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(54) Intelligent switch with touch sensor

Intelligenter Berührungsschalter

Commutateur intelligent avec capteur tactile

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Description

FIELD OF THE INVENTION

[0001] The present invention relates to new intelligent electrical current switching devices and more parzicularly, 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 out to turn it off, the batteries will, in a very short time, become exhausted. Should the flashlight be left in a turaed-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 tens 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 or 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 rurned "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 predetermined 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 or 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 an switches suffer from the same disadvantages as the switches described above in rotation to ponable 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 predetermined 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 the invention, there is provided an electrical device as defined in Claim 1. Preferred embodiments are defined in the dependent claims.

[0016] 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 an devices.

[0017] According to the invention, there is provided a microchip adapted to control lighting in buildings. 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 witing 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.

[0018] The present invention provides an electronic apparatus which includes an electrical device, comprising a power supply, an activaling/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.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019]

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 microchip 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

[0020] 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 folloiving 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.

[0021] 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.

[0022] 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.

[0023] 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.

[0024] 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 controVreset 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.

[0025] 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.

[0026] 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.

[0027] 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.

[0028] 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.

[0029] 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.

[0030] 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.

[0031] 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 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 imelligent functions pre-programmed therein, such as, for example but not limited to, battery 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.

[0032] Figures 8A and 8B are block diagrams of two different further embodiments of the present invention. Micracbip 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 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 current switch 202 does not conduct (that is, the switch is open and does not allow current to flow to toad 105), then voltage drop over load 105 is zero and in the case of a flashlight, no illumination is provided from the bulb. 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 close and circuit 803 will be powered by capacitor 205. When circuit 803 is adequately powered, 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.

[0033] When the charging capacitor 205 starts to become depleted, control/reset means 201 will recognize 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 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 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 Dashlight'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.

[0034] 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.

[0035] 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.

[0036] 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.

[0037] 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.

[0038] 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 flashlights, 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.

[0039] 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.

[0040] 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.

[0041] 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.

[0042] 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.

[0043] 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 reference 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.

[0044] 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.

[0045] 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.

[0046] 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.

[0047] 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.

[0048] 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.

[0049] 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 concrolling the operation of the switch 1210, as described hereinbefore.

[0050] 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.

[0051] 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.

[0052] 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.

[0053] Reference 1407 denotes an MMI wall unit, and reference 1408 denotes a high voltage roof unit.

[0054] 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 rday 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.

[0055] In another embodiment, the microchips 1403 and 1503 are adapted to receive commands not only via the MMI input but also over the toad 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.

[0056] 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 diaerent 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.

[0057] 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 dosed 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. 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.

[0058] 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.

[0059] 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 dosures of the switch then the next switch operation will switch the flashlight off rather than stepping the microchip to another mode.

[0060] 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.

[0061] 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.

[0062] 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 AC power source and a light source (105), the system including a microchip (103, 201, 203) and an MMI activation/deactivation interface to select at least one function from multiple functions to be controlled by the microchip, the interface including at least one switch (102, 106, 1210) connected to at least one input to the microchip so that the input transmits respective control signals to the microchip indicating switch operations, the input and switch not forming a serial link in a circuit that transfers energy between the power source and the light source and wherein:

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

source (105) activation status; and
(b) the switching system is **characterized in that** the MMI interface includes at least a touch sensor type switch and **in that** the switching system conforms to one of the following configurations:

(i) wherein the microchip (103, 201, 203) is configured such that at least one 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, and selects a switching off function if a period of switch deactivation prior to the touch sensor switch operation exceeds a predetermined period;
(ii) wherein the microchip (103, 201, 203) is configured to select a switching off function upon an operation of the touch sensor switch if the preceding time period of switch deactivation was longer than a predefined period, and wherein the microchip is further configured to control the adjustment of power to a light source based on signals received from the MMI interface;
(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 switch deactivation and the number of switch activations signals, received through the touch sensor type MMI interface switch;
(iv) wherein the microchip (103, 201, 203, 1113) is configured to control a find-in-the-dark function by controlling a visible indicator (1104, 1404, 105) and wherein said indicator is activated to at least give an indication of the touch sensor type switch (106,) activation; and
(v) wherein the switching system(803,1408) is connected to the circuit that links the power source(101, 1204) and the light source (105), by only two connections, and includes an energy storage device(205,207) to power at least the microchip(103, 201,203,1503) and the touch sensor MMI interface at certain times and wherein the energy storage device is recharged at certain other times.

2. The switching system of claim 1 wherein the power source is 110/220V AC and the microchip is configured to conform to configuration 1b (i).

3. The switching system of claim 1 wherein the power source is 110/220V AC and the microchip is configured to conform to configuration 1b (ii).

4. The switching system of claim 1 wherein the power source is 110/220V AC and the microchip is configured to conform to configuration 1b (iii).

5. The switching system of claim 1 wherein the power source is 110/220V AC and the microchip is configured to conform to configuration 1 b (iv).

6. The switching system of claim 1 wherein the power source is 110/220V AC and the microchip is configured to conform to configuration 1 b(v).

7. The switching system of claim 1 wherein the power source is 110/220V AC and the microchip is configured to conform at least to two configurations selected from 1b (i) to 1 b (v).

8. The switching system of any one of claims 1 to 7 wherein the microchip is configured to control an automatic delayed shut off function of a function that was activated in response to an activation signal received through the MMI interface.

9. The switching system of any one of claims 1 to 8 wherein the microchip is further configured to control an adjustment of power to the light source based on the number of MMI switch activations.

10. The switching system of any one of claims 1 to 9 wherein the microchip is configured to control a find-in-the-dark indicator when the light source has been turned off by the user.

11. The switching system of any one of claims 1 to 10 wherein conductive paint is used to implement the MMI interface.

12. The switching system of any one of claims 1 to 10 wherein a conducive substance similar to paint, is used to implement the MMI interface.

13. The switching system of any one of claims 1 to 10 wherein flexible tape that includes conductive material Is used to Implement the MMI interface.

14. The switching system of any one of claims 1 to 13 wherein the microchip (103, 201. 2031) is further conflgured to have an address and to transmit or receive commands from a controller,

15. The switching system of claim 14 wherein the commands Include at least an address field.

16. The switching system of claim 15 wherein the ad-

dress field comprises a global address.

17. The switching system of any one of claims 14 to 16 wherofn the commands are transmitted or received by the microchip over a power line.

