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(54) **SWITCHING DEVICE SUITABLE FOR WIRELESS CONTROL OF AN ELECTRICAL CIRCUIT**

(57) Switching device (10, 10', 10") suitable for wireless control of an electrical circuit that requires at least one manual switch (i, i'), wherein the switching device (10, 10', 10") comprises a DPDT switch (1), which comprises a pair of primary terminals (1a) and a pair of secondary terminals (1b), and a processing unit (2) electrically linked to be powered by two power terminals (2a, 2b), as well as means to control the DPDT switch (1) and wireless communication means (2c), being configured and ready to carry out switching instructions on the DPDT switch (1) received through the wireless communication means (2c), where the power terminals (2a, 2b) are in electrical connection to the two terminal of a same pair or terminals from said pair of primary terminals (1a) and said pair of secondary terminals (1b) of the DPDT switch (1).

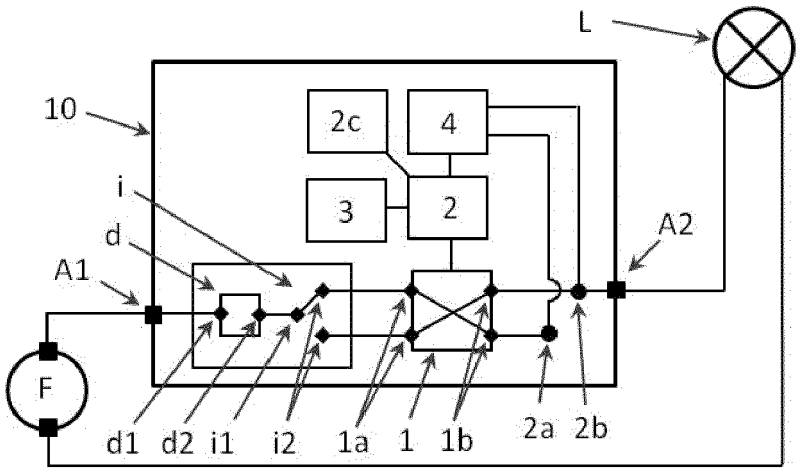

Fig. 2

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Description

[0001] The technical field of the present invention is framed in that of switching devices, in particular, those that have means to control wirelessly those electrical circuits that also require plugs or manual switches.

BACKGROUND OF INVENTION

[0002] Wireless DPDT (Double-Pole Double-Throw) switches suitable for remote control of circuits having two manual SPDT (Single-Pole Double-Throw) switches are known in the state of the art.

[0003] In particular, the Spanish patent application P201930954 discloses a wireless communication switching system for the control of lighting circuits, configured to be interspersed between the two manual SPDT switches of the circuit and to be able to control the on and off of the light through a Smartphone and without cancelling those manual SPDT switches. This system comprises a pair of relays configured to act as a DPDT (Double-Pole Double-Throw)switch, which is controlled by a processing unit with wireless communication via WIFI. It also has a converter and a battery whose power terminals are connected to one side and another of the DPDT switch, with the intention of powering the processing unit and charging the battery when the lighting circuit is open (i.e. when the light is off), while the battery powers the processing unit when the lighting circuit is closed (i.e. when the light is on). At the same time, the system interprets that the light is off when these terminals receive power, as well as that it is on when they do not receive it, and sends the corresponding interpretation to that Smartphone via WIFI with the intention of showing the user if the light is on or off.

[0004] However, in the previous system it may occur that the DPDT switch and the manual SPDT switches are in a switching position such that the lighting circuit is open (i.e. the light is off), but the battery is not charging, as illustrated in settings (a) and (b) of figure1. On the one hand, it means that the system is interpreting that the light is on, even if the user has turned it off with one of the manual SPDT switches (and therefore it is sending uncertain information to the Smartphone of the user). And on the other hand, those settings make the battery drain, in which case, it would be impossible for the user to control the lighting circuit remotely. In addition, this system is intended to work only on circuits with two manual SPDT switches; it cannot operate on circuits with a single SPDT switch or with plugs.

[0005] Therefore, there is a need for a wireless circuit control device with a plug or with one or two SPDT switches, while being able to be powered whenever the circuit is open.

DESCRIPTION OF THE INVENTION

[0006] The present invention consists of a switching device for electrical circuits of the type comprising a power supply (such as a electrical outlet for a lighting circuit or a plug circuit) and an electrical load (such as a light bulb or any device connected to a plug), allowing the switching device to wirelessly control the on and off functions of the electrical load, as well as its consumption, while allowing the use of at least one manual SPDT switch (such as two SPDT switches connected to each other).

[0007] The present switching device suitable for wireless control of an electrical circuit comprises:

- at least one primary external connector, arranged to receive at least one electrical connection element from the outside of the switching device, such as an electrical cable from the circuit load, or from a power source or from an output terminal of a manual switch,
- at least one secondary external connector, arranged to receive at least one electrical connection element from the outside of the switching device, such as an electrical cable from the circuit load, or from a power supply or from an output terminal of another manual switch,
- a DPDT switch (especially capable of being digitally controlled), comprising a pair of primary terminals and a pair of secondary terminals, where at least one of the primary terminals is in electrical connection to the at least one primary external connector and/or where at least one of the secondary terminals is in electrical connection to the at least one secondary external connector, either directly or through a switch or dimmer,
- a processing unit with two power terminals, as well as DPDT switch control and wireless communication means, being configured and arranged to receive switching instructions on the DPDT switch through the wireless communication means and carry them out.

