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

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
09 February 2023 (09.02.2023)

WIPO | PCT

(10) International Publication Number
WO 2023/011674 A1

(51) International Patent Classification:
H03K 17/28 (2006.01) *G06Q 50/12* (2012.01)
G05B 19/00 (2006.01) *H05B 47/10* (2020.01)

(21) International Application Number:
PCT/CZ2022/050070

(22) International Filing Date:
03 August 2022 (03.08.2022)

(25) Filing Language: Czech

(26) Publication Language: English

(30) Priority Data:
PUV 2021-39059 03 August 2021 (03.08.2021) CZ

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

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

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

(54) **Title:** POWER CONTROL SYSTEM

(57) **Abstract:** The object of the invention is a power control system that comprises a voltage supply, a set of power outputs (11) adapted for connecting electrical appliances, a control unit (2), and a door sensor (3), wherein the control unit (2) is connected to the door sensor (3) and is adapted to record the opening and/or closing of the door based on data from the door sensor (3) and is adapted to connect the set of power outputs (11) to the voltage supply based on data from the door sensor (3). The system further comprises a control element (4) connected to the control unit (2), wherein the control unit (2) is adapted to measure time and to disconnect the set of power outputs (11) from the voltage supply when a predetermined time is measured, wherein the control element (4) is adapted to extend the time until the set of power outputs (11) are disconnected from the voltage supply by the control unit (2).

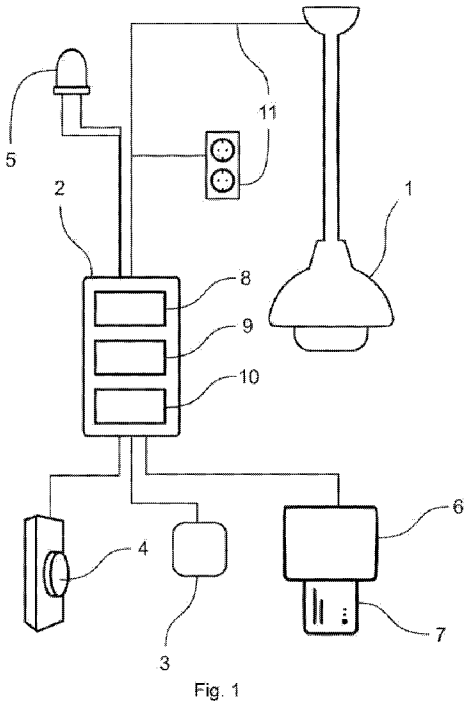

Fig. 1

WO 2023/011674 A1

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Published:

— *with international search report (Art. 21(3))*

— *in black and white; the international application as filed contained color or greyscale and is available for download from PATENTSCOPE*

Power control system

Technical Field

The present technical solution relates to systems for supplying and stopping the supply of voltage to sockets or appliances in a room, in particular a room for short-term accommodation. Specifically, it refers to a system that automatically supplies voltage to sockets, chandeliers, ceiling lights, air conditioning, etc. in a room and cuts off the voltage supply after a certain period of time unless user intervention extends that time or stops a timer or unless the user is verified to obtain the ability to supply voltage permanently.

Background of the Invention

In the state of the art, there are known systems for lighting hotel rooms, wherein these systems are controlled by a timer. For example, such a system will light up a chandelier when a door to a room is opened and at the same time it will start the timer. After a certain period of time, for example ten minutes, the lights will go out, wherein this can be prevented, for example, by a motion sensor that keeps the chandelier lit while people are in the room.

An example of such a solution is the solution in the document JPH08124409A describing room lighting with a timer and means for detecting human presence. The lighting is switched on automatically, e.g., by opening the door, and is automatically switched off if the detection means do not detect the presence of people for some period of time.

However, this solution is quite complicated, it is limited to the control of light sources, and does not allow to deactivate the automatic lighting control.