18. The switching system of any one of claims 1 to 17 wherein the MMI Interface Includes multiple switches.

19. The switching system of claim 18 wherein at least one of the multiple switches are based on structures setacted from the flowing group: carbon coated membrane type switches and push button type switches.

20. The switching system according to any one of claims 1 to 19, wherein a serial switch(102) Is present In the circuit that links the power supply and the light source.

21. The switching system of any one of claims 1 to 20 further comprising a casing (1202) and wherein a light source (105, 1104, 1206, 1404), a switch (1210, 102, 106, 1402), the power switch (202, 1212) and the microchip (1212, 103, 1403, 1503) are all coupled to said casing, and/or enclosed in said casing.

22. The switching system of any one of claims 3 to 7 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.

23. A switching system according to any one of claims 1 to 22, **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 upon a switch activation at least based on the preceding time period of said switch deactivation.

24. The switching system according to any one of claims 1 to 23 wherein the only power source is mains.

25. A switching system according to any one of claims 1 to 17 and 20 to 24 which comprises a single touch sensor type MMI interface or switch.

Revendications

1. Un système de commutation pour utilisation avec une source d'alimentation en courant alternatif et une source de lumière (105), le système comportant une micropuce (103, 201, 203) et une interface d'activation/désactivation homme-machine (IHM) destinée à sélectionner au moins une fonction parmi de multiples fonctions qui doivent être commandées par la micropuce, l'interface comportant au moins un commutateur (102, 106, 1210) connecté à au moins une entrée à la micropuce, de sorte que l'entrée transmette des signaux de commande respectifs à la micropuce indiquant des opérations de commutateur, l'entrée et le commutateur ne formant pas de liaison série dans un circuit qui transfère de l'énergie entre la source d'alimentation et la source de lumière, et dans lequel :

(a) le système de commutation est configuré de sorte que la micropuce soit alimentée sans tenir compte de la position d'opération du commutateur (102) et/ou l'état d'activation de la source de lumière (105) ; et
(b) le système de commutation est **caractérisé en ce que** l'interface IHM comporte au moins un commutateur du type détecteur d'effleurement et **en ce que** le système de commutation se conforme à l'une des suivantes configurations :

(i) dans lequel la micropuce (103, 201, 203) est configurée de sorte qu'au moins un commutateur (102, 106) fonctionne initialement comme commutateur de mise sous tension lorsque le commutateur est activé, et la micropuce commande ensuite un ajustement graduel et uniforme de l'énergie alimentée à la source de lumière (105), sur la base de la durée de l'activation du commutateur (102, 106), et sélectionne une fonction de mise hors tension si une période de désactivation du commutateur préalablement à l'opération du commutateur détecteur d'effleurement dépasse une période prédéterminée ;
(ii) dans lequel la micropuce (103, 201, 203) est configurée pour sélectionner une fonction de mise hors tension lors d'une opération du commutateur détecteur d'effleurement si la durée précédente de désactivation du commutateur a été plus longue qu'une période prédéfinie, et dans lequel la micropuce est en outre configurée pour commander l'ajustement d'énergie destinée à une source de lumière sur la base de signaux reçus depuis l'interface IHM ;
(iii) dans lequel la micropuce est configurée de sorte que le commutateur (102, 106) fonctionne initialement comme commutateur de mise sous tension lorsque le commutateur est activé, et la micropuce sélectionne ensuite une fonction lors d'une opération suivante du commutateur sur la base

de la durée d'activation du commutateur, la durée de désactivation du commutateur et le nombre de signaux d'activation de commutateur, reçus à travers le commutateur d'interface IHM du type détecteur d'effleurement ;

(iv) dans lequel la micropuce (103, 201, 203, 1113) est configurée pour commander une fonction de localisation dans le noir par commande d'un indicateur visible (1104, 1404, 105) et dans lequel ledit indicateur est activé pour au moins procurer une indication de l'activation du commutateur (106) du type détecteur d'effleurement ; et

(v) dans lequel le système de commutation (803, 1408) est connecté au circuit qui lie la source d'alimentation (101, 1204) et la source de lumière (105), par deux connexions uniques, et comporte un dispositif d'accumulation d'énergie (205, 207) pour alimenter au moins la micropuce (103, 201, 203, 1503) et l'interface IHM à détecteur d'effleurement à certains moments et dans lequel le dispositif d'accumulation d'énergie est rechargé à certains autres moments.

2. Le système de commutation selon la revendication 1, dans lequel la source d'alimentation est du courant alternatif à 110/220 V et la micropuce est configurée pour se conformer à la configuration lb(i).

3. Le système de commutation selon la revendication 1, dans lequel la source d'alimentation est du courant alternatif à 110/220 V et la micropuce est configurée pour se conformer à la configuration 1b(ii).

4. Le système de commutation selon la revendication 1, dans lequel la source d'alimentation est du courant alternatif à 110/220 V et la micropuce est configurée pour se conformer à la configuration 1b(iii).

5. Le système de commutation selon la revendication 1, dans lequel la source d'alimentation est du courant alternatif à 110/220 V et la micropuce est configurée pour se conformer à la configuration lb(iv).

6. Le système de commutation selon la revendication 1, dans lequel la source d'alimentation est du courant alternatif à 110/220 V et la micropuce est configurée pour se conformer à la configuration 1b(v).

7. Le système de commutation selon la revendication 1, dans lequel la source d'alimentation est du courant alternatif à 110/220 V et la micropuce est configurée pour se conformer au moins à deux configurations choisies parmi 1b(i) à 1b(v).

8. Le système de commutation selon l'une quelconque des revendications 1 à 7, dans lequel la micropuce est configurée pour commander une fonction de coupure retardée automatique d'une fonction qui a été activée en réponse à un signal d'activation reçu à travers l'interface IHM.

9. Le système de commutation selon l'une quelconque des revendications 1 à 8, dans lequel la micropuce est en outre configurée pour commander un ajustement d'énergie destinée à la source de lumière sur la base du nombre d'activations du commutateur IHM.

10. Le système de commutation selon l'une quelconque des revendications 1 à 9, dans lequel la micropuce est configurée pour commander un indicateur de localisation dans le noir lorsque la source de lumière a été éteinte par l'utilisateur.

11. Le système de commutation selon l'une quelconque des revendications 1 à 10, dans lequel de la peinture conductrice est utilisée pour mettre en oeuvre l'interface IHM.

