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Choi et al.

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(45) **Date of Patent: Aug. 6, 2024**

(54) **LOUVER ASSEMBLY CAPABLE OF HAVING MOUNTED THEREON SOLAR CELL PANEL**

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(72) Inventors: **Chul Jun Choi**, Gangseo-gu Seoul (KR); **Jong Tae Kim**, Gangseo-gu Seoul (KR)

(73) Assignee: **LX HAUSYS, LTD.**, Seoul (KR)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 127 days.

(21) Appl. No.: **17/785,549**

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(86) PCT No.: **PCT/KR2020/018389**
§ 371 (c)(1),
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PCT Pub. Date: **Jun. 24, 2021**

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(30) **Foreign Application Priority Data**

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Dec. 14, 2020 (KR) 10-2020-0174290
Dec. 14, 2020 (KR) 10-2020-0174292

(51) **Int. Cl.**
H02S 40/34 (2014.01)
H02S 30/10 (2014.01)
H02S 40/22 (2014.01)

(52) **U.S. Cl.**
CPC ***H02S 40/34*** (2014.12); ***H02S 30/10*** (2014.12); ***H02S 40/22*** (2014.12)

(58) **Field of Classification Search**
CPC H02S 40/34; H02S 40/32; H02S 30/10
See application file for complete search history.

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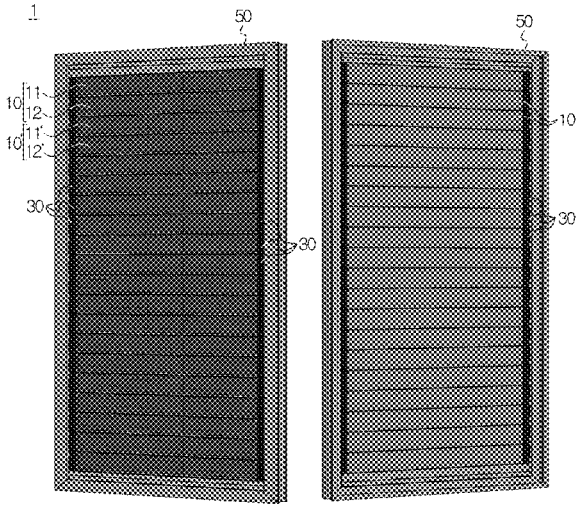
Primary Examiner — Jayne L Mershon
(74) *Attorney, Agent, or Firm* — Panitch Schwarze Belisario & Nadel LLP

(57) **ABSTRACT**

A solar cell louver assembly includes: a plurality of solar cell module units having a solar cell panel part, with a pair of terminal portions provided on both end parts, a pair of first electrode terminals electrically connected to the respective terminal portions, and a pair of first caps mounted on the solar cell panel part to surround the respective first electrode terminals; second electrode terminals electrically connected to the first electrode terminals, and second caps accommodating the second electrode terminals and having mounted thereon the first caps; a frame unit having an inner frame such that the second caps are mounted rotatably in the length direction, and an outer frame surrounding the inner frame; and a connector unit between the inner and outer frames and having a pair of third electrode terminals electrically connecting the second electrode terminals of adjacent module units when mounted in the frame unit.

29 Claims, 44 Drawing Sheets



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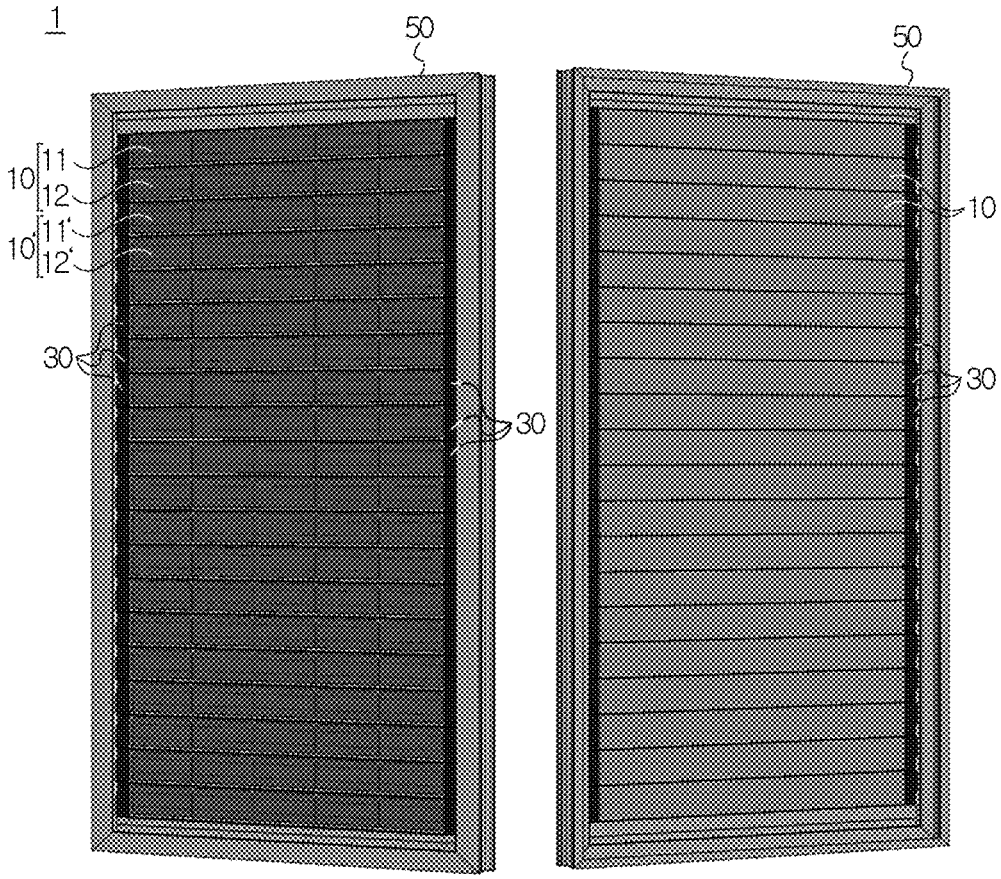
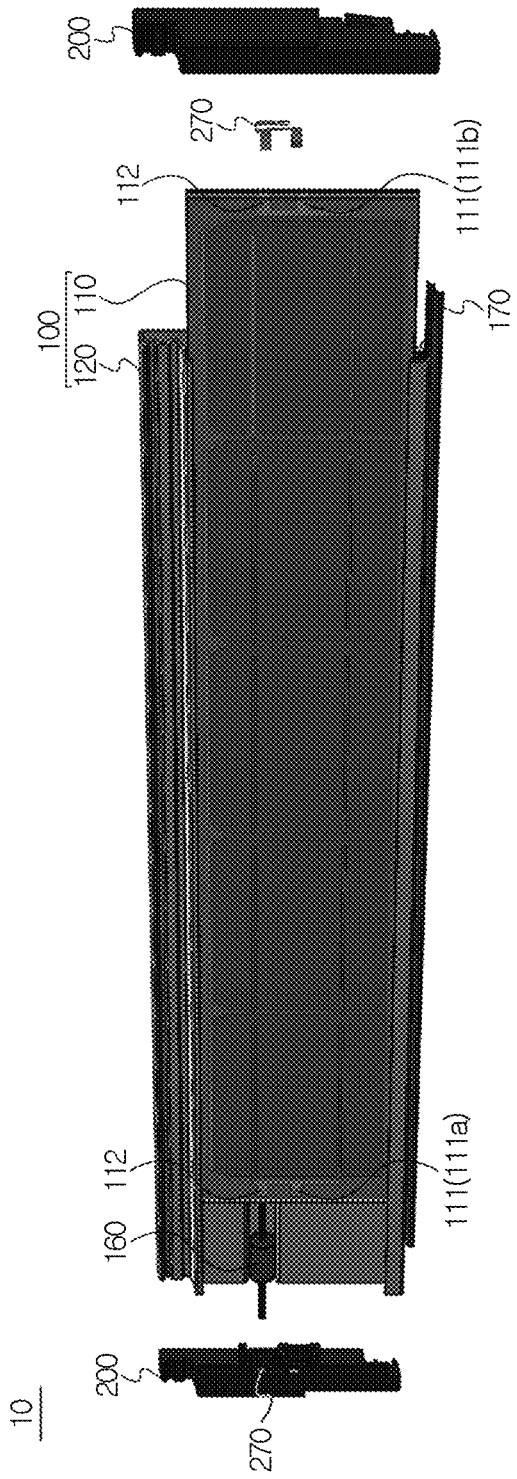
* cited by examiner

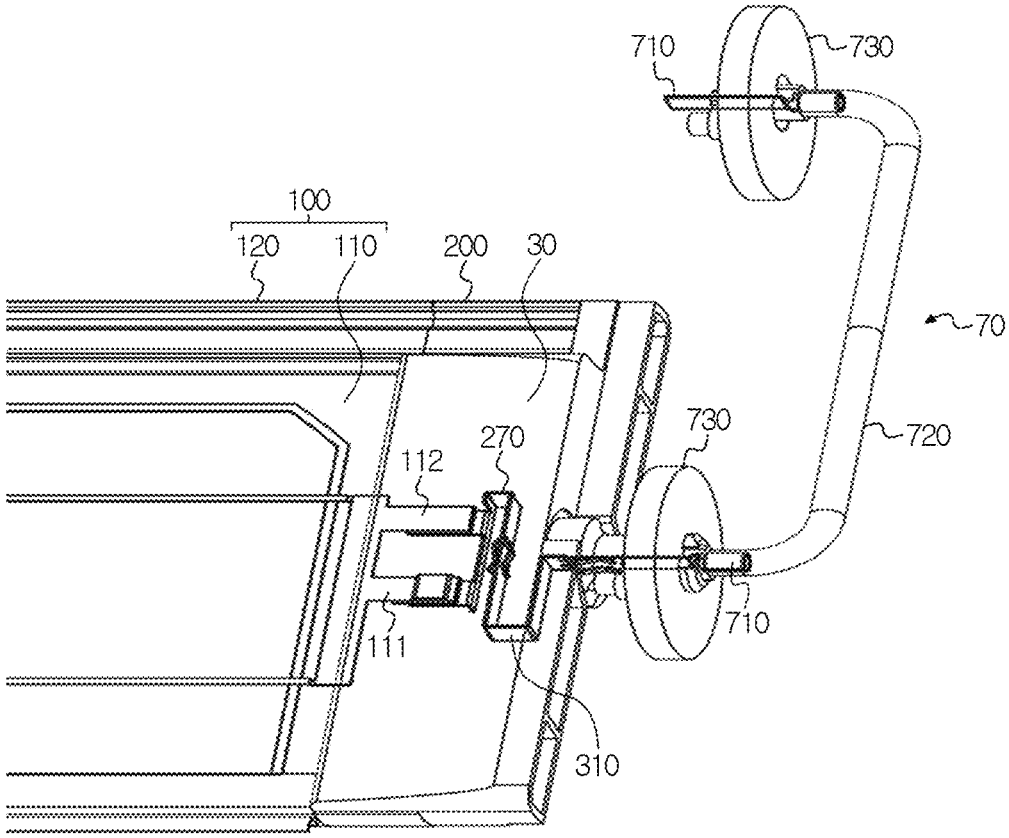
[FIG. 1]





[FIG. 2]

[FIG. 3]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111
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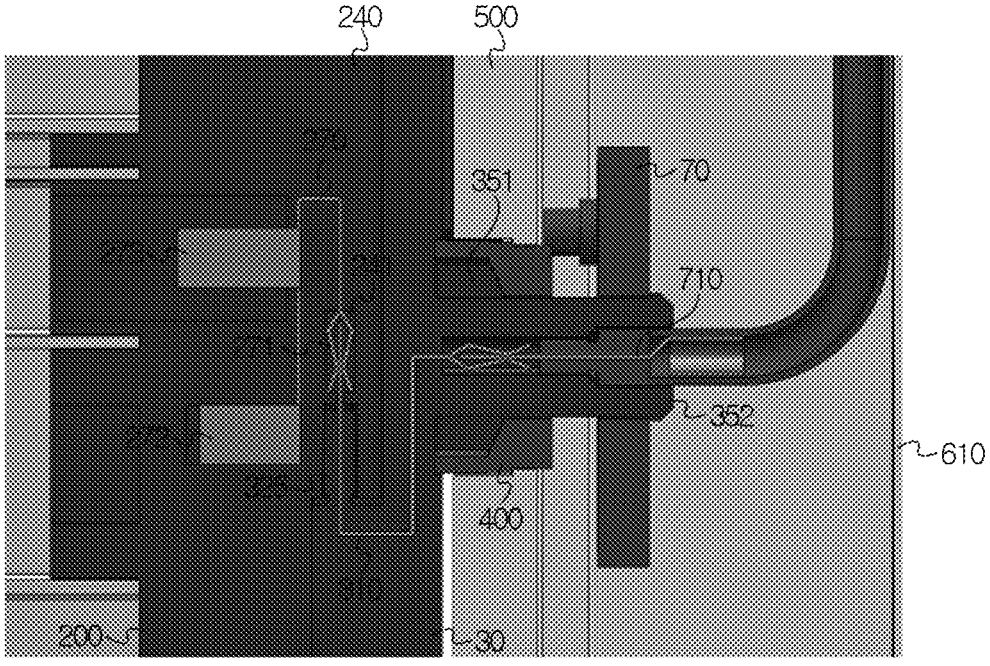
[FIG. 4]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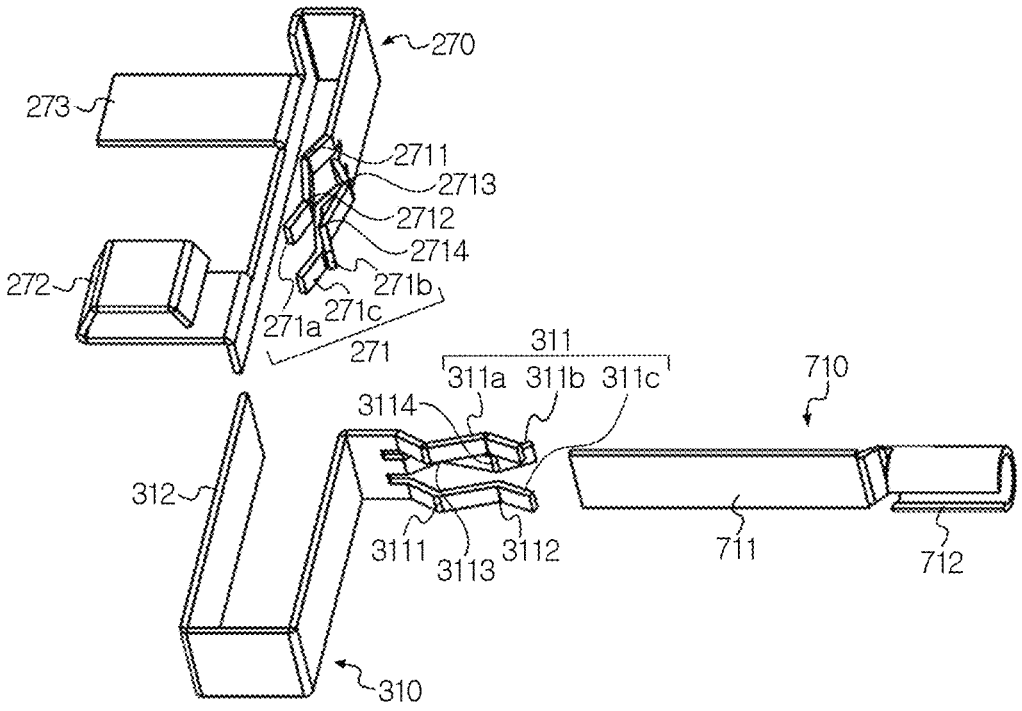
[FIG. 5]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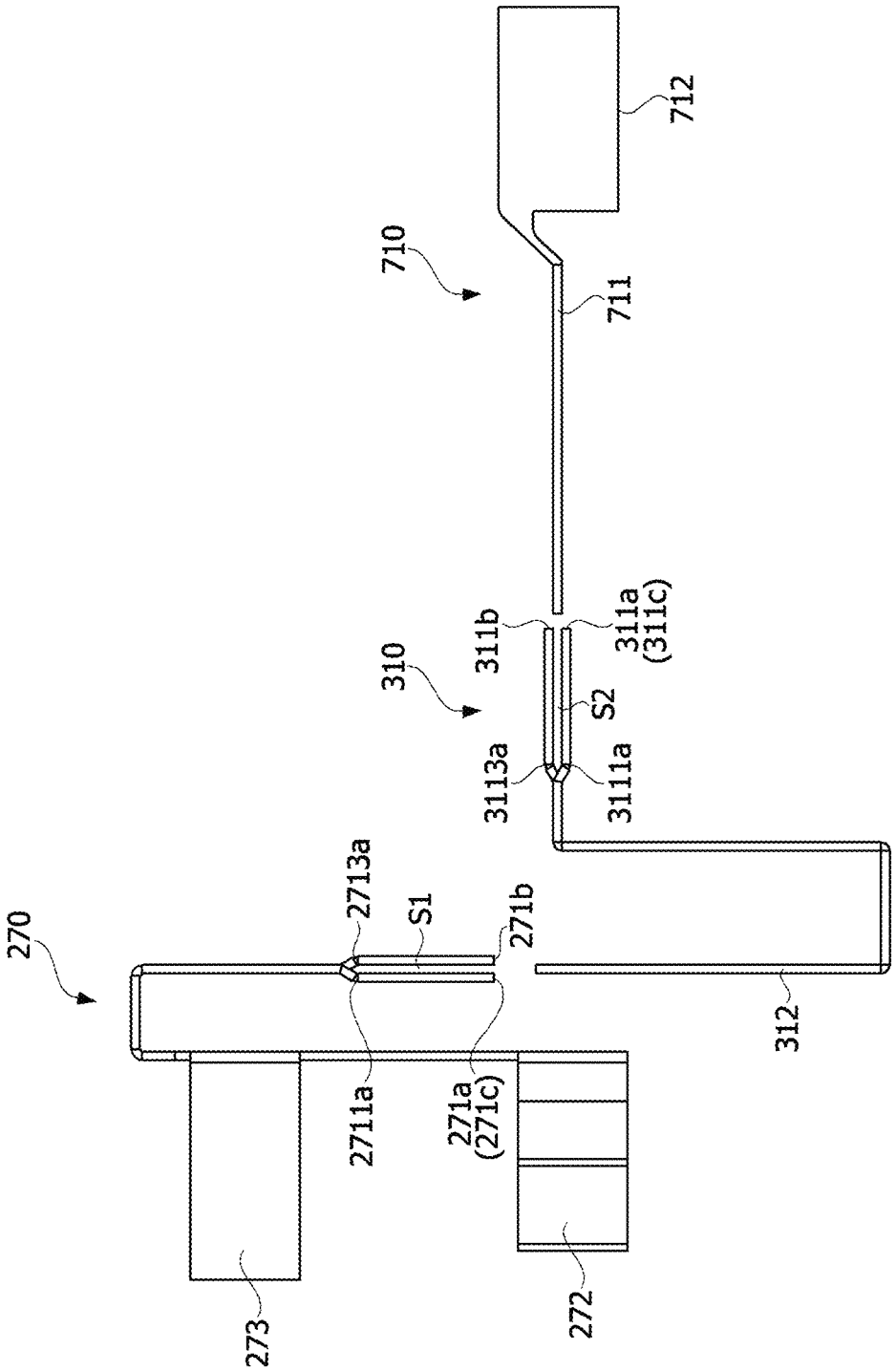
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S2
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S1
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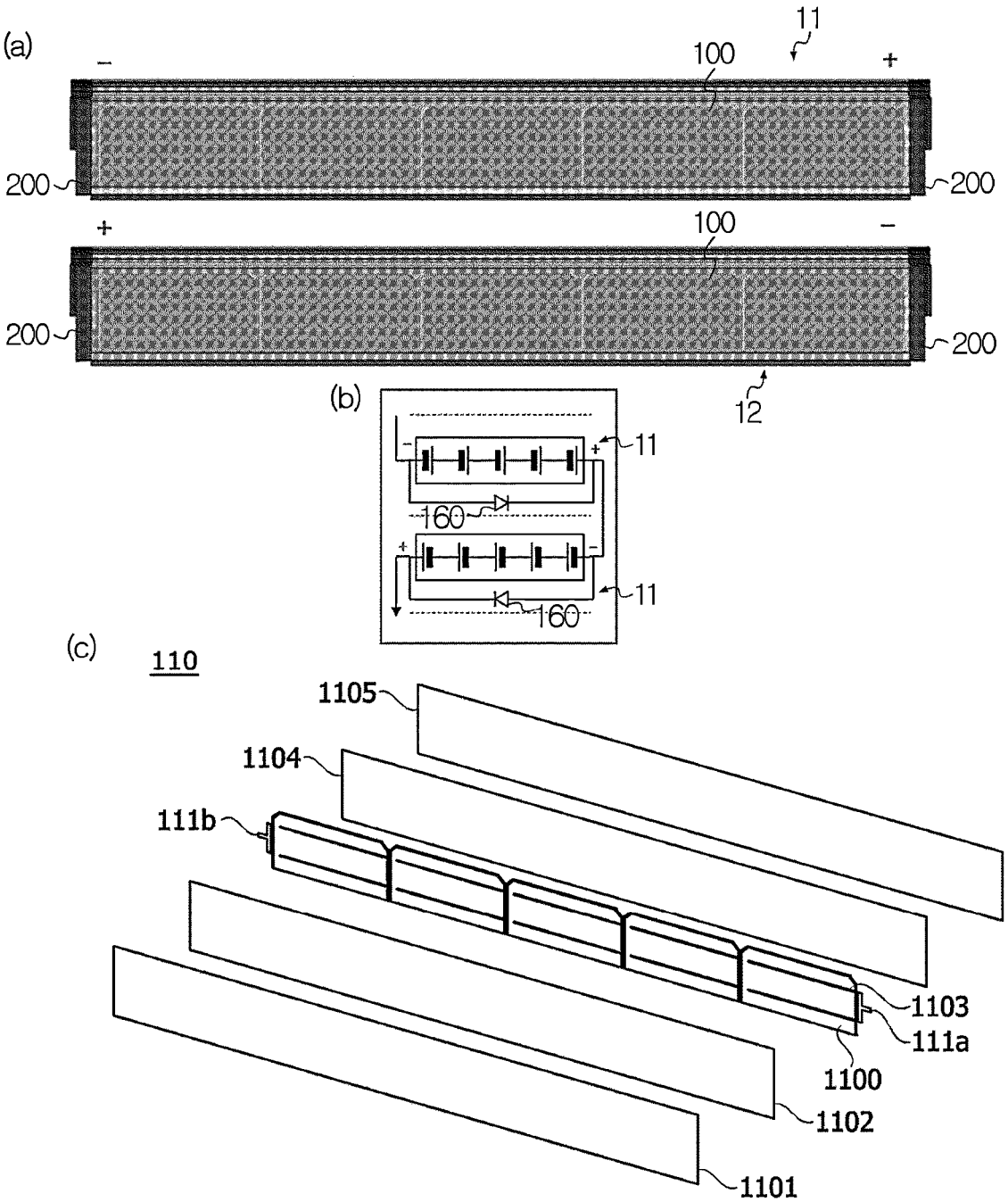
271a
(271c)
272
273