[0008] The present switching device is characterized in that the power terminals are in electrical connection with the two terminals of the same pair of terminals of the DPDT switch, either the pair of primary terminals or the pair of secondary terminals.

[0009] With this switching device, when installed in an electrical circuit with one or more manual switches, whether SPDT switches or DPDT switches, it is possible for the power terminals of the processing unit to be in electrical connection with the output terminals of the same manual switch. As a result, there is no switching combination of the circuit SPDT switches where the power terminals do not receive voltage when the circuit is open. In other words, provided that the circuit is open, the processing unit will be powered and remain in wireless communication with the system from which the user

controls the DPDT switch.

[0010] In relation to wireless communication means, they may consist, for example, of a WIFI or Bluetooth module, with which the processing unit communicates with a control software, which, among other things, allows control of the DPDT switch. This software, for example, can be a phone application and/or a web available on an Internet-accessible cloud server. In this way, control can be done remotely from anywhere in the world and at any time. Communication with the processing unit can also be carried out by any voice control device, such as those consisting on Amazon Alexa, IFTTT or Google Home. In addition, the software can implement many other functions, such as timing (setting an opening and/or closing time of the circuit) or controlling power consumption.

[0011] In a preferred embodiment, the switching device comprises one primary external connector and one secondary external connector, where one of the primary terminals of the DPDT switch is electrically connected to the primary external connector and one of the secondary terminals is in electrical connection to the secondary external connector. In this embodiment, as can be observed, the electrical load of the circuit can consist of a plug where an electrical device is plugged in, making it wirelessly controllable through the switching device. In this case, the switching device can also be integrated into the plug, providing savings in manufacturing costs in relation to whether the plug was manufactured separately from the switching device, as well as savings on installation costs, as its installation is as simple and fast as installing a common plug.

[0012] In another preferred embodiment, the switching device comprises one primary external connector, one secondary external connector, and a manual control element, which can include a SPDT switch and/or a dimmer. In the case of a manual SPDT switch, it has an input terminal and two output terminals, where:

- the two primary terminals of the DPDT switch are in electrical connection with the two output terminals of the manual SPDT switch,
- the input terminal of the manual SPDT switch is in electrical connection to the primary external connector, and
- one of the secondary terminals of the DPDT switch is in electrical connection to the secondary external connector.

[0013] In this embodiment, the switching device comprises both the functionality of opening and closing the circuit wirelessly and manually on a single device. This embodiment, on the one hand, provides savings in manufacturing costs in relation to whether the manual SPDT switch is manufactured separately from the switching device, and on the other hand, provides savings in installation costs, as its installation is as simple and fast as the installation of a common manual switch.

[0014] If the switching device also comprises a dimmer, it has two terminals, where one of the two is in electrical connection either to the primary external connector or to the secondary external connector (that is, it is located at one end of the switching device).

[0015] In another preferred embodiment, the switching device comprises two primary external connectors and a secondary external connector, where:

- the two primary terminals of the DPDT switch are in electrical connection to the two primary external connectors and
- one of the secondary terminals of the DPDT switch is in electrical connection to the secondary external connector.

[0016] As can be inferred, this embodiment with a single secondary external connector is suitable for wireless control of circuits that have a single external manual SPDT switch. The primary external connectors of the switching device are arranged to connect to the respective terminal output connectors of the external manual switch, while the secondary external connector is arranged to connect to the cable that closes the circuit (usually the cable that comes from the circuit load, although it could also come from the power source if the installation has been done the other way around).

[0017] In another even more preferred embodiment, the switching device comprises two primary external connectors and two secondary external connectors, where:

- the two primary terminals of the DPDT switch are in electrical connection to the two primary external connectors and
- the two secondary terminals of the DPDT switch are electrically connected to the two secondary external connectors.

[0018] This embodiment of the switching device allows it to be installed in both electrical circuits comprising a manual SPDT switch and those comprising two, without losing their functionality. In the case where the circuit has only one manual SPDT switch, the connection of the present embodiment is the same as the connection of the above-mentioned embodiment, only that one of the two secondary external connectors is left unconnected. In the event that the circuit has two manual SPDT switches, the switching device is arranged to be installed interspersed between the two.

[0019] In an optional embodiment, the processing unit is arranged and configured to switch the DPDT switch in case the power terminals do not receive voltage (the fact that the power terminals do not receive voltage will usually be because a user has switched one of the manual switches). In the case that the DPDT switch is switched

and does not receive tension, the processing unit is preferably arranged and configured to send a warning to the user(e.g. through the control software) that the circuit has run out of electricity.

