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(54) **DEVICE AND METHOD FOR GESTURE CONTROL OF MOTORIZED BLINDS**

(57) The invention relates to a gesture control method and device for motorized blinds comprising two different circuits: (a) a power circuit; and (b) a control circuit, wherein the power circuit is configured to be coupled to the shaft of the blind motor; and wherein the control circuit comprises at least one positioning sensor, which is a presence detection sensor for detecting presence by means of a laser array that is configured to detect and identify the gestures of a user in the lower perpendicular of the positioning sensor.

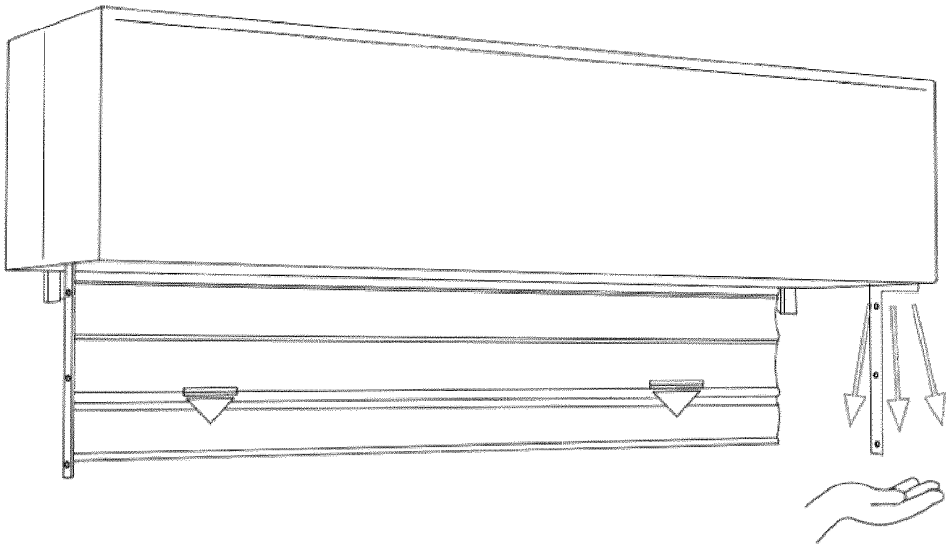

FIG.3

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Description

Technical field of the invention

[0001] The present invention relates to a gesture control device for windows which is included in the technical field of home automation, and particularly in the technical field of IoT (Internet of Things).

State of the art

[0002] Gesture control has recently become the focus of development. In particular, the mass availability of preferably optical detection systems such as, for example, Sony's EYETOY® camera or Sony's PLAYSTATION MOVE® camera or Microsoft's Kinect® camera, allows a low-cost optical detection of a room, and therefore the possibility of gesture control. In relation to systems of this type, methods for controlling televisions or even home automation systems, for example, by means of gestures have already been developed as is known from document US 2011/0032423 A1. Furthermore, document US 2008/0062257 A1 discloses a gesture control in which at least two cameras capture the user's gestures. The gesture control described in said document refers to gestures in relation to a display, such that a display is always necessary for gesture control.

[0003] An evolution of these systems is described in European patent EP 2 710 777 B1, which relates to a home automation control system and a method for controlling a home automation system by means of gestures. This system comprises: (a) detection means which are configured to detect gestures in a room; (b) storage means which are configured to store associations between a virtual sensor in, against, or on a room bounding surface and a gesture to which the sensor responds, and to store an association between the virtual sensor and an actuator; and (c) control means for actuating the actuator when the gesture to which the sensor responds is detected by the detection means.

[0004] More recently, document US 2023/0236669 A1 describes a sunshading louver control system based on gesture recognition, comprising: a data collector, an information processing unit, an information determining unit, and a terminal control unit. Indoor images are collected in real time. Based on the indoor images, an action region of gesture motion is positioned and feature extraction is performed thereon to obtain hand motion parameters. The hand motion parameters are analysed to obtain gesture information. The gesture information is compared with preset gesture information. When the preset gesture information contains the gesture information, corresponding adjustment is performed on a sunshading louver according to a preset operation logic corresponding to the gesture information. When the preset gesture information does not contain the gesture information, the gesture information is determined to be invalid. The lifting and rotation angles of the louver can be automatically controlled according to various gestures of indoor personnel, thereby rapidly realizing regulation of indoor illumination and natural ventilation quantity, and meeting the change of personnel's demand for indoor environment.