Summary of the Technical Solution

The shortcomings of the solutions known from the state of the art are to a certain extent eliminated by a power control system that comprises a voltage supply, a set of power outputs adapted for the connection of electrical appliances, a control unit, and a door sensor. The control unit is connected to the door sensor and is adapted to record the opening and/or closing of the door based on the signal or data from the door sensor. The connection of the control unit to the door sensor, which can be wired or wireless, thus enables the transmission of digital or analogue data from the sensor to the control unit. For example, the door sensor acts as a switch that is open when the door is opened and closed when the door is closed, wherein the control unit records this opening and closing as a change in voltage or current.

Furthermore, the control unit is adapted to connect a set of power outputs to the voltage supply based on data or signal from the door sensor, for example when the door is opened or closed. This adaptation can be implemented by connecting the control unit to the switch or switches, for example a circuit breaker, which implement(s) the connection and disconnection of the power outputs to the voltage supply, in particular mains supply. It is also possible to use transistors or relays. The system of the technical solution further comprises a control element connected to the control unit. This connection can also be wired or wireless, and the control element can be any device that can be used to provide the control unit with information about a specific user intervention. For example, it can be a button, touch screen, microphone, motion sensor, etc.

The control unit is further adapted to measure time and to disconnect the set of power outputs from the voltage supply when a predetermined time is measured. For example, when the door provided with the door sensor is opened or closed, the power outputs can be connected to the voltage supply and the timer can be started, and after the time has expired, the control unit disconnects the power outputs again. The timer can be implemented as a software module or it can be a stand-alone hardware component, for example a mechanical timer or preferably a digital timer controlled by a crystal. Based on the timer data, the control unit receives information about the elapsed time or can receive information about the current time and compare the threshold time stored in a memory with the time elapsed since the power outputs were connected, the door was

closed, or other event triggering the timer occurred. The control element is adapted to extend the time until the set of power outputs is disconnected from the voltage supply by the control unit. For example, the control element can set or allow the user to enter a new time value after which (without further user intervention on the control element) the power outputs are disconnected from the voltage supply, in other words, set the time until the electricity is switched off in these outputs and in the appliances that can be powered by them. In addition, the control element can extend the specified time by restarting the timer. Preferably, however, this extension is implemented by switching off the timer, so that the subsequent disconnection of the power outputs is not provided directly by the timer, but by another event, e.g., another opening or closing of the door, which starts the timer again, or another instruction of the user through the control element, which can start the timer again or switch off the electricity directly.

The power outputs can be mainly sockets, for example all sockets in a hotel room or just a part of the sockets. They can also be the voltage supply to lights, heating, air conditioning, ceiling fan, television, etc. The room may also comprise power outputs that are not connected or disconnected by the system of the technical solution. Preferably, the control unit is further adapted to switch on the electricity, i.e., to connect the power outputs to the voltage supply, based on data from the control element, e.g., based on pressing the same button that can be used to switch off the timer. Thus, if the electricity is switched off while the user is in the room, they can switch it back on with the control element without having to open and close the door.

The present technical solution therefore allows to automatically supply voltage to sockets, lights, etc. when entering an apartment, office, hotel room, etc. After a certain period of time, the electricity is switched off again, unless user intervention delays or deactivates this switch-off. This reduces the electricity consumption when the user does not need electricity or is not in the room / hotel room at all. For example, there is no risk that a guest will leave the room in the morning and leave the television or air conditioning on. The guest's departure from the room is recorded by the control unit, which can then start the timer, regardless of whether the electricity was switched on or off when the door was opened/closed. When the timer expires, the electricity is switched off, regardless of whether the guest has just entered or left the room.

The preferred possibility of using the motion sensor as a control device or one of the control devices can then prevent a situation where one guest leaves the room and

another stays in it, wherein the electricity would subsequently be disconnected for the other guest if they did not extend or deactivate the timer again in the given time. The described system will thus reduce energy consumption without significantly affecting the guests or making their stay unpleasant.

The control unit may be adapted to start measuring time at the moment the door is opened, i.e., at the moment a signal is received from the door sensor; this signal containing information from which the control unit recognizes that the door has been opened. For example, the control unit records the disconnection or connection of a contact in the door sensor and then ensures the timer starts, or records the current time for subsequent measurement of the preset time.