[FIG. 6]

[FIG. 7]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200
200
200
12
(b)
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160
(c)
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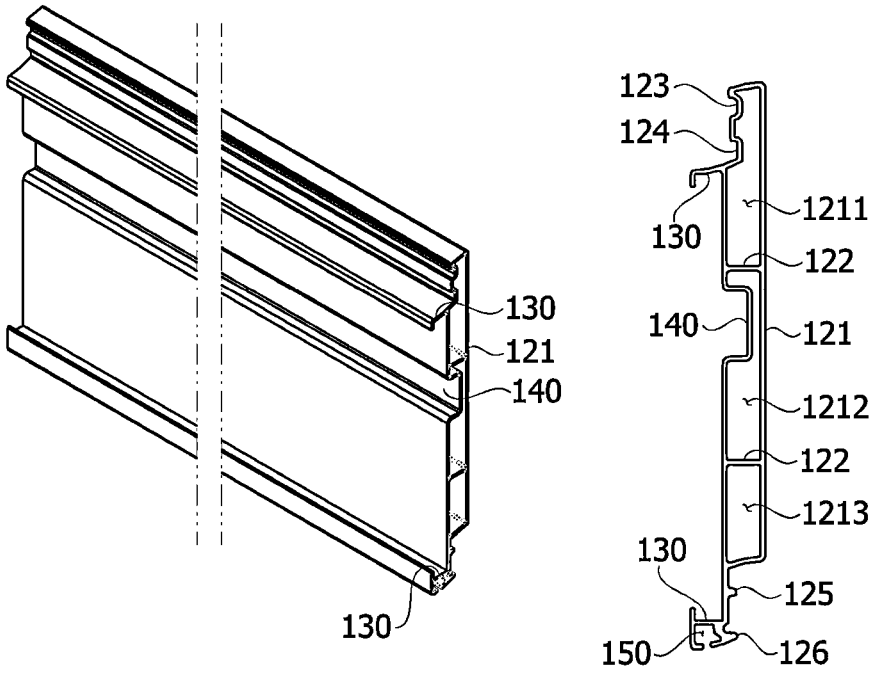
1103
111a
1100
1102
1101

[FIG. 8]

120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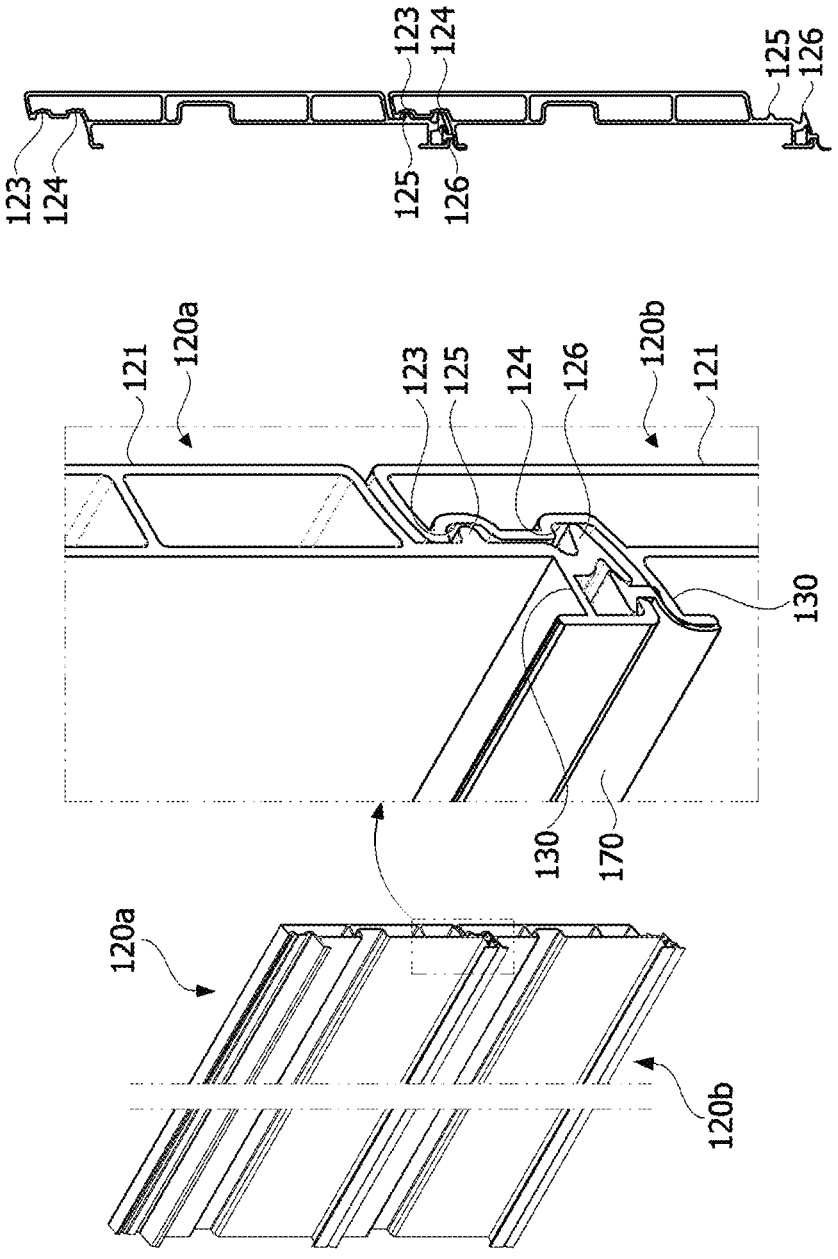
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124
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120b
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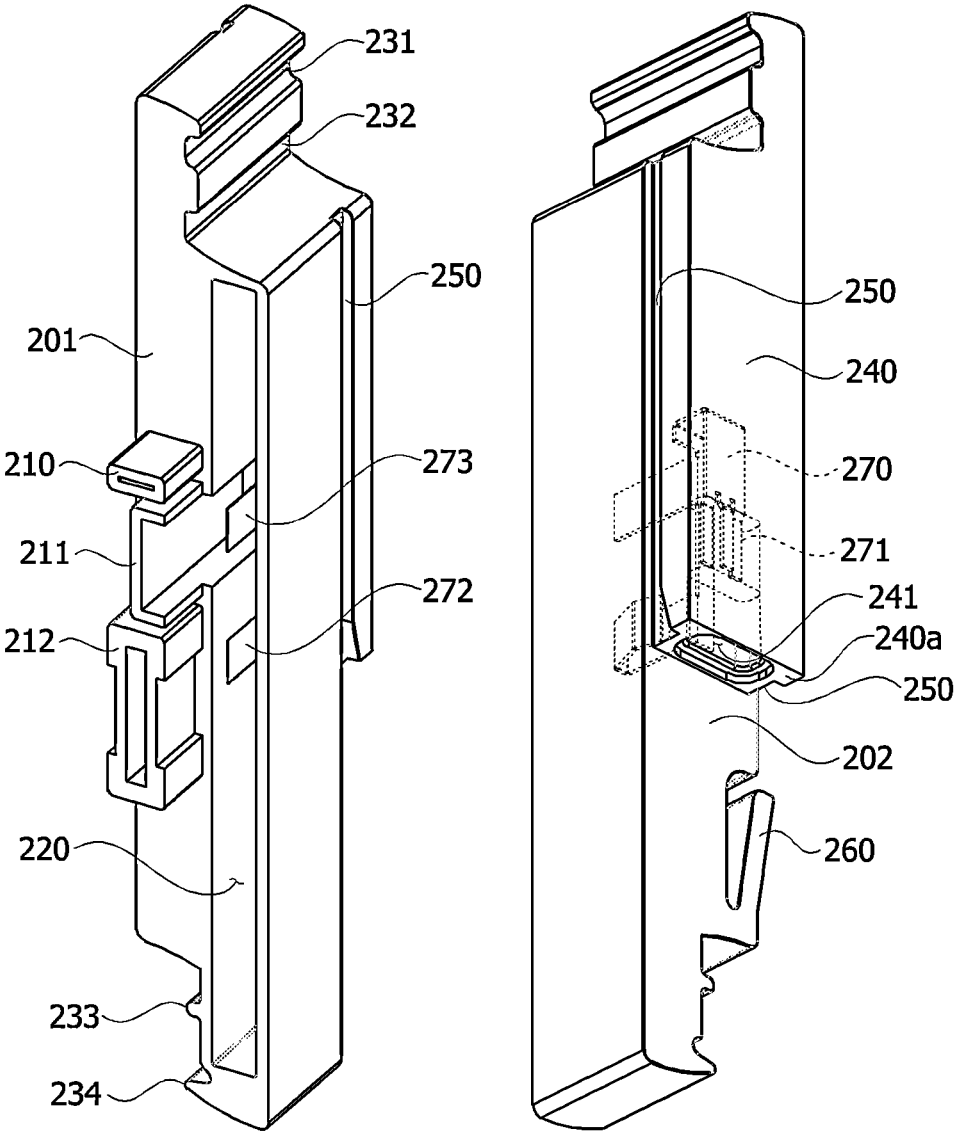
120a
120b

[FIG. 9]

[FIG. 10]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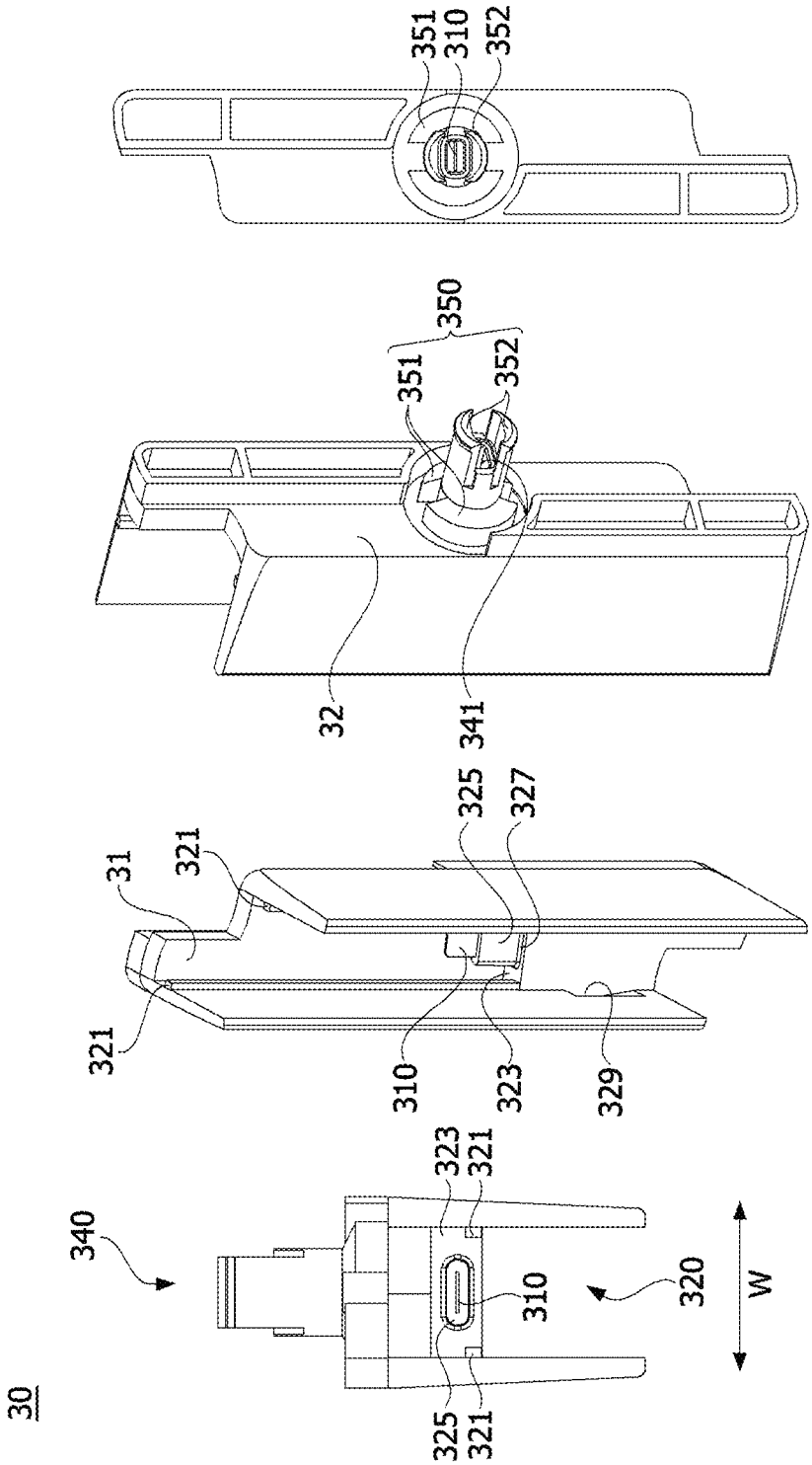
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W
325
321
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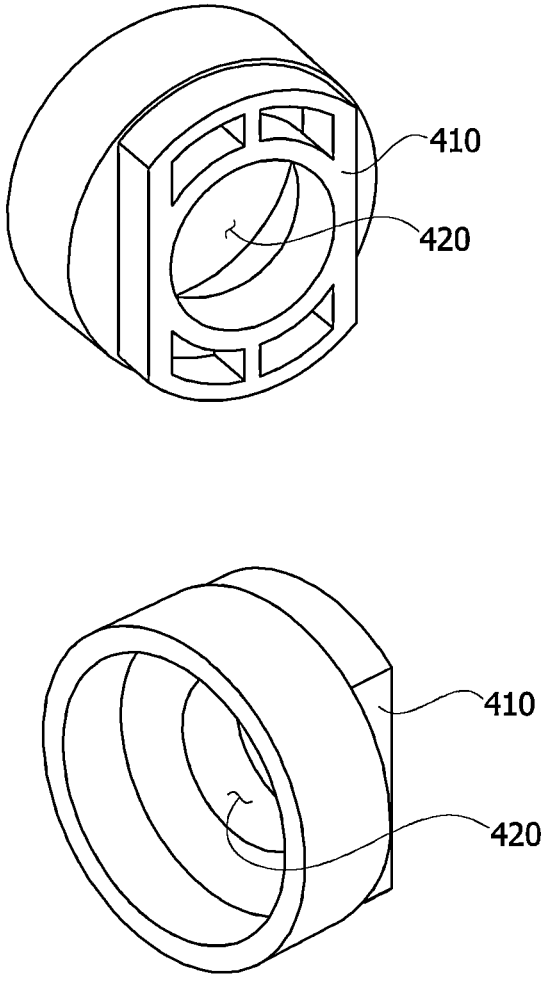
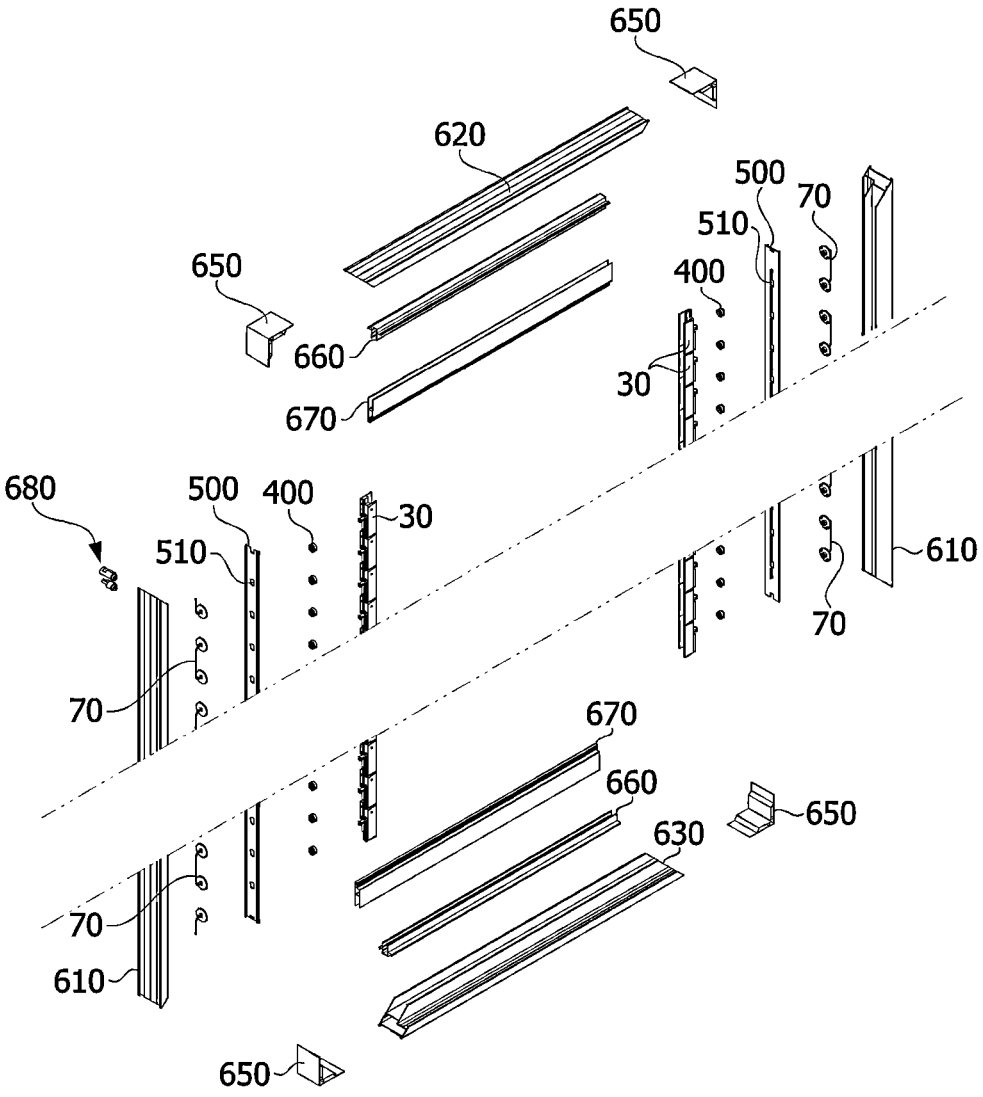
[FIG. 11]