[0005] Document EP3328000B1, belonging to the same proprietors as the present invention, discloses a home automation control device starting out with a conventional door or window, providing passive protection against any external meteorological agents, or against other types of attacks, with the door or window of the invention also establishing active protection as a result of it being able to perceive temperature, interior and exterior humidity, to know the position of the sun and the index of UV ray incidence on the door or window. In this way, it is capable of reacting actively to meteorological adversities and configuring elements such as the height of the blinds, the lowering of awnings or curtains and the opening of door leaves or window sashes, as well as turning the air-conditioning on/off. It is for this reason that the control device used for doors or windows is an important tool for the energy efficiency of the home, as well as providing security to the home passively, like any traditional door or window. Furthermore, the control device is capable of perceiving through its sensors when a door or window is being forced or when said enclosure is open such that it: (a) sends the information to an application (App) on the user's mobile phone, setting off an alarm and notifying the security company; and (b) enters an active defence mode lowering the blinds to make entry difficult and activating a camera to record a video that may identify the aggressors.

Description of the invention

[0006] The object of the present invention relates to a gesture control device for motorized blinds which can be integrated in the blind box or compact. Furthermore, an object of the invention relates to the device being capable of controlling blind movement with gestures, without needing to have a physical switch, and thereby saving on installation, since the device is housed and integrated in the actual box of the motorized blind. To that end, gesture identification by means of an array of nine lasers emitting from the device is fundamental. This object is achieved by means of the claims accompanying the present specification.

[0007] The device of the invention is installed in the blind box or wall using a construction cover, since the technical effect sought consists of replacing traditional switches, with the actuation being by means of a gesture that simulates movement in the direction to which the blind is to be directed. In order to operate the invisible switch, the user must place him/herself perpendicularly below the blind and perform the gesture of touching the wall. In this way, it is possible to simulate an invisible switch.

[0008] For the device to operate correctly, it is neces-

sary to perform the gestures exclusively in the lower perpendicular of the door and/or window, although it would be possible to replace all the switches of a house with the suitable implementation. Furthermore, the device of the invention results in an evident aesthetic improvement, given that the wall is not interrupted by the presence of switches.

[0009] Throughout the description and the claims, the word "comprise" and its variants are not intended to exclude other technical features, additions, components or steps. For those skilled in the art, other objects, advantages and features of the invention will be deduced from both the description and the practical use of the invention. The following examples and drawings are provided by way of illustration and are not intended to limit the present invention. Furthermore, the present invention covers all possible combinations of particular and preferred embodiments indicated herein.

Brief description of the figures

[0010] What follows is a very brief description of a series of drawings that aid in better understanding the invention and which are expressly related to an embodiment of said invention that is presented by way of a non-limiting example of the same.

Figure 1 shows a first view of the gesture control device for motorized blinds integrated in the blind box.

Figure 2 shows a second view of the gesture control device for motorized blinds integrated in the blind box.

Figure 3 shows a diagram for the gesture control of a motorized blind according to the present invention.

Detailed description of an embodiment of the invention

[0011] The attached figures show an embodiment of the invention. More specifically, the gesture control device for motorized blinds comprises two different circuits: (a) a power circuit; and (b) a control circuit. In particular embodiments of the invention, it may further comprise one or more peripherals, as will be described in detail below in the present specification.

[0012] The power circuit is configured to be coupled in any end cap device on the market, both as a result of its size and concave shape, allowing perfect coupling to the shaft of the blind motor.

[0013] The power circuit is shown in Figure 1. One of the functions of the power circuit of the present invention is to connect the cables of the devices that will be connected to the control circuit and of the blind motor. These connectors are:

a first power supply cable connector (1). In this connector, a bundle of three phase/neutral/ground cables which are responsible for powering this circuit and the motor is connected.
a second blind motor cable connector (2), in which the four cables of the blind motor, i.e., two phase cables/neutral cable/ground cable, are plugged.
a third control circuit connector (3) which is configured to connect the power circuit with the control circuit; and
a fourth ambient light peripheral connector (4), which is optional and will allow plugging in an ambient LED strip with which the blind box is lighted up.

