normal switch on the wall that currently functions as both a power-switch and MMI can be replaced by a low current switching device like a membrane switch, touch pad or carbon coated switching device. Since very low currents are required by the MMI switch (device) that replaces the normal wall mounted (A/C) switch, it is possible to replace the normal high voltage/current (dangerous) wiring to the switch and from the switch to the lead (light), with connectivity means suitable to the new low current DC requirements. As such, in the case of normal A/C wiring (110V/220V), the dangerous wiring can now be restricted to the roof or ceiling and all switches (MMI's) can inherently be safe. This may make the expensive and regulated safety piping required for the wiring of electricity to wall switches redundant.

[0053] In a specific embodiment, the traditional wiring between the light and the wall switch is replaced by flexible current conducting tape that can be taped from the roof and down the wall to the required location. In another embodiment, the connections can be made by current conducting paint or similar substances. In both cases above, it can be painted over with normal paint to conceal it. This makes changing the location of a wall switch or the addition of another switch very easy.

[0054] The microchip according to the present invention can be located in the power fitting of the light. The microchip having the low current (MMI) input and a power switch to block or transfer the energy to the load (light, fan, air conditioner). It reacts to the inputs received to activate or disable, or control other functions, of whatever device it is controlling.

[0055] The microchip may be adapted to contain the high current/voltage switch or control an external switching device or relay. The microchip may also, as in the other embodiments discussed, have some intelligence to control functions like dimming, delayed shut off, timed

activation/deactivation, timed cycles, flashing sequences and gradual on/off switching. The microchip may also be adopted, as in a specific flashlight embodiment discussed, to provide a location/emergency signal for lighting/flashing an LED.

[0056] Figure 12 shows a flashlight 1200 with a housing 1202, batteries 1204, a bulb 1206, a reflector and lens 1208, a switch 1210 and a microchip 1212. The flashlight has a conventional appearance but its operation is based on the microchip 1212 controlling the operation of the switch 1210, as described hereinbefore.

[0057] Figure 13 illustrates that a battery 1300 with positive and negative terminals 1302 and 1304 respectively, and of substantially conventional shape and size, can be fabricated with an integral microchip 1306, of the type described hereinbefore. Alternatively the microchip can be mounted to the battery, for example by being inserted into a preformed cavity. As the microchip is inserted into the cavity it makes contact with the positive and negative terminals on the battery. The microchip also carries external terminals so that when the battery is inserted into an appliance (not shown) it makes direct contact with corresponding terminals on the appliance so that the microchip is automatically connected in circuit.

[0058] The power input 101 in Figure 14 may be DC (eg 12V) as is commonly used for some lights or A/C (110V or 240V). The device shown as 1403 may be monolithic or be a multichip unit having a relay (solid state or mechanical), a regulator (eg: 110AC volt to 12V DC) and a microchip as discussed in this application.

[0059] In a specific embodiment, Ic pin 1406 can normally be high and a closure of input means 1402, e.g. any of the low current switching devices described above, can be detected as Ic pin 1405 also goes too high. To flash the LED 1404 the microchip will reverse the polarities so that Ic pin 1405 becomes high with regards to Ic pin 1406. During this time, it may not be possible to monitor the closure of the input 1402 switch and the LED 1404 may not shine should the input 1402 be closed. In another embodiment, microchip 1403 is able to detect closure of input 1402 before reversing the voltage polarity as discussed and if it detects closure, it does not proceed with reversing the polarity.

[0060] Reference 1407 denotes an MMI wall unit, and reference 1408 denotes a high voltage roof unit.

[0061] In Figure 15, microchip 1503 does not contain a current switch (eg switch 102) as shown in Figure 2. However, if desired a regulator 1504 and relay 1505 can be integrated into a single monolithic microchip 1503. In case of a 12V (DC) local voltage this may be done in any event unless the current/power considerations are too high to make it practical.