[0020] In a preferred embodiment, the device comprises an electronic dimmer, understanding as electronic dimmer as a component capable of being electronically controlled by a processing unit and suitable for regulating the consumption, the current intensity and/or the electrical voltage of an electrical circuit. The electronic dimmer comprises a first connector and a second connector, and has electronic means to carry out such regulation. The first connector is in electrical connection to one of the power terminals and the second connector is in electrical connection to the other of the power terminals. At the same time, the electronic dimmer is electronically linked to the processing unit, to be controlled by it. Thanks to this, the user can wirelessly regulate the consumption, current and/or voltage that receive the electrical load as long as the circuit remains open. Preferably, the processing unit comprises means and/or is configured to register the dimming setting the electronic dimmer is at any given moment, which, in combination with the fact that it may be configured and arranged to switch the DPDT switch in case it does not receive power, allows the switching device to always be receiving power and the electronic dimmer be always available to control wirelessly the circuit. In this case, in order for the processing unit to be able to interpret when the user desires to change the state of the circuit using the manual switch and act accordingly, the processing unit is arranged and configured preferably to, after having carried out the aforementioned switching of the DPDT switch, control the electronic dimmer in at least one of the following ways:

A) In case the load consumption was not completely reduced before having switched the DPDT switch (i.e. for example, the light was on):
◦ Then the electronic dimmer reduces completely the load consumption (i.e., for example, turning off the light).

B) In case the load consumption was completely reduced before having switched the DPDT switch (i.e. for example, the light was off):

◦ Then the electronic dimmer increases the load consumption to a value previously indicated to the processing unit (i.e. for example turning on the light at maximum intensity or at an intensity chosen by the user through the control software), or

◦ The electronic dimmer increases the load consumption to settled value before it was completely reduced the load consumption (i.e. turning on the light at the same intensity as it was before turning it off, which could also be user selectable in the control software).

[0021] Thanks to this, in combination with the fact that the DPDT switch is commuted when the user operates one of the manual switches, it is possible for the electronic dimmer to maintain a permanent control of the circuit regulation, at the same time that the manual switches stay fully operational. At the same time, preferably, the processing unit can be configured to send the registered information to the software management. In this way, the management software can calculate the consumption of the electrical circuit and communicate it to the user.

[0022] It is also the subject of this invention the procedure to be performed by any of the embodiments described above or below about the present switching device, by which the regulation of the circuit by means of the electronic dimmer is always available, at the same time than the manual switches are maintained fully operational, and the processing unit continuously controls when the user has wanted to change the state of the circuit by operating one of them. The procedure includes the stages of:

- record the state of regulation in which the electronic dimmer is set,
- in case the processing unit stops receiving power, to switch the DPDT switch, and
- control the electronic dimmer in such a way that it performs one of the following steps:

    ◦ Completely reduce the load consumption in the event that the load consumption was not completely reduced before switching the DPDT switch.

    ◦ Increase the load consumption in the event that the load consumption was completely reduced before switching the DPDT switch, either to its maximum value, to any previously set value, or to the level prior to the complete reduction of load consumption.

[0023] Optionally, the procedure can include a stage at which the processing unit calculates the electrical consumption of the circuit using the information about the electronic dimmer regulation and sends the consumption value to the user. Alternatively, the stage may consist of the processing unit sending the information about electronic dimmer regulation to external software and it calculates the electrical consumption of the circuit and sends it to the user.

[0024] In an optional embodiment, the switching device comprises a battery linked to the processing unit, designed and arranged to be charged when those power terminals receive voltage, as well as to power the processing unit when the power terminals do not receive

voltage. As a result, when the circuit is closed, the processing unit can be powered from the battery (for example, being useful in the event that an electronic dimmer is not available, or if it is available, to power the processing unit during the switching process). In this case and preferably, the processing unit comprises means and/or is configured to determine whether the received power comes from the power terminals or from the battery. Optionally, it can also be configured to send a signal with such information to the software to make relevant interpretations. Thanks to this, in some of the previously mentioned embodiments, the user will be able to be informed instantly through his Smartphone of whether someone has opened or closed the circuit manually or wirelessly in real time.

[0025] In a possible embodiment for AC electrical circuits, i.e. with a power supply with a phase and a neutral, the switching device preferably comprises a voltage converter interspersed between the two power terminals and the processing unit, being the voltage converter configured and ready to receive the voltage from the power terminals and to convert it into an adequate voltage to provide it to the processing unit.

[0026] In another possible embodiment for DC electrical circuits, i.e. with a power supply with positive pole and negative pole, the switching device preferably comprises a second DPDT switch. In this case, a pair of terminals of each DPDT switch is in electrical connection between themselves and simultaneously with those power terminals. At the same time, the second DPDT switch is also linked to the processing unit, and the latter comprises means and/or is configured to detect whether the power source comes in the opposite direction that is needed and, in that case, switch both DPDT switches. In this way, the processing unit is able to reverse the direction of the current if required. Obviously, of the remaining terminal pairs of both DPDT switches, at least one terminal of one pair is in electrical connection to the at least one primary external connector and at least one terminal of the other pair is in electrical connection with the at least one secondary external connector.

[0027] In a possible embodiment of the switching device, the DPDT switch comprises a double switch or bipolar switch, with two fixed terminals and two pairs of switchable terminals, each pair with a first and a second switchable terminal, where the first switchable terminals of each pair are in contact with the second switchable terminals of the other pair.