[0014] The control circuit is a circuit of reduced dimensions (measuring in a particular embodiment 30 mm x 21 mm). This circuit houses all the control electronics, comprising:

a positioning sensor, which is a sensor consisting of an array of up to nine lasers configured to detect and identify the user's gestures in the lower perpendicular thereof;
an optional air quality sensor for variants of the device with added functionalities;
a wireless module and a processor, used for communications with an APPLICATION and an external server;
a reset button;
a LED for state control; and
a power circuit connector.

[0015] The device is capable of measuring the gestures performed in front of the window. The device is capable of precisely measuring up to a height of five meters and with a cone of about 30 cm around the sensor. The sensor used is a presence sensor with an array of nine lasers, wherein the distance and the moment of cutting are measured at each of the points of the array, whereby the gesture that the user has performed in the lower perpendicular of the sensor can be established.

[0016] As a result of a plurality of predefined gestures, the user is capable of raising and lowering the blind completely or in intermediate positions.

[0017] The device does not require Internet connection or connection to any APPLICATION for its operation, although linking with the APPLICATION can be performed in order to remotely control the device.

[0018] As a result of being integrated in the blind box itself, savings is achieved in installation, with the connection being made and the physical switch being housed in the window. Being integrated facilitates the process for producing both the blind box and the window, as well as on-site installation.

- This device is designed for current blind and window manufacturing industry, giving it a competitive advantage with respect to other solutions of the current

industry. As a result of the device of the present invention, motorized blinds are assembled more quickly on site because the switch is installed in the blind itself. It is more novel and intuitive as it presents a new way to interact with the blind by means of gestures.

- Control by means of gestures is the most representative. Depending on the gesture, the blinds of a window in a room of the entire house can be raised or lowered.

- Furthermore, the device is developed to produce the blind within a much shorter time than at present. This is due to the assembly device thereof and to functionalities such as the automatic end-of-travel which means that the operator does not need to regulate the blind.

- It also has A LED strip connector, so the user who wishes to have ambient light in the blind boxes will only have to contract this functionality and the manufacturer will install it very quickly. Both the colur of the ambient light, as well as the intensity of said light, can be controlled with this device.

- The power circuit of the invention has a Hall sensor for measuring the consumption of the blind motor, as a result of this sensor and a series of algorithms and complex calculations, it is possible to detect whether the blind detects an obstacle when being lowered and stop the lowering so as not to break the blind. Furthermore, an alert is sent to the user by means of the APPLICATION.

- As a result of the incorporation of the Hall sensor in the power circuit of the invention, the state of the blind can be analysed and reflected in the APPLICATION. All this by using the most cost-effective and reliable motor on the market, which is the tubular mechanical motor.

- If a mechanical motor with an encoder is used, end-of-travel regulation can also be dispensed with, since the device of the present invention would do so automatically.

[0019] The wireless communication circuit, which will preferably comply with protocol 802.11 b/g/n, is responsible for connecting the device with a remote server in order to be able to control the blind additionally from a mobile application in a mobile device of the user or by means of a web service. Wireless communications are encrypted (preferably by means of WPA or WPA2 protocols). To that end, the invention implements an algorithm which changes the encryption seed once every 24 hours. This encryption seed is propagated throughout the entire architecture of the door or window network and throughout the remote server. In this way, obtaining the encryption password by sniffing is made impossible, since the time required to figure it out exceeds 24 hours.

[0020] A commercial circuit which implements the "Thread" protocol such as, for example, the "EM358x and EM359x SoCs for zigbee® and Thread" circuit, is used for communication between the devices of the invention. This protocol is used to connect various home automation devices to the local network of the house, such as the device of the invention or other compatible devices, such as those described in EP3328000B1. In this way, if a door or window at the end of the house does not have any wireless signal, the windows create an internal network encrypted by this protocol which interconnects all of them with the window which is connected to the remote server, along with the blind of the invention.

[0021] The "Thread" protocol uses standards such as IPv6 and 6LoWAN, having the capacity to safely and readily connect hundreds of devices in a mesh network, which is a network typology that provides greater coverage and capacity for load balancing. Among the notable advantages of the network are its capacity to scale up to hundreds of devices without any points of failure, which ensures that the connected devices are available when required. Security is another favourable point of this protocol, since it is offered through high-level encryption. Lastly, it should be noted that the users will be capable of connecting devices compatible with "Thread" to one another and to the remote server through a portable electronic device of the user or a computer.