[0062] In another embodiment, the microchips 1403 and 1503 are adapted to receive commands not only via the MMI input but also over the load power (electricity) wiring. This would allow a central controller to send out various commands to various power points, controlled

by a microchip according to this invention, by using address information of specific microchips or using global (to all) commands.

[0063] Referring again to Figure 1, and this is being done purely for the sake of example, the microchip 103 is activated by sliding or activating a switch 102. It is apparent that different switches can be provided for different functions of the microchip. However, in order to enhance the user-friendliness of the device, a single switch may be capable of controlling different functions of an appliance such as a flashlight to which the microchip is mounted.

[0064] Assume for the sake of example that the switch 102 is used to turn the microchip on in the sense that a flashlight is turned on. A switch 110 may then be used at any time to turn the flashlight off, by appropriately controlling operation of the microchip. This is a conventional approach to controlling the operation of the microchip. As an alternative the operation of the switch 102 can be sensed by means of a timing device 112. The timing device is started when the switch 102 is closed and after a short time period, say of the order of 5 seconds or less, which is measured by the timing device, the mode or function of the switch 102 changes so that, upon further actuation of the switch 102, the switch duplicates the function of the switch 110 which can therefore be dispensed with. Thus, initially the switch 102 functions as an on-switch while, a short period after its actuation, the switch 102 functions as an off-switch. It follows that with minor modifications to the circuitry of the microchip a single switch can exhibit multi-mode capabilities with the different modes being distinguished from each other or being exhibited on a time basis or, if necessary, on any other basis.

[0065] Multimode capabilities can for example be incorporated in a microchip wherein the function of a switch is also linked to time. In this sense the word "function" means the action which ensues or results upon the detection of the closure of the switch. For example a single switch may, from an off state of a flashlight, enable (a) the switching on of the flashlight and (b) the selection of one of a number of various modes like dimming level, flashing rate/sequence etc when the switch is closed a number of times.

[0066] If however a certain time is allowed to pass (say five seconds) without any further closure of the switch taking place (indicating a mode has been selected), the function resulting from the next closure may be changed. Thus instead of selecting another mode, the closure may be interpreted as an "off" command.

[0067] In other words a sequence of switch closures within five seconds of each other will continue to step the microchip through a number of predefined modes. However should at any stage a time of more than five seconds elapse between consecutive presses or closures of the switch then the next switch operation will switch the flashlight off rather than stepping the microchip to another mode.

[0068] Clearly these characteristics are not confined to the use of the chip with a flashlight for the chip can be used with other applications to vary the mode of operation thereof in an analogous way. Thus, for the flashlight, the function of the switch will affect the operation of the flashlight in a manner which is dependent on the time period between successive actuations of the switch. More generally, in any electrical device which is controlled by means of the microchip the operation of the device will be regulated by the function which is exhibited by a switch which is in communication with the microchip. The switch function in turn is dependent on the duration of a time period between successive operations of the switch.

[0069] Other modes can also be exhibited by a single switch. For example, depending on requirement, a switch can be used for on and off operation, for initiating the transmission of an emergency signal, for initiating the gradual dimming of a flashlight or the like. The scope of the invention is not limited in this regard.

[0070] While the preferred embodiments of the present invention have been described in detail, it will be appreciated by those of ordinary skill in the art that changes and modifications may be made to said embodiments without, however, departing from the spirit and scope of the present invention as claimed.