[0028] In a possible embodiment of the switching device, the DPDT switch comprises a pair of relays as switching elements, which are easily controllable by the processing unit.

[0029] As a preferred embodiment, in the case of being equipped with a battery, the switching device comprises means to prevent it from draining. These means to prevent the battery from running out may consist of means to detect whether the load is currently receiving electric current and/or means to determine the remaining battery level. With regard to the means to detect whether or not it is receiving electric current, in an appropriate option for the case where the electrical circuit charge is a lighting component, the means required comprises a light sensor arranged and configured to detect whether the lighting component of the electrical circuit is on or off mode and, in such case, send the corresponding signal to the processing unit, to allow it to perform accordingly. In a second option, the means to detect whether the load is receiving electric current include a voltmeter or an ammeter for determining if there is a current flow through the load, while also arranged to provide the processing unit such information in order to allow it to run the appropriate actions. Regarding the means to determine the remaining battery level, one of the possible options is that the means comprise a timer for counting the elapsed time during which the processing unit has not received power and allowing the unit to estimate the remaining battery time available and perform relevant actions. In a second option, the means comprise a battery level meter arranged to inform the processing unit with such information and to take appropriate actions.

[0030] In relation to the relevant actions to be performed by the processing unit, all the above mentioned options may be combined with one or more of the following embodiments and/or stages to be performed by the processing unit in case the battery reaches a certain level, where the processing unit is arranged and configured to:

- Switch the DPDT switch.
- Turn Off.
- Send a signal to the user in order to inform him that either:
    - ◦ the switching device has not received power for a certain time, either because he has forgotten to open the circuit or because the power supply does not provide voltage (i.e., for example, that there has been an electrical power outage),
    - ◦ the switching device will soon proceed to go to off mode until it receives power again,
    - ◦ the switching device will switch the DPDT switch and that the circuit may open, either ask the user to check that the power supply provides voltage and/or ask the user to switch one of the switches (either a manual one or the DPDT switch from the switching device).

[0031] In a possible embodiment, the capacity of the battery is sized to provide power to the processing unit for a defined period, which can be between 12 and 96 hours, although it is preferably 24 hours.

[0032] An advantage of the previously described em-

bodiments of the switching device is that they can be manufactured to a sufficiently small size so that they can be placed inside the title block of a previously existing manual SPDT switch, in order to keep the existing aesthetical appearance (which usually has the same design in all switches of a home). In addition, the system is powered only by the existing connections on a switch, so it is not necessary to install any additional connection or any specific protocol or any other additional device doing the control system's function in order to be coordinated with the other manual switches.

[0033] These and other characteristics and advantages of the system subject to the present invention will be evident from the description of a preferred but not exclusive embodiment, which is illustrated as a non-limiting example in the accompanying drawings.

[0034] It is also noted that some elements have been indexed as primary and secondary, but such indexing is only intended to differentiate and name elements that are similar but not the same. No idea of priority of such indexation should be inferred, as these elements can be exchanged without betraying the invention. In addition, this indexing does not imply any order in the assembly or use of the elements of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0035]

Figure 1 (a).- It is a schematic representation of an electrical circuit with a first embodiment of a wireless communication switching system for the control of lighting circuits as described in the state of the art.

Figure 1(b).- It is a schematic representation of an electrical circuit with a second embodiment of wireless communication switching system for the control of lighting circuits as described in the state of the art.

Figure 2.- It is schematic representation of an electrical circuit that includes a first preferred embodiment of the present switching device.

Figure 3.- It is a schematic representation of an electrical circuit that includes a second preferred embodiment of the present switching device.

Figure 4.- It is a schematic representation of an electrical circuit that includes a third preferred embodiment of the present switching device.

DESCRIPTION OF PREFERRED EMBODIMENTS

[0036] As shown in figures 2 to 4, the present switching device (10, 10', 10") is suitable for the wireless control of electrical circuits of the type comprising at least one power supply (F) and one electrical load (L), and which also comprises at least one manual switch (i, i'). For it, it is needed a control software with functions such as, among other things, transmitting the switching instructions of the DPDT switch. This software, for example, can be a phone application and/or a web available on an Internet-accessible cloud server.

[0037] Figure 2 shows an embodiment of the switching device (10) suitable mainly for circuits where it is required to be able to open and close the circuit manually and wirelessly, as well as regulate the consumption of the load (L) at least manually. This embodiment includes:

- a primary external connector (A1) and a secondary external connector (A2),
- a DPDT switch (1), which comprises a pair of primary terminals (1a) and a pair of secondary terminals (1b),
- a processing unit (2) in connection with the DPDT switch (1) and configured to control it, as well as linked to wireless communication means (2c), a battery(3), two power terminals (2a, 2b) and a voltage converter (4) arranged to convert the voltage received into the power terminals (2a, 2b) and provide it to the processing unit (2),
- a manual dimmer (d) and a manual SPDT switch (i), where the manual dimmer (d) comprises a first terminal (d1) and a second terminal (d2), while the manual SPDT switch (i) comprises one input terminal (i1) and two output terminals (i2), where:
    - ◦ said first terminal (d1) is in electrical connection to the primary external connector (A1),
    - ◦ said second terminal (d2) is in electrical connection to the input terminal (i1) of the manual SPDT switch (i),
    - ◦ the two output terminals (i12) of the manual SPDT switch (i) are in electrical connection to the two primary terminals (1a) of the DPDT switch (1),
    - ◦ one of the secondary terminals (1b) of the DPDT switch (1) is in electrical connection with one of the power terminals (2a, 2b) and the other secondary terminal (1b) is in electrical connection to the other power terminal (2b, 2a), and
    - ◦ one of the secondary terminals (1b) of the DPDT switch (1) is in electrical connection to the secondary external connector (A2).