12. Le système de commutation selon l'une quelconque des revendications 1 à 10, dans lequel une substance conductrice similaire à la peinture est utilisée pour mettre en oeuvre l'interface IHM.

13. Le système de commutation selon l'une quelconque des revendications 1 à 10, dans lequel du ruban flexible qui comporte du matériau conducteur est utilisé pour mettre en oeuvre l'interface IHM.

14. Le système de commutation selon l'une quelconque des revendications 1 à 13, dans lequel la micropuce (103, 201, 2031) est configurée en outre pour avoir une adresse et pour émettre ou recevoir des ordres depuis une unité de commande.

15. Le système de commutation selon la revendication 14, dans lequel les ordres comportent au moins une zone adresse.

16. Le système de commutation selon la revendication 15, dans lequel la zone adresse comprend une adresse globale.

17. Le système de commutation selon l'une quelconque des revendications 14 à 16, dans lequel les ordres sont transmis ou reçus par la micropuce sur un courant porteur.

18. Le système de commutation selon l'une quelconque des revendications 1 à 17, dans lequel l'interface IHM comporte de multiples commutateurs.

19. Le système de commutation selon la revendication

18, dans lequel au moins l'un des multiples commutateurs est basé sur des structures choisies dans le groupe constitué de : commutateurs du type à membrane revêtus de carbone et commutateurs du type à bouton-poussoir.

20. Le système de commutation selon l'une quelconque des revendications 1 à 19, dans lequel un commutateur série (102) est présent dans le circuit qui lie l'alimentation électrique et la source de lumière.

21. Le système de commutation selon l'une quelconque des revendications 1 à 20, comprenant en outre un boîtier (1202) et dans lequel une source de lumière (105, 1104, 1206, 1404), un commutateur (1210, 102, 106, 1402), le commutateur d'alimentation (202, 1212) et la micropuce (1212, 103, 1403, 1503) sont tous couplés audit boîtier, et/ou protégés dans ledit boîtier.

22. Le système de commutation selon l'une quelconque des revendications 3 à 7, dans lequel la micropuce est en outre configurée pour commander un ajustement graduel de l'alimentation destinée à la source de lumière de sorte que le changement de clarté soit uniforme.

23. Un système de commutation selon l'une quelconque des revendications 1 à 22, **caractérisé en ce que** la micropuce commande un ajustement d'énergie par une connexion et une déconnexion intermittentes de la source d'alimentation, de sorte que toute période morte dans laquelle la source d'alimentation n'est pas connectée à la source de lumière ne soit pas facilement visible par un utilisateur et ladite micropuce commande également la sélection de la fonction de coupure lors d'une activation du commutateur au moins sur la base de la durée précédente de ladite désactivation du commutateur.

24. Le système de commutation selon l'une quelconque des revendications 1 à 23, dans lequel la seule source d'alimentation est le réseau électrique.

25. Un système de commutation selon l'une quelconque des revendications 1 à 17 et 20 à 24, qui comprend une seule interface ou commutateur IHM du type détecteur d'effleurement.

Patentansprüche

1. Ein Schaltsystem zur Benutzung mit einer Wechselstromquelle und einer Lichtquelle (105), wobei das System einen Mikrochip (103, 201, 203) und eine MMI Aktivierungs-/Deaktivierungs-Schnittstelle zur Auswahl von mindestens einer Funktion von mehreren von dem Mikrochip zu kontrollierenden Funktionen einschließt, wobei die Schnittstelle mindestens einen Schalter (102, 106, 1210) einschließt, der mit mindestens einem Eingang zu dem Mikrochip verbunden ist, so dass der Eingang die jeweiligen Steuerungssignale an den Mikrochip überträgt, der Schaltoperationen angezeigt, wobei der Eingang und der Schalter keine serielle Verbindung in dem Schaltkreis bilden, welcher Energie zwischen der Energiequelle und der Lichtquelle überträgt, und bei dem:

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

(b) das Schaltsystem **dadurch gekennzeichnet ist, dass** die MMI-Schnittstelle mindestens einen Sensorschalter einschließt und **dadurch**, dass sich das Schaltsystem an eine der folgenden Konfigurationen anpasst:

(i) wobei der Mikrochip (103, 201, 203) so konfiguriert ist, dass mindestens ein Schalter (102, 106) zu Beginn als ein Schalter zum Einschalten funktioniert, wenn der Schalter aktiviert wird und der Mikrochip dann eine allmähliche und gleichmäßige Regulierung der Energie steuert, mit der die Lichtquelle (105) versorgt wird, basierend auf der Dauer der Betätigung des Schalters (102, 106), und er wählt dann eine Ausschalt-Funktion, wenn die Dauer der Deaktivierung des Schalters vor der Betätigung des Sensorschalters einen vorherbestimmten Zeitraum überschreitet;

(ii) wobei der Mikrochip (103, 201, 203) konfiguriert ist, um auf die Betätigung des Sensorschalters eine Ausschalt-Funktion auszuwählen, wenn die vorhergehende Dauer der Deaktivierung des Schalters länger war als der vorherbestimmte Zeitraum, und wobei der Mikrochip ferner konfiguriert ist, um die Regulierung der Energie zu der Lichtquelle zu steuern, basierend auf den Signalen, die von der MMI-Schnittstelle empfangen werden;

(iii) wobei der Mikrochip so konfiguriert ist, dass der Schalter (102, 106) zu Beginn als ein Schalter zum Einschalten funktioniert, wenn der Schalter aktiviert wird, und der Mikrochip dann auf die nächste Betätigung des Schalters eine Funktion auswählt, basierend auf der Dauer der Schalteraktivierung, auf der Dauer der Schalterdeaktivierung und der Anzahl der Schalterbetätigungssignale, die über den Sensor-MMI-Schnittstellen-Schalter empfangen werden;

(iv) wobei der Mikrochip (103, 201, 203, 1113) konfiguriert ist, um eine Funktion zum Finden im Dunkeln zu steuern, indem eine sichtbare Anzeigevorrichtung (1104, 1404, 105) gesteuert wird, und wobei diese Anzeigevorrichtung aktiviert ist., um zumindest die Aktivierung des Sensorschalters (106) anzuzeigen; und

(v) wobei das Schaltsystem (803, 1408) mit dem Schaltkreis verbunden ist, der die Energiequelle (101, 1204) und die Lichtquelle (105) über nur zwei Verbindungen verbindet, und eine Vorrichtung (205, 207) zur Speicherung von Energie einschließt, um zumindest den Mikrochip (103, 201, 203, 1503) und den Sensor-MMI-Schnittstellen-Schalter zu gewissen Zeiten mit Energie zu versorgen und wobei die Vorrichtung zur Speicherung von Energie zu gewissen anderen Zeiten aufgeladen wird.