Claims

1. A switching system for use with an exhaustible power source and a light source (105), the system including a microchip(103,201,203) and an MMI activation/deactivation interface to select from multiple functions, the interface including an input to the microchip and a switch(102,106, 1210) connected to the input so that the input transmits respective control signals to the microchip indicating switch operations, each of which comprises an activation or deactivation operation, the interface not forming a serial link in the circuit that transfers the energy between the power source and the light source and wherein:

(a) the microchip controls the connection of the power source to the light source in response to respective control signals received through said switch (102);

(b) the microchip is adapted to control the power supplied to the light source(105) to perform one of a plurality of functions including at least a power adjustment function of power supplied to the light source, the selection of which is dependent on the signals received through the switch (102);

(c) the switching system is configured such that the microchip is powered irrespective of the switch(102) position and/or light source(105)

activation status; and

(d) which is **characterized in that** the microchip controls the connection of the power source to the light source, through a power switch (202), **in that** the switch (102, 106, 1210) is a momentary activation switch and **in that** the switching system conforms to at least one of the following configurations:

(i) wherein the microchip(103, 201, 203) is configured such that the switch(102,106) functions initially as an on-switch when the switch is activated, and the microchip then controls a gradual and smooth adjustment of the power supplied to the light source (105), based on the time period of switch (102,106) actuation;

(ii) wherein the microchip is configured such that the switch(102,106) functions initially as an on-switch when the switch is activated, and the microchip(103, 201, 203) then selects a switching off function upon a next operation of the switch, if the preceding time period of switch activation was longer than a predefined period;

(iii) wherein the microchip is configured such that the switch(102, 106) functions initially as an on-switch when the switch is activated, and the microchip then selects a function upon a next operation of the switch based on the time period of switch activation, the time period of the switch de-activation and the number of switch activation signals, received through the MMI interface;

(iv) wherein the switching system comprise an energy storage device(205,207) that powers the microchip(103,803) when the power switch(202) is conducting energy to the light source, and wherein the power source(101) supplies power to the microchip(103,803) when the power switch(202) is not conducting energy to the light source (105); and

(v) wherein the microchip(103, 201,203,1113) is configured to control a find-in-the-dark function by activating an indicator(1104), and wherein said indicator (1104) also gives an indication of the operation of the switch (1111, 102, 106).

2. The switching system of claim 1 wherein the microchip conforms to at least two of the configurations in (d).

3. The switching system of claim 1 or 2 wherein the microchip is configured to control an automatic delayed shut off function in response to an activation signal received through the input to the microchip.

4. The switching system of any one of claims 1 to 3 wherein the microchip is configured to control the find-in-the-dark indicator (1104) after the light source (105) has been turned off.

5. The switching system of any one of claims 1 to 4 wherein the microchip is adapted to control recharging of the power source.

6. The switching system of any one of claims 1 to 5 wherein the microchip (103, 201, 203) has multiple inputs and only one input is connected to the switch (102, 106).

7. The switching system of any one of claims 1 to 5 wherein the microchip (103, 201, 2031) is further configured to have an address and to receive commands from another controller.

8. The switching system of claim 7 wherein the commands include at least an address field.

9. The switching system of claim 8 wherein the address field comprises a global address.

10. The switching system of any one of claims 7 to 9 wherein the commands are received by the microchip over a power line to the microchip.

11. The switching system of claim 1 which conforms to at least the configuration in (d) (iii) and wherein the switching system including the microchip is connected to the power source by only one connection and to the light source by only one connection, wherein the microchip(201,203) is connected in parallel to the power switch (202).

12. The switching system of any one of claims 1 to 11 which conforms at least to the configuration in (d) (iii) and when said microchip power is supplied directly from said power source, the energy storage device is recharged from the power source.

13. The switching system of any one of claims 1 to 12 wherein the switch (106) comprises at least a touch pad or touch sensor.

14. The switching system of any one of claims 1 to 13 wherein the microchip is further configured to control a function to monitor the energy in the power source and to give an indication to a user as to the remaining energy in the power source.