[FIG. 12]



[FIG. 13]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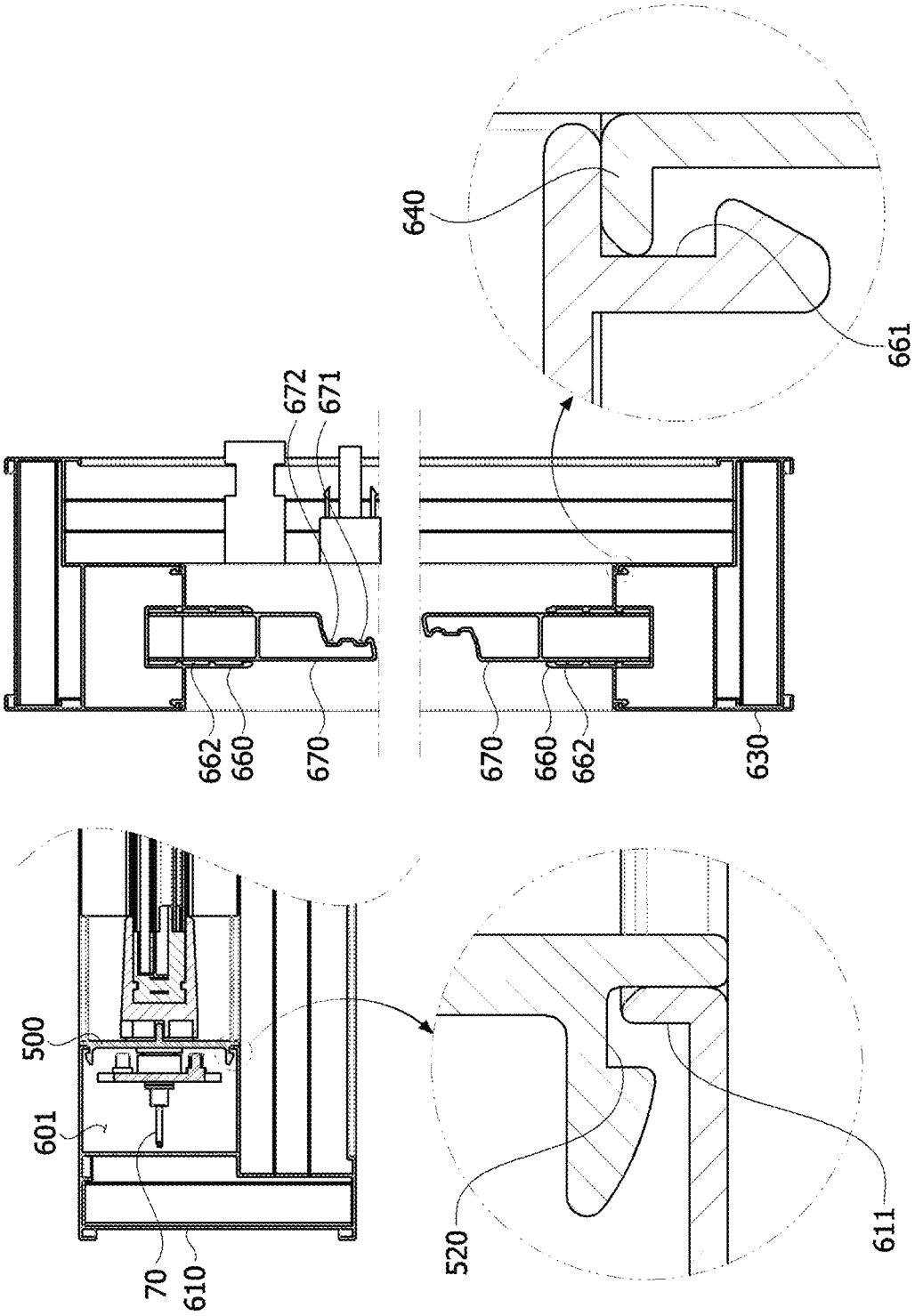
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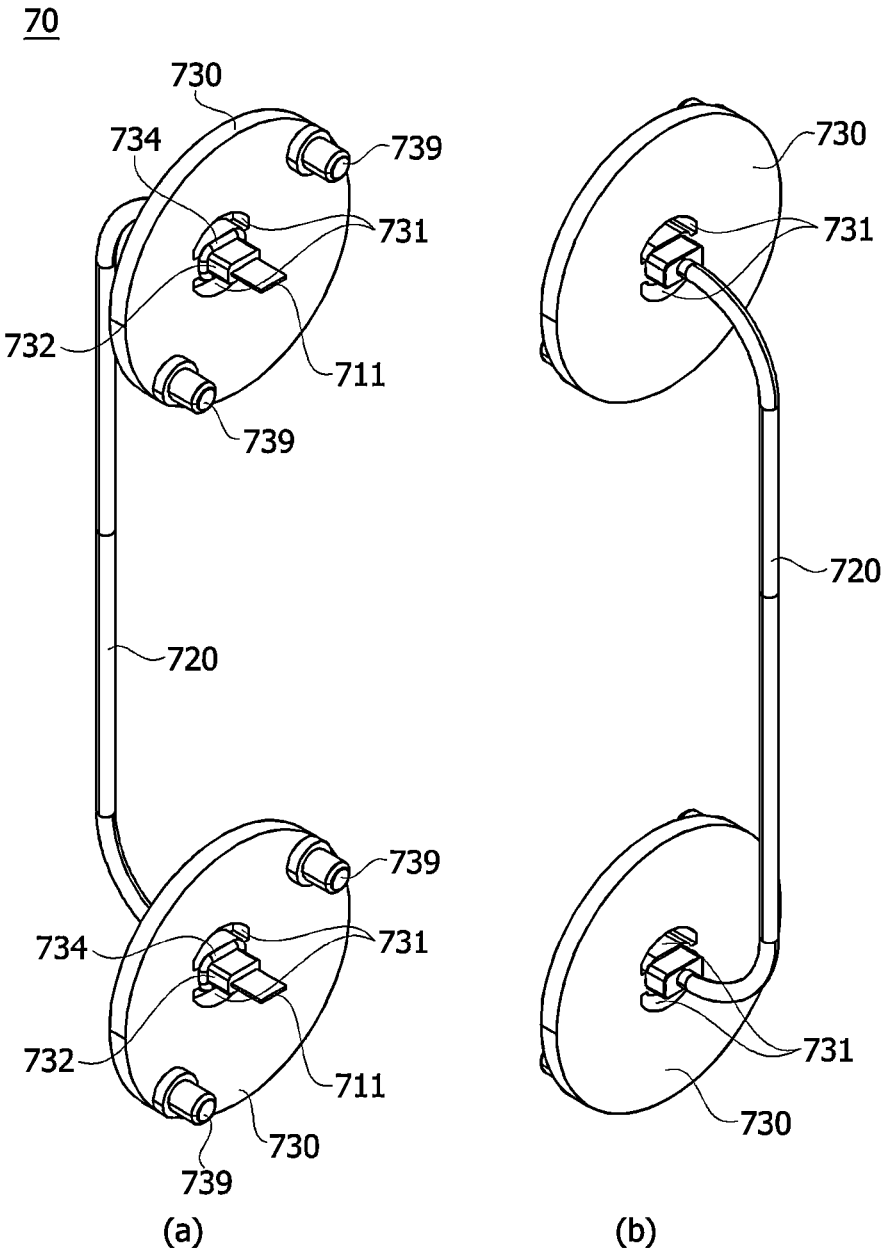
[FIG. 14]

[FIG. 15]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(a)
730
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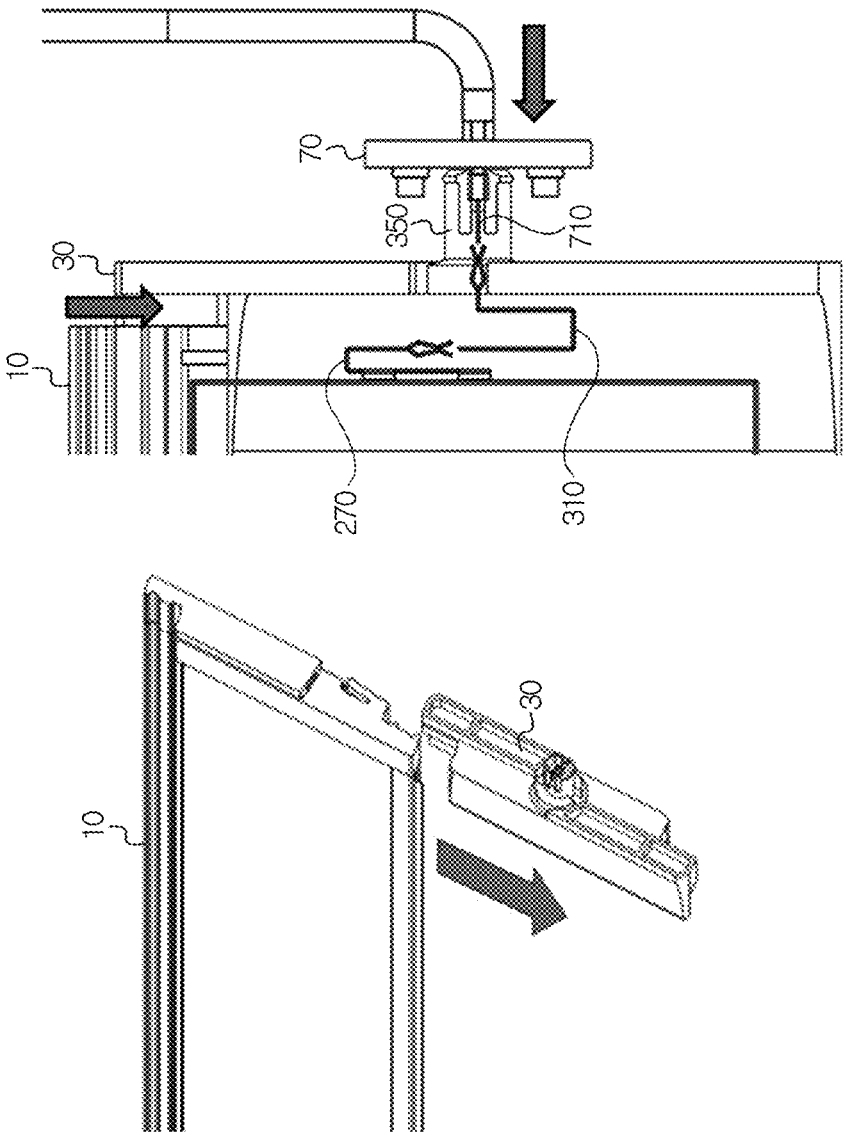
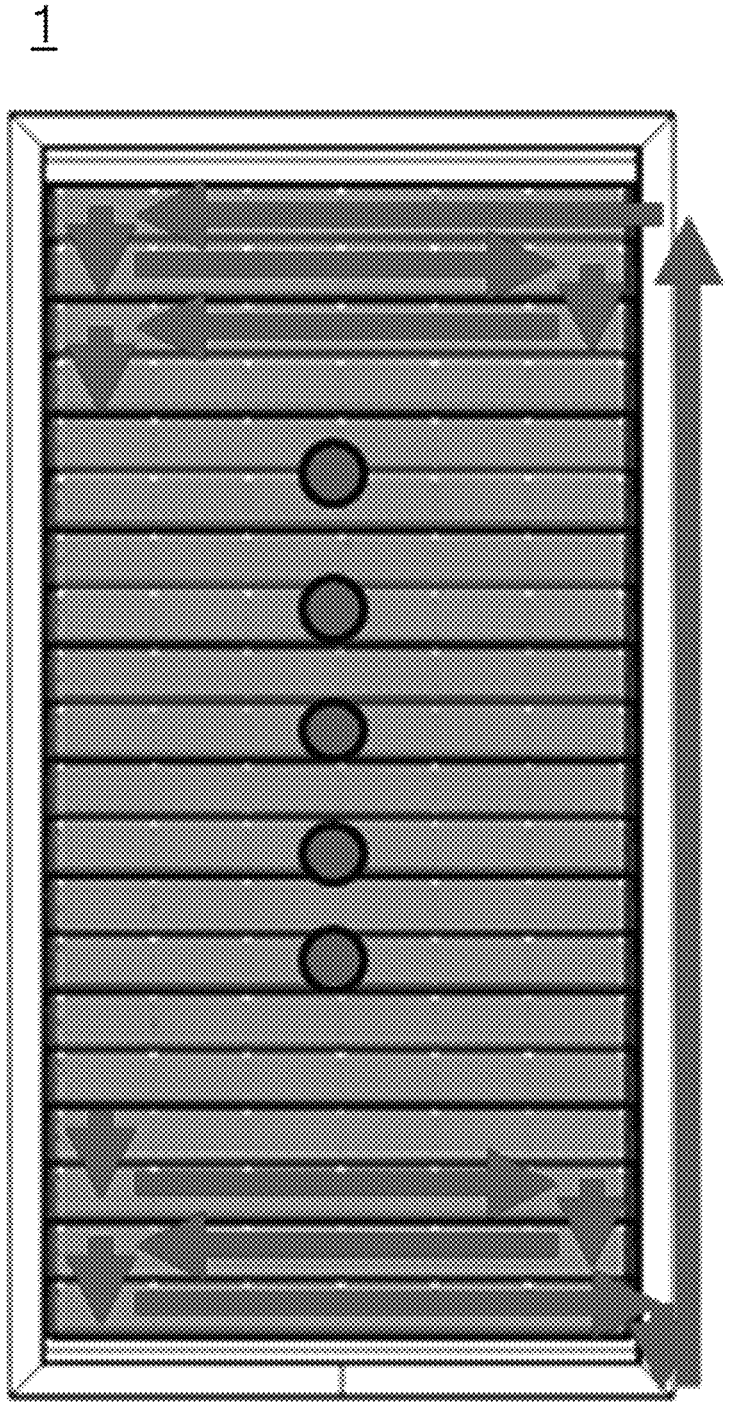
720
731
730
(b)



[FIG. 16]

[FIG. 17]



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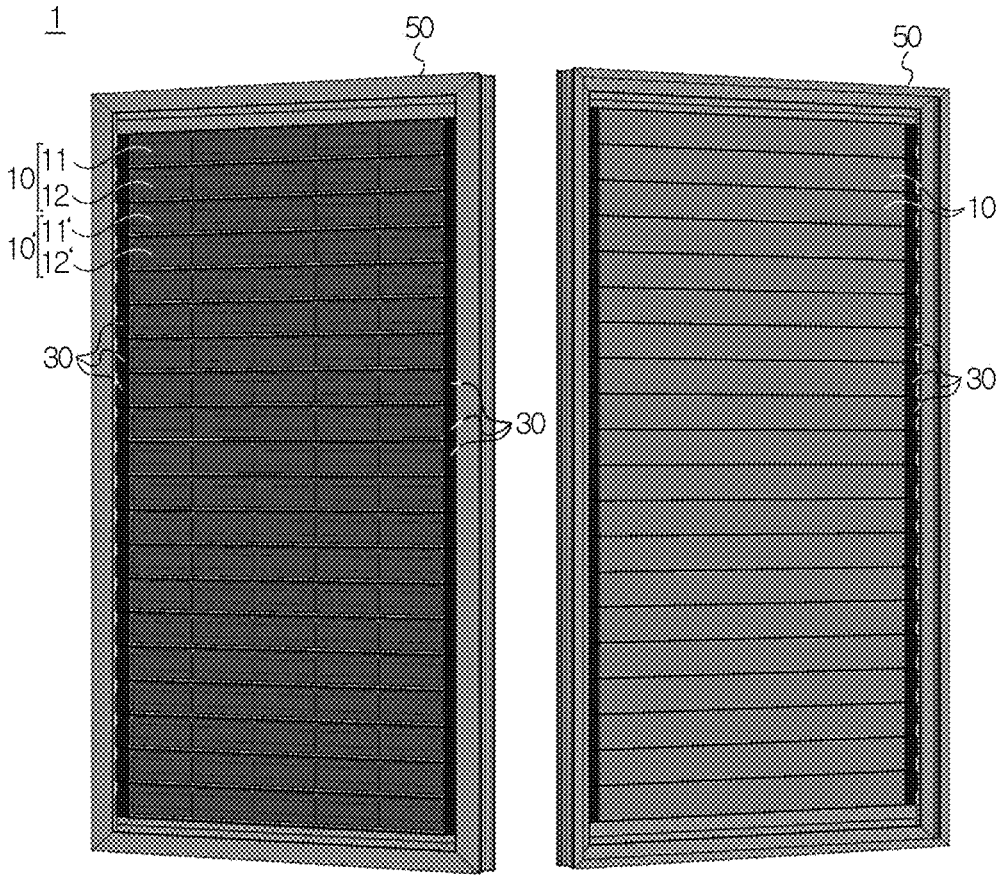
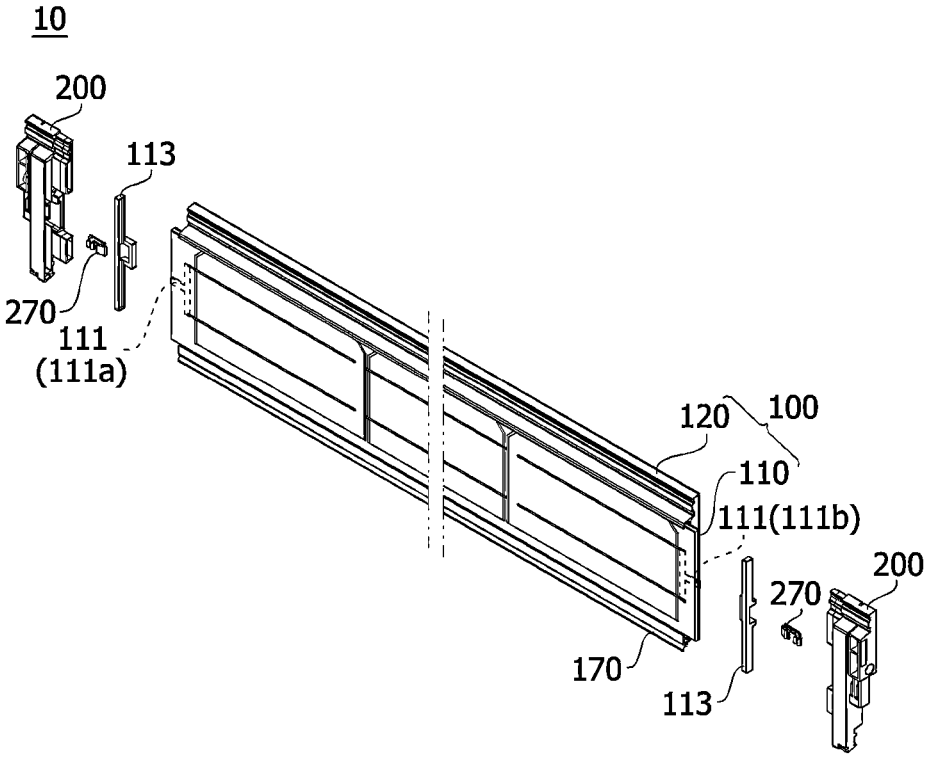