[0022] Once the device is connected to electricity, the device runs a check and calibration process which in turn comprises the stages of:

(a) checking that the blind has a blind motor connected:

(a.1) wherein the check is performed by measuring the electricity consumed by the relays, such that if they do not consume any electricity a blind is absence and the service is not initialized, the switch for the blind is disconnected so that the user does not perceive any interaction; and
(a.2) if a blind is present, perform a two-step calibration process:

(a.2.1) raising the blind until it reaches its end of travel; the device detects through its consumption that the motor has stopped and memorizes its highest position, as well as the time used in the process; this data is stored in the device of the invention and sent to the remote server that integrates the system; this "blind_up" position will be self-calibrated every time the window loses connection to the mains or is reset;
(a.2.2) lowering the blind to the lower end of travel, memorizing in this case which is the

lower position state, as well as the time used in the process; and wherein this data is stored in the device and sent to the remote server connected with the device of the invention remotely, with the "blind_down" position;

(a.2.3) calculating the intermediate positions since, as a result of steps

(a.2.1) - (a.2.2), the system is capable of knowing the state of the blind because the raising and lowering times have been measured; as a result, and through the user application, it is possible to tell the blind service to be placed, for example, in a position of three quarters of its travel or in the middle of its travel from a menu of predefined positions on the user application.

[0023] After the check and calibration process, a communication process is established between the device of the invention and a remote server which is in turn connected to an application installed on a portable electronic device of the user or is accessible through a web application. The blinds never communicate directly with the application. For communication, either indoors or outdoors, the remote server is used to interconnect the blind services with the mobile application. The communication channel with the outdoors will be wireless, therefore own device such as a Hub or Gateway will be necessary, since communication is performed directly with the premises/user's own router through the 802.11 b/g/n protocol (in a particular non-limiting embodiment).

[0024] The device of the invention therefore implements a remote communications process by means of the WIFI (802.11 b/g/n) and Thread (IEEE 802.15.4) protocols. The device can communicate by means of either of the two protocols or a combination of both.

[0025] The wireless communication process comprises the stages of:

(a) connecting the device object of the invention to the power grid, such that when the device is first connected it acts as an access point generating its own network;

(b) providing the WIRELESS network data through the user APPLICATION, such that the device of the invention is registered in the WIRELESS network and the router provides an IP address by means of DHCP;

(c) sending to the remote server the data of the device of the invention including, at least: the IP address, a unique identifier of the device of the invention and services it provides, such that the information is sent to the user application from the remote server, such that the door or window can be controlled through the application itself.

[0026] The "Thread" communication process comprises at least one stage of connection with compatible home automation devices, such that this type of communication would be intended for the incorporation of the device in a local area home automation network. This protocol has the advantage of being more secure, energy efficient; it is an open protocol that carries IPV6 natively, based on a mesh network that allows no points of failure in the network, and runs on standard 802.15.4 radios. In any case, a network architecture formed by all the devices present in the same home would be obtained in the end.

[0027] In either of the two communication processes, a communication encryption process is established. For any exchange of information between any of the components generally involved in communications (control device/remote server/portable electronic device of the user), encryption is performed in two virtual layers:

(a) a first communication encryption layer, such that a "token" is requested for the encryption thereof; wherein said "token" identifies the communication for validation in the server and which comprises requesting a token (PToken) from the server for first level encryption;

(b) a second information encryption layer, such that once the communication is authenticated, what is performed is to encrypt the user's communication; and wherein this encryption is performed using the so-called User_Token which was generated when the user was registered in the system and a home was created in which the control devices according to the invention were added; and wherein the messages are encrypted by means of the token of the first encryption layer and by the User_Token; and

(c) wherein the encryption seed changes once every 24 hours.

[0028] The remote server comprises a database structure, which is the essential part for the correct functioning of the system. The various services and databases are hosted in the server. The remote server comprises means for running the following services:

Before a device can be used and linked to the application, the user must be registered in the remote server. It is at this point and through the account registration service that the user is assigned space in the account database and the structure thereof is created. Three types of accounts can be created and devices can be assigned from this service:

Main or master account: This is the main account to which the added devices are linked and from which secondary or slave accounts can be created.