15. The switching system of any one of claims 1 to 14 further comprising a casing(1202) and wherein the light source(1206), the switch(1210), the power switch(1212) and the microchip(1212, 103) are all coupled to said casing, or enclosed in said casing. 5
16. The switching system of any one of claims 1 to 15 wherein the microchip is further configured to control a gradual adjustment of power to the light source such that the change in brightness is smooth. 10
17. The switching system of claim 14 which conforms to at least the configuration in (d) (v) and wherein the find-in-the-dark indicator assists in locating a device with which the switching system is used, or the switch (102, 106), in the dark and wherein the remaining energy indicator and the find-in-the-dark indicator (1104) are combined. 15
18. The switching system of claim 14 or 17 wherein the remaining energy indicator functions when the light source (105) is switched off by a user. 20
19. A switching system according to any one of claims 1 to 18, **characterized in that** the microchip provides a delayed shut-off function. 25
20. A switching system according to any one of claims 1 to 19, **characterized in that** the microchip controls an adjustment of power through an intermittent connection and disconnection of the power source, such that any dead period wherein the power source is not connected to the light source is not easily visible to a user and said microchip also controls the selection of the shut off function by the time duration of said switch de-activation actions and the number of activation signals, received from said switch through the input. 30
21. A switching system according to any one of claims 1 to 20, **characterized in that** the selection of the switch-off function by a user is dependent on the time duration of said switch activation actions, the time duration of said switch de-activation actions and the number of activation signals, received from said switch through the input. 35

Patentansprüche 50

1. Schaltsystem zur Verwendung mit einer erschöpfbaren Energiequelle und einer Lichtquelle (105), wobei das System einen Mikrochip (103, 201, 203) und eine MMI-Aktivierungs-/Deaktivierungsschnittstelle zum Auswählen aus mehreren Funktionen hat, wobei die Schnittstelle einen Eingang zum Mikrochip und einen Schalter (102, 106, 1210) hat, der 55

mit dem Eingang verbunden ist, sodass der Eingang jeweilige Steuersignale zum Mikrochip überträgt, die Schaltvorgänge anzeigen, die jeweils einen Aktivierungs- oder Deaktivierungsvorgang umfassen, wobei die Schnittstelle keine serielle Verbindung in dem Schaltkreis bildet, der die Energie zwischen der Energiequelle und der Lichtquelle überträgt, und wobei:

(a) der Mikrochip die Verbindung der Energiequelle mit der Lichtquelle in Reaktion auf jeweilige durch den genannten Schalter (102) erhaltene Steuersignale steuert;

(b) der Mikrochip die Aufgabe hat, die der Lichtquelle (105) zugeführte Energie zum Durchführen einer von einer Mehrzahl von Funktionen zu regeln, darunter wenigstens eine Energieeinstellungsfunktion der der Lichtquelle zugeführten Energie, deren Auswahl von den durch den Schalter (102) erhaltenen Signalen abhängt;

(c) das Schaltsystem so konfiguriert ist, dass der Mikrochip ungeachtet der Position des Schalters (102) und/oder des Aktivierungsstatus der Lichtquelle (105) mit Energie versorgt wird; und

(d) das **dadurch gekennzeichnet ist, dass** der Mikrochip die Verbindung der Energiequelle mit der Lichtquelle durch einen Leistungsschalter (202) steuert, dass der Schalter (102, 106, 1210) ein Momentaktivierungsschalter ist und dass das Schaltsystem wenigstens einer der folgenden Konfigurationen entspricht:

(i) bei der der Mikrochip (103, 201, 203) so konfiguriert ist, dass der Schalter (102,106) anfänglich als Einschalter funktioniert, wenn der Schalter aktiviert wird, und der Mikrochip dann auf der Grundlage des Zeitintervalls der Betätigung des Schalters (102, 106) eine allmähliche und gleichmäßige Einstellung der der Lichtquelle (105) zugeführten Energie steuert;

(ii) bei der der Mikrochip so konfiguriert ist, dass der Schalter (102,106) anfänglich als Einschalter funktioniert, wenn der Schalter aktiviert wird, und der Mikrochip (103, 201, 203) dann bei einem nächsten Schalterbetrieb eine Ausschaltfunktion auswählt, wenn das vorhergehende Zeitintervall der Schalteraktivierung länger als ein vordefiniertes Intervall war;