2. Das Schaltsystem nach Anspruch 1, wobei die Energiequelle eine Wechselstromquelle mit 110/220 V ist und der Mikrochip konfiguriert ist, um sich an die Konfiguration 1b (i) anzupassen.

3. Das Schaltsystem nach Anspruch 1, wobei die Energiequelle eine Wechselstromquelle mit 110/220 V ist und der Mikrochip konfiguriert ist, um sich an die Konfiguration 1b (ii) anzupassen.

4. Das Schaltsystem nach Anspruch 1, wobei die Energiequelle eine Wechselstromquelle mit 110/220 V ist und der Mikrochip konfiguriert ist, um sich an die Konfiguration 1b (iii) anzupassen.

5. Das Schaltsystem nach Anspruch 1, wobei die Energiequelle eine Wechselstromquelle mit 110/220 V ist und der Mikrochip konfiguriert ist, um sich an die Konfiguration 1b (iv) anzupassen.

6. Das Schaltsystem nach Anspruch 1, wobei die Energiequelle eine Wechselstromquelle mit 110/220 V ist und der Mikrochip konfiguriert ist, um sich an die Konfiguration 1b (v) anzupassen.

7. Das Schaltsystem nach Anspruch 1, wobei die Energiequelle eine Wechselstromquelle mit 110/220 V ist und der Mikrochip konfiguriert ist, um sich zumindest an zwei aus 1b (i) bis 1b (v) ausgewählte Konfigurationen anzupassen.

8. Das Schaltsystem nach einem der Ansprüche 1 bis 7, wobei der Mikrochip so konfiguriert ist, um eine automatische Verzögerungs-Abschalt-Funktion einer Funktion zu steuern, die in Erwiderung auf ein über die MMI-Schnittstelle empfangenes Aktivierungssignal aktiviert wurde.

9. Das Schaltsystem nach einem der Ansprüche 1 bis 8, wobei der Mikrochip ferner konfiguriert ist, um die Regulierung der Energie zu der Lichtquelle zu steuern, basierend auf der Anzahl der MMI-Schalter-Aktivierungen.

10. Das Schaltsystem nach einem der Ansprüche 1 bis 9, wobei der Mikrochip konfiguriert ist, um eine Anzeigevorrichtung zum Finden im Dunkeln zu steuern, wenn die Lichtquelle von dem Benutzer ausgeschaltet wurde.

11. Das Schaltsystem nach einem der Ansprüche 1 bis 10, wobei zur Implementierung der MMI-Schnittstelle leitfähige Farbe verwendet wird.

12. Das Schaltsystem nach einem der Ansprüche 1 bis 10, wobei zur Implementierung der MMI-Schnittstelle eine leitfähige Substanz verwendet wird, die so ähnlich wie Farbe ist.

13. Das Schaltsystem nach einem der Ansprüche 1 bis 10, wobei zur Implementierung der MMI-Schnittstelle ein flexibles Band verwendet wird, das leitfähiges Material einschließt.

14. Das Schaltsystem nach einem der Ansprüche 1 bis 13, wobei der Mikrochip (103, 201, 2031) ferner konfiguriert ist, um eine Adresse zu besitzen und um Befehle an ein Steuergerät zu übertragen und von diesem zu empfangen.

15. Das Schaltsystem nach Anspruch 14, wobei die Befehle zumindest ein Adressfeld einschließen.

16. Das Schaltsystem nach Anspruch 15, wobei das Adressfeld eine globale Adresse umfasst.

17. Das Schaltsystem nach einem der Ansprüche 14 bis 16, wobei die Befehle über eine Stromleitung von dem Mikrochip übertragen oder empfangen werden.

18. Das Schaltsystem nach einem der Ansprüche 1 bis 17, wobei die MMI-Schnittstelle Parallelschalter einschließt.

19. Das Schaltsystem nach Anspruch 18, wobei mindestens einer der Parallelschalter auf einer Struktur basiert, die aus der folgenden Gruppe ausgewählt ist: karbonbeschichtete Folienschalter und Tastschalter.

20. Das Schaltsystem nach einem der Ansprüche 1 bis 19, wobei ein serieller Schalter (102) in dem Schaltkreis vorhanden ist, der die Energieversorgung mit der Lichtquelle verbindet.

21. Das Schaltsystem nach einem der Ansprüche 1 bis 20, das ferner ein Gehäuse (1202) umfasst, und wobei die Lichtquelle (105, 1104, 1206, 1404), ein Schalter (1210, 102, 106, 1402) der Netzschalter (202, 1212) und der Mikrochip (1212, 103, 1403, 1503) alle mit diesem Gehäuse verbunden sind und/ oder in diesem Gehäuse eingeschlossen sind.

22. Das Schaltsystem nach einem der Ansprüche 3 bis 7, wobei der Mikrochip ferner konfiguriert ist, um eine allmähliche Regulierung der Energie für die Lichtquelle zu steuern, so dass der Wechsel der Helligkeit gleichmäßig ist.

23. Ein Schaltsystem nach einem der Ansprüche 1 bis 22, **dadurch gekennzeichnet, dass** der Mikrochip die Regulierung der Energie über eine diskontinuierliche Verbindung und Trennung mit der Energiequelle steuert, so dass der tote Zeitraum, in der die Energiequelle nicht mit der Lichtquelle verbunden ist, von dem Benutzer nicht leicht sichtbar ist, und **dadurch**, dass dieser Mikrochip ebenso die Auswahl der Abschaltfunktion auf die Aktivierung des Schalters hin steuert, zumindest basierend auf der vorhergehenden Dauer dieser Deaktivierung des Schalters.

24. Das Schaltsystem nach einem der Ansprüche 1 bis 23, wobei die einzige Energiequelle das Stromnetz ist.

25. Ein Schaltsystem nach einem der Ansprüche 1 bis 17 und 20 bis 24, das eine einzige Sensor-MMI-Schnittstelle oder Schalter umfasst.

