(12) INNOVATION PATENT
(19) AUSTRALIAN PATENT OFFICE

(11) Application No. **AU 2019100423 A4**

(54) Title
Solar roller blind

(51) International Patent Classification(s)
E06B 9/68 (2006.01) ***H01L 31/04*** (2014.01)

(21) Application No: **2019100423** (22) Date of Filing: **2019.04.23**

(45) Publication Date: **2019.05.30**
(45) Publication Journal Date: **2019.05.30**
(45) Granted Journal Date: **2019.05.30**

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ABSTRACT

A solar roller blind includes a base (1), a reeling unit (2), a screen (3), a control unit (4), a plurality of power supply units (5), and an electricity storage unit (6). The power supply units (5) are provided at the base (1), are suspended below a reeling opening (12) of the base (1), and are each provided with an outdoor-facing first light-receiving side (51) for receiving sunlight and converting the received sunlight into electric energy and an opposite indoor-facing second light-receiving side (52) for receiving lamplight and converting the received lamplight into electric energy. The electricity storage unit (6) stores the electric energy and is separately electrically connected to the reeling unit (2) and the control unit (4) in order to power the two units with the stored electric energy. The solar roller blind is capable of continuous power conversion to power itself and therefore saves energy.

2019100423 23 Apr 2019

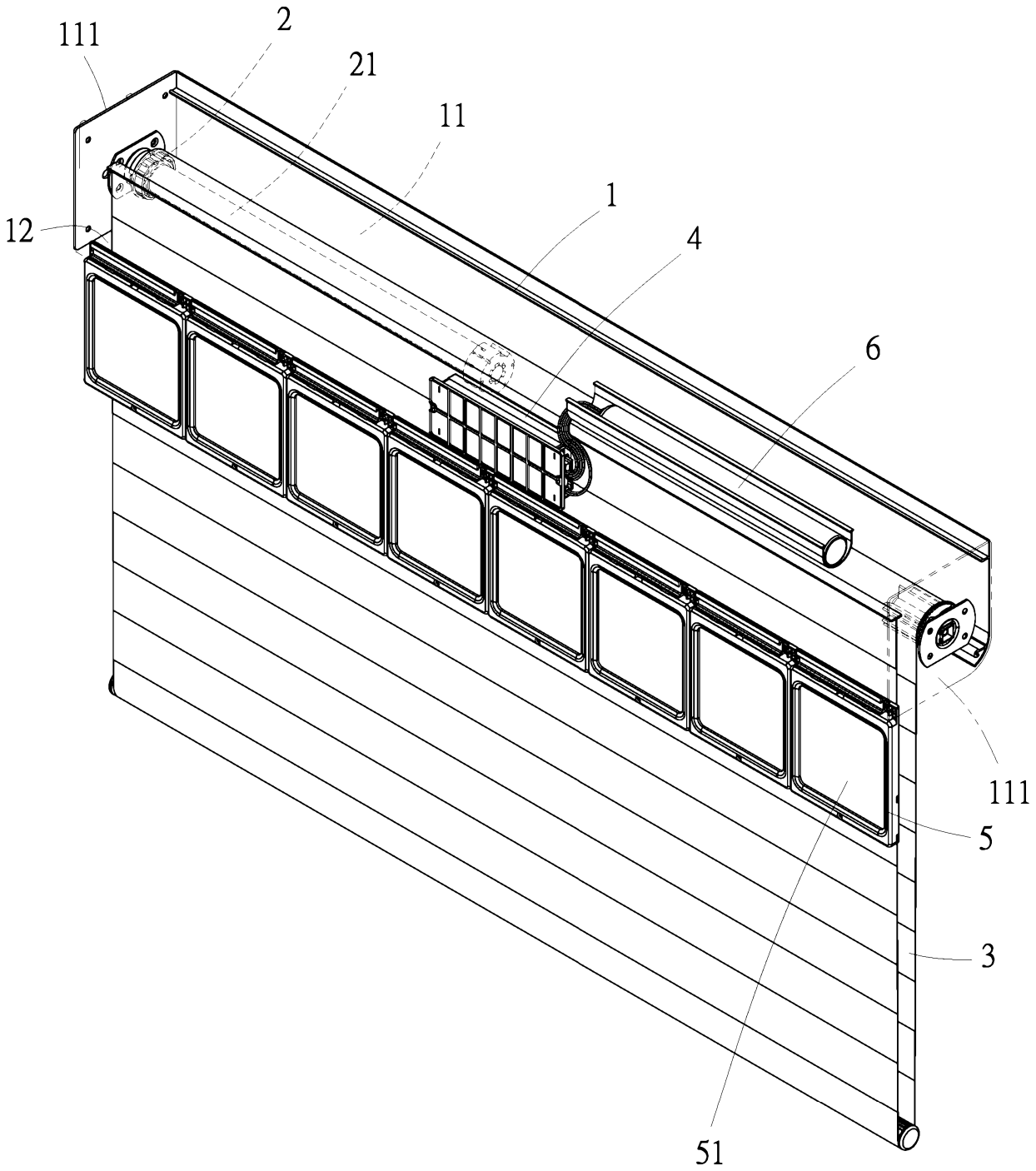

FIG. 1

SOLAR ROLLER BLIND

TECHNICAL FIELD

[0001] The present invention relates to a roller blind structure configured to receive sunlight, lamplight, or both at the same time and convert the received light energy into electric energy so as to be powered thereby.