(iii) bei der der Mikrochip so konfiguriert ist, dass der Schalter (102, 106) anfänglich als Einschalter funktioniert, wenn der Schalter aktiviert wird, und der Mikrochip dann beim

- nächsten Schalterbetrieb eine Funktion auf der Grundlage des Zeitintervalls der Schalteraktivierung, des Zeitintervalls der Schalterdeaktivierung und der Zahl der Schalteraktivierungssignale, die über die MMI-Schnittstelle erhalten werden, ausgewählt;
- (iv) bei der das Schaltsystem einen Energiespeicherbaustein (205, 207) umfasst, der den Mikrochip (103, 803) mit Energie versorgt, wenn der Leistungsschalter (202) Energie zur Lichtquelle leitet, und bei dem die Energiequelle (101) dem Mikrochip (103, 803) Energie zuführt, wenn der Leistungsschalter (202) keine Energie zur Lichtquelle (105) leitet; und
- (v) bei der der Mikrochip (103, 201, 203, 1113) zum Steuern einer Funktion zum Finden im Dunkeln durch Aktivieren eines Anzeigers (1104) konfiguriert ist und bei der der genannte Anzeiger (1104) auch eine Anzeige des Betriebs des Schalters (1111, 102, 106) liefert.
2. Schaltsystem nach Anspruch 1, bei dem der Mikrochip wenigstens zwei der Konfigurationen in (d) entspricht.
 3. Schaltsystem nach Anspruch 1 oder Anspruch 2, bei dem der Mikrochip konfiguriert ist, um eine automatische verzögerte Ausschaltfunktion in Reaktion auf ein durch den Eingang zum Mikrochip erhaltenes Aktivierungssignal zu steuern.
 4. Schaltsystem nach einem der Ansprüche 1 bis 3, bei dem der Mikrochip konfiguriert ist, um den im Dunkeln zu findenden Anzeiger (1104) nach dem Ausschalten der Lichtquelle (105) zu steuern.
 5. Schaltsystem nach einem der Ansprüche 1 bis 4, bei dem der Mikrochip ausgeführt ist, um das Wiederaufladen der Energiequelle zu steuern.
 6. Schaltsystem nach einem der Ansprüche 1 bis 5, bei dem der Mikrochip (103, 201, 203) mehrere Eingänge hat und nur ein Eingang mit dem Schalter (102, 106) verbunden ist.
 7. Schaltsystem nach einem der Ansprüche 1 bis 5, bei dem der Mikrochip (103, 201, 2031) ferner konfiguriert ist, um eine Adresse zu haben und Befehle von einer anderen Steuereinheit zu erhalten.
 8. Schaltsystem nach Anspruch 7, bei dem die Befehle zumindest ein Adressfeld enthaltenen.
 9. Schaltsystem nach Anspruch 8, bei dem das Adressfeld eine globale Adresse umfasst.
 10. Schaltsystem nach einem der Ansprüche 7 bis 9, bei dem die Befehle vom Mikrochip über eine Energiezuleitung zum Mikrochip erhalten werden.
 11. Schaltsystem nach Anspruch 1, das wenigstens der Konfiguration in (d) (iii) entspricht und bei dem das Schaltsystem mit dem Mikroschalter durch nur eine Verbindung mit der Energiequelle und durch nur eine Verbindung mit der Lichtquelle verbunden ist, wobei der Mikrochip (201, 203) mit dem Leistungsschalter (202) parallel geschaltet ist.
 12. Schaltsystem nach einem der Ansprüche 1 bis 11, das wenigstens der Konfiguration in (d) (iii) entspricht und bei dem, wenn die genannte Mikrochipenergie direkt von der genannten Energiequelle zugeführt wird, der Energiespeicherbaustein von der Energiequelle wiederaufgeladen wird.
 13. Schaltsystem nach einem der Ansprüche 1 bis 12, bei dem der Schalter (106) wenigstens ein Berührungsfeld oder einen Berührungssensor umfasst.
 14. Schaltsystem nach einem der Ansprüche 1 bis 13, bei dem der Mikrochip ferner zum Steuern einer Funktion zum Überwachen der Energie in der Energiequelle und zum Liefern einer Anzeige an einen Benutzer bezüglich der restlichen Energie in der Energiequelle konfiguriert ist.
 15. Schaltsystem nach einem der Ansprüche 1 bis 14, das ferner ein Gehäuse (1202) umfasst und bei dem die Lichtquelle (1206), der Schalter (1210), der Leistungsschalter (1212) und der Mikrochip (1212, 103) alle mit dem genannten Gehäuse verbunden oder in dem genannten Gehäuse eingeschlossen sind.
 16. Schaltsystem nach einem der Ansprüche 1 bis 15, bei dem der Mikrochip ferner zum Steuern einer allmählichen Einstellung der Energie zur Lichtquelle konfiguriert ist, sodass die Helligkeitsänderung gleichmäßig ist.
 17. Schaltsystem nach Anspruch 14, das wenigstens der Konfiguration in (d) (v) entspricht und bei dem der im Dunkeln zu findende Anzeiger beim Auffinden einer Vorrichtung, mit der das Schaltsystem verwendet wird, oder des Schalters (102, 106) im Dunkeln hilft und bei dem die Restenergieanzeige und der im Dunkeln zu findende Anzeiger (1104) miteinander kombiniert sind.
 18. Schaltsystem nach Anspruch 14 oder 17, bei dem der Restenergieanzeiger funktioniert, wenn die