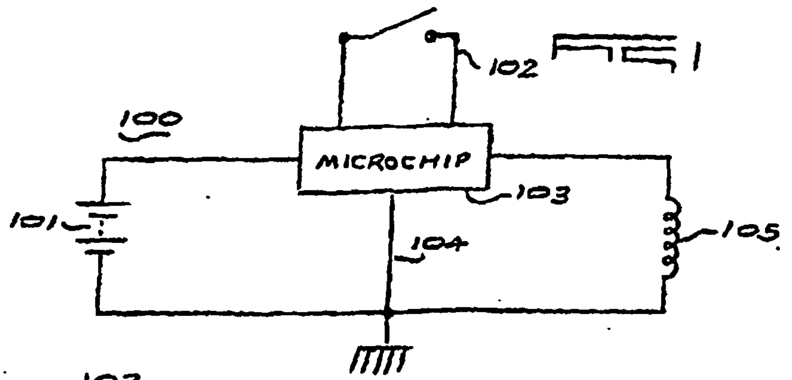


FIG 1

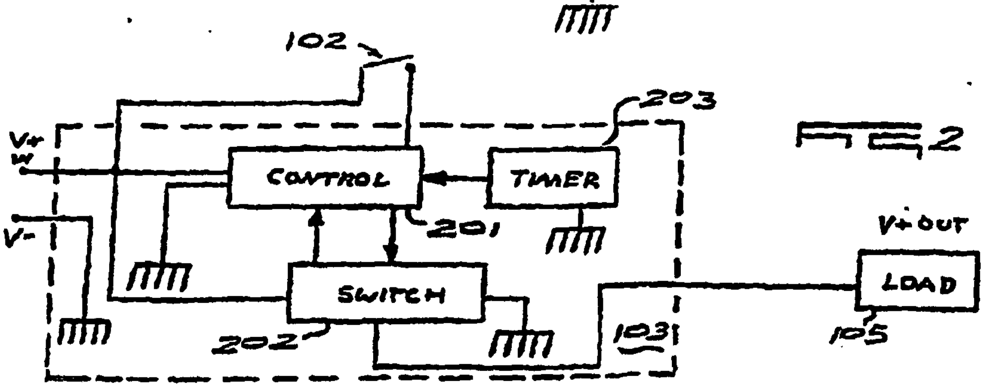


FIG 2

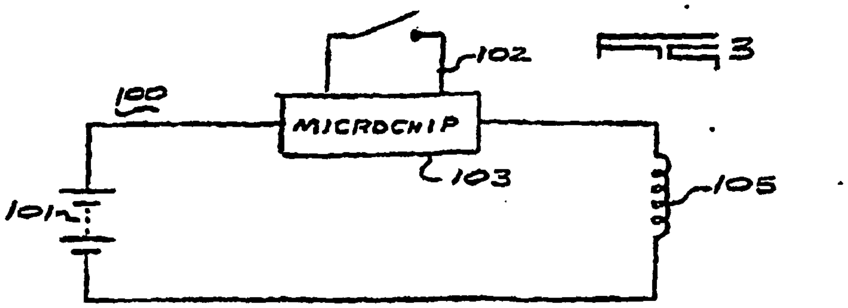


FIG 3

FIG 4

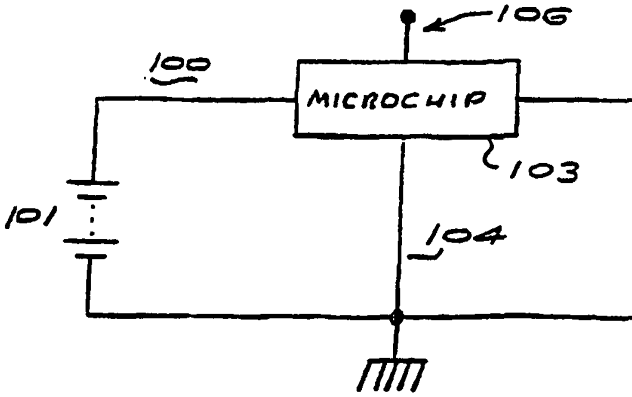


FIG 5

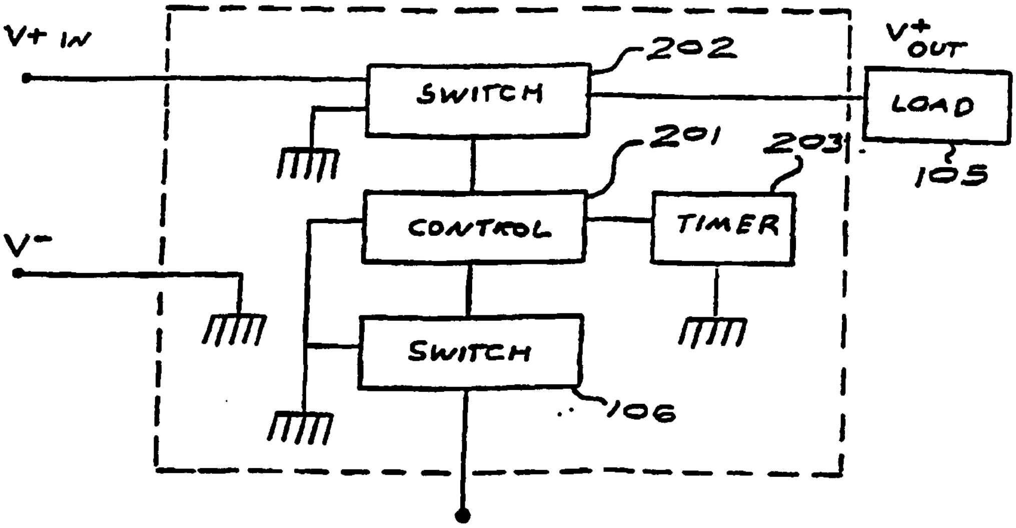


FIG 6

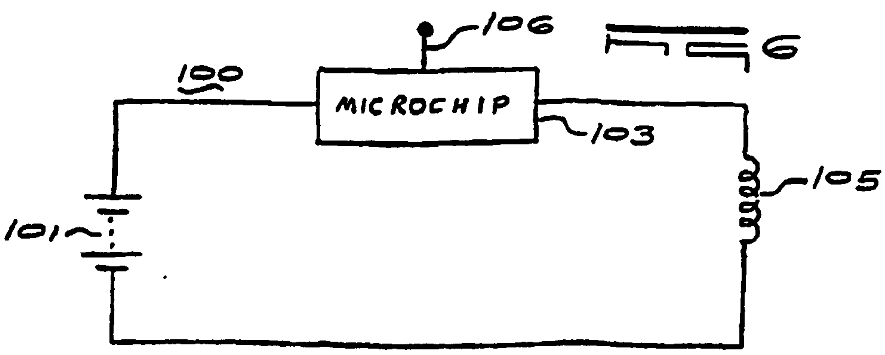


FIG 7