The control unit can also be adapted to start measuring time at the moment the door is closed (at the moment when corresponding data is received from the door sensor), i.e., as a result of e.g., connection or disconnection of the contact in the door sensor. Starting the timer can be the result of the same event as switching the electricity on, but it can also be the result of a different event, e.g., opening the door can cause the electricity to be switched on, but only closing it will start the timer.

The control element can be selected from a set comprising a switch, in particular a button, a motion sensor, a card reader, a code reader, and a chip reader. The button is preferable for its simplicity and low purchase price. On the other hand. a more complex control device, e.g., a card reader, touch screen, or button assembly, may allow additional functions, e.g., setting the time to switch-off, user authentication, notification of remaining time until switch-off, etc. The control element may be a control element that further controls, for example, air conditioning, heating, television, etc.

Preferably, the power control system further comprises an indicator adapted to indicate the time measurement, i.e., that the timer is switched on and that after some time the electricity will be switched off automatically. This can be a light source, buzzer, display, etc. Alternatively or additionally, the system may comprise an indicator for indicating the amount of time remaining before the set of power outputs is disconnected from the voltage supply by the control unit. For example, such an indicator comprises a display showing the time, a light source with a variable color, intensity, flashing frequency, etc., a loudspeaker with a voice output indicating an impending electricity switch-off, or a combination of these or similar features.

Preferably, the control unit is further adapted to verify the user and to stop time measurement based on user verification. User verification can be, for example, establishing the identity of the user, e.g., via a chip card that the guest uses to unlock the room door, or it can be simply verification that the user has certain permissions without establishing their identity. For example, the user may be hotel staff, for example, the system may only allow verification for hotel staff, wherein guests, for example, must use a button as the control element. For example, the staff may be able to switch on the electricity in multiple rooms at once and/or prevent the timer from being switched on again after walking through the door. The staff can for example heat or air-condition the rooms before the guests arrive or permanently switch on the lights for a period of time such that it is not necessary to press the button/insert the card every time one walks through the door while cleaning.

Preferably, the control unit is further adapted to deactivate the disconnection of the set of power outputs from the voltage supply by the control unit depending on the data from the door sensor based on user verification. Thus, the user verification not only stops the timer but leaves the electricity on regardless of further opening and closing of the door as described above.

The user verification can be implemented via the control element. In this case, the control element is, for example, a reader or keyboard that allows some form of verification.

However, the power control system may further comprise a verification device selected from a set comprising a keyboard, a touch screen, a card reader, a code reader, a chip reader, a lock, and a fingerprint reader, wherein user verification is implemented via the verification device. The control device will then, for example, only allow the electricity switch-off to be delayed or the timer to be stopped until the next opening and/or closing of the door is recorded, while the verification device can switch the electricity on indefinitely, for example, until the next verification, until an electricity switch-off instruction is given on the display, or until a button is pressed, etc.

The set of power outputs may comprise elements selected from a set comprising sockets and voltage supplies for lighting sources, heating and/or air conditioning device. On the other hand, the voltage supplies for, for example, a refrigerator, alarm etc. can be powered permanently, regardless of the system of the technical solution.

Description of Drawings

A summary of the technical solution is further clarified using exemplary embodiments thereof, which are described with reference to the accompanying drawings, in which:

fig. 1 schematically shows a system of the present technical solution, wherein the control device in this embodiment of the system is a button, the power outputs are a chandelier and a socket, the verification device is a chip card reader, and the indicator is an LED light source, and wherein it can be seen that the control unit comprises a timing module, a control module, and a memory, and

fig. 2 shows a flow chart illustrating the function of the system of fig. 1 in one exemplary embodiment.

Exemplary Embodiments of the Technical Solution

The technical solution will be further clarified using exemplary embodiments with reference to the respective drawings.

The object of the present solution is a power control system that comprises a control unit 2, a timer, a control element 4, a door sensor 3 adapted to record door motion, and a set of power outputs 11. The control unit 2 receives data from the timer, the control element 4, and the door sensor 3, and, based on this data, implements the connection and disconnection of the power outputs to and from the voltage supply, e.g., it controls an electromagnetic relay connecting the voltage supply to the power outputs 11.