Lichtquelle (105) von einem Benutzer ausgeschaltet wird.

19. Schaltsystem nach einem der Ansprüche 1 bis 18, **dadurch gekennzeichnet, dass** der Mikrochip eine verzögerte Ausschaltfunktion bereitstellt. 5
20. Schaltsystem nach einem der Ansprüche 1 bis 19, **dadurch gekennzeichnet, dass** der Mikrochip eine Energieeinstellung durch ein intermittierendes Verbinden und Trennen der Energiequelle steuert, sodass jedwede Totzeit, während der die Stromquelle nicht mit der Lichtquelle verbunden ist, für einen Benutzer nicht leicht sichtbar ist, und der genannte Mikrochip auch die Auswahl der Ausschaltfunktion durch die Zeitdauer der genannten Schalterdeaktivierungsaktionen und die Anzahl der von dem genannten Schalter durch den Eingang erhaltenen Aktivierungssignale steuert. 10 15 20
21. Schaltsystem nach einem der Ansprüche 1 bis 20, **dadurch gekennzeichnet, dass** die Auswahl der Ausschaltfunktion durch einen Benutzer von der Zeitdauer der genannten Schalteraktivierungsaktionen, der Zeitdauer der genannten Schalterdeaktivierungsaktionen und der Anzahl der Aktivierungssignale, die von dem genannten Schalter durch den genannten Eingang erhalten werden, abhängt. 25 30

Revendications

1. Système de commutation destiné à être utilisé avec une source d'énergie épuisable et une source lumineuse (105), le système comprenant une puce (103, 201, 203) et une interface d'activation / de désactivation de l'IHM pour faire une sélection parmi de multiples fonctions, l'interface comprenant une entrée sur la puce et un commutateur (102, 106, 1210) connecté sur l'entrée de telle manière que l'entrée transmet des signaux de commande respectifs à la puce pour indiquer les opérations du commutateur, opérations comportant chacune une opération d'activation ou de désactivation, l'interface ne formant pas une liaison série dans le circuit qui transfère l'énergie entre la source d'énergie et la source lumineuse et dans lequel : 35 40 45
- (a) la puce commande la connexion entre la source d'énergie et la source lumineuse en réponse aux signaux de commande respectifs reçus par le biais dudit commutateur (102) ; 50
- (b) la puce est adaptée pour commander l'énergie fournie à la source lumineuse (105) afin d'effectuer une fonction parmi une pluralité de fonctions comprenant au moins une fonction d'ajustement de l'énergie fournie à la source lu- 55

mineuse, la sélection de cette fonction étant fonction des signaux reçus par le biais du commutateur (102) ;