[0038] With this embodiment of the switching device (10), it is possible to open and close a circuit, as well as to regulate the electrical load consumption, both manually and wirelessly. As it can be inferred, the fact that it comprises a voltage converter (4) is in order to be suitable

for electric AC circuits, although the scope of protection of the invention also encompasses the option without voltage converter (4). As can also be inferred, the manual dimmer (d) and a manual SPDT switch (i) can be integrated into the switching device housing (10), reducing circuit costs. However, the scope of the present invention also covers the option that the manual dimmer (d) and the manual SPDT switch (i) are independent of the switching device (10). On the other hand, the manual dimmer (d) can also comprise electronic means to be linked and controllable by the processing unit (2), so that the user can also regulate the consumption of the load (L) wirelessly.

[0039] Figure 3 shows an embodiment of the switching device (10') suitable mainly for DC electrical circuits which comprise a manual switch (i') external to the switching device (10'). This embodiment comprises:

- two primary external connectors (A1) and a secondary external connector (A2),

- a first DPDT switch (1) and a second DPDT switch (1'), each comprising a pair of primary terminals (1a, 1a') and a pair of secondary terminals (1b, 1b'), where the primary terminals (1a) of the first DPDT switch (1) are electrically connected to the primary external connectors (A1), and where one of the secondary terminals (1b') of the second DPDT switch (1') is in electrical connection to the secondary external connector (A2),

- a processing unit (2) in connection with the DPDT switches (1, 1') and configured to control them, as well as with wireless communication means (2c), a battery (3) and two power terminals (2a, 2b), where the power terminals (2a, 2b) are in electrical connection to the secondary terminals (1b) of the first DPDT switch (1) and with the primary terminals (1a') of the second DPDT switch (1').

[0040] With this embodiment of the switching device (10'), it is possible to open and close a circuit with the manual switch (i') external to the switching device (10'), as well as to change the direction of the electric current received by the processing unit (2). As can be inferred, the scope of protection of the invention also covers the option that this embodiment has a second manual switch(i') and/or DPDT switches external to the switching device (10'), as well as other elements described in this memory.

[0041] In the embodiments shown in Figures 2 and 3, the electrical circuit is open and the power terminals (2a, 2b) receive voltage, so the processing unit (2) is powered and the battery (3) is charged. In case the user operates the manual switch (i, i') or one of the DPDT switches (1, 1') the circuit will close and the processing unit (2) will be powered by the battery (3). In these accomplishments, the processing unit (2) is also arranged and configured to determine whether the power it receives comes from the power terminals (2a, 2b) or battery (3), while it is configured to send this information to the control software, in order to inform the user of the changes of status on the electrical circuit as a result or manual operation of the switches (i, i').

[0042] Figure 4 shows an embodiment of the switching device (10") suitable mainly for circuits where it is required to be able to open and close the circuit manually and wirelessly, as well as regulate the consumption of the load (L) at least wirelessly. This embodiment includes:

- two primary external connectors (A1) and two secondary external connectors (A2), a DPDT switch (1), comprising a pair of primary terminals (1a) and a pair of secondary terminals (1b), the primary terminals (1a) being electrically connected to the primary external connectors (A1) and the secondary terminals (1b) being electrically connected to the secondary external connectors (A2),

- a processing unit (2) in connection with the DPDT switch (1) and configured to control it, as well as linked to a wireless communication means (2c), a battery (3), two power terminals (2a, 2b) and a voltage converter (4) arranged to convert the received voltage into the power terminals (2a, 2b) and provide it to the processing unit (2), where the power terminals (2a, 2b) are in electrical connection to the primary terminals (1a) of the DPDT switch (1),

- an electronic dimmer (5) in connection with the processing unit (2), as well as arranged and configured to be controlled by it, with a first connector (5a) and a second connector (5b), among which it has electronic means to regulate the consumption of the electrical circuit, being the first connector (5a) in electrical connection with one of the power terminals (2a) and the second connector (5b) in electrical connection with the other of the power terminals (2b).

[0043] Additionally, the electronic dimmer (5) may comprise means to allow to be manually controlled by the user from outside the switching device (10").