BACKGROUND ART

[0002] Generally, the conventional roller blinds are designed to be raised and lowered by hand, so it takes much physical effort and time to operate those blinds. As a labor-saving and time-saving alternative, electric roller blinds were developed and are now commercially available. Since electric roller blinds are powered by electricity, typically mains electricity from a wall socket, a large number of wall sockets will be called for if it is desired to equip a row of windows with such blinds. However, not only may a host of wall sockets compromise the interior design of a house esthetically, but also it is impossible for an old house to be so wired in the first place as to supply electricity to a plurality of densely spaced wall sockets. In the latter case, additional wiring to an existing power source must be installed, and the esthetics or integrity of the decor of the house is very likely to be impaired as a result.

[0003] In light of the above, Taiwan Utility Model Patent No. M458447, entitled "window blind structure capable of power generation" and granted on August 1, 2013, discloses a window blind structure with a slat assembly, wherein the slat assembly is composed of a plurality of slats and is provided with at least one pulling cord for selectively drawing together, drawing apart, or tilting the slats, and wherein the outer surface of each slat is provided with a solar cell for converting light energy into electric energy. The solar cells are electrically connected to a battery module via a wire that runs along the pulling cord, and the battery module has an output end connected to at least one electrical appliance. Thus, while the slats block out the sun, the solar cells on the slats can convert light energy into electric energy and store the electric energy into the battery module; in other words, the window blind can provide shading and generate electricity at the same time. This dual-function device preserves the shading function of the window blind and eliminates the

need to install a solar generator elsewhere so that, without taking up any extra space, the same window blind provides a new mode of solar energy application that can be implemented in a common living environment to save energy and reduce carbon dioxide emissions.

[0004] According to the '447 patent, the solar cells are provided directly on the outdoor-facing surfaces of the slats to receive sunlight and convert the received sunlight into electric energy to be supplied to an external electrical appliance. This patented window blind, however, is still configured to be raised and lowered manually, which is both physically demanding and time consuming. Moreover, the solar cells are not exposed to sunlight when the slats are drawn together or when the sun has moved to an unfavorable position. On a cloudy day or at night, the solar cells cannot generate electricity either. The window blind disclosed in the '447 patent, therefore, has its drawbacks in use.

[0005] Taiwan Utility Model Patent No. M370011, entitled "solar window blind assembly" and granted on December 1, 2009, discloses a window blind assembly that includes a window unit and an electric window blind. The window unit includes an outer frame and at least one solar window. The solar window includes a window frame, at least one glass pane, and a thin-film solar panel mounted on the glass pane. The electric window blind includes a supporting frame, a motor, a screen mounted on the supporting frame, a controller electrically connected to the motor, and a battery separately electrically connected to the thin-film solar panel and the controller. The screen is reeled in or out as the motor rotates. The electric window blind works not on mains electricity but on the electric energy converted from the solar energy received.

[0006] While the solar window blind assembly in the '011 patent can directly convert sunlight into electric energy for use by the motor to reel in or out the screen, the thin-film solar panel mounted on the outdoor-facing surface of the glass window may hinder the opening and closing of the glass window, and power generation is also impossible on a cloudy day or at night. Thus, the solar window blind assembly still leaves something to be desired.

201910042 3 23 Apr 2019

SUMMARY OF INVENTION

[0007] In view of the foregoing drawbacks of the existing window blinds, the present invention provides a solar roller blind that includes a base, a reeling unit, a screen, a control unit, a plurality of power supply units, and an electricity storage unit. The base defines a receiving space therein and is provided with a reeling opening in communication with the receiving space. The reeling unit is provided in the receiving space and is provided with a driving element. The screen is coupled to the reeling unit, extends out of the reeling opening, and can be reeled in, and consequently raised, by the reeling unit in order to be received in the receiving space. The control unit is provided at the base and is signal-connected to the reeling unit in order to turn on and off the driving element. The power supply units are provided at the base, are suspended below the reeling opening, and each have two opposite sides, namely a first light-receiving side and a second light-receiving side. The first light-receiving sides face outdoors and are configured to receive sunlight and convert the received sunlight into electric energy. The second light-receiving sides face indoors and are configured to receive lamplight and convert the received lamplight into electric energy. The electricity storage unit is provided at the base and is electrically connected to the power supply units in order to receive and store the electric energy. The electricity storage unit is separately electrically connected to the reeling unit and the control unit in order to supply thereto the electricity required for their operation.