Secondary accounts: Secondary accounts have the same services as the main account, but cannot create other accounts.

Slave or unprivileged accounts: this type of account is created by the main account and has a more

restricted range of action both in terms of the devices it controls and the services being run.

[0029] As a result of this service, when the master account creates other accounts, these new accounts inherit all the information from the main account. To that end, the account database manages all the accounts and their hierarchies by linking them with the other databases and services.

[0030] As a result of the device and method of the present invention, it is possible to have a switch with wireless connectivity, which allows lowering the costs of intervention in buildings. Furthermore, the device being integrated in the blind during the manufacturing process thereof also simplifies assembly, and the reduces costs.

Claims

1. A gesture control method for a motorized blind which comprises:

checking and calibrating a gesture control device for a motorized blind;
establishing a first communication channel with at least one gesture control device for a motorized blind in order to create a local area network;
establishing a second communication channel with at least one external remote server;
establishing a third communication channel between the external remote server and at least one portable electronic user device; wherein establishing the third communication channel comprises an encryption process for encrypting communications with two encryption layers:

wherein in a first communication encryption layer, a token which identifies the communication is requested for its validation in the external remote server and which comprises requesting a first token from the external remote server; and
wherein in a second communication information encryption layer, once the communication is authenticated in the external remote server, the user communication is encrypted; and wherein this encryption is performed using a second user token and wherein the messages are encrypted by means of the first token of the first encryption layer and by the second user token of the second encryption layer; and
wherein an encryption seed of the encryption process changes at least once every 24 hours;

which is **characterized in that** it comprises:

detecting the gestures of a user in the lower perpendicular of the blind by means of a presence sensor with a laser array;
identifying the detected gestures; and
activating the blind according to the identified gestures.

2. A gesture control device for motorized blinds comprises two different circuits: (a) a power circuit; and (b) a control circuit configured to run the method of claim 1, wherein the power circuit is configured to be coupled to the shaft of the blind motor; and which is **characterized in that** the control circuit comprises at least one positioning sensor, which is a presence detection sensor for detecting presence by means of a laser array that is configured to detect and identify the gestures of a user in the lower perpendicular of the positioning sensor.

3. The control device according to claim 1, wherein the positioning sensor is configured to detect the gestures of the user in a cone of 30 cm in diameter around the sensor.

4. The control device according to any one of claims 2 or 3, wherein the sensor which is used is a presence detection sensor for detecting presence by means of an array of nine lasers, wherein for each of the points of the array the distance and the moment of cutting with the user's hand are calculated, whereby the gesture that the user has performed in the lower perpendicular of the sensor can be established.