[FIG. 19]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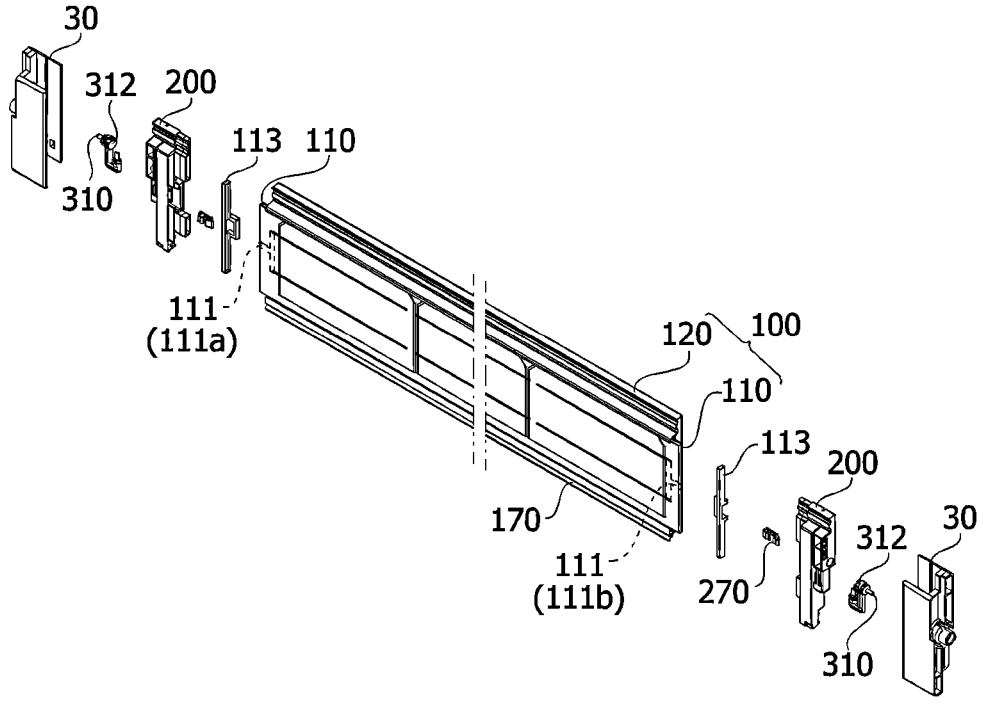
111
(111a)
120
100
110
111(111b)
200
270
170
113

[FIG. 20]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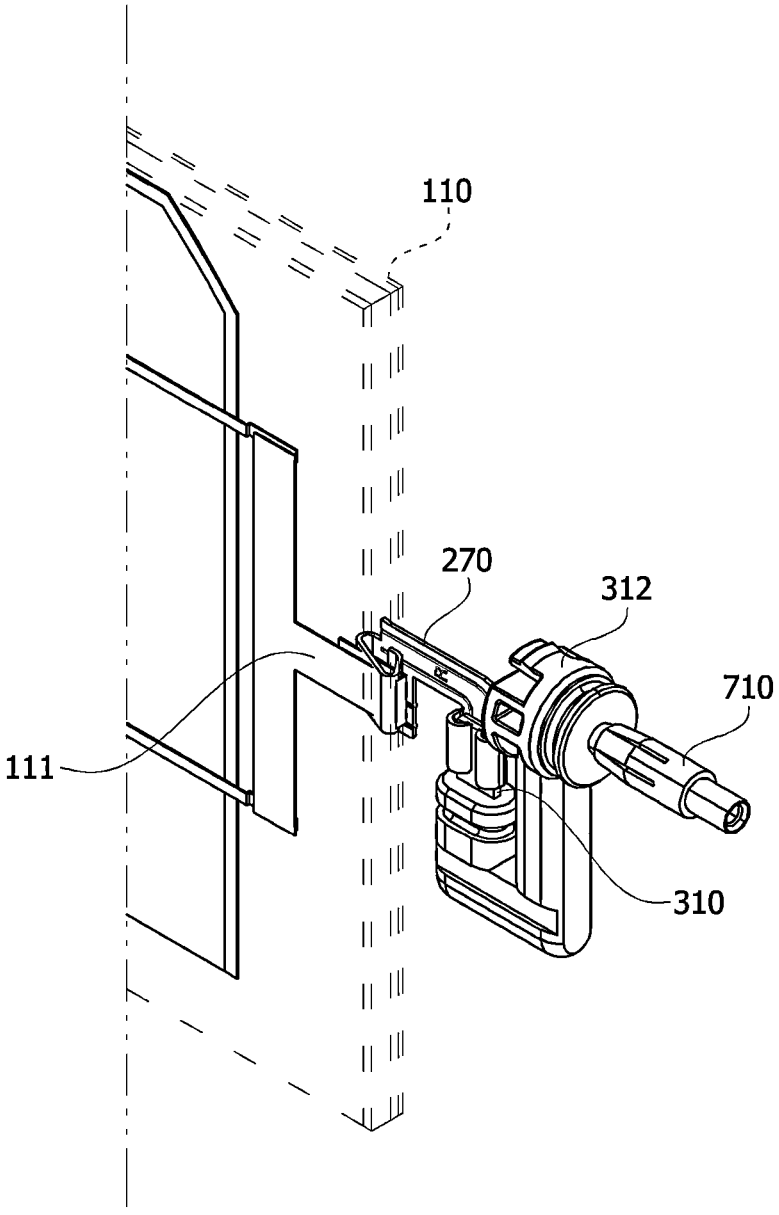
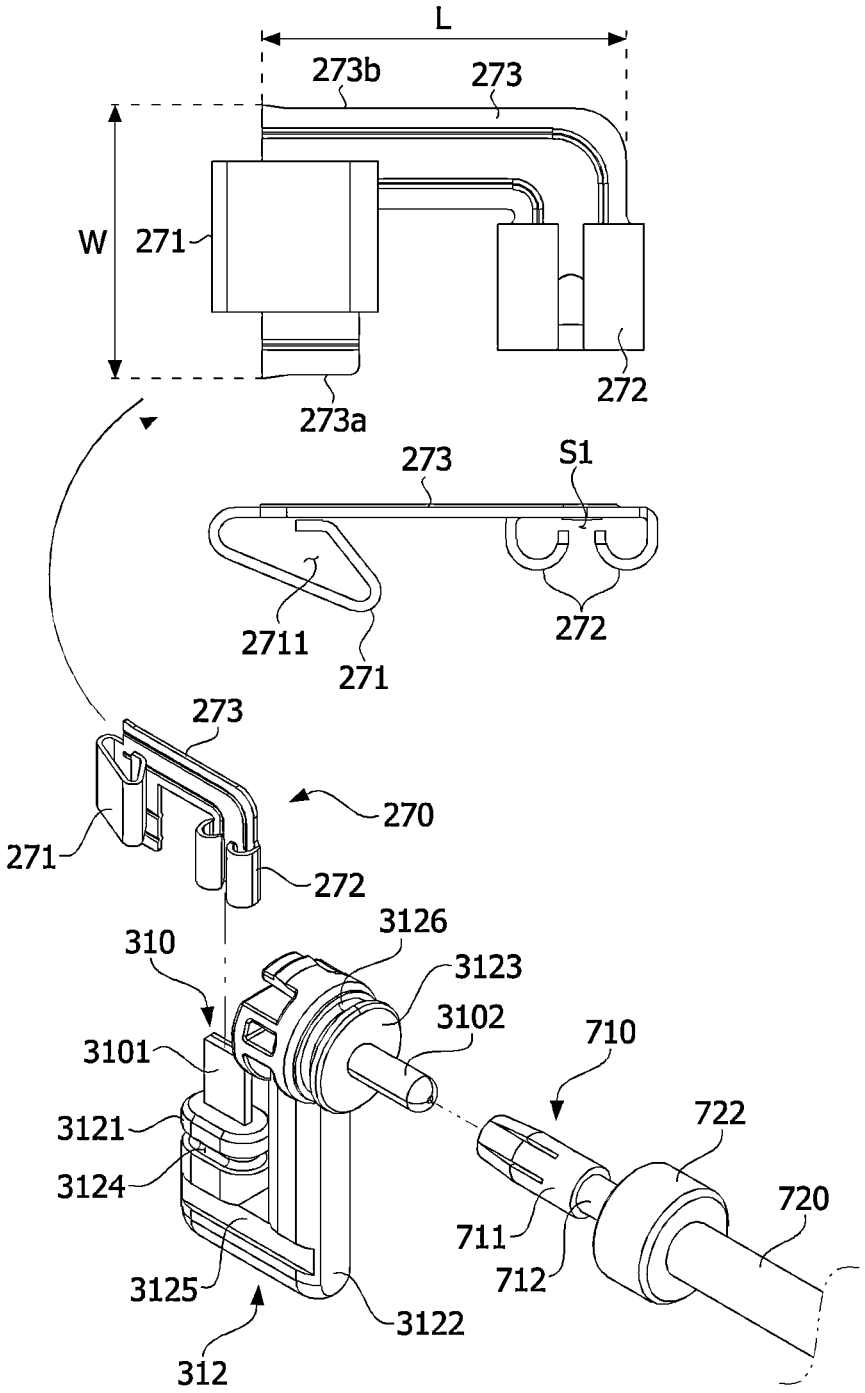
(111b)
270
310

[FIG. 21]



[FIG. 22]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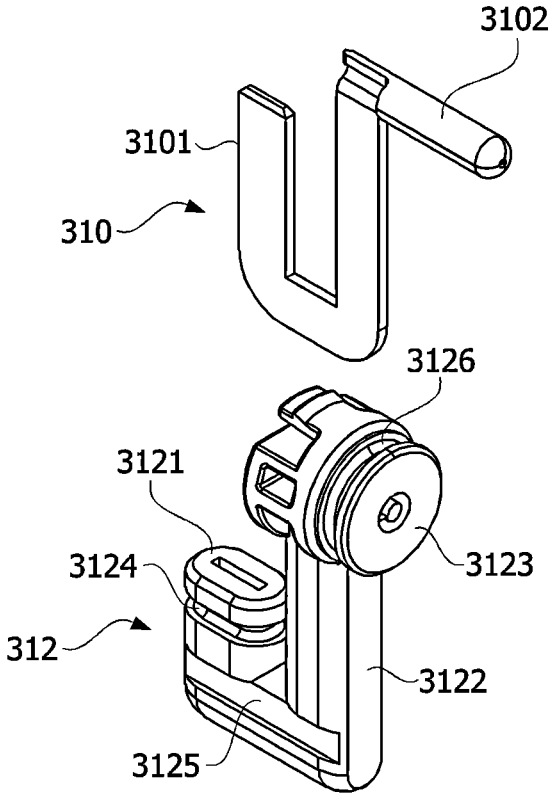
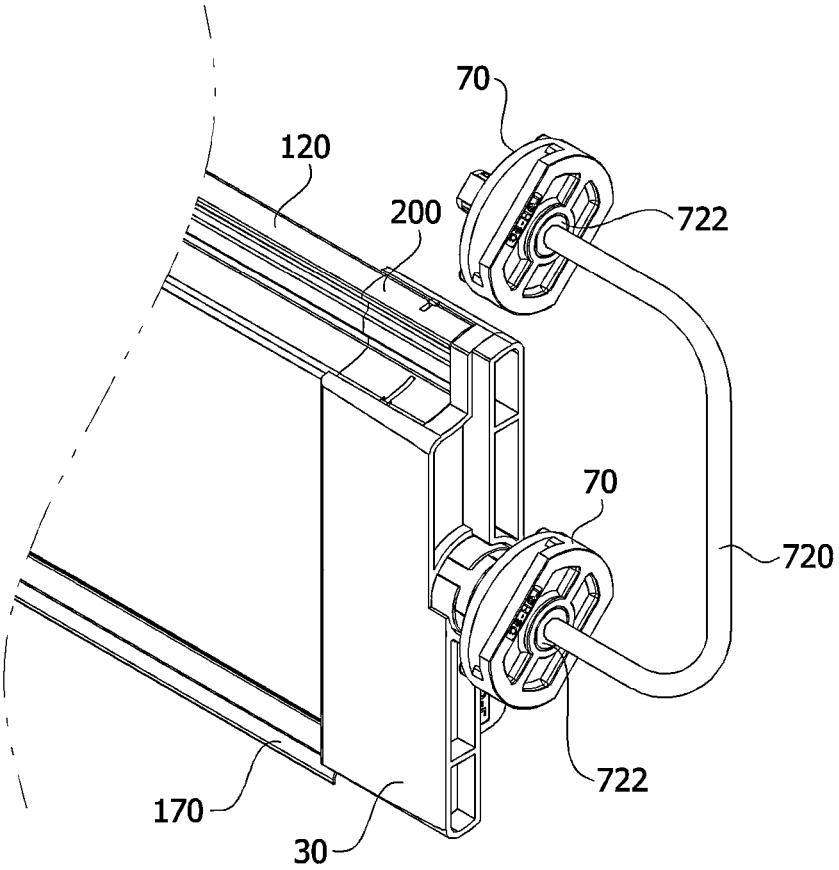
312

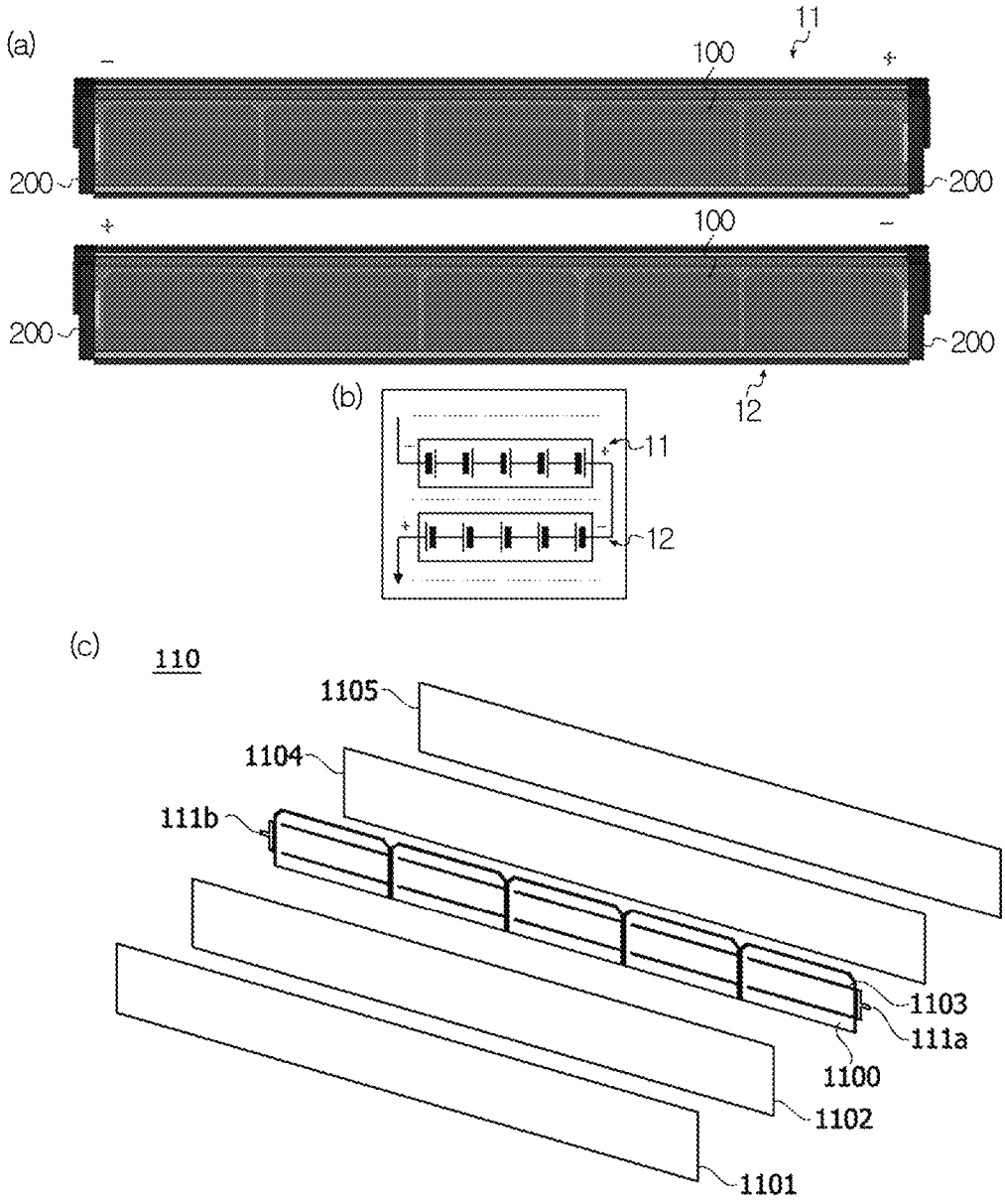
[FIG. 23]



[FIG. 24]