[0008] The receiving space has two opposite ends each provided with a fixing base, and the driving element is fixed on one of the fixing bases.

[0009] The driving element is a stepper motor.

[0010] The power supply units are dye-sensitized solar cells.

[0011] The technical features stated above have the following advantages:

[0012] 1. With the first light-receiving sides facing outdoors to receive sunlight and convert the received sunlight into electric energy, and the second light-receiving sides facing indoors to receive lamplight and convert the received lamplight into electric energy,

2019100423 23 Apr 2019

power conversion can continue for a long time to prevent a shortage of power supply to the solar roller blind, thereby allowing the solar roller blind to work incessantly without using mains electricity, i.e., in an energy-saving manner.

[0013] 2. Now that electric energy can be obtained entirely by converting sunlight and indoor lamplight, there is no need to use wall sockets for mains electricity, and hence no need to install extra sockets or additional wiring to an existing power source. This ensures that the esthetics and integrity of the decor of a house where the solar roller blind is to be installed can be preserved.

BRIEF DESCRIPTION OF DRAWINGS

[0014] FIG. 1 is a perspective view of an embodiment of the present invention;

[0015] FIG. 2 is a perspective view of the embodiment in FIG. 1 from another viewing angle;

[0016] FIG. 3 shows a state of use of the embodiment in FIG. 1, with the power supply units receiving sunlight and lamplight at the same time;

[0017] FIG. 4 shows another state of use of the embodiment in FIG. 1, with the screen lowered to shield an indoor space from sunlight, and with the power supply units receiving only sunlight; and

[0018] FIG. 5 shows yet another state of use of the embodiment in FIG. 1, with the power supply units receiving only lamplight at night.

DESCRIPTION OF EMBODIMENTS

[0019] Referring to FIG. 1 and FIG. 2, the solar roller blind according to an embodiment of the present invention includes a base 1, a reeling unit 2, a screen 3, a control unit 4, a plurality of power supply units 5, and an electricity storage unit 6.

2019100423 23 Apr 2019

[0020] The base 1 is provided therein with a receiving space 11, which extends along the entire length of the base 1. Each of the two opposite lateral ends of the receiving space 11 is provided with a fixing base 111, and a reeling opening 12 is provided in a bottom portion of the base 1 and communicates with the receiving space 11.

[0021] The reeling unit 2 is provided in the receiving space 11 of the base 1 and is provided with a driving element 21. The driving element 21 is fixed on one of the fixing bases 111, and the driving element 21 in this embodiment is a stepper motor by way of example.

[0022] The screen 3 is coupled to the reeling unit 2 and extends out of the reeling opening 12. The reeling unit 2 can reel in and thereby raise the screen 3 so that the screen 3 is received in the receiving space 11. The two lateral ends of the screen 3 abut against the two fixing bases 111 respectively.

[0023] The control unit 4 is provided at the base 1 and is signal-connected to the reeling unit 2 in order to turn on and off the driving element 21.

[0024] The power supply units 5 are provided at the base 1 and are suspended below the reeling opening 12. The power supply units 5 in this embodiment are dye-sensitized solar cells. Each power supply unit 5 has two opposite sides defined respectively as a first light-receiving side 51 and a second light-receiving side 52. The first light-receiving sides 51 face outdoors and are configured to receive sunlight and convert the received sunlight into electric energy. The second light-receiving sides 52 face indoors and are configured to receive lamplight and convert the received lamplight into electric energy.

[0025] The electricity storage unit 6 is provided at the base 1 and is electrically connected to the power supply units 5. The electricity storage unit 6 is separately electrically connected to the reeling unit 2 and the control unit 4 in order to supply to the reeling unit 2 and the control unit 4 the electric energy required for their operation.

[0026] To use, referring to FIG. 2 and FIG. 3, the base 1 is fixed on the indoor side of a wall and is located adjacent to a glass window A, with the first light-receiving sides 51 of

20191004423 23 Apr 2019

the power supply units 5 facing the glass window A to receive sunlight, and the second light-receiving sides 52 facing indoors to receive indoor lamplight. Once the solar roller blind is in place, the driving element 21 of the reeling unit 2 can be turned on or off through the control unit 4 by either automatic remote control or manual control, in order to raise or lower the screen 3 and thereby let in or block out the sun.