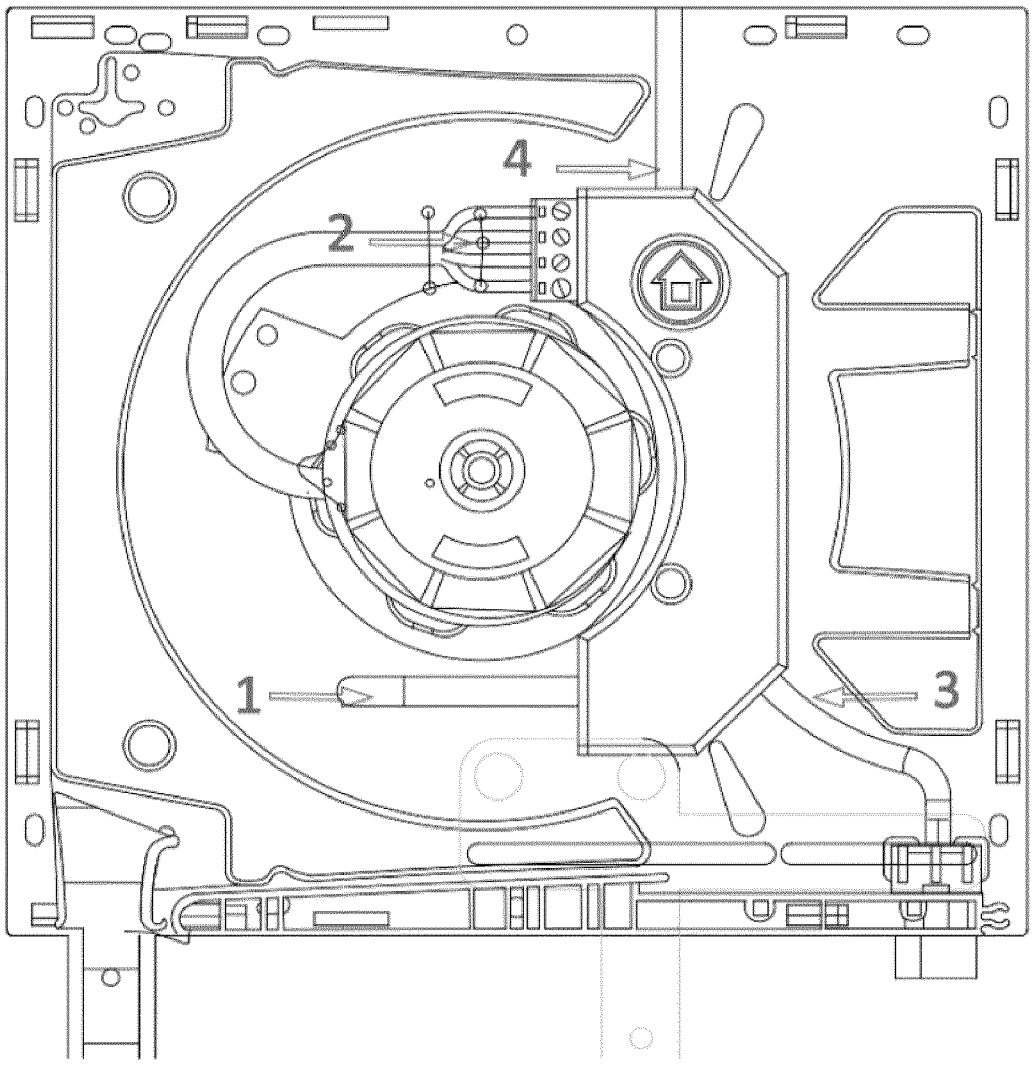

FIG.1

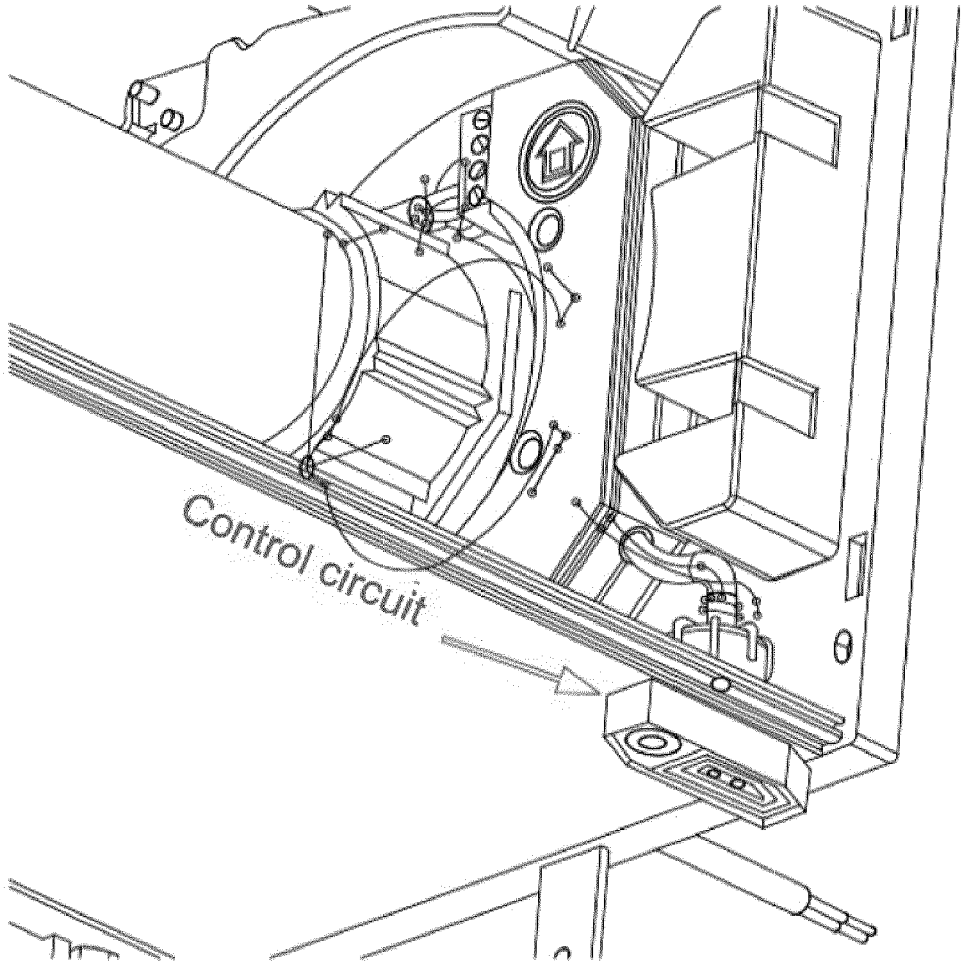

FIG.2

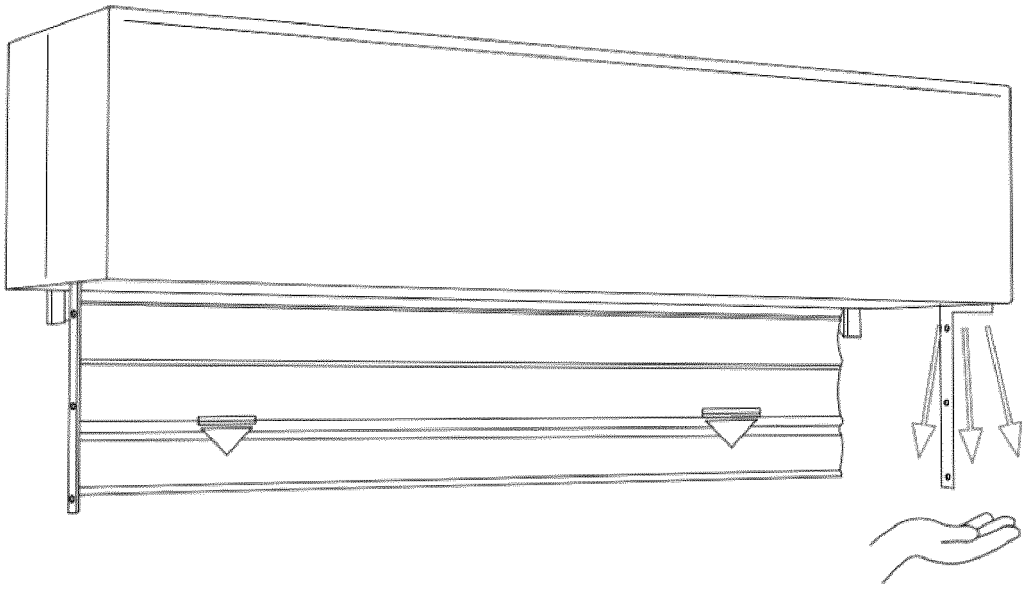

FIG.3

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EUROPEAN SEARCH REPORT

Application Number
EP 23 38 3155

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,D	EP 3 328 000 B1 (SISTEPLAST PVC S L [ES]) 10 July 2019 (2019-07-10) * figures 1-3 *	1-4	INV. E06B9/68
A	US 2018/062691 A1 (BARNETT JR THOMAS CHARLES [US]) 1 March 2018 (2018-03-01) * figures 1-8 *	1-4	
A	JP 2021 195828 A (NICHIBEI KK) 27 December 2021 (2021-12-27) * figures 1-27 *	1-4	

TECHNICAL FIELDS SEARCHED (IPC)

E06B
E05F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	15 April 2024	Petrinja, Etiel

CATEGORY OF CITED DOCUMENTS

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EPO FORM 1503 03.82 (P04C01)

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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15-04-2024

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 3328000 B1	10-07-2019	EP 3328000 A1	30-05-2018
		ES 2749599 T3	23-03-2020
		WO 2018234604 A1	27-12-2018
US 2018062691 A1	01-03-2018	US 2018062691 A1	01-03-2018
		US 2019028134 A1	24-01-2019
JP 2021195828 A	27-12-2021	NONE	

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 20110032423 A1 **[0002]**
- US 20080062257 A1 **[0002]**
- EP 2710777 B1 **[0003]**
- US 20230236669 A1 **[0004]**
- EP 3328000 B1 **[0005] [0020]**