[0044] Thanks to this configuration, the electronic dimmer (5) can regulate the current consumption (L), as long as the circuit is open. To ensure that the circuit is always open and the electronic dimmer (5) is always available, the processing unit (2) comprises means and is configured to record the status or regulation in which the electronic dimmer is set (5), while configured and arranged to operate the DPDT switch (1) when it is not receiving power (which will usually corresponds of a manual operation of one SPDT switch (i') by a user with the intention of changing the state of the circuit). Obviously, the electronic dimmer (5) must be controlled accordingly by the processing unit (2) to achieve the state of the circuit that

the user has required, being in one of the following ways:

- to completely reduce the consumption of the electrical load (L) if the power consumption is not completely reduced before the DPDT switch (1) has been switched,

- to increase the consumption of the electrical load (L) in case such consumption was completely reduced before the DPDT switch had been operated, (1) either to a previously indicated value to the processing unit (2) or to the state in which it was before it completely reduced the consumption of the load (L).

[0045] In any of the above embodiments, the battery is configured and arranged to be charged by the processing unit (2) when such power terminals (2a, 2b) receive voltage, as well as to power the processing unit (2) when the power terminals (2a, 2b) do not receive voltage. While it is true that in the embodiments of Figures 2 and 3 the batteries (3) must have an adequate capacity so that the circuit can be closed and power the processing unit (2) for hours, in the embodiment of Figure 4 the capacity of the battery (3) can be much less, since it will only need to power the processing unit (2) during the period of time that it takes to detect that it have stopped receiving power and switch the DPDT switch (1).

[0046] The details, shapes, dimensions and other accessory elements of the present invention may be conveniently replaced by others that are technically equivalent without departing from the scope defined by the claims listed below.

Claims

1. Switching device (10, 10', 10") suitable for wireless control of an electrical circuit of the type comprising a power supply (F) and an electrical load (L), and requiring at least one manual SPDT switch (i, i'), where the switching device (10, 10', 10") comprises:

    - at least one primary external connector (A1),
    - at least one secondary external connector (A2),
    - a DPDT switch (1), comprising a pair of primary terminals (1a) and a pair of secondary terminals (1b), where at least one from said primary terminals (1a) and said secondary terminal terminals (1b) is in electrical connection with at least one from said primary external connectors (A1) and said secondary external connectors (A2), and
    - a processing unit (2) electrically linked to be powered with two power terminals (2a, 2b), as well as means to control the DPDT switch (1) and wireless communication means (2c), being configured and ready to carry out any switching instructions over the DPDT switch (1) received from the wireless communication means (2c),

    the switching device (10, 10', 10") being **characterized in that** the power terminals (2a, 2b) are in electrical connection with the two terminals of a same pair of terminals from said pair of primary terminals (1a) and said pair of secondary terminals (1b) of the DPDT switch (1).

2. Switching device (10) according to claim 1, wherein it comprises a primary external connector (A1), a secondary external connector (A2), a manual dimmer (d) and a manual SPDT switch (i), where the manual dimmer (d) comprises two terminals (d1, d2), while the manual SPDT switch (i) comprises an input terminal (i1) and two output terminals (i2), where:

    - one of the terminals (d1, d2) of the manual dimmer (d) is in electrical connection with one from said primary external connector (A1) and said secondary external connector (A2),
    - the two output terminals (i2) of the manual SPDT switch (i) are in electrical connection to the primary terminals (1a) of the DPDT switch (1), and
    - one of the secondary terminals (1b) of the DPDT switch (1) is in electrical connection to the secondary external connector (A2).

3. Switching device (10') according to any of the previous claims, **characterized in that** comprises a second DPDT switch (1'), being one of its pair of terminals (1a', 1b') in electrical connection with one of the pair of terminals (1a, 1b) of the first DPDT switch (1), as well as with said power terminals (2a, 2b), while it is linked to the processing unit (2) to be controlled by it.

4. Switching device (10') according to claim 3, wherein the processing unit (2) comprises means to detect whether the received power is in the opposite direction needed and, in that case, switch both DPDT switches (1, 1').

5. Switching device (10, 10") according to any of the previous claims, wherein it comprises a voltage converter (4) interspersed between the power terminals (2a, 2b) and the processing unit (2), being the voltage converter (4) configured and arranged to receive voltage from the power terminals (2a, 2b) and to convert it into an adequate voltage to provide it to the processing unit (2).

6. Switching device (10, 10', 10") according to any of the previous claims, wherein the processing unit (2) is configured to operate a DPDT switch (1, 1') if the power terminals (2a, 2b) do not receive voltage.

7. Switching device (10, 10', 10") according to claim 6, wherein the processing unit (2) is configured to issue a warning telling the user that the electrical circuit has run out of electricity in case a DPDT switch (1, 1') has been switched and does not receive power.

8. Switching device (10") according to any of the previous claims, **characterized in that** comprises an electronic dimmer (5) suitable for regulating the consumption of the electrical load (L), arranged and configured to be controlled by the processing unit (2), with a first connector (5a) and a second connector (5b) among which it has electronic means to regulate the consumption of the electrical load (L), being the first connector (5a) in electrical connection with one of the power terminals (2a, 2b) and the second connector (5b) in electrical connection to the other of the power terminals (2b, 2a).

9. Switching device (10") according to claim 8, wherein the processing unit (2) comprises means to record the state of regulation at which the electronic dimmer is set (5).