[0027] During daytime, the screen 3 can be raised and reeled in completely, as shown in FIG. 3, allowing the light of the sun B to pass through the glass window A and fall on the first light-receiving sides 51 of the power supply units 5. The first light-receiving sides 51 will receive the sunlight and convert it into electric energy so that the power supply units 5 charge (i.e., store the electric energy into) the electricity storage unit 6 continuously. The electricity storage unit 6 will store the incoming electric energy in order to power the reeling unit 2 and the control unit 4 with the stored electric energy. The solar roller blind, therefore, can work in an energy-saving manner without using mains electricity. If an indoor lamp C is turned on to emit light at the same time, the lamplight will fall on the second light-receiving sides 52 of the power supply units 5, and the second light-receiving sides 52 will receive the lamplight, convert the received lamplight into electric energy, and store the electric energy into the electricity storage unit 6 continuously, in order for the electricity storage unit 6 to support the operation of the reeling unit 2 and of the control unit 4 by outputting the stored electric energy thereto. Thus, the second light-receiving sides 52 also contribute to the energy-saving feature of the solar roller blind.

[0028] When the sun B is too bright, the screen 3 can be lowered to block out sunlight, as shown in FIG. 4. In that case, the light of the sun B will pass through the glass window A and fall on the first light-receiving sides 51 of the power supply units 5, and the first light-receiving sides 51 will receive the sunlight, convert the received sunlight into electric energy, and store the electric energy into the electricity storage unit 6, in order for the electricity storage unit 6 to output the stored electric energy to the reeling unit 2 and the control unit 4 to support their operation. As the solar roller blind remains operative in this state without using mains electricity, the energy-saving effect is achieved just as well.

[0029] When it is nighttime or when it is cloudy with little sunlight, referring to FIG. 5, the indoor lamp C is turned on to emit light, which falls on the second light-receiving sides 52 of the power supply units 5. The second light-receiving sides 52 receive the

2019100423 23 Apr 2019

lamplight, convert the received lamplight into electric energy, and store the electric energy into the electricity storage unit 6, allowing the electricity storage unit 6 to support the operation of the reeling unit 2 and of the control unit 4 by outputting the stored electric energy thereto. As the solar roller blind can work in this state without using mains electricity, the intended energy-saving effect is also achieved.

[0030] It should be pointed out that the power supply units 5 can be configured to convert very low light (be it sunlight, lamplight, or otherwise) into electric energy and store the electric energy into the electricity storage unit 6. This ensures that the reeling unit 2 and the control unit 4 will have electricity available for a long time.

[0031] The embodiment described above should have shed enough light on the operation, use, and effects of the present invention. The foregoing embodiment, however, is only one preferred embodiment of the invention and is not intended to be restrictive of the scope of the invention. All equivalent changes and modifications made according to the appended claims and the disclosure of this specification should fall within the scope of the invention.

2019100423 23 Apr 2019

CLAIMS

1. A solar roller blind, comprising:

a base defining a receiving space therein and provided with a reeling opening in communication with the receiving space;

a reeling unit provided in the receiving space and provided with a driving element;

a screen coupled to the reeling unit and extending out of the reeling opening, wherein the screen is able to be reeled in, and thus raised, by the reeling unit so as to be received in the receiving space;

a control unit provided at the base, wherein the control unit is signal-connected to the reeling unit in order to turn on and off the driving element;

a plurality of power supply units provided at the base, wherein the power supply units are suspended below the reeling opening and are each provided with a first light-receiving side and an opposite second light-receiving side, the first light-receiving sides face outdoors and are configured to receive sunlight and convert the received sunlight into electric energy, and the second light-receiving sides face indoors and are configured to receive lamplight and convert the received lamplight into electric energy; and

an electricity storage unit provided at the base, wherein the electricity storage unit is electrically connected to the power supply units in order to receive and store the electric energy, and the electricity storage unit is separately electrically connected to the reeling unit and the control unit in order to supply the stored electric energy to, and thereby enable operation of, the reeling unit and the control unit.

2. The solar roller blind of claim 1, wherein the receiving space has two opposite ends each provided with a fixing base, and the driving element is fixed on one of the fixing bases.