The system is shown in fig. 1 in an exemplary embodiment and comprises a set of power outputs 11 comprising a socket and a voltage supply for a light source 1. Furthermore, the system comprises a voltage supply (not shown), in particular a mains voltage supply, a control unit 2, a door sensor 3, a control element 4, an indicator 5, and a verification device 6. The system of the technical solution is installed, for example, in a room, such as a hotel room, and the door sensor 3, for example a reed contact, is then

placed on the door to this room, is data-connected to the control unit 2, and the control unit 2, based on the data from the door sensor 3, is able to recognize whether the door is open or closed or, alternatively, to recognize at least a motion of the door or motion in the area of the door. The control element 4 is connected to the control unit 2 and in the embodiment shown, it is a button.

The control unit 2 comprises, in the embodiment shown, a physical memory 10, a software control module 8, and a software timing module 9. The timing module 9 may be, for example, a crystal, as is common in the prior art, or a crystal and a time measuring processor. However, it is also possible to use a mechanical timer. In some embodiments, the control module 8 and the timing module 9 may be replaced by a single module performing both the control and timing functions. The control module 8 is adapted to receive data from, among others, the door sensor 3, the control element 4, and the timing module 9 and is adapted to connect the power outputs 11 to the voltage supply (i.e., to switch on the electricity) and to disconnect them from the voltage supply (i.e., to switch off the electricity). For example, the control unit 2 can directly switch on the circuit breaker and the control module 8 determines whether the power supply occurs or not, i.e., whether the circuit breaker is switched on or off. Connection of the set of power outputs 11 in the exemplary embodiment occurs when the door is opened, and their disconnection occurs when a predetermined period of time has elapsed since the door was closed. Opening or closing of the door is detected by the door sensor 3 and time measurement is provided by the timing module 9. In some embodiments, the timing module 9 also compares the elapsed time with a threshold value, in others this function is performed by the control module 8.

Furthermore, the control module 8 is adapted to extend the time until the electricity is switched off when the button is pressed. This extension can, for example, just restart the timer switched on when the door is opened and implemented by the timing module 9, where the preset time can be, for example, 5 min, 10 min, 20 min, 1 hour, etc. Alternatively, this extension may take the form of setting the timer to a different time than that for which it was set when the door was opened and the electricity was switched on. For example, when the door is closed, the timer can be set for a time period of 5 minutes, wherein after this time has elapsed, information is issued from the timing module 9 to the control module 8, which switches the electricity off. Pressing the button before and

preferably after the time has elapsed will set the timer to, for example, half an hour, an hour, etc.

In preferred embodiments, pressing the button, or any other action of the control element 4 other than the button, as will be described in more detail below, may not reset or reset the timer, but may switch it off. In the flow chart in fig. 2, which describes the operation of the system, the timer switch-off is not shown for the sake of brevity; it can occur, for example, at the same time the indicator is switched off. The electricity will then be switched on until the electricity is switched off by a system component other than timing module 9, for example by pressing the button again, opening of the door, switching an additional switch, etc. Preferably, the electricity is switched off after the button is pressed by another opening and closing of the door, which again starts the timer, and when the time expires, the electricity is switched off. This ensures that when the guest leaves the room, no appliance that does not need to be switched on is left switched on.

The verification device 6 is implemented as a chip card 7 reader in the embodiment shown. This reader is used to verify users, such as hotel staff. The verification device 6 may or may not be usable by guests. The control unit 2, after inserting the chip card 7 into the reader, verifies that the chip card 7 belongs to an authorized person, for example by verifying the identification number of the card in the staff database in the memory 8. Subsequently, the control unit 2 stops the timer if the timer is running so that the verified person can have the electricity switched on permanently in the room. Unlike the timer being stopped by a button, in the exemplary embodiment shown, the timer is not switched back on when the door is opened and closed after user verification. The subsequent switching off the electricity then requires user intervention, for example another insertion of the chip card 7 into the reader, pushing the button again, etc.