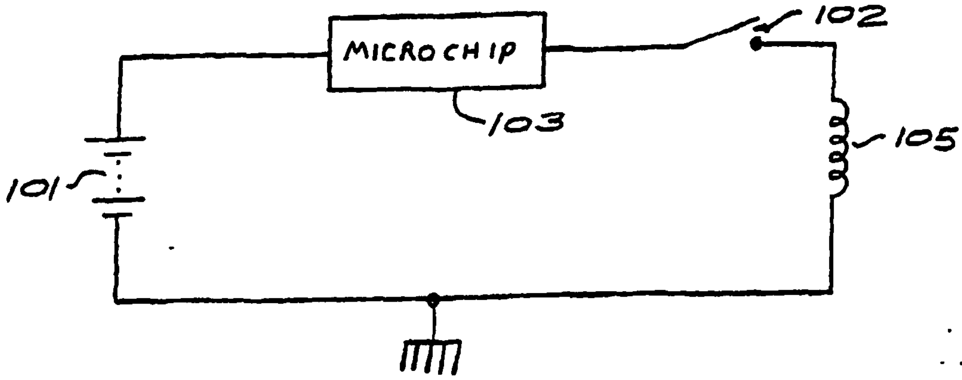


FIG 8A

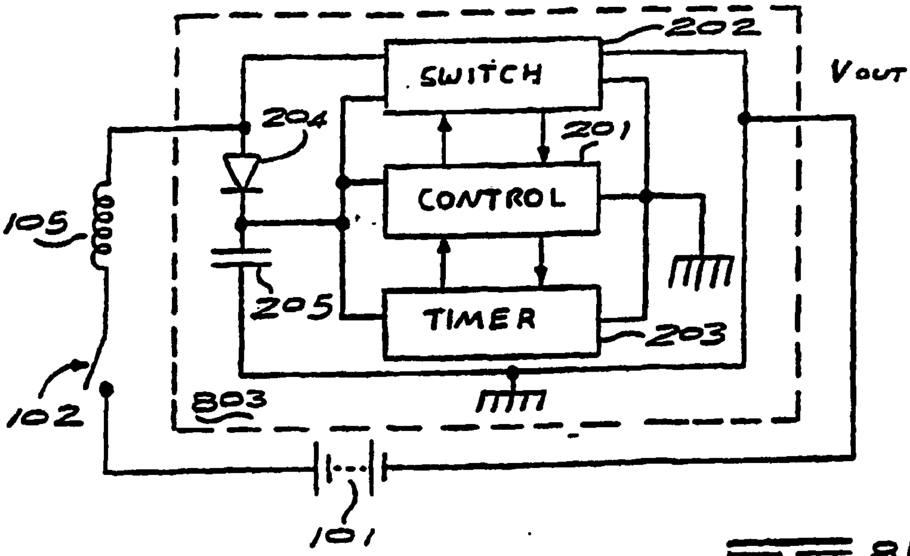


FIG 8B

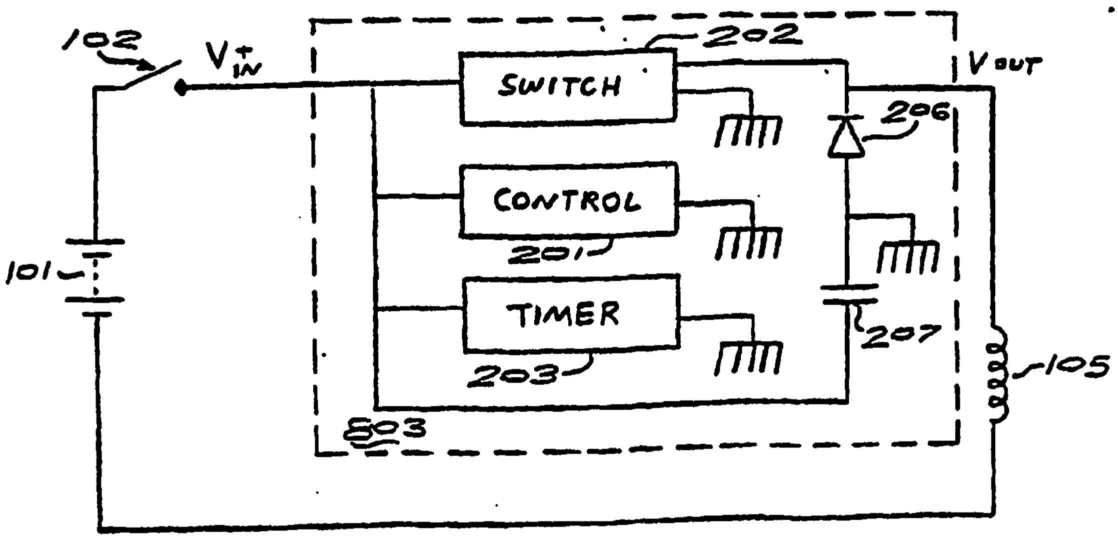


FIG 9

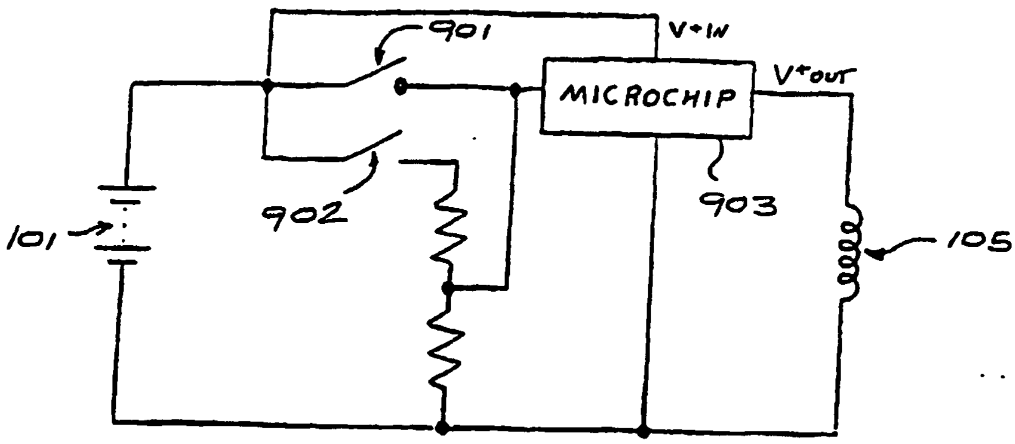


FIG 10

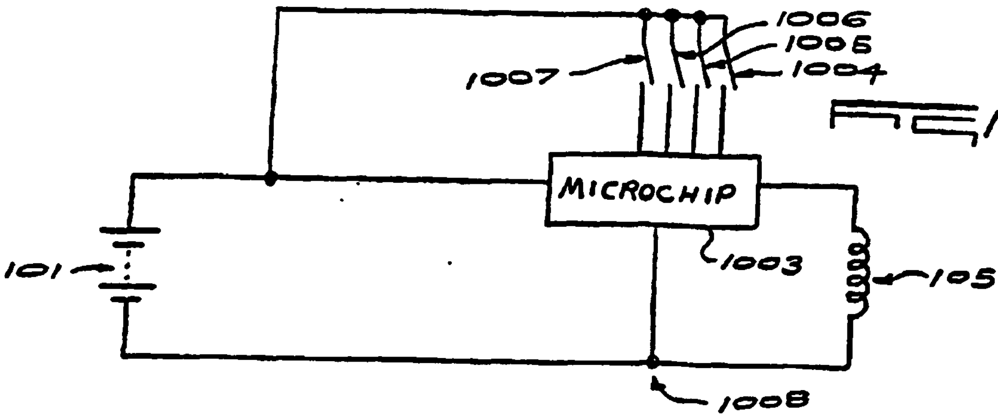


FIG 11

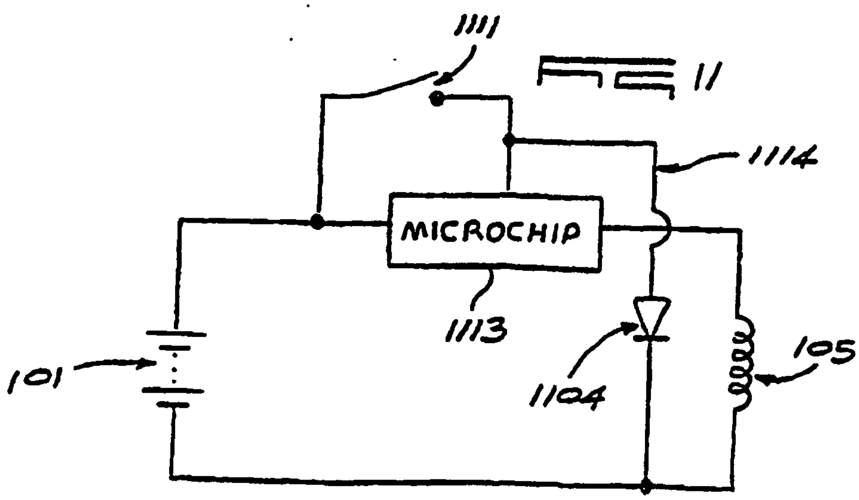


FIG 12