3. The solar roller blind of claim 1, wherein the driving element is a stepper motor.

4. The solar roller blind of claim 1, wherein the power supply units are dye-sensitized solar cells.

2019100423 23 Apr 2019

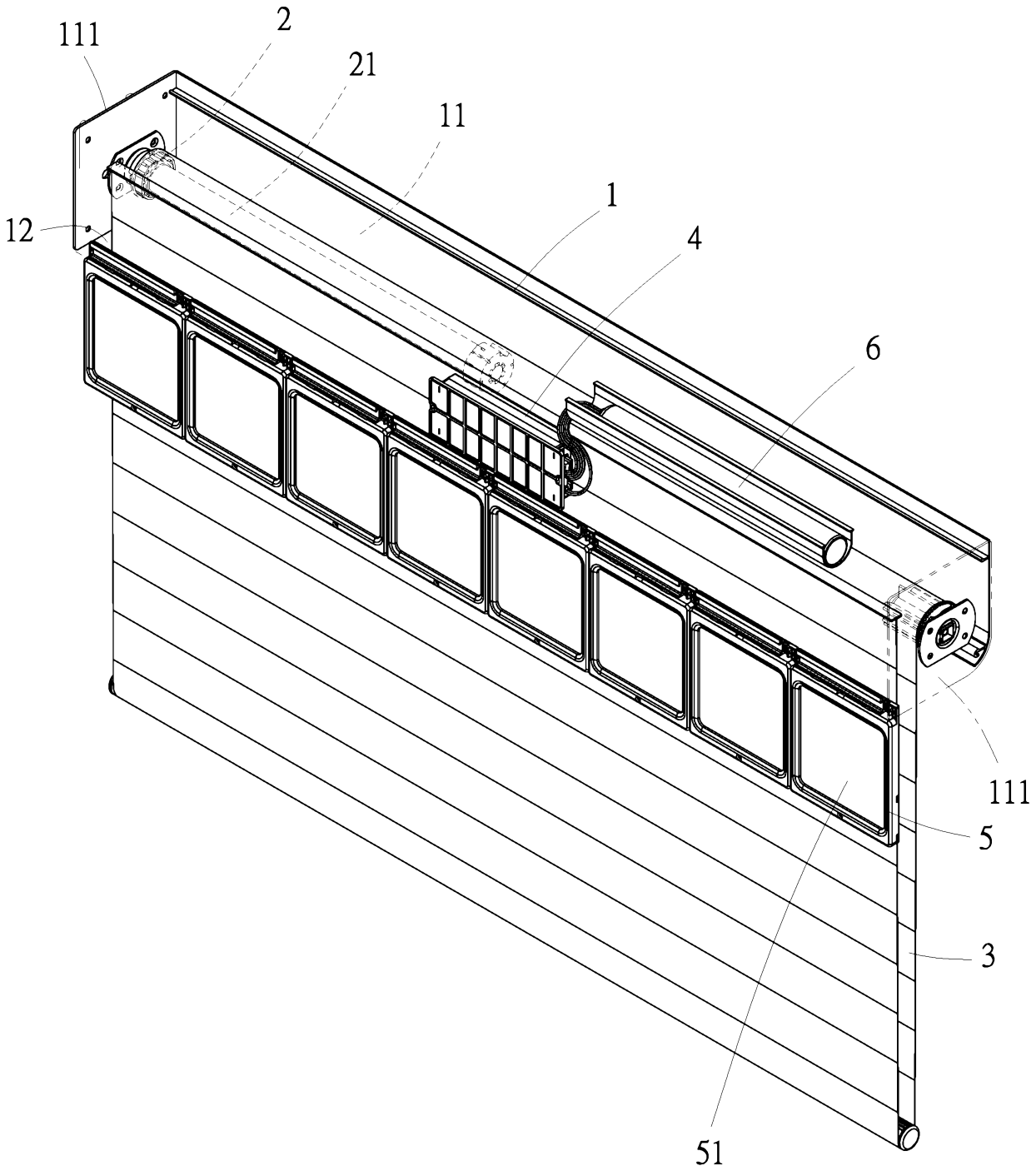

FIG. 1

2019100423 23 Apr 2019