10. Switching device (10") according to claim 9 when it depends on claim 6, wherein the processing unit (2) is configured to control the electronic dimmer (5) in one of the following ways:

    - to completely reduce the consumption of the electric load (L) in case the power consumption is not completely reduced before the DPDT switch (1, 1') has been switched, or
    - to increase the consumption of the electric charge if the power consumption was completely reduced before having switched the DPDT switch (1, 1'), either to a value previously indicated to the processing unit (2) or to the state in which it was before it had completely reduced the consumption of the electric load (L).

11. Switching device (10, 10', 10") according to any of the previous claims, wherein it comprises a battery (3) electrically linked to the processing unit (2), configured and arranged to be charged when such power terminals (2a, 2b) receive voltage, as well as to power the processing unit (2) when the power terminals (2a, 2b) receive no voltage.

12. Switching device (10, 10', 10") according to claim 11, where the processing unit (2) comprises means to determine whether the received power comes from the power terminals (2a, 2b) or from the battery (3).

PRIOR ART:

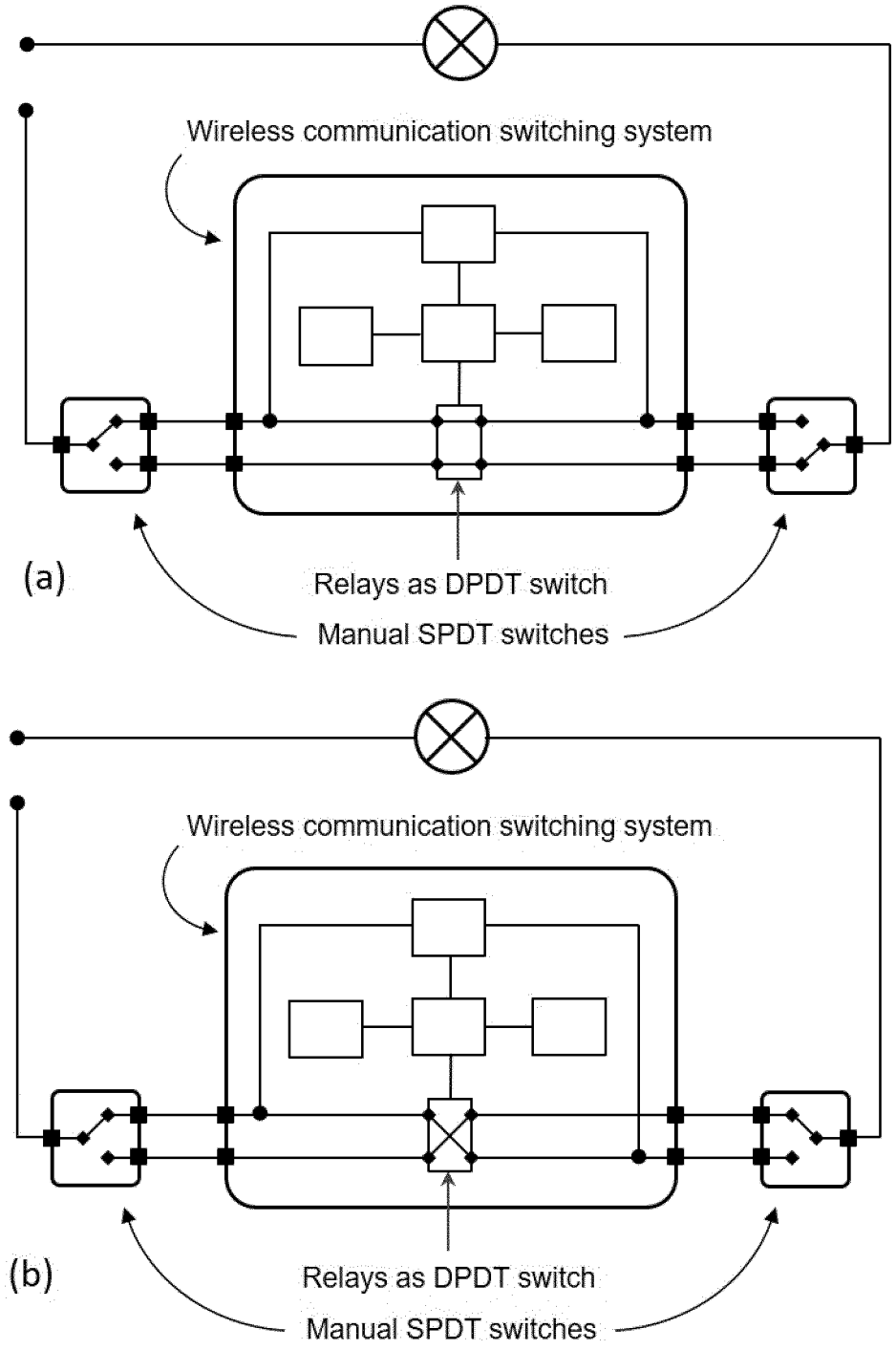

Fig. 1