The indicator 5 is adapted to inform the users that the timer is started, and therefore that after a certain period of time the power outputs 11 will be disconnected from the voltage supply. In the embodiment shown, the indicator 5 is a LED light source that starts flashing when the door is closed and stops flashing when the timer is stopped by a button or reader or when the electricity is switched off. Alternatively, the timer and/or indicator 5 may be switched on when the door is opened. Alternatively or additionally, the indicator 5 may indicate not only the running of the timer but also the time until the time expires, i.e. the time remaining until the electricity is switched off. For example, the flashing frequency can increase, the intensity of the light can increase, the number of LEDs lit can

increase, the color of the LEDs can change, etc. Alternatively or additionally, the indicator 5 may be, for example, a buzzer or loudspeaker, another light source, a hand on a dial indicating the remaining time, a timer on a display, etc. Preferably, the indicator 5 provides both visual and audio indication, meaning it comprises e.g., a light source and a buzzer.

In alternative embodiments, the control element 4 is a different type of switch than a button, for example a conventional two-position switch, a lever switch, etc. In other embodiments, the control element 4 is a chip reader, chip card 7 reader, barcode or other code reader, etc. In such embodiments, the control element 4 may be used not only to delay/cancel the electricity switch-off but also to verify the users, which in the above-described embodiment is implemented by a special verification device 6 – a chip card 7 reader. Preferably, neither the control device 4 nor the verification device 6 requires the permanent presence of the chip card 7, chip, code, or other verification element. However, embodiments are also possible where inserting the chip card 7 into the reader stops the timer and deactivates the switching on/off of electricity based on the data from the door sensor 3 and removing it starts the effect of the door sensor 3 and possibly the timer again. In some embodiments, the system may comprise a plurality of control devices 4 or verification devices 6. Furthermore, the system may then comprise multiple sets of power outputs 11. For example, one system is then shared by an entire floor or an entire hotel, wherein each hotel room has its own set of power outputs 11 connected and disconnected due to a corresponding door sensor 3 and control element in that room. The verification elements 6 located in corridors may then allow, for example, permanent switch-on of the electricity in the entire hotel or the entire floor, wherein each room may have an individual verification element 6 for permanently switching the electricity on in that room.

In further alternative embodiments, the software modules of the control unit 2 may be implemented as stand-alone devices or as modules running on stand-alone devices. In further alternative embodiments, the door sensor 3 may be, for example, a different type of magnetic sensor than the reed contact described above, or another type of sensor adapted to record the opening and/or closing of the door. For example, an infrared or laser door sensor 3, a motion sensor recording motion in the door area, a light-sensitive sensor, etc. can be used.

In alternative embodiments, the verification device 6 may be, for example, a code reader such as a QR code reader, or a reader of chips other than those on the chip cards

7. Alternatively, the verification device 6 may be, for example, a keyboard or touch screen on which the authorized person enters a password, performs a certain gesture, etc. Alternatively, the verification device 6 may be, for example, a fingerprint reader or a mechanical lock, wherein the authorized persons then need a key for verification.

In a preferred embodiment, the electricity switch-on is ensured not only by opening the door but also by the control device 4 and/or the verification device 6. Therefore, if the electricity is switched off by the timer while the user is in the room, they can switch on the electricity e.g., by pressing a button, without having to open and close the door.

The set of power outputs 11 may comprise more power outputs than two as in the embodiment shown. In particular, it may comprise a plurality of sockets and a plurality of voltage supplies for light sources, possibly for electric heating, air conditioning, fan, television, etc. The room provided with the system of the technical solution preferably further comprises permanently powered power outputs 11, which cannot be disconnected from the voltage supply by the timer or by the control unit 2. For example, this is a power supply for a refrigerator that requires permanent power supply, a power supply for an alarm or smoke detector, etc.

In some embodiments, the electricity switch-on and the start of time measurement may occur simultaneously, e.g., both as a result of the door opening or closing. In other embodiments, the control module 8 can ensure that the electricity is switched on when the door is opened and the time starts to be measured only when the door is closed, or, conversely, that the electricity is switched on only when the door is closed but the time starts to be measured already when it is opened. In some other embodiments, the verification by the verification device 6 may switch on the electricity for a certain period of time as measured by the timing module 9, where this period of time is significantly longer than the period of time set when the door is opened. This allows the staff to switch on the electricity by verification, wherein walking through the door will not affect the electricity switch-off, and it eliminates the need for user intervention to switch the electricity off. For example, this time can be three hours, during which time the rooms can be cleaned and the cleaning staff does not have to think about the need to switch the electricity off when they are finished.