[FIG. 25]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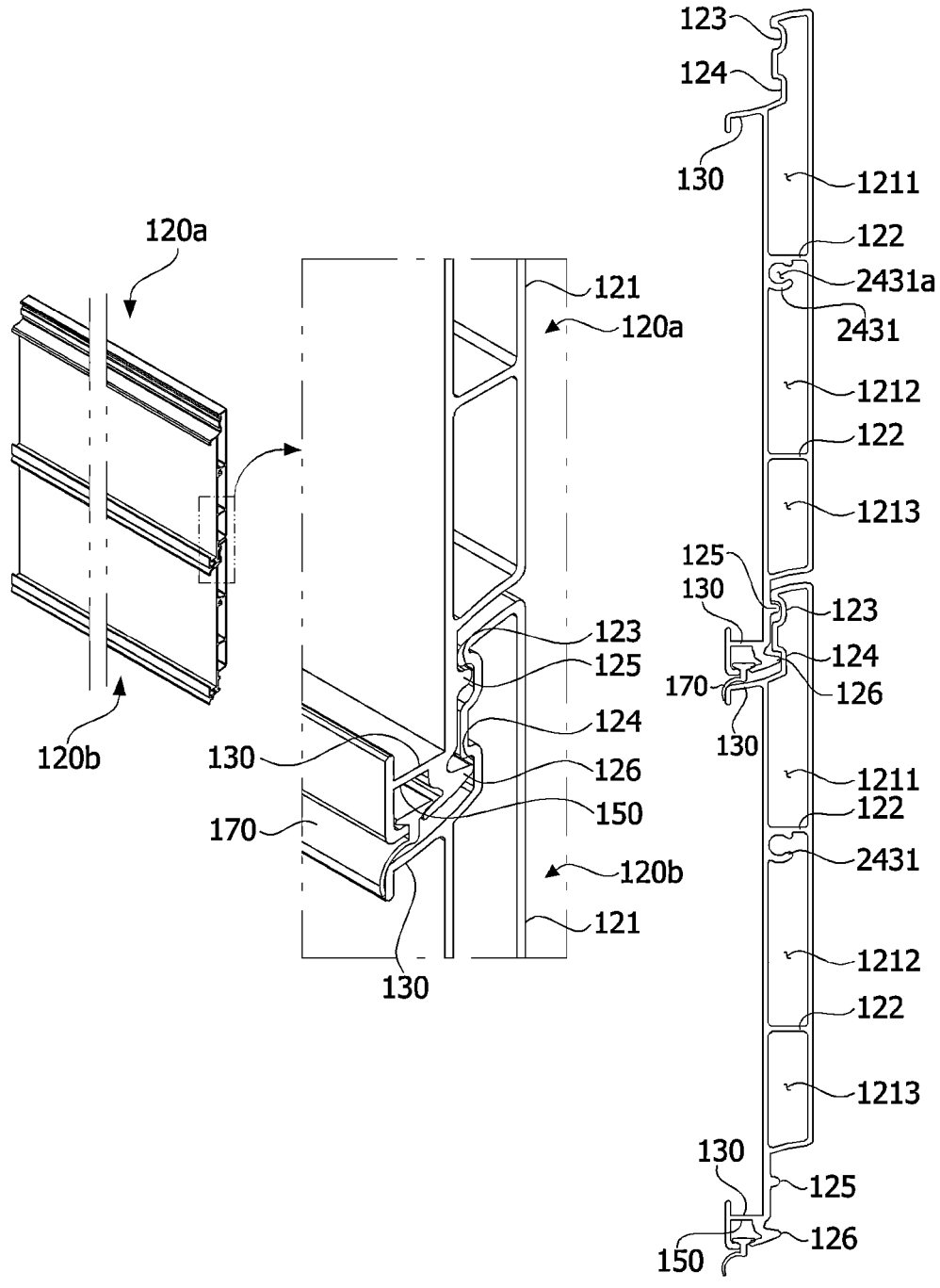
[FIG. 26]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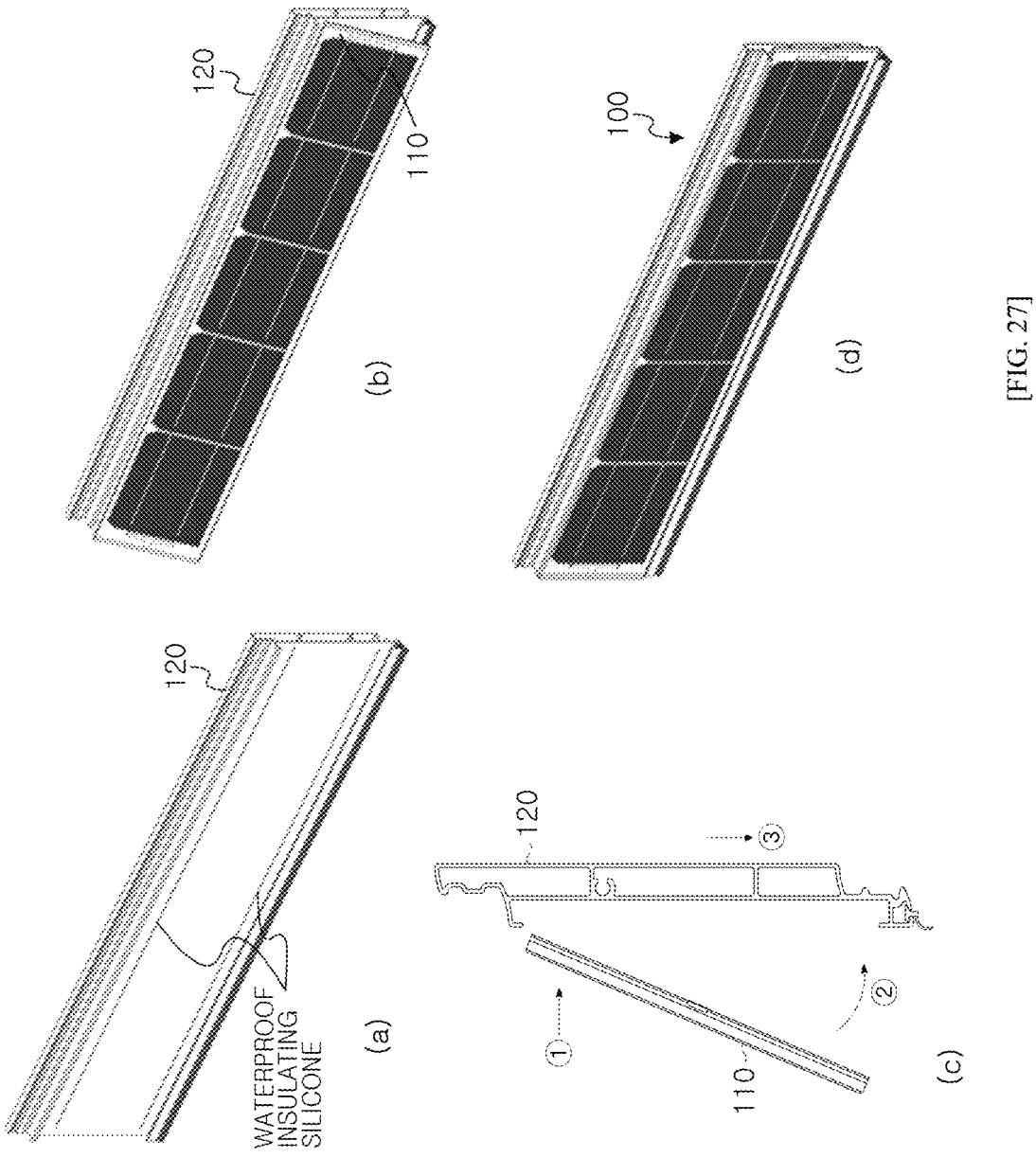
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(d)
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INSULATING
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①
②
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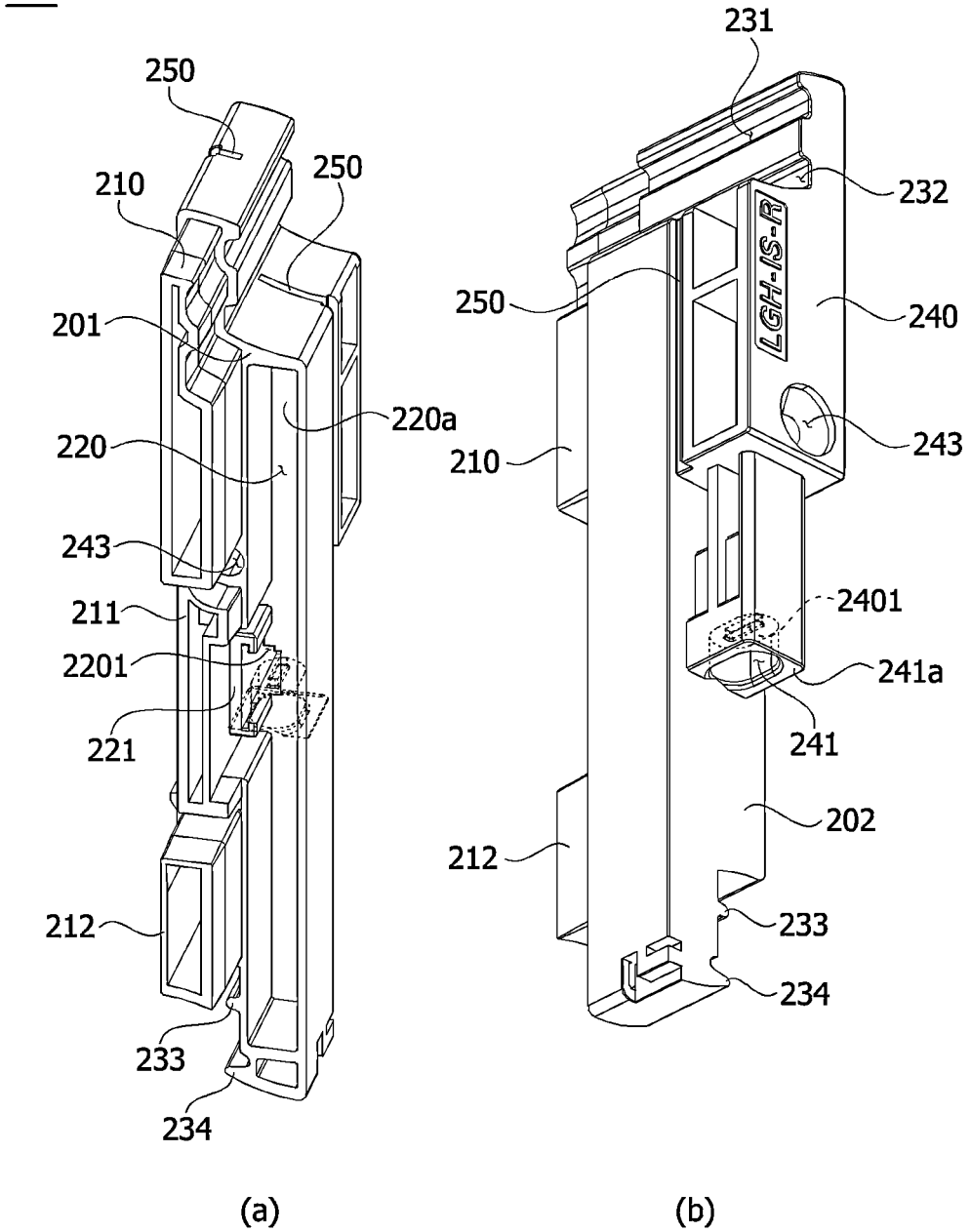
(c)

[FIG. 27]

[FIG. 28]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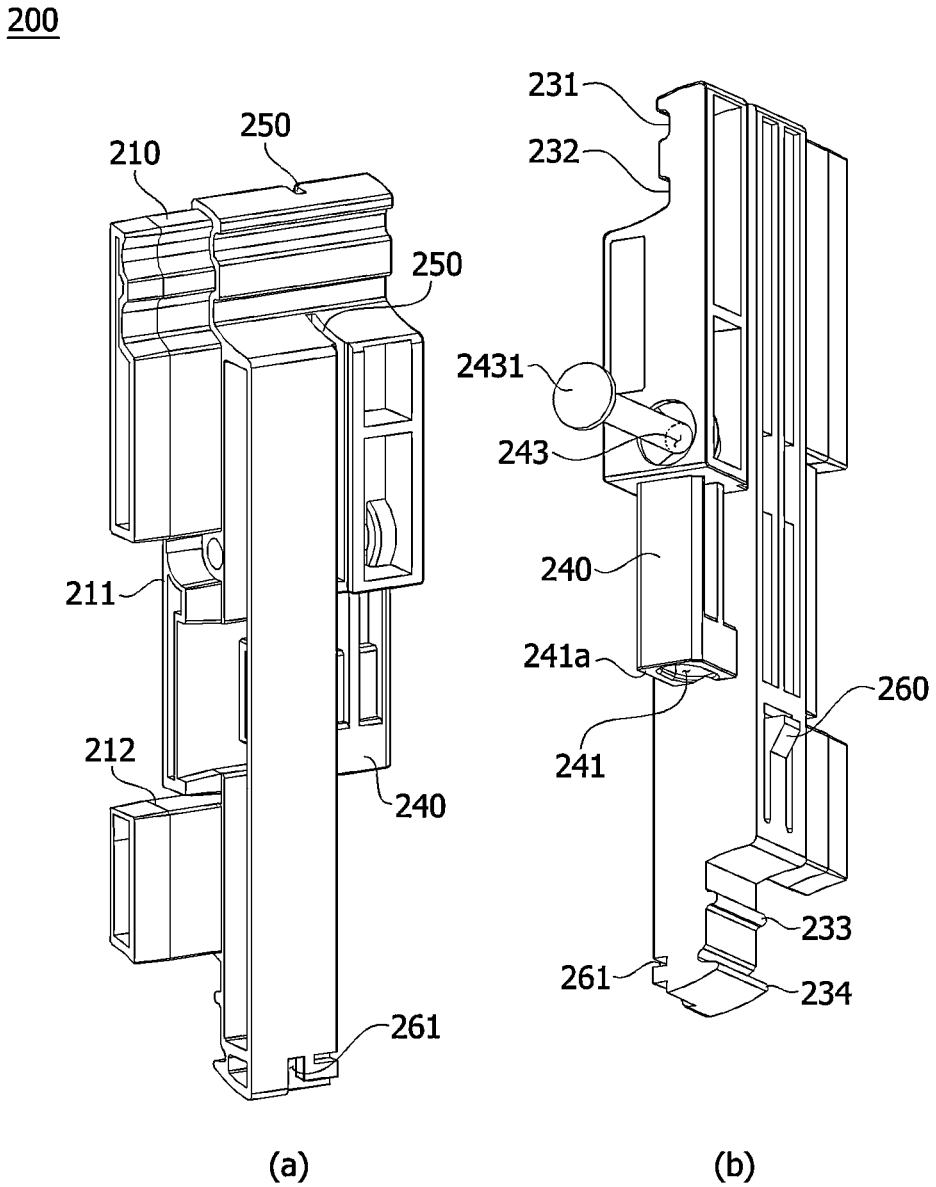
(b)

[FIG. 29]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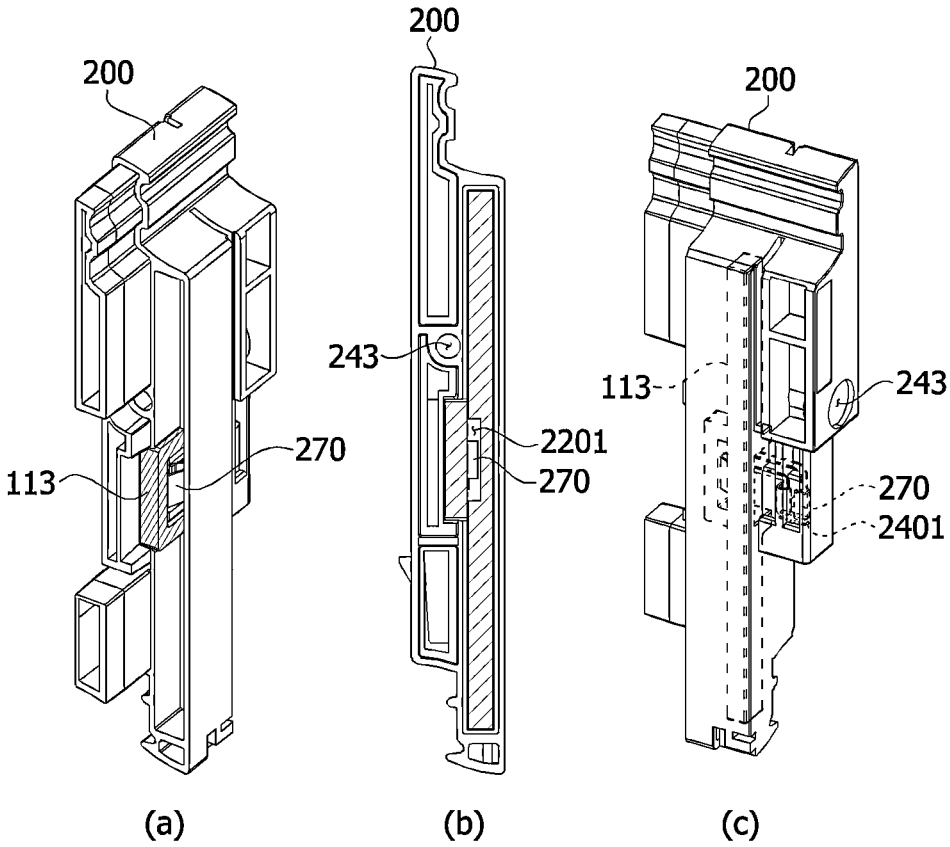
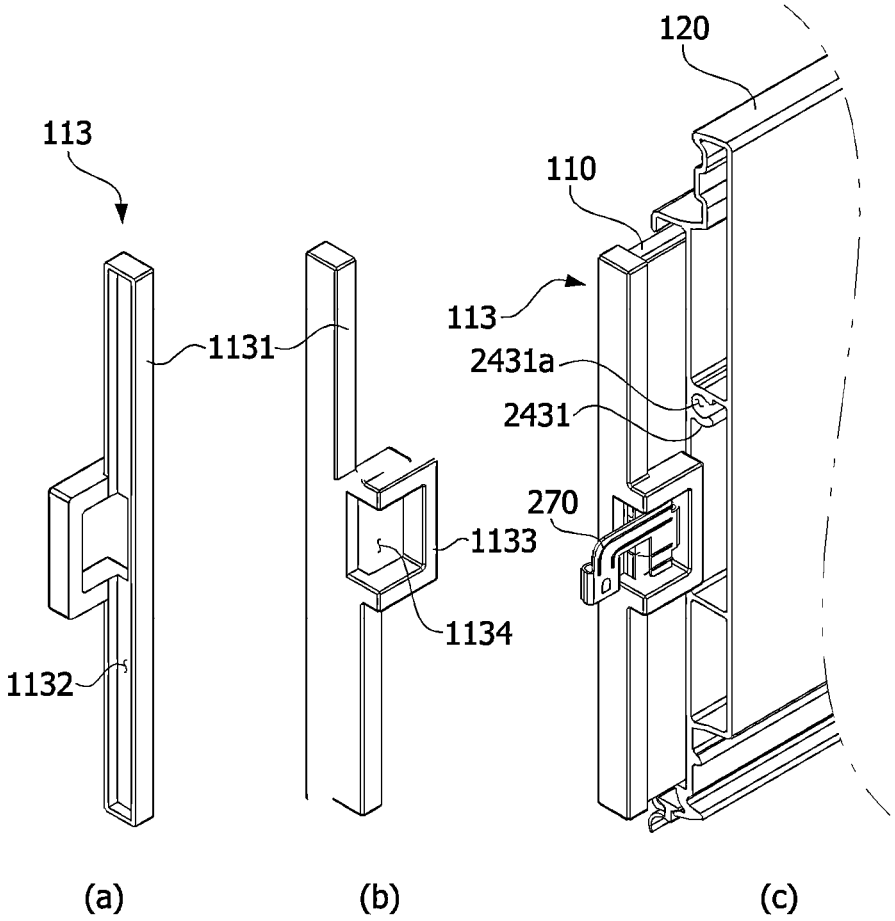
(a)
(b)

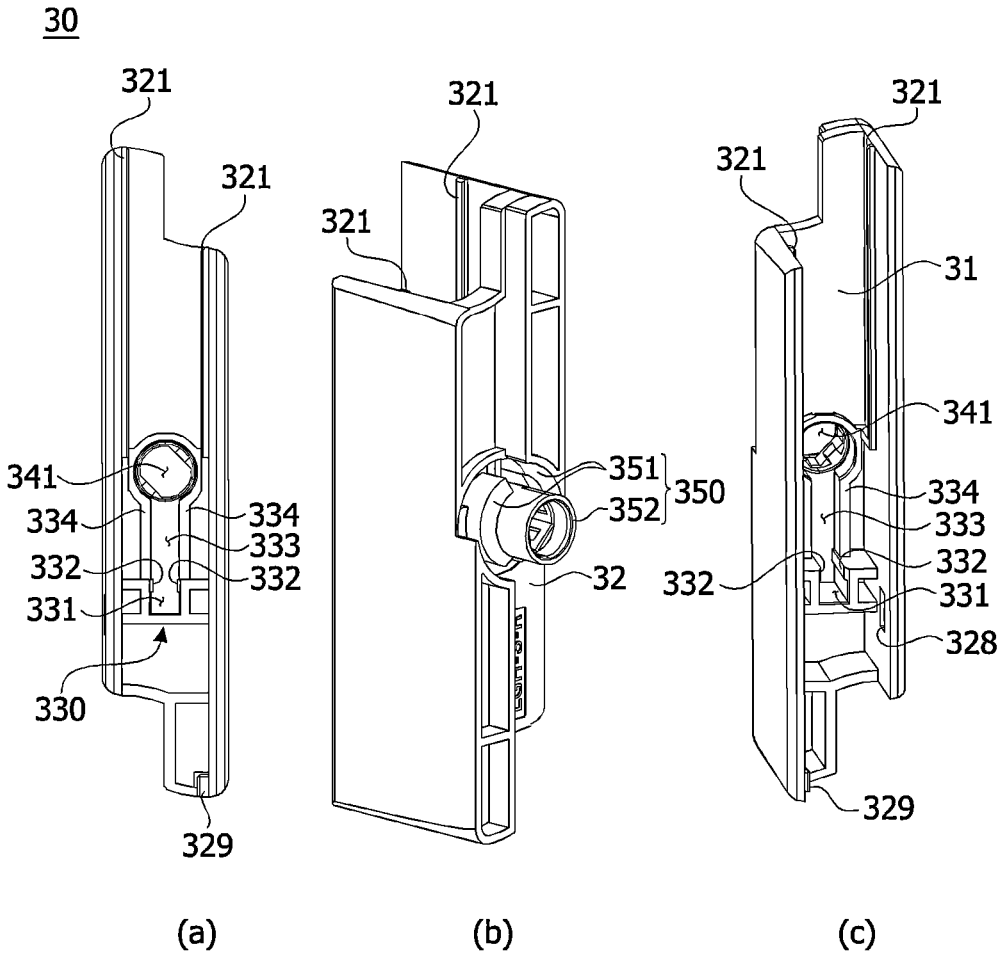
[FIG. 30]



[FIG. 31]