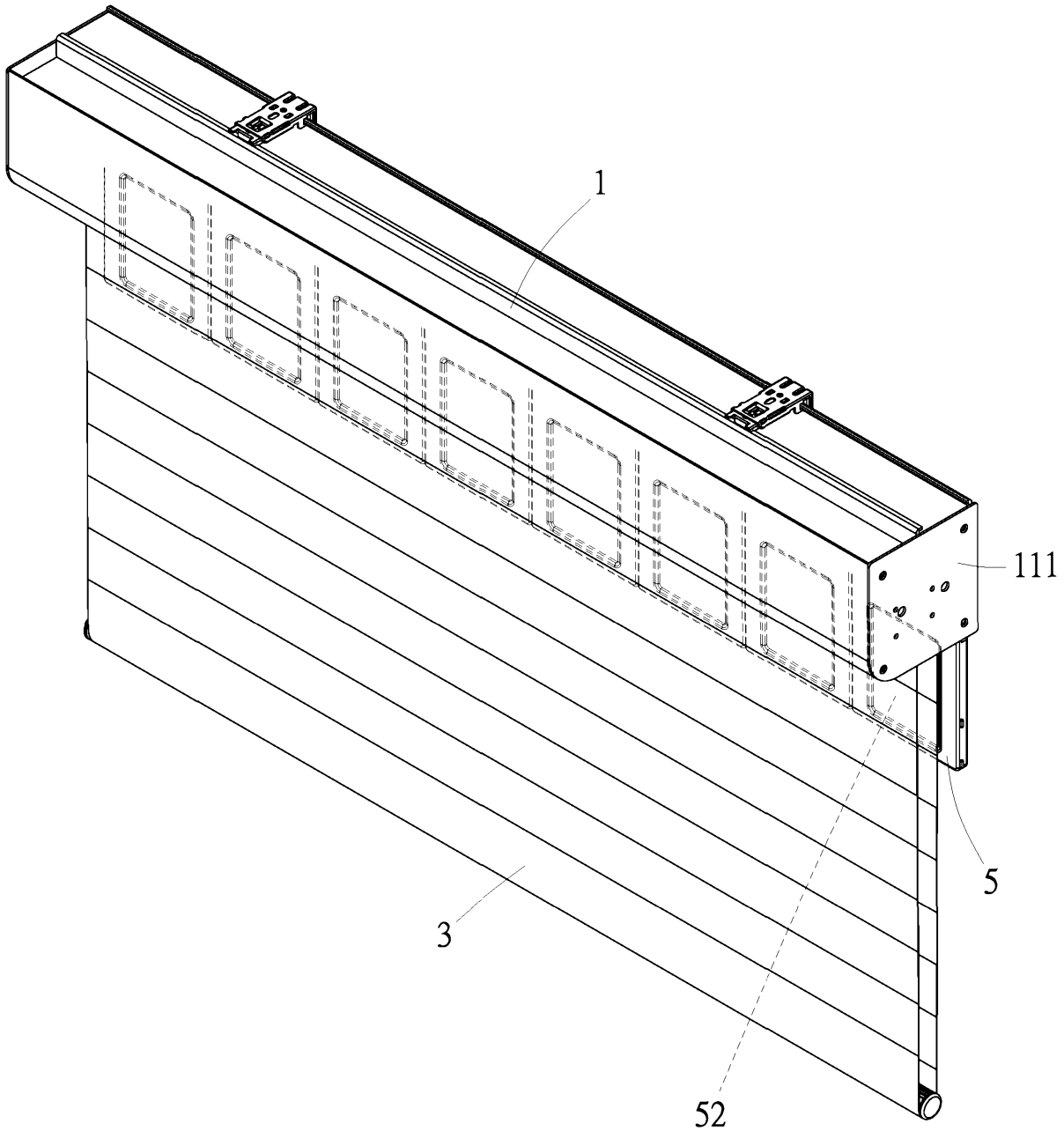

FIG. 2

2019100423 23 Apr 2019

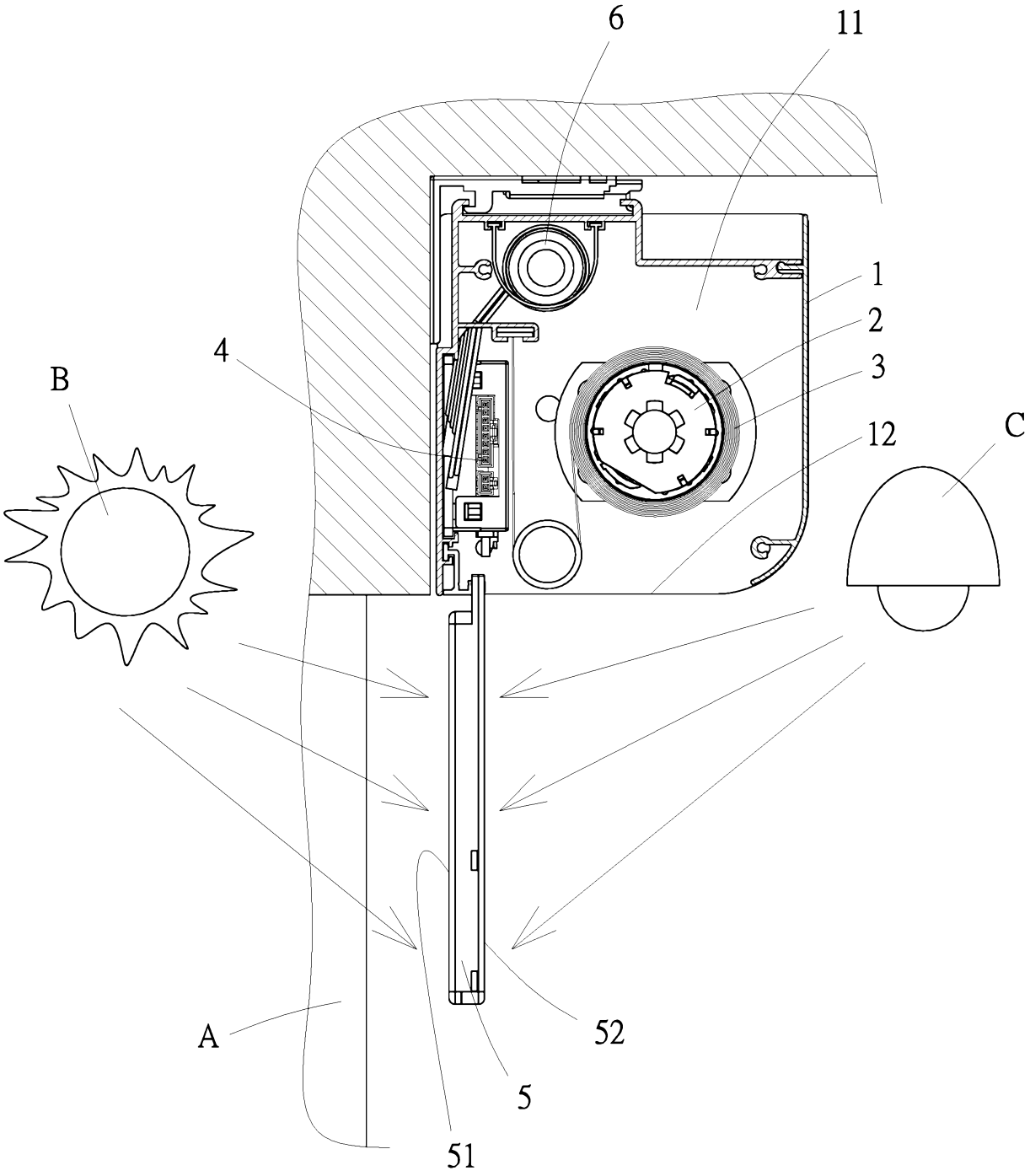

FIG. 3