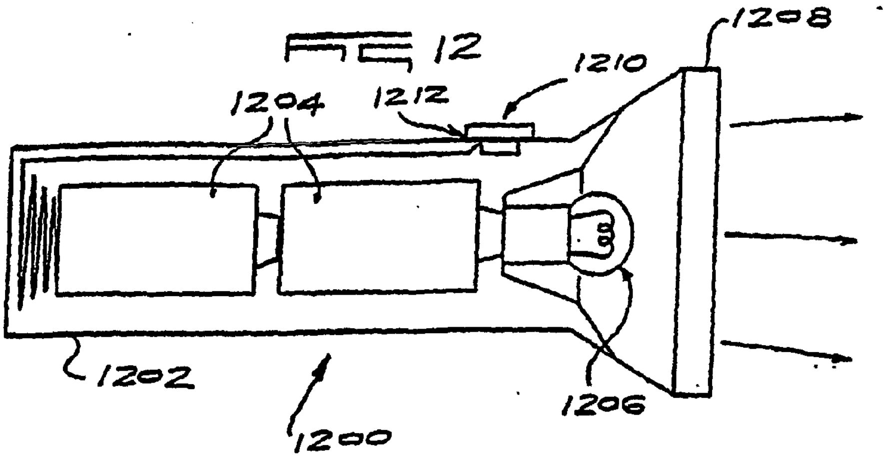


FIG 13

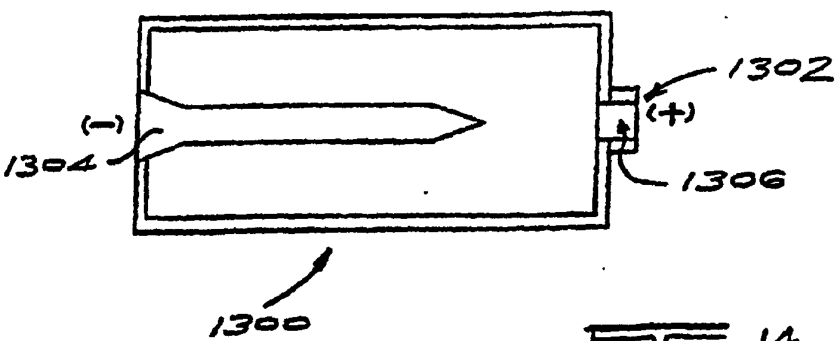


FIG 14

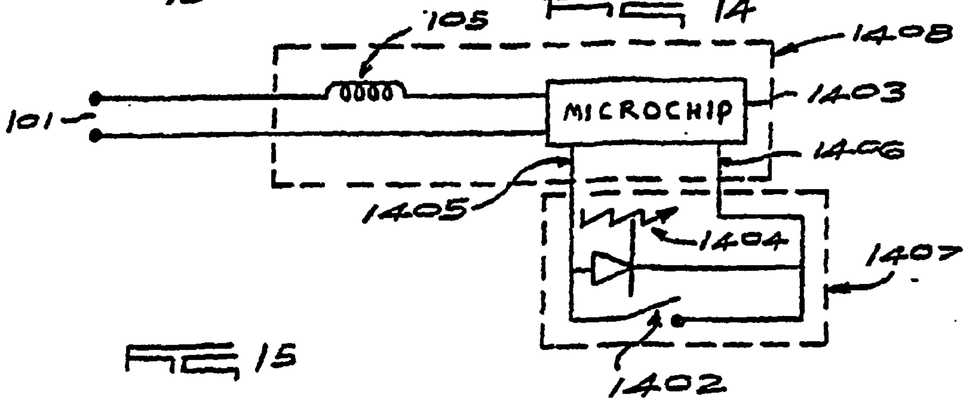
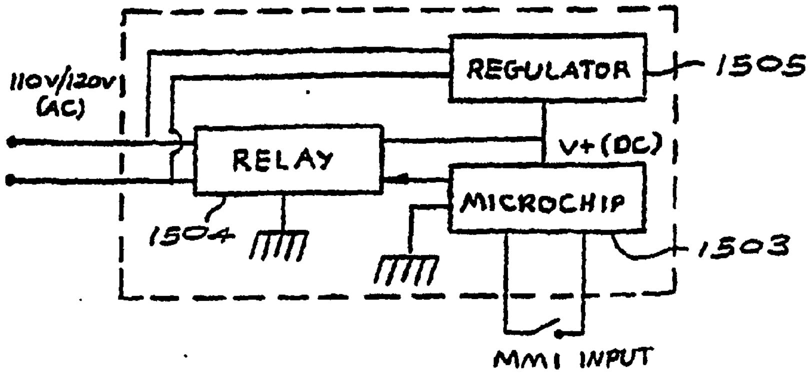


FIG 15



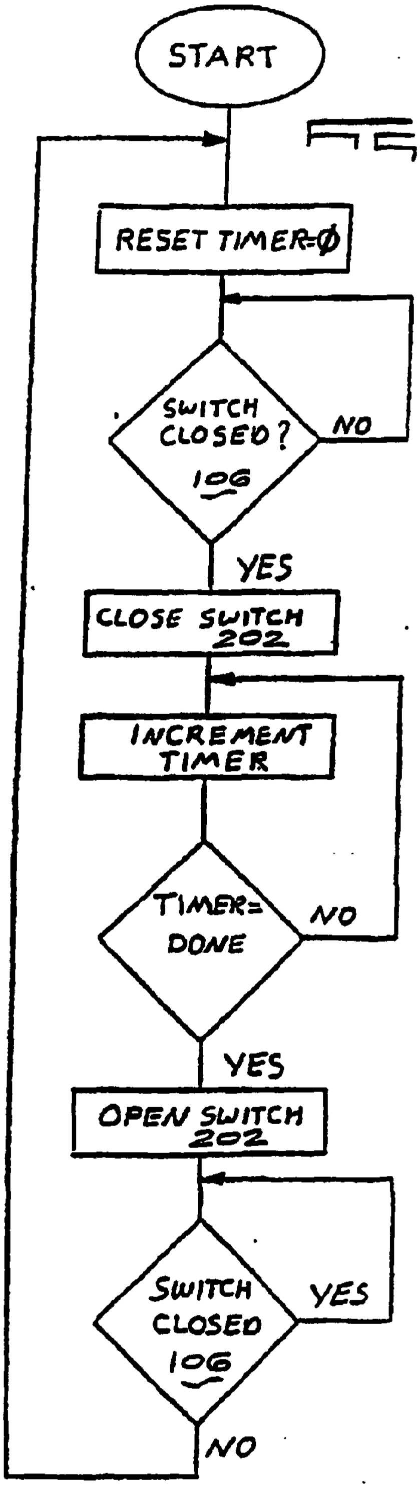

START
RESET TIMER=Ø
SWITCH CLOSED?
106
NO
YES
CLOSE SWITCH 202
INCREMENT TIMER