[FIG. 32]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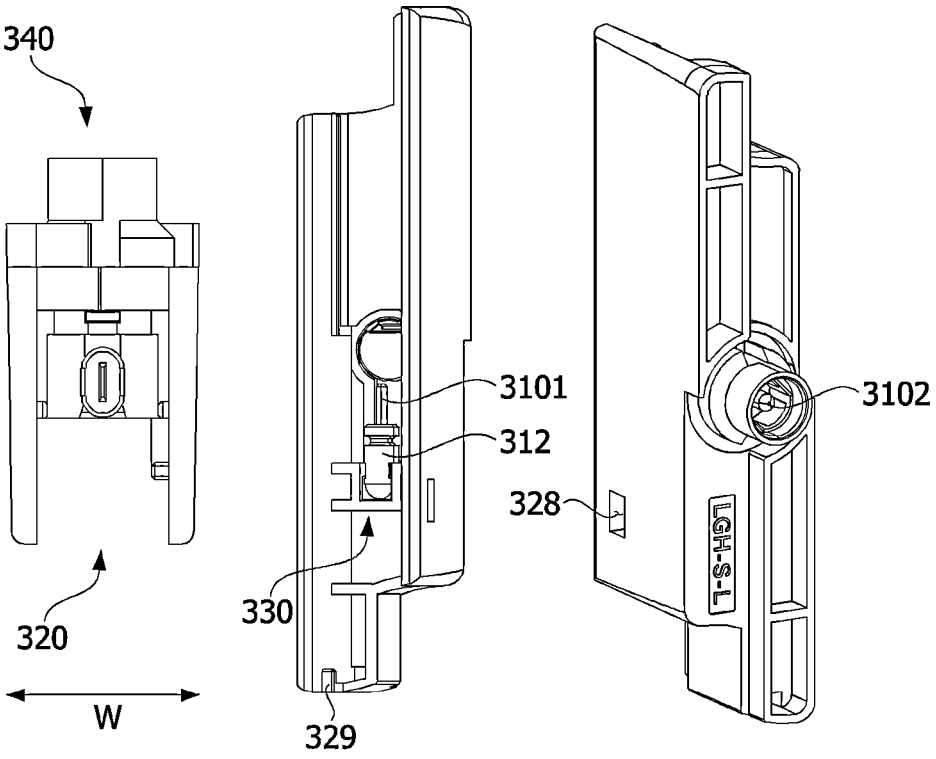
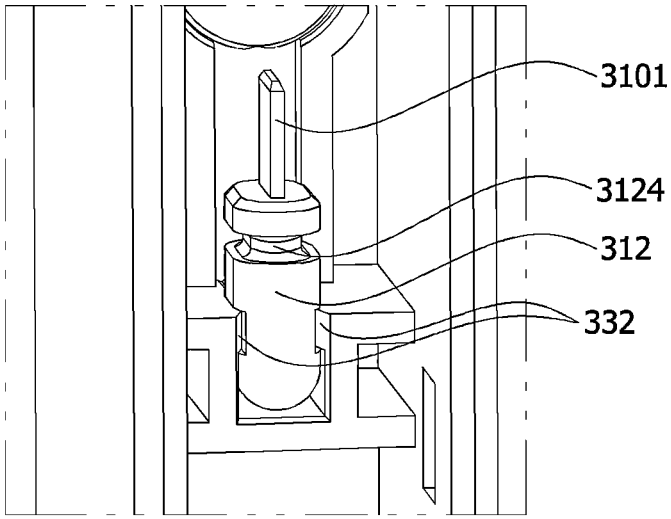
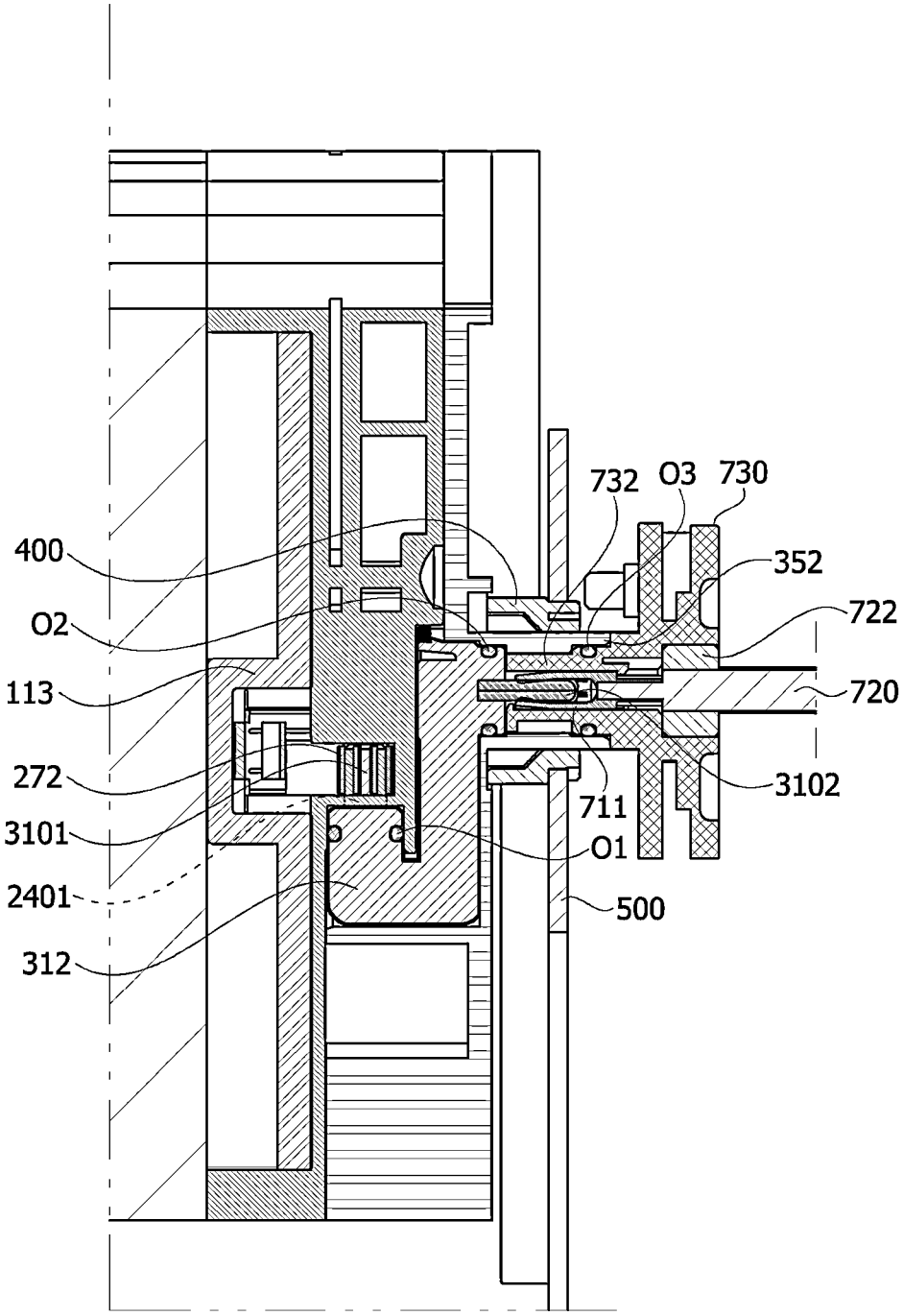
(a)
(b)
(c)

[FIG. 33]





[FIG. 34]


732
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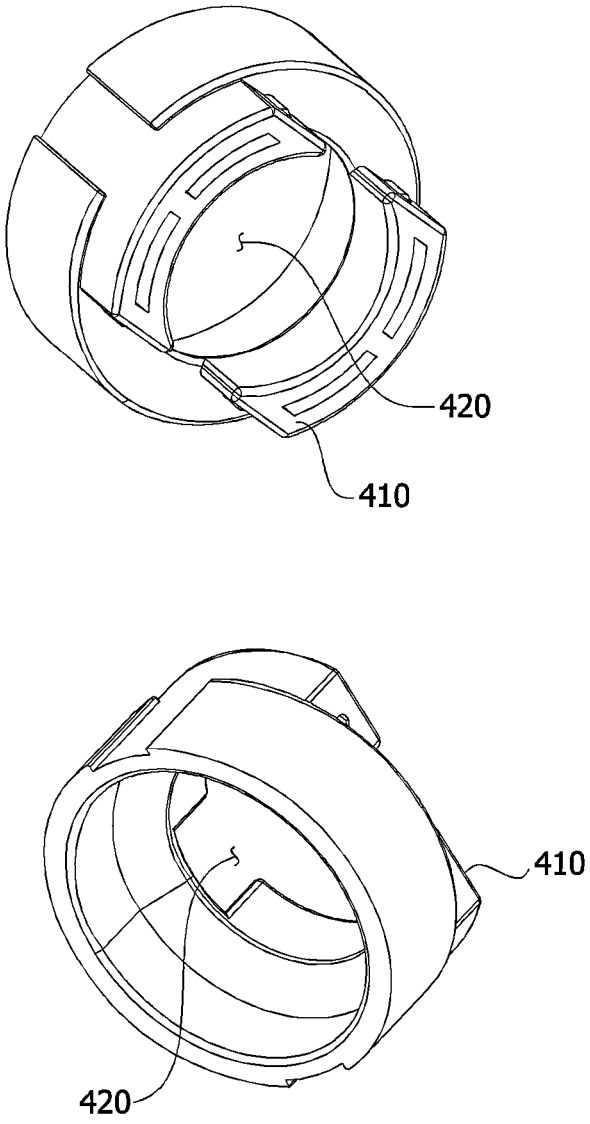
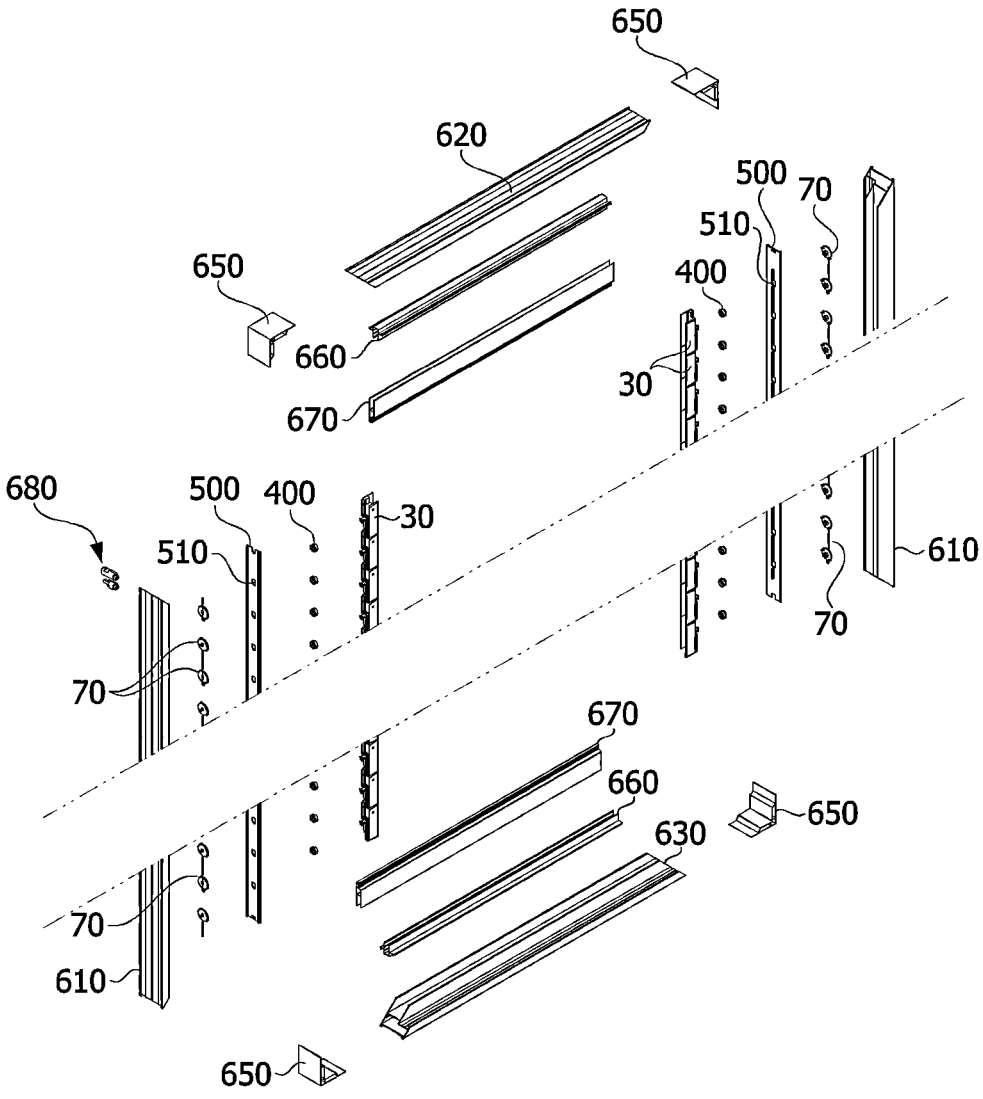
[FIG. 35]



[FIG. 36]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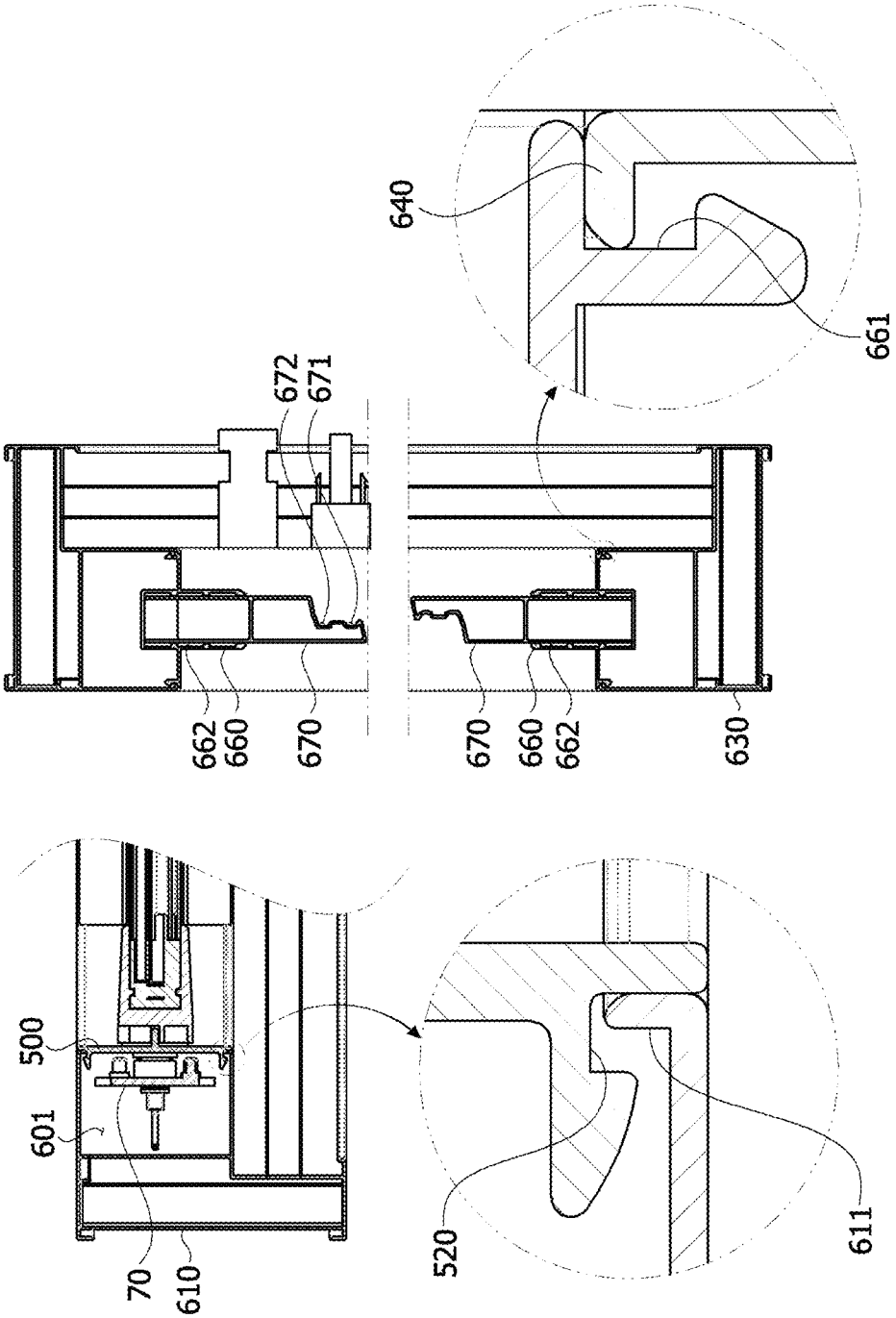
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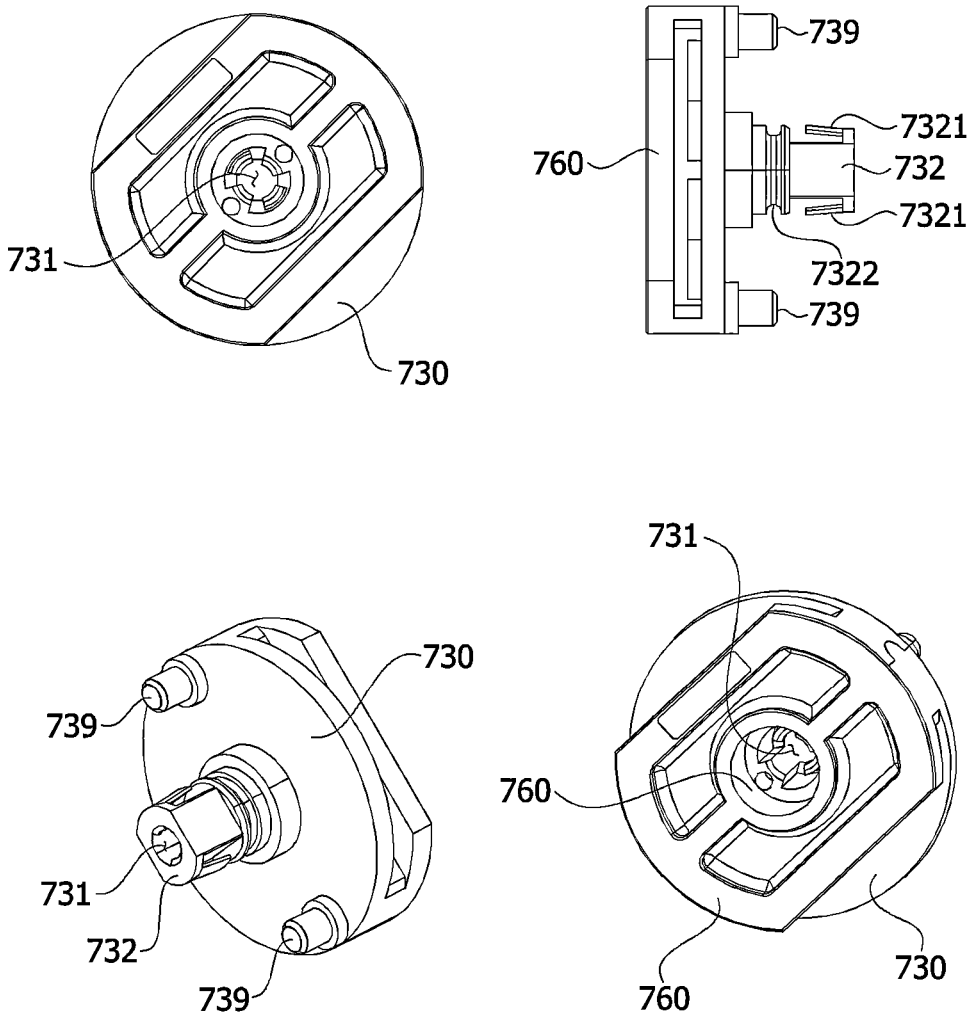
[FIG. 37]