The alternatives and modifications described above can be combined at the discretion of a skilled person, in particular it is possible to combine different types of control elements 4, verification devices 6, indicators 5, and power outputs 11.

List of Reference Signs

1 - Light source

2 - Control unit

3 - Door sensor

4 - Control element

5 - Indicator

6 - Verification device

7 - Chip card

8 - Control module

9 - Timing module

10 - Memory

11 - Power output

CLAIMS

1. A power control system that comprises a voltage supply, a set of power outputs (11) adapted to connect electrical appliances, a control unit (2), and a door sensor (3), wherein the control unit (2) is connected to the door sensor (3) and is adapted to record the opening and/or closing of the door based on data from the door sensor (3) and is adapted to connect the set of power outputs (11) to the voltage supply based on data from the door sensor (3), **characterized in that** the system further comprises a control element (4) connected to the control unit (2), wherein the control unit (2) is adapted to measure time and to disconnect the set of power outputs (11) from the voltage supply when a predetermined time is measured, wherein the control element (4) is adapted to extend the time until the set of power outputs (11) are disconnected from the voltage supply by the control unit (2).

2. The power control system of claim 1, **characterized in that** the control unit (2) is adapted to start measuring time upon receipt of data from the door sensor (3) indicating the opening of the door.

3. The power control system of claim 1, **characterized in that** the control unit (2) is adapted to start measuring time upon receipt of data from the door sensor (3) indicating the closing of the door.

4. The power control system of any one of claims 1 to 3, **characterized in that** the control element (4) is selected from a set comprising a switch, a motion sensor, a card reader, a code reader, and a chip reader.

5. The power control system of any one of claims 1 to 4, **characterized in that** it further comprises an indicator (5) adapted to indicate a time measurement and/or to indicate the amount of time remaining until the set of power outputs (11) are disconnected from the voltage supply by the control unit (2).

6. The power control system of any one of claims 1 to 5, **characterized in that** the control unit (2) is further adapted to verify the user and to stop the time measurement based on the user verification.

7. The power control system of claim 6, **characterized in that** the control unit (2) is further adapted to deactivate the disconnection of the set of power outputs (11) from the voltage supply by the control unit (2) depending on the data from the door sensor (3) based on user verification.

8. The power control system of any one of claims 7 to 8, **characterized in that** the user verification is implemented via the control element (4).

9. The power control system of any one of claims 7 to 9, **characterized in that** it further comprises a verification device (6) selected from a set comprising a keyboard, a touch screen, a card reader, a code reader, a chip reader, a lock, and a fingerprint reader, wherein user verification is implemented via the verification device (6).

10. The power control system of any one of claims 1 to 9, **characterized in that** the set of power outputs (11) comprises elements selected from a set comprising sockets and voltage supplies for light sources, for heating, and for air conditioning devices.