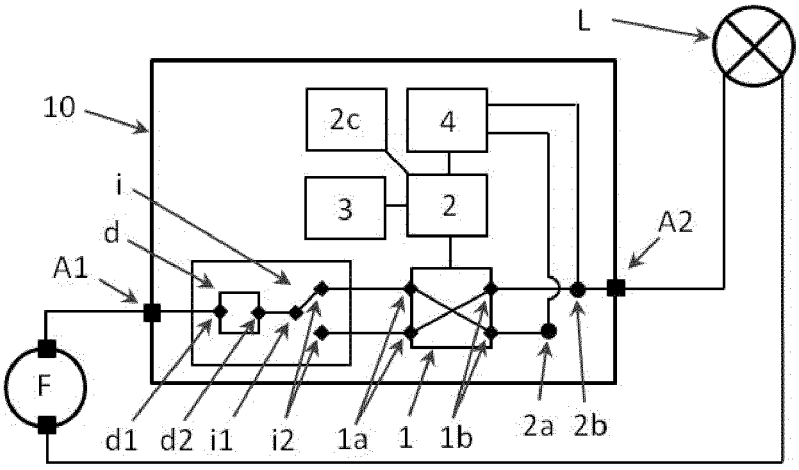

Fig. 2

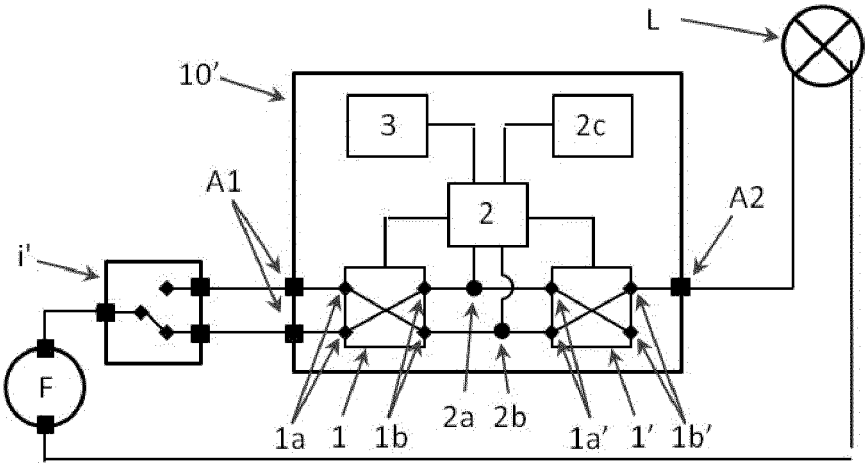

Fig. 3

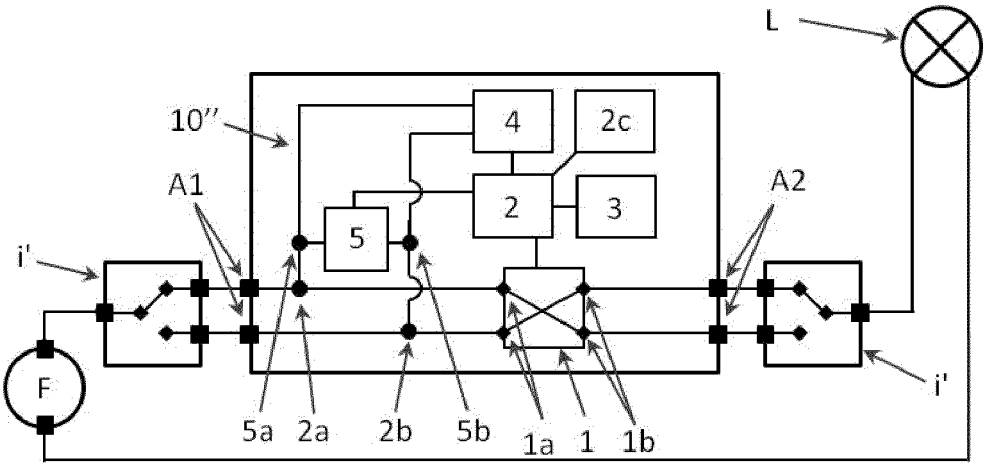

Fig. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 20 38 3130

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	ES 2 740 598 A1 (ASISTENTES DIGITALES S L [ES]) 24 July 2020 (2020-07-24) * page 3 - page 7; figures 1-3 * -----	1-12	INV. H01H89/00 H05B47/19
A	US 8 269 376 B1 (ELBERBAUM DAVID [JP]) 18 September 2012 (2012-09-18) * column 8 - column 12; figures 1A-2B * -----	1-12	

TECHNICAL FIELDS SEARCHED (IPC)

H01H
H05B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	26 May 2021	Beaugrand, Francois

CATEGORY OF CITED DOCUMENTS

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26-05-2021

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
ES 2740598 A1	24-07-2020	ES 2740598 A1	24-07-2020
		WO 2021084154 A1	06-05-2021
US 8269376 B1	18-09-2012	AU 2012304921 A1	10-04-2014
		CN 104054153 A	17-09-2014
		EP 2754165 A1	16-07-2014
		HK 1200975 A1	14-08-2015
		IL 231279 A	29-12-2016
		JP 5650359 B1	07-01-2015
		JP 2015501504 A	15-01-2015
		KR 20130026968 A	14-03-2013
		US 8269376 B1	18-09-2012
		WO 2013036321 A1	14-03-2013

EPO FORM P0459

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Patent documents cited in the description

- ES 201930954 **[0003]**