(c) le système de commutation est configuré de telle manière que la puce est alimentée quelle que soit la position du commutateur (102) et / ou quel que soit l'état d'activation de la source lumineuse (105) ; et

(d) qui est **caractérisé en ce que** la puce commande la connexion entre la source d'énergie et la source lumineuse, par le biais d'un commutateur marche-arrêt (202), **en ce que** le commutateur (102, 106, 1210) est un commutateur d'activation à rappel et **en ce que** le système de commutation est conforme à au moins l'une des configurations suivantes :

(i) dans lequel la puce (103, 201, 203) est configurée de telle manière que le commutateur (102, 106) fonctionne dans un premier temps en tant que commutateur de mise sous tension quand le commutateur est activé, et la puce commande alors un ajustement progressif et en douceur de l'énergie fournie à la source lumineuse (105), et ce, en fonction de la période d'activation du commutateur (102, 106) ;

(ii) dans lequel la puce est configurée de telle manière que le commutateur (102, 106) fonctionne dans un premier temps en tant que commutateur de mise sous tension quand le commutateur est activé, et la puce (103, 201, 203) sélectionne alors une fonction de mise hors tension lors d'une prochaine opération du commutateur, si la période précédente d'activation du commutateur était supérieure à une période prédéfinie ;

(iii) dans lequel la puce est configurée de telle manière que le commutateur (102, 106) fonctionne dans un premier temps en tant que commutateur de mise sous tension quand le commutateur est activé, et la puce sélectionne alors une fonction lors d'une prochaine opération du commutateur en fonction de la période d'activation du commutateur, de la période de désactivation du commutateur et du nombre de signaux d'activation du commutateur, reçus par le biais de l'interface IHM ;

(iv) dans lequel le système de commutation comporte un dispositif de stockage d'énergie (205, 207) qui alimente la puce (103, 803) quand le commutateur marche-arrêt (202) conduit de l'énergie vers la