TIMER= DONE
NO
YES
OPEN SWITCH 202
SWITCH CLOSED
106
YES
NO

FIG 16

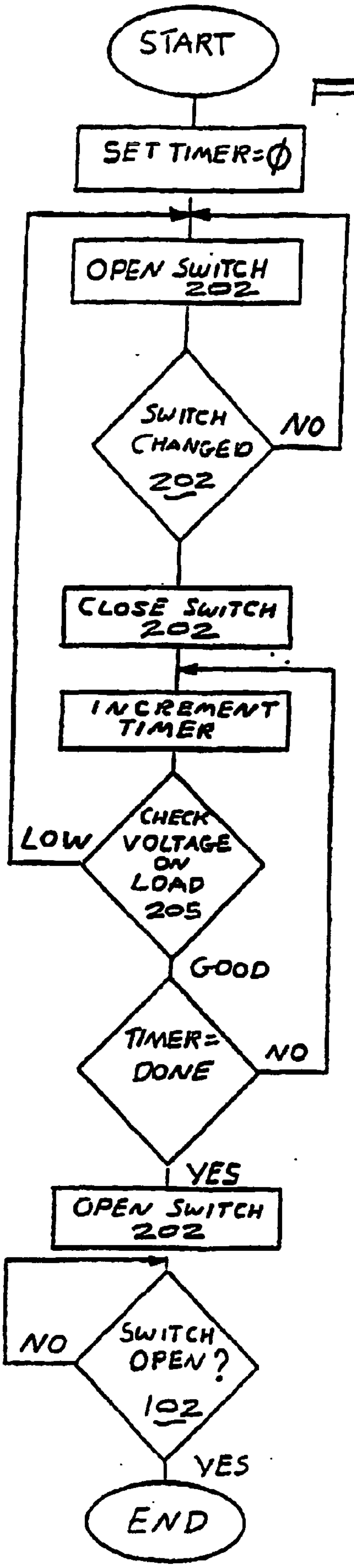

START
SET TIMER=Ø
OPEN SWITCH 202
SWITCH CHANGED
202
NO
CLOSE SWITCH 202
INCREMENT TIMER
CHECK VOLTAGE ON LOAD 205
LOW
GOOD
TIMER= DONE
NO
YES
OPEN SWITCH 202
SWITCH OPEN?
102
NO
YES
END

FIG 17