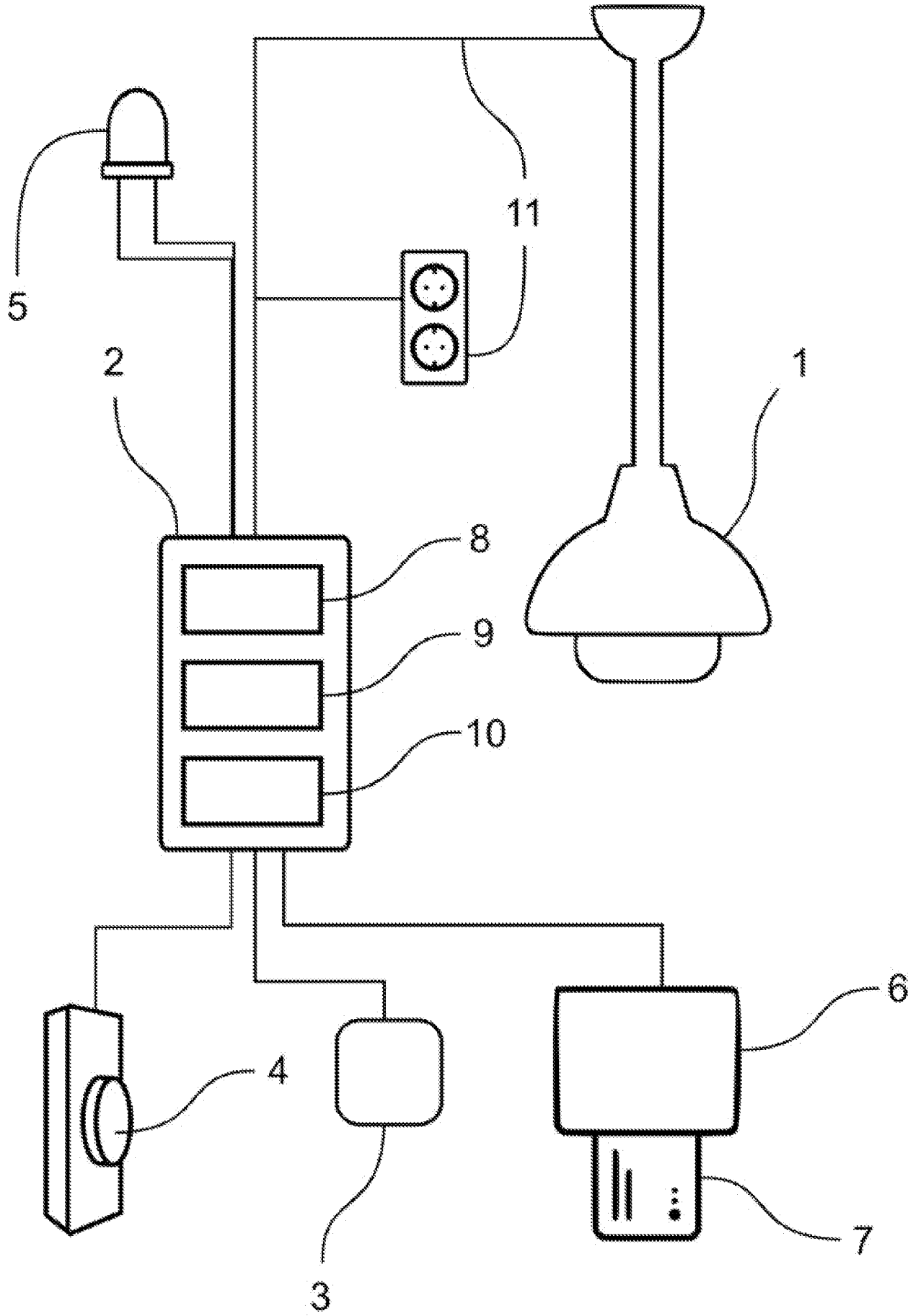

Fig. 1

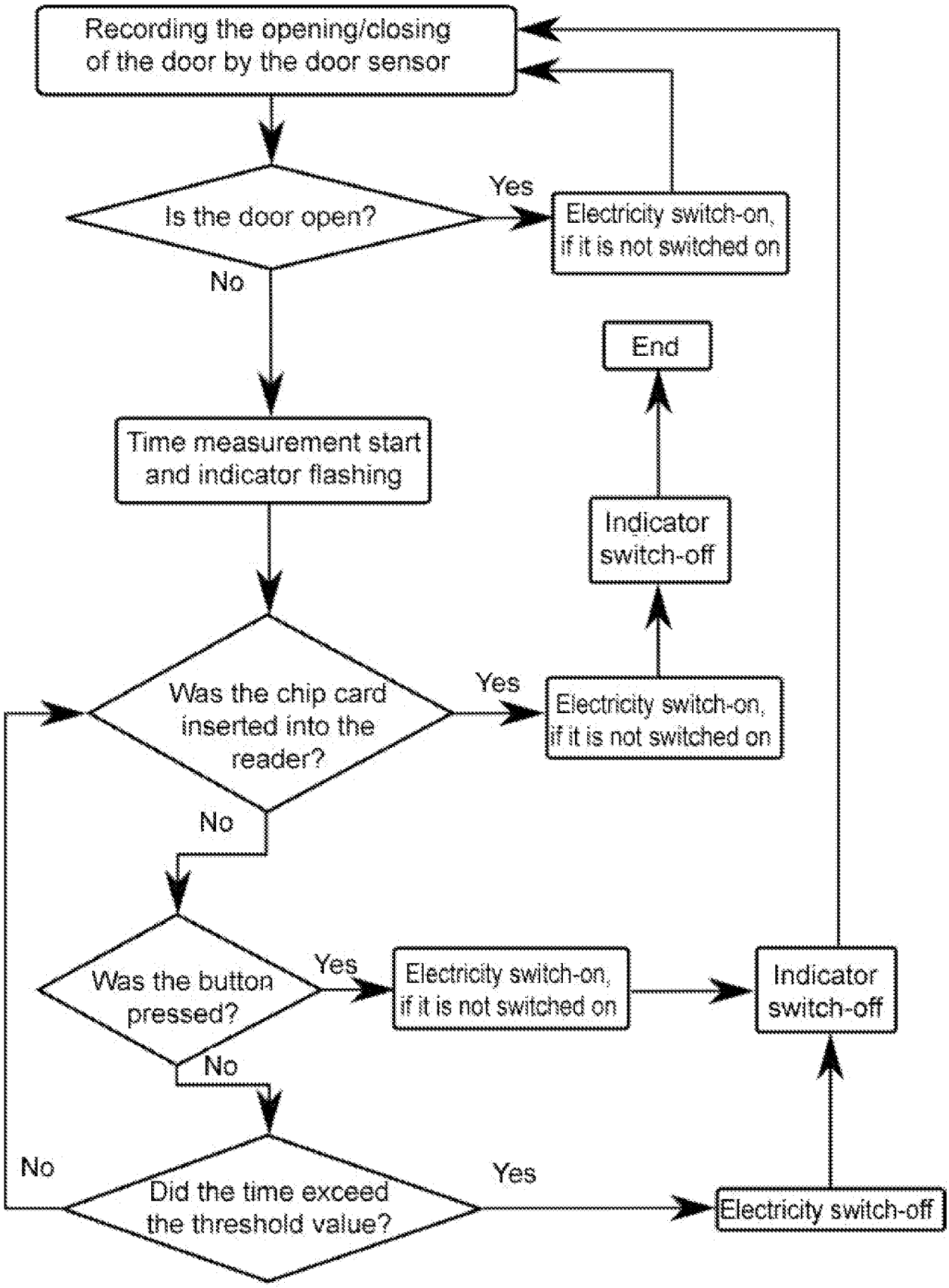
Recording the opening/closing of the door by the door sensor
Is the door open?
Yes
Electricity switch-on, if it is not switched on
No
Time measurement start and indicator flashing
End
Indicator switch-off
Was the chip card inserted into the reader?
Yes
Electricity switch-on, if it is not switched on
No
Was the button pressed?
Yes
Electricity switch-on, if it is not switched on
Indicator switch-off
No
Did the time exceed the threshold value?
Yes
No
Electricity switch-off

Fig. 2

INTERNATIONAL SEARCH REPORT

International application No
PCT/CZ2022/050070

A. CLASSIFICATION OF SUBJECT MATTER
INV. H03K17/28 G05B19/00 G06Q50/12 H05B47/10
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H03K G06Q G05B H05B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 315 596 A (JOHNSON JR PHILIP ET AL) 16 February 1982 (1982-02-16) figures 1-3	1-10
X	EP 3 188 573 A1 (STABIL PIOTR NARCZYK [PL]) 5 July 2017 (2017-07-05) figures 1, 2	1-10
X	US 4 058 740 A (DALTON JAMES H ET AL) 15 November 1977 (1977-11-15) figure 1	1-10
X	CN 210 199 535 U (LI FANXING) 27 March 2020 (2020-03-27) abstract	1-10
X	US 4 223 301 A (GRIMES JOHNNY C ET AL) 16 September 1980 (1980-09-16) figures 1, 2	1-10

☐ Further documents are listed in the continuation of Box C.

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Date of the actual completion of the international search	Date of mailing of the international search report
2 November 2022	10/11/2022

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/CZ2022/050070

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