2019100423 23 Apr 2019

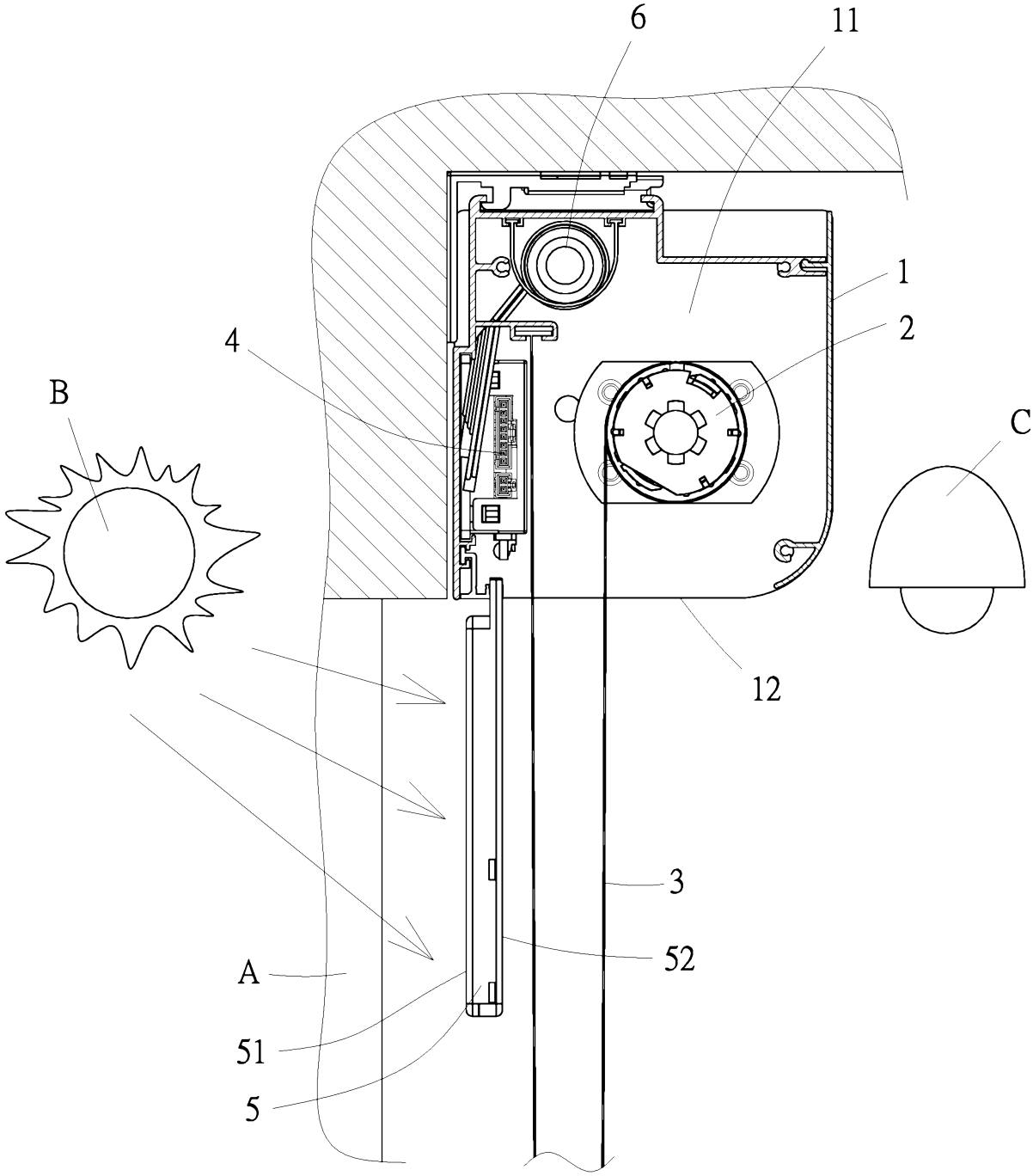

FIG. 4

2019100423 23 Apr 2019

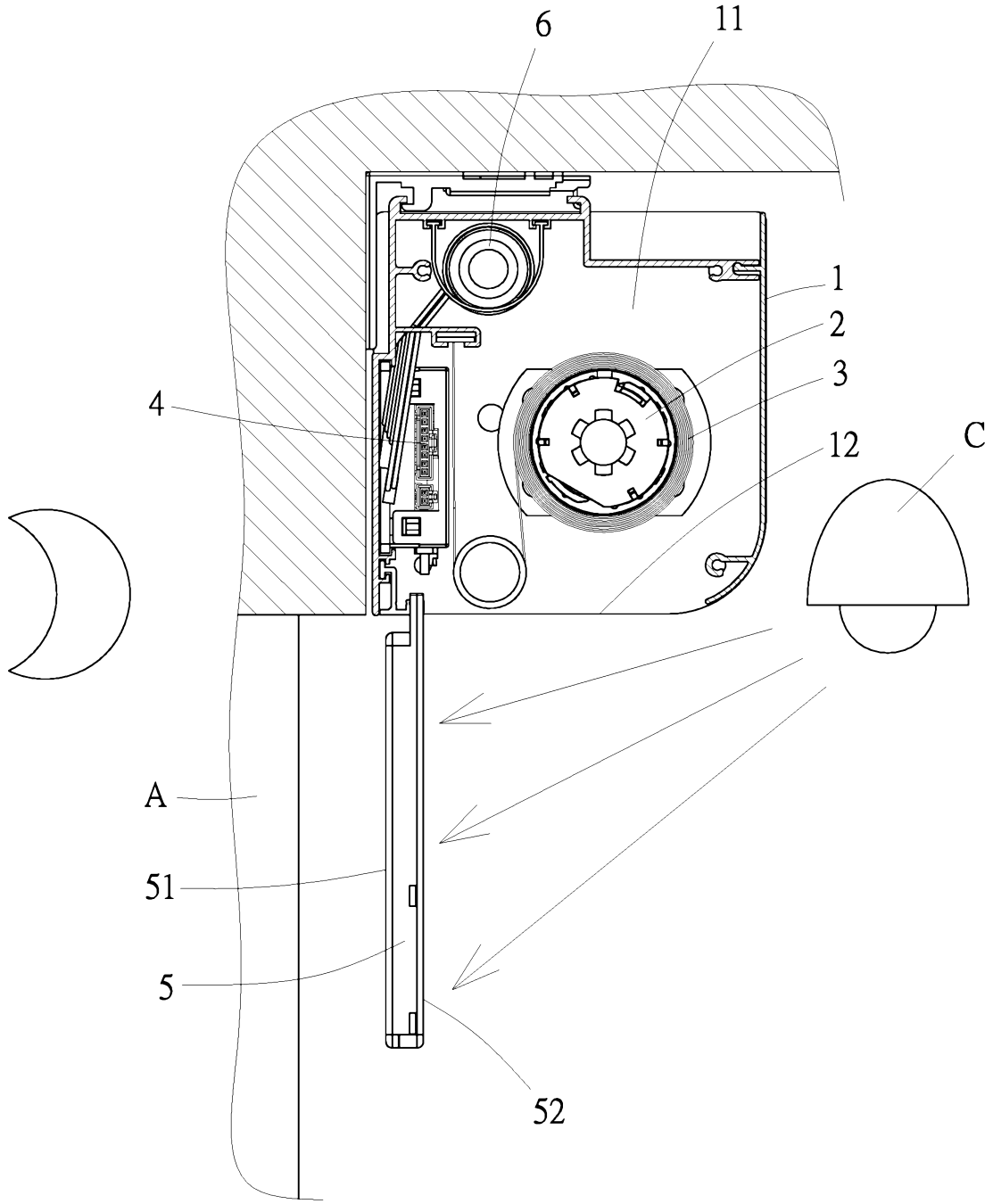

FIG. 5