[FIG. 38]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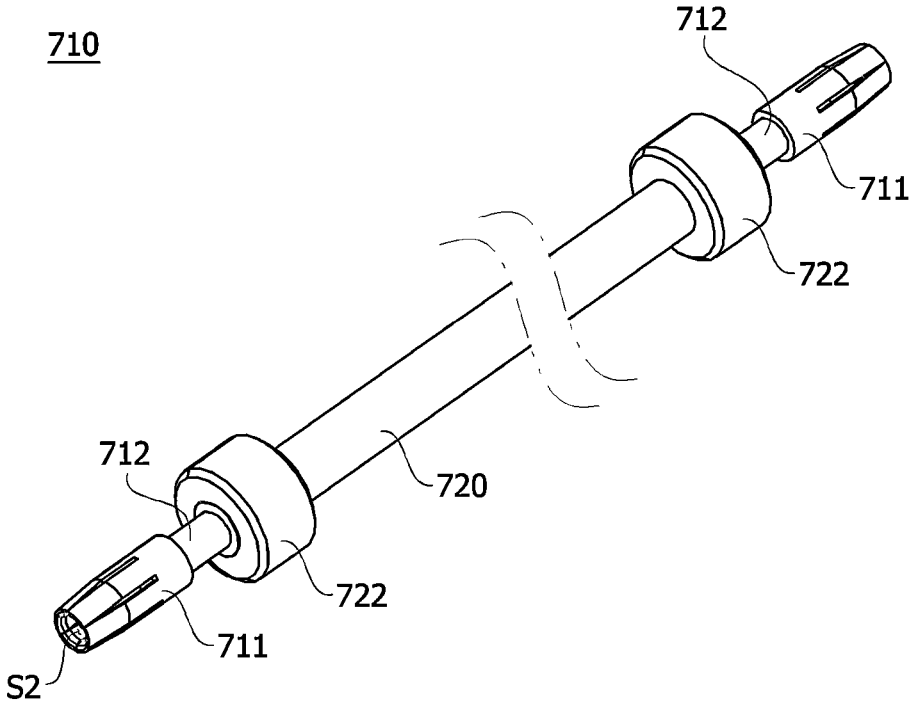
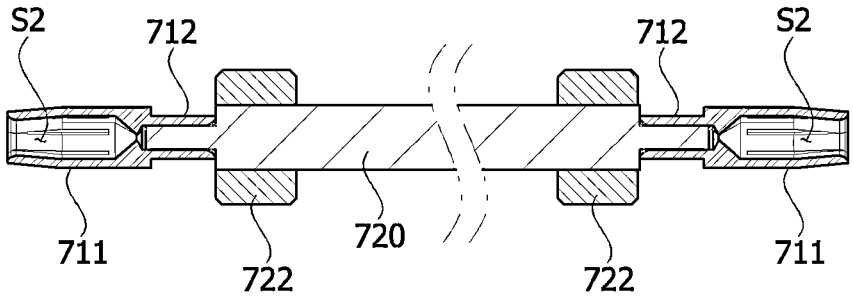
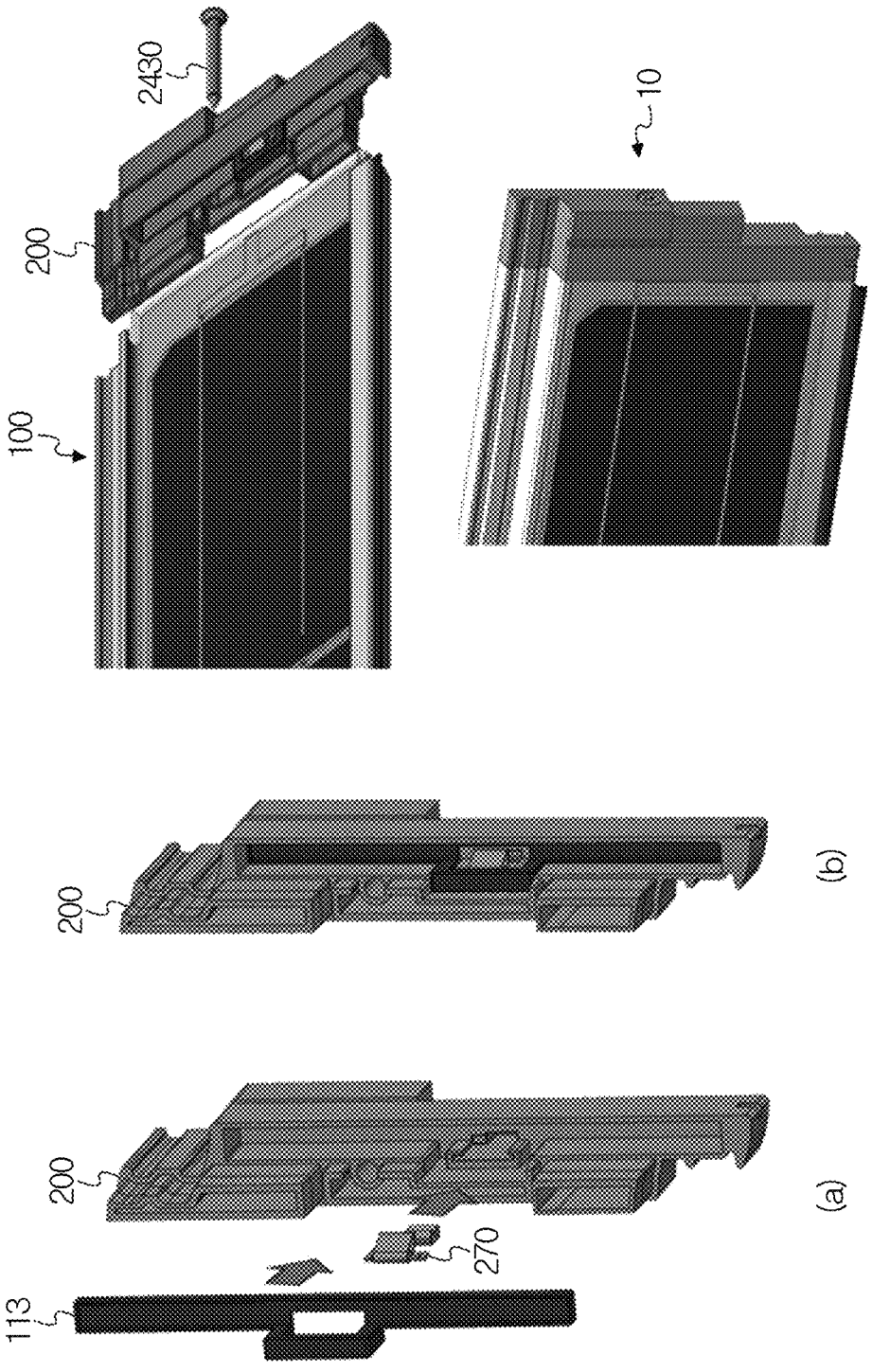
739
760
7321
732
7321
7322
739
739
730
731
732
739
731
760
760
730

[FIG. 39]

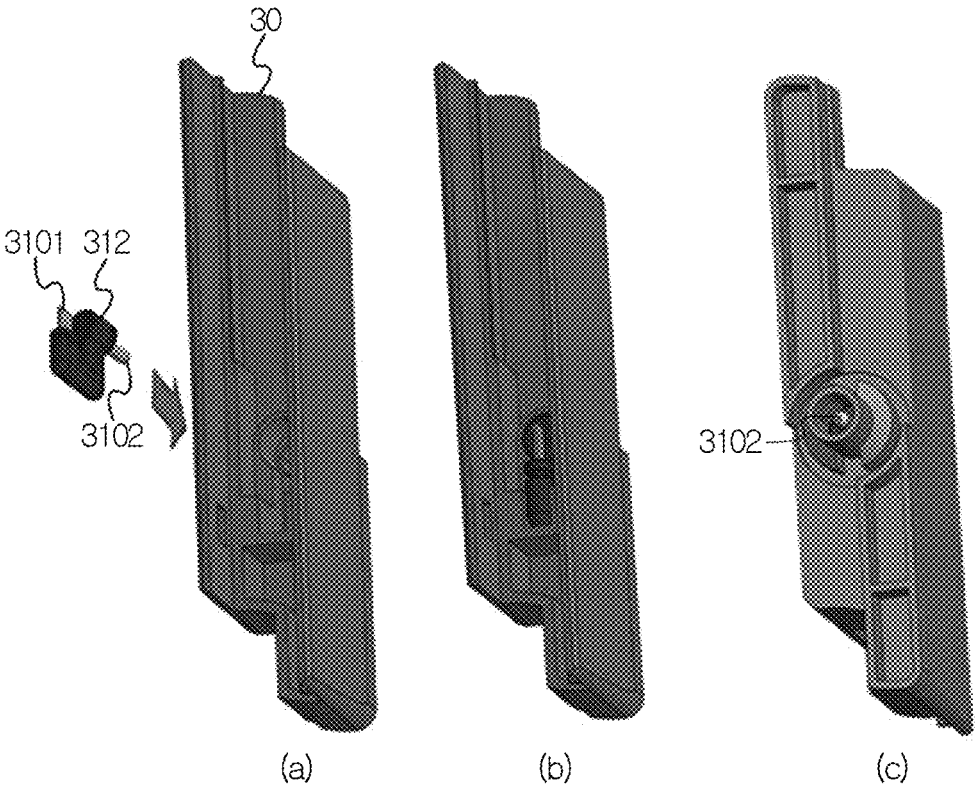

710
712
711
722
720
712
722
711
S2


S2
712
712
S2
711
722
720
722
711

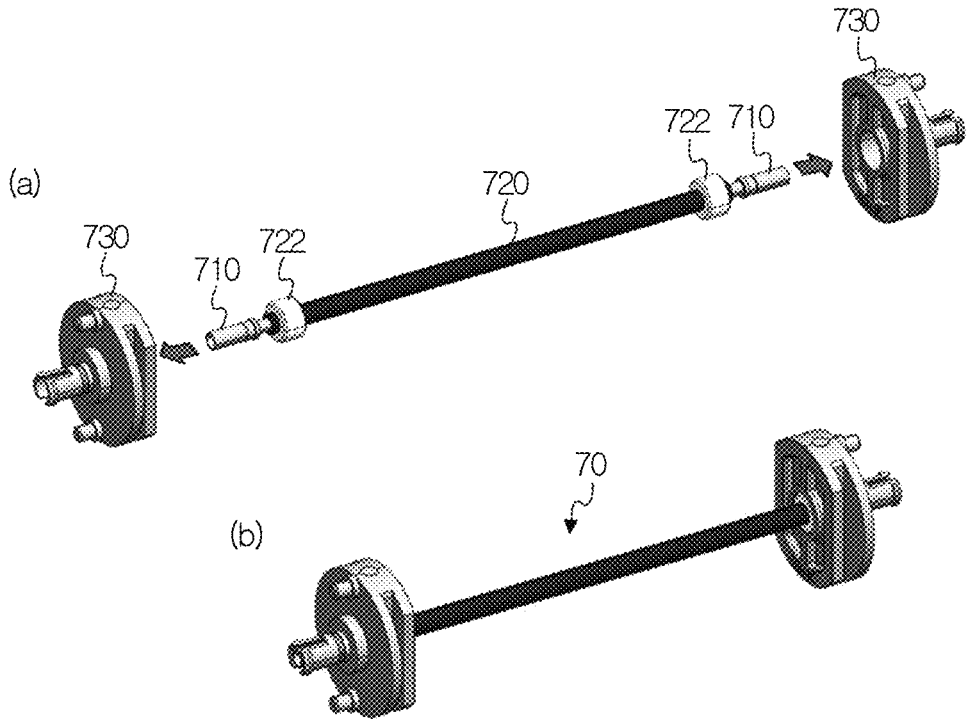


[FIG. 40]

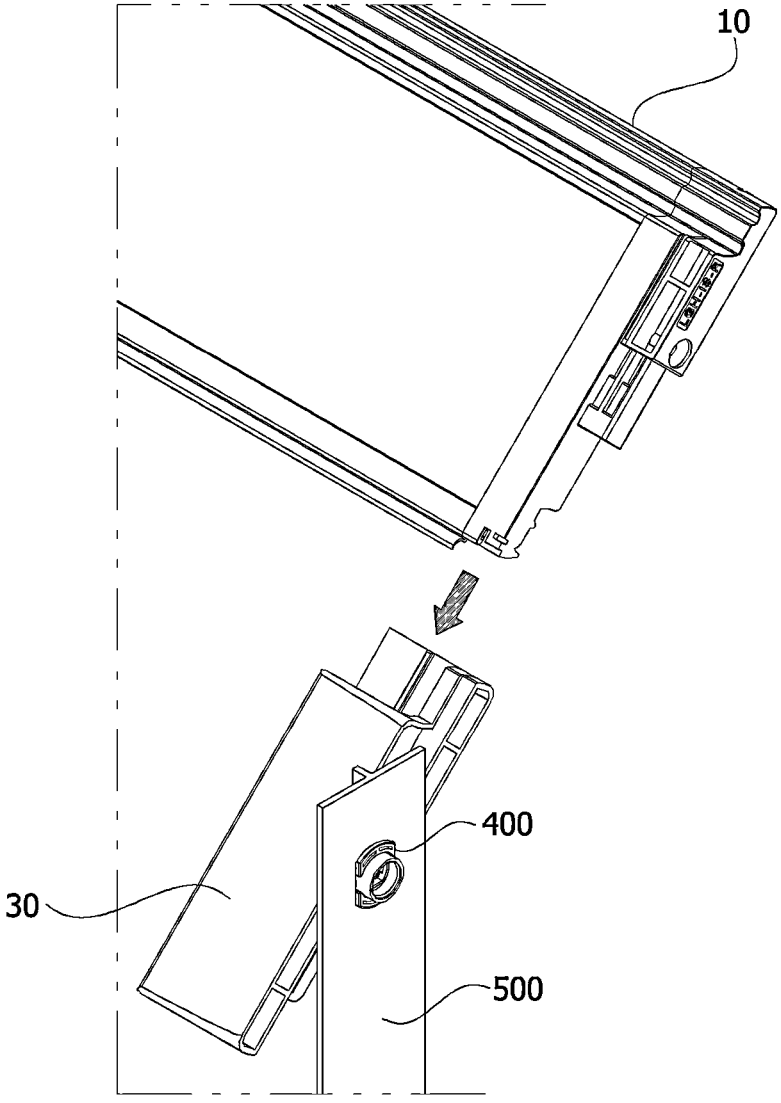
[FIG. 41]



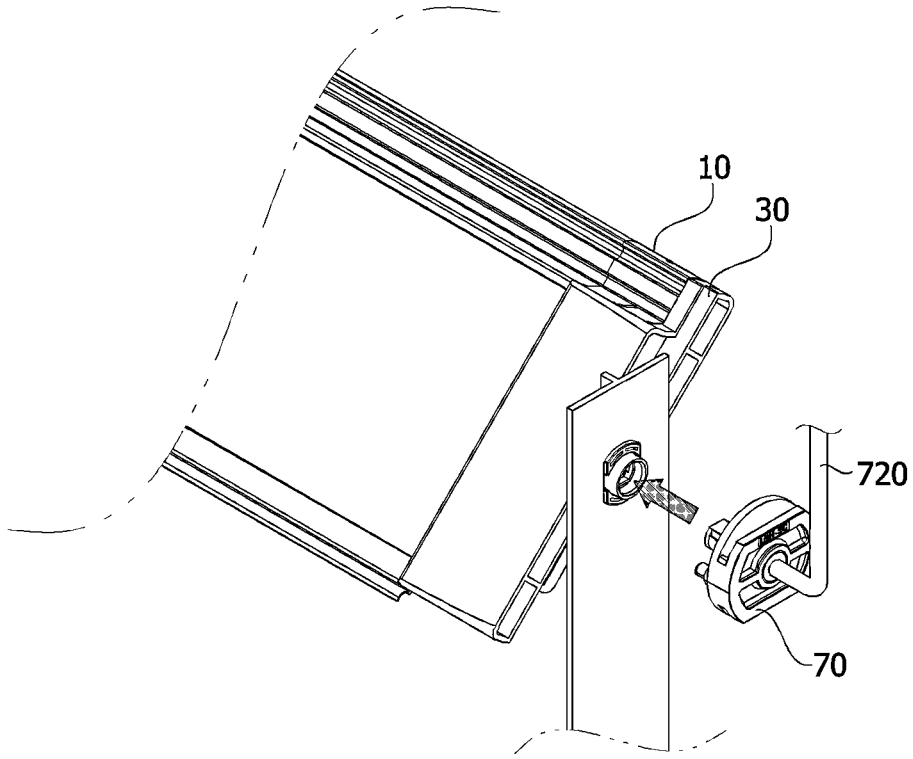
[FIG. 42]



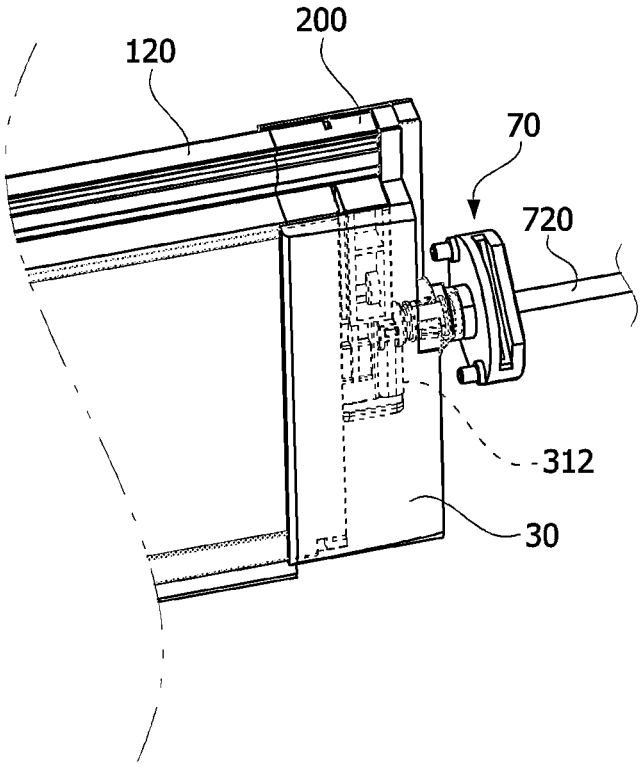
[FIG. 43]



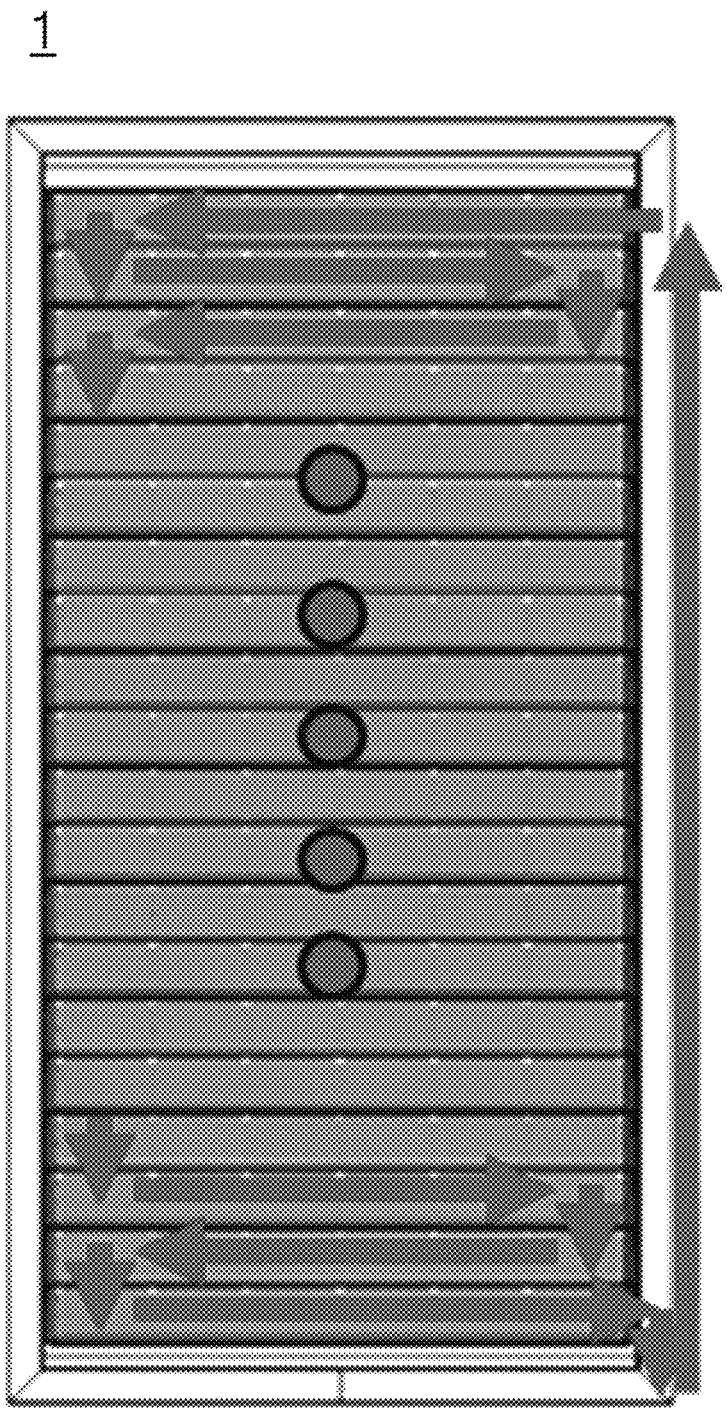
[FIG. 44]



[FIG. 45]



[FIG.46]



LOUVER ASSEMBLY CAPABLE OF HAVING MOUNTED THEREON SOLAR CELL PANEL

TECHNICAL FIELD

The present invention relates to a louver assembly allowing a solar cell panel to be mounted thereon, in which a solar cell panel (solar module) is integrated with a louver window applicable to a public building.

BACKGROUND ART

Recently, as a way to reduce energy consumption, efforts to use natural energy such as solar energy as alternative energy have been attempted. In photovoltaic systems using sunlight of the solar energy, photovoltaic modules are installed on an outer wall on which a large amount of sunlight is present among outer walls of a building, and after the photovoltaic modules collect sunlight, the collected sunlight is converted into electric energy and the electric energy is supplied to the inside of the building.

When the photovoltaic modules of such a photovoltaic system are connected in series, there are problems in that a connection structure of wires electrically connected is complicated and the wires are damaged or broken by external factors because the wires are exposed to the outside.

Thus, not only the manufacturing costs and installation costs of the photovoltaic module increase, but also there is a problem in that maintenance for failure is not easy.

In addition, when the photovoltaic modules are connected in series, there is a problem in that water easily penetrates into the photovoltaic modules due to the connection structure of the wires.

Therefore, there is a need for a technique for solving the above problems.

DISCLOSURE

Technical Problem

The present invention is directed to providing a louver assembly on which a solar cell panel (photovoltaic module), in which a plurality of solar cell modules are more easily connectable in series without the exposure of wires to the outside, is mounted.