- source lumineuse, et dans lequel la source d'énergie (101) fournit de l'énergie à la puce (103, 803) quand le commutateur marche-arrêt (202) ne conduit pas d'énergie à la source lumineuse (105) ; et
- (v) dans lequel la puce (103, 201, 203, 1113) est configurée pour commander une fonction de repérage dans l'obscurité par le biais de l'activation d'un indicateur (1104), et dans lequel ledit indicateur (1104) donne aussi une indication de l'opération du commutateur (1111, 102, 106).
2. Système de commutation selon la revendication 1, dans lequel la puce est conforme à au moins deux des configurations précisées en (d).
 3. Système de commutation selon la revendication 1 ou la revendication 2, dans lequel la puce est configurée pour commander une fonction de fermeture temporisée automatique en réponse à un signal d'activation reçu par le biais de l'entrée sur la puce.
 4. Système de commutation selon l'une quelconque des revendications 1 à 3, dans lequel la puce est configurée pour commander l'indicateur de repérage dans l'obscurité (1104) une fois que la source lumineuse (105) a été éteinte.
 5. Système de commutation selon l'une quelconque des revendications 1 à 4, dans lequel la puce est adaptée pour commander la recharge de la source d'énergie.
 6. Système de commutation selon l'une quelconque des revendications 1 à 5, dans lequel la puce (103, 201, 203) a de multiples entrées et seule une entrée est connectée au commutateur (102, 106).
 7. Système de commutation selon l'une quelconque des revendications 1 à 5, dans lequel la puce (103, 201, 2031) est par ailleurs configurée pour avoir une adresse et recevoir des ordres en provenance d'un autre contrôleur.
 8. Système de commutation selon la revendication 7, dans lequel les ordres comprennent au moins un champ d'adresse.
 9. Système de commutation selon la revendication 8, dans lequel le champ d'adresse comprend une adresse globale.
 10. Système de commutation selon l'une quelconque des revendications 7 à 9, dans lequel les ordres sont reçus par la puce par le biais d'une ligne électrique connectée à la puce.
 11. Système de commutation selon la revendication 1, qui est conforme à au moins la configuration précisée en (d) (iii) et dans lequel le système de commutation comprenant la puce est connecté à la source d'énergie par une seule connexion et à la source lumineuse par une seule connexion, dans lequel la puce (201, 203) est connectée en parallèle au commutateur marche-arrêt (202).
 12. Système de commutation selon l'une quelconque des revendications 1 à 11, qui est conforme à au moins la configuration précisée en (d) (iii) et quand l'énergie de ladite puce est fournie directement en provenance de ladite source d'énergie, le dispositif de stockage d'énergie est rechargé par la source d'énergie.
 13. Système de commutation selon l'une quelconque des revendications 1 à 12, dans lequel le commutateur (106) comporte au moins une touche à effleurement ou un capteur à effleurement.
 14. Système de commutation selon l'une quelconque des revendications 1 à 13, dans lequel la puce est par ailleurs configurée pour commander une fonction destinée à surveiller l'énergie dans la source d'énergie et à donner une indication à un utilisateur quant à l'énergie qui reste dans la source d'énergie.
 15. Système de commutation selon l'une quelconque des revendications 1 à 14, comportant par ailleurs un boîtier (1202) et dans lequel la source lumineuse (1206), le commutateur (1210), le commutateur marche-arrêt (1212) et la puce (1212, 103) sont tous accouplés audit boîtier, ou renfermés dans ledit boîtier.
 16. Système de commutation selon l'une quelconque des revendications 1 à 15, dans lequel la puce est par ailleurs configurée pour commander un ajustement progressif de l'énergie fournie à la source lumineuse de telle manière que le changement au niveau de la luminosité se fait en douceur.
 17. Système de commutation selon la revendication 14 qui est conforme à au moins la configuration précisée en (d) (v) et dans lequel l'indicateur de repérage dans l'obscurité aide à localiser dans l'obscurité un dispositif avec lequel le système de commutation est utilisé, ou le commutateur (102, 106), et dans lequel l'indicateur d'énergie qui reste et l'indicateur de repérage dans l'obscurité (1104) sont combinés.
 18. Système de commutation selon la revendication 14 ou la revendication 17, dans lequel l'indicateur d'énergie qui reste fonctionne lorsque la source lumineuse (105) est éteinte par un utilisateur.

19. Système de commutation selon l'une quelconque des revendications 1 à 18, **caractérisé en ce que** la puce procure une fonction de fermeture temporaire.

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20. Système de commutation selon l'une quelconque des revendications 1 à 19, **caractérisé en ce que** la puce commande un ajustement de l'énergie par le biais d'une connexion et d'une déconnexion par intermittence de la source d'énergie, de telle manière que toute période inerte pendant laquelle la source d'énergie n'est pas connectée à la source lumineuse n'est pas facilement visible pour un utilisateur et **en ce que** la puce commande aussi la sélection de la fonction de fermeture en fonction de la durée des actions de désactivation dudit commutateur et du nombre de signaux d'activation, reçus en provenance dudit commutateur par le biais de l'entrée.

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21. Système de commutation selon l'une quelconque des revendications 1 à 20, **caractérisé en ce que** la sélection de la fonction de mise hors tension par un utilisateur dépend de la durée des actions d'activation dudit commutateur, de la durée des actions de désactivation dudit commutateur et du nombre de signaux d'activation, reçus en provenance dudit commutateur par le biais de l'entrée.

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