The present invention is also directed to providing a louver assembly in which photovoltaic power generation according to an angle is possible by insertion-mounting a solar cell panel in a louver frame.

The present invention is also directed to providing a louver assembly of which the number of insert injection-molded electrode terminals for serial connection of solar cell modules is minimized to improve productivity, facilitate product production, and further improve waterproof performance.

Technical Solution

According to an embodiment of the present invention, a solar cell louver assembly includes a plurality of solar cell modules which each include a solar cell panel unit including one pair of terminal portions provided at both end portions thereof, one pair of first electrode terminals electrically connected to the terminal portions, and one pair of first caps mounted on the solar cell panel unit to surround the first electrode terminals, a plurality of second caps each including a second electrode terminal electrically connected to the first electrode terminal, a frame unit provided such that each of the plurality of second caps is rotatably mounted in a length direction, and connector parts each including one pair of third electrode terminals configured to electrically connect the second electrode terminals of two adjacent solar cell modules when the plurality of solar cell modules are mounted on the frame unit.

According to another embodiment of the present invention, a solar cell louver assembly includes a plurality of solar cell modules which each include a solar cell panel unit including one pair of terminal portions provided at both end portions thereof, one pair of first electrode terminals electrically connected to the terminal portions, and one pair of first caps mounted on the solar cell panel unit to surround the first electrode terminals, a plurality of second caps each including a second electrode terminal electrically connected to the first electrode terminal and a terminal housing configured to surround at least a partial area of the second electrode terminal, a frame unit provided such that each of the plurality of second caps is rotatably mounted in a length direction, and connector parts each including one pair of third electrode terminals configured to electrically connect the second electrode terminals of two adjacent solar cell modules when the plurality of solar cell modules are mounted on the frame unit, wherein each first electrode terminal is detachably mounted inside the first cap, and each second electrode terminal is formed integrally with the terminal housing through insert injection molding and is detachably mounted inside the second cap.

Advantageous Effects

According to the present invention, since a louver assembly of the present invention can be assembled in the same manner as in a conventional louver window, assembly is easier.

In addition, the louver assembly can serve as a louver window, and concurrently, series-connected solar cell panels can generate electricity.

Furthermore, the plurality of solar cell panels can be more easily connected in series without the exposure of wires to the outside.

In particular, the number of electrode terminals to be insert-injection-molded is minimized in a structure for serial connection of the solar cell panels, thereby facilitating production product and improving productivity.

DESCRIPTION OF DRAWINGS

FIG. **1** shows perspective views illustrating a front surface and a rear surface of a louver assembly on which a solar cell panel is mounted according to a first embodiment of the present invention.

FIG. **2** is an exploded perspective view illustrating a solar cell module according to the first embodiment of the present invention.

FIG. **3** is a partial enlarged view of FIG. **1**.

FIG. **4** is a cross-sectional view of FIG. **3**.

FIGS. **5** and **6** are a perspective view and a side view illustrating first to third electrode terminals according to the first embodiment of the present invention.

FIG. **7** shows views illustrating a state in which a plurality of solar cell modules of FIG. **2** are electrically connected.

FIG. **8** shows a perspective view and a side cross-sectional view of a blade frame on which a solar cell panel is mounted according to the first embodiment of the present invention.

FIG. **9** shows perspective views and a side cross-sectional view illustrating a state in which the blade frame is disposed in a vertical direction according to the first embodiment of the present invention.

FIG. **10** shows views illustrating a first cap including a first electrode terminal according to the first embodiment of the present invention.

FIG. **11** shows views illustrating a second cap according to the first embodiment of the present invention.

FIG. **12** shows views illustrating a fixing member according to the first embodiment of the present invention.

FIGS. **13** and **14** show views illustrating a frame unit according to the first embodiment of the present invention.

FIG. **15** shows perspective views illustrating a connector part according to the first embodiment of the present invention.

FIG. **16** shows views illustrating a state in which the solar cell module is mounted on the second cap and the connector part is mounted in the second cap according to the first embodiment of the present invention.

FIG. **17** is a view illustrating a state in which a solar cell louver assembly is connected in series according to the first embodiment of the present invention.

FIG. **18** shows perspective views illustrating a front surface and a rear surface of a louver assembly according to a second embodiment of the present invention.

FIG. **19** is an exploded perspective view illustrating a solar cell module according to the second embodiment of the present invention.

FIG. **20** is an exploded perspective view illustrating the solar cell module and second caps according to the second embodiment of the present invention.

FIG. **21** is a partial perspective view illustrating electrical connections of a terminal portion of a solar cell panel and first to third electrode terminals according to the second embodiment of the present invention.

FIG. **22** is an exploded perspective view of the first to third electrode terminals according to the second embodiment of the present invention.

FIG. **23** is an exploded perspective view illustrating the second electrode terminal and a terminal housing of FIG. **22**.

FIG. **24** is a perspective view illustrating a configuration in which solar cell modules are electrically connected in series by a connector part according to the second embodiment of the present invention.

FIGS. **25**A and **25**B illustrate a state in which the solar cell modules are electrically connected according to the second embodiment of the present invention, and FIG. **25**C is a view illustrating components of the solar cell panel according to the second embodiment of the present invention.

FIG. **26** shows perspective views and a side cross-sectional view of a blade frame on which the solar cell panel is mounted according to the second embodiment of the present invention.

FIG. **27** shows views illustrating a state in which the solar cell panel is mounted on the blade frame according to the second embodiment of the present invention.

FIGS. **28** and **29** shows views illustrating a first cap in which the first electrode terminal is detachably mounted according to the second embodiment of the present invention.

FIG. **30** shows views illustrating a state in which the first electrode terminal and a first gasket are mounted in the first cap according to the second embodiment of the present invention.

FIG. **31** shows views for describing a state in which the first electrode terminal and the first gasket are mounted in the solar cell panel according to the second embodiment of the present invention.

FIGS. **32** and **33** show views illustrating the second cap according to the second embodiment of the present invention.

FIG. **34** is a cross-sectional view illustrating electrical connections of the first to third electrode terminals in a state in which the first cap, the second cap, and the connector part are mounted on the solar cell module according to the second embodiment of the present invention.

FIG. **35** shows views illustrating a fixing member according to the second embodiment of the present invention.

FIGS. **36** and **37** show views for describing a frame unit according to the second embodiment of the present invention.

FIGS. **38** and **39** show perspective views illustrating the connector part according to the second embodiment of the present invention.

FIG. **40** shows views illustrating a sequence in which the solar cell module is assembled according to the second embodiment of the present invention.

FIG. **41** shows views illustrating a sequence in which the terminal housing and the injection-molded second electrode terminal are assembled in the second cap according to the second embodiment of the present invention.

FIG. **42** shows views illustrating a sequence in which the connector part is assembled according to the second embodiment of the present invention.

FIGS. **43** and **44** are views for describing a sequence in which the solar cell module is mounted according to the second embodiment of the present invention.

FIG. **45** is a view illustrating a state in which the solar cell module is mounted on the second cap and the connector part is mounted on the second cap according to the second embodiment of the present invention.

FIG. **46** is a view illustrating a state in which a solar cell louver assembly is connected in series according to the second embodiment of the present invention.

MODES OF THE INVENTION

Hereinafter, exemplary embodiments of the present invention will be described in detail with reference to the accompanying drawings. Prior to the description, it should be understood that the terms used in the present specification and the appended claims should not be construed as limited to general and dictionary meanings, but interpreted based on the meanings and concepts corresponding to technical aspects of the present invention on the basis of the principle that the inventor is allowed to define terms appropriately for the best explanation.

In addition, for convenience of description, sizes and shapes of the illustrated constituent members may be exaggerated or reduced.

Therefore, the embodiments disclosed in the present specification and the configurations illustrated in the drawings are merely the most exemplary embodiments of the present invention, and not all of them represent the technical ideas of the present invention, and thus it should be understood that there may be various equivalents and modified examples that could substitute therefore at the time of filing the present application.

First, throughout the present specification, a vertical direction refers to a direction perpendicular to a ground

surface, and a horizontal direction refers to a direction parallel to the ground surface.

In addition, in the present document, a side of a solar cell panel on which sunlight is incident is referred to as a front surface (front), and a side in a direction opposite to the front surface is referred to as a rear surface (rear).

Here, the front surface may be installed to face the outside, and the rear surface may be installed to face the inside.

In addition, although it will be described below that a first cap **200**, a second cap **30**, and a connector part **70** are illustrated as being mounted at one side of a solar cell panel, it should be understood that the same may apply to the other side of the solar cell panel.

Hereinafter, a louver assembly **1** on which a solar cell panel is mountable according to a first embodiment of the present invention will be described in detail with reference to the accompanying FIGS. **1** to **17**, and a louver assembly **1** on which a solar cell panel is mountable according to a second embodiment of the present invention will be described in detail with reference to FIGS. **18** to **46**.

FIG. **1** shows perspective views illustrating a front surface and a rear surface of the louver assembly **1** on which a solar cell panel is mounted according to the first embodiment of the present invention. FIG. **2** is an exploded perspective view illustrating a solar cell module according to the first embodiment of the present invention. FIG. **3** is a partial enlarged view of FIG. **1**. FIG. **4** is a cross-sectional view of FIG. **3**. FIGS. **5** and **6** are a perspective view and a side view illustrating first to third electrode terminals according to the first embodiment of the present invention.

Referring to FIGS. **1** to **6**, the louver assembly **1** on which a solar cell panel is mounted according to the first embodiment of the present invention (hereinafter, referred to as "louver assembly") includes a plurality of solar cell modules **10**, second caps **30**, a frame unit **50**, and connector parts **70**.

Specifically, referring to FIG. **2**, the plurality of solar cell modules **10** each include a solar cell panel unit **100** including one pair of terminal portions **111** provided at both end portions thereof, one pair of first electrode terminals **270** electrically connected to the terminal portions **111**, and one pair of first caps **200** mounted on the solar cell panel unit **100** to surround the first electrode terminals **270**.

In addition, the second cap **30** may accommodate the first electrode terminal **270** and the second electrode terminal **310** to be electrically connected to the first electrode terminal **270** and may be provided as a plurality of second caps **30** such that the first caps **200** are mounted thereon.

The first electrode terminal **270** in each of the first caps **200** may be integrally formed with the first cap **200** while insert-injected into the first cap **200**.

In addition, the second electrode terminal **310** in each of the second caps **30** may be integrally formed with the second cap **30** while insert-injected into the second cap **30**.

In the present document, insert injection refers to commonly used insert injection molding and means that a certain insert member is installed in an insert injection molding device in advance, and then a molten resin is injected onto the insert member to manufacture an insert-molded product as a final product.

That is, in the present invention, the first cap or the second cap may be manufactured by injecting a molten resin onto the first electrode terminal or the second electrode terminal as an insert member.

In addition, the frame unit **50** includes an inner frame **500** provided such that the plurality of second caps **30** are each mounted thereon to be rotatable in a length direction and an outer frame **600** surrounding the inner frame **500**.

In addition, the connector part **70** is disposed between the inner frame **500** and the outer frame **600** and includes one pair of third electrode terminals **710** for electrically connecting the second electrode terminals **310** of two adjacent solar cell modules **10** (**11** and **12**) when the plurality of solar cell module **10** are mounted on the frame unit **50**.

Here, the third electrode terminal **710** in each of the connector parts **70** may be integrally formed with the connector part **70** while insert-injected into the connector part **70**.

More specifically, referring to FIGS. **2** to **4**, when the first cap **200** is mounted on the second cap **30**, the second electrode terminal **310** may be in contact with the first electrode terminal **270**, and when the connector part **70** is mounted on the second cap **30**, the third electrode terminal **710** may be provided in contact with the second electrode terminal **310**.

That is, the first electrode terminal **270** and the second electrode terminal **310** may be electrically connected in physical contact (direct contact) with each other, and the second electrode terminal **310** and the third electrode terminal **710** may be electrically connected in physical contact (direct contact) with each other so that the first electrode terminal **270** and the third electrode terminal **710** may be electrically connected.

In addition, one terminal of the first and second electrode terminals **270** and **310** may be provided with a space into which the other terminal thereof is inserted, and when the first cap **200** is mounted on the second cap **30**, one terminal of the first and second electrode terminals **270** and **310** may be inserted into the other terminal thereof.

Specifically, referring to FIGS. **5** and **6**, the first electrode terminal **270** may include a plurality of first electrode rods **271** (**271***a*, **271***b*, and **271***c*) forming a space S**1** into which the second electrode terminal **310** is inserted. At least one first electrode rod **271** may be bent one or more times and may be provided such that the second electrode terminal is in contact with a bent portion of the first electrode rod or is inserted into a space between bent portions of the first electrode rods.

That is, a space S**1** into which the second electrode terminal **310** is inserted may be a space between the first electrode rods, wherein the space is formed by bending the plurality of first electrode rods **271** one or more times.

As one embodiment in the first embodiment, as shown in FIG. **5**, when three first electrode rods **271** are provided, two first electrode rods **271***a* and **271***c* spaced apart from each other by a certain interval may be formed to each include a first bent portion **2711** bent toward a solar cell panel (leftward) and a second bent portion **2712** formed to extend from the first bent portion and bent toward the second cap **30** (rightward).

In this case, on the other hand, the remaining first electrode rod **271***b* formed between the two first electrode rods **271***a* and **271***c* may be formed to include a third bent portion **2713** bent toward the second cap **30** and a fourth bent portion **2714** formed to extend from the third bent portion **2713** and bent toward the solar cell panel.

That is, when each of the first electrode rods is bent two or more times, at least one first electrode rod may be provided to be bent in a different direction from the remaining first electrode rods.

In particular, the first bent portion and the third bent portion may be provided to be bent in different directions,

and the second bent portion and the fourth bent portion may be formed to be bent in different directions.

As another embodiment of the first embodiment, as shown in FIG. **6**, when three first electrode rods **271** are provided, two first electrode rods **271***a* and **271***c* spaced apart from each other by a certain interval may be formed to each include a first bent portion **2711***a* bent toward the solar cell panel.

In this case, on the other hand, the remaining first electrode rod **271***b* formed between the two first electrode rods may be formed to include a second bent portion **2713***b* bent toward the second cap **30**.

That is, when each of the first electrode rods is formed to be bent one time, the first bent portion and the second bent portion may be formed to be bent in different directions so that a certain space may be formed between the first electrode rods.

In addition, the first electrode terminal **270** includes a first connection portion **272** electrically connected to the solar cell panel and a second connection portion **273** in contact with a bypass diode.

In addition, the plurality of first electrode rods **271** (**271***a*, **271***b*, and **271***c*), the first connection portion **272**, and the second connection portion **273** may be formed integrally.

Furthermore, one terminal of the second and third electrode terminals **310** and **710** may be provided with a space S**2** into which the other terminal thereof is inserted, and when the connector part **70** is mounted on the second cap **30**, one terminal of the second and third electrode terminals **310** and **710** may be provided to be inserted into the other terminal thereof.

Specifically, the second electrode terminal **310** includes a plurality of second electrode rods **311** (**311***a*, **311***b*, and **311***c*) forming a space into which the third electrode terminal **710** is inserted. At least one second electrode rod **311** may be bent one or more times and may be provided such that the third electrode terminal **710** is in contact with a bent portion of the second electrode rod **311** or is inserted into a space between bent portions of the second electrode rods **311**.

That is, a space S**1** into which the third electrode terminal **710** is inserted may be a space between the first electrode rods, wherein the space is formed by bending the plurality of second electrode rods **311** one or more times.

As one embodiment of the first embodiment, as shown in FIG. **5**, when three second electrode rods **311** are provided, two second electrode rods **311***a* and **311***c* spaced apart from each other by a certain interval may be formed to each include a first bent portion **3111** bent downward (downward direction) and a second bent portion **3112** formed to extend from the first bent portion and bent upward (upward direction).

In this case, on the other hand, the remaining second electrode rod **311***b* between the two second electrode rods **311***a* and **311***c* may be formed to include a third bent portion **3113** bent upward (upward direction) and a fourth bent portion **3114** is formed to extend from the third bent portion **2713** and bent downward (downward direction).

That is, when each of the second electrode rods is bent two or more times, at least one second electrode rod may be provided to be bent in a different direction from the remaining second electrode rods.

In particular, the first bent portion and the third bent portion may be provided to be bent in different directions, and the second bent portion and the fourth bent portion may be formed to be bent in different directions.

As another embodiment of the first embodiment, as shown in FIG. **6**, when three second electrode rods **311** are provided, two second electrode rods **311***a* and **311***c* spaced apart from each other by a certain interval may be formed to each include a first bent portion **3111***a* bent downward.

In this case, on the other hand, the remaining second electrode rod **311***b* formed between the two second electrode rods may be formed to include a second bent portion **3113***a* bent upward.

That is, when each of the second electrode rods is formed to be bent one time, the first bent portion and the second bent portion may be formed to be bent in different directions so that the certain space S**2** may be formed between the second electrode rods.

In addition, the second electrode terminal **310** may include a third connection portion **312** which is formed to extend from the second electrode rod **311** and is electrically connected to the first electrode terminal.

The plurality of second electrode rods **311** and the third connection portion **312** may be formed integrally.

That is, the third connection portion **312** may be in contact with the bent portion of the first electrode rod or may be inserted into the space between bent portions of the first electrode rods to be electrically connected to the first electrode terminal.

In addition, when the second cap **30** is mounted on the inner frame **500**, the plurality of second electrode rods **311** may be provided such that at least partial areas thereof are exposed at a space between the inner frame **500** and the outer frame **600**.

In addition, the third electrode terminal **710** may include a fourth connection portion **711** which is in contact with the bent portion of the second electrode rod of the second electrode terminal or is inserted into the space S**2** between bent portions of the second electrode rods and a fifth connection portion **712** which is formed to extend from the fourth connection portion **711** and electrically connects two solar cell modules **10** (**11** and **12**) adjacent to each other in the length direction of the inner frame **500**.

In addition, the connector part **70** includes a connection member **720** which surrounds each of the third electrode terminals **710** and one pair of mounting members **730** which are connected to the connection member **720**, are positioned at vertical end portions of the third electrode terminals **710** to expose the third electrode terminals **710**, and are provided to be mounted on the second cap **30**.

Here, the fourth connection portion **711** of the third electrode terminal **710** may be positioned at a side of the mounting member **730** exposed to the outside, and the fifth connection portion **712** may be provided at a side of the connection member **720**.

Due to such a configuration, there is an effect that the first to third electrode terminals can be electrically connected more stably.

Meanwhile, FIG. **7** is a perspective view illustrating the solar cell panel **110** according to the first embodiment of the present invention.

Referring to FIG. **7**, the solar cell panel **110** includes the one pair of terminal portions **111** provided at both end portions thereof.

The solar cell panel **110** (also referred to as "photovoltaic module") is provided to extend in a length direction and includes first and second terminals **111***a* and **111***b* at both end portions thereof (first and second end portions).

The first terminal **111***a* may have any one of positive polarity and negative polarity, and the second terminal **111***b* may have the other one of positive polarity and negative polarity.

In addition, the solar cell panel may include, for example, a glass **1101**, one or more encapsulants (EVA) **1102** and **1104**, one or more solar cells **1100**, a cell string **1103** for connecting the solar cells **1100** in series, and a back sheet **1105**.

Here, the solar cells **1100** may be connected in series through the cell string **1103** to constitute a solar battery (also referred to as "solar cell string").

The glass **1101** may be a surface on which sunlight is incident and may serve to protect the solar battery disposed thereunder from an external environment and to scatter light to allow reflected light to be incident again.

As an example, the glass may protect the solar battery, which is easily broken when external hail or fire occurs, from an impact and an external flame.

Here, although a thickness of the glass may be 2.8 mm, the present invention is not limited thereto, and the thickness of the glass may be 2.8 mm or less or less than 2.8 mm.

Specifically, the thickness of the glass may be in a range of 0.1 mm to 2.8 mm, 0.2 mm to 2.7 mm, 0.3 mm to 2.6 mm, 0.4 mm to 2.5 mm, 0.5 mm to 2.4 mm, 0.6 mm to 2.3 mm, 0.7 mm to 2.2 mm, 0.8 mm to 2.1 mm, 0.9 mm to 2.0 mm, 1.0 mm to 1.9 mm, 1.1 mm to 1.8 mm, 1.2 mm to 1.7 mm, 1.3 mm to 1.6 mm, or 1.4 mm to 1.5 mm, but the present invention is not limited thereto.

More specifically, the glass **1101** of the solar cell panel **110** may have a first surface on which light is incident and a second surface which faces the solar battery in a direction opposite to the first surface. The first surface may be a surface that is anti-reflection-coated (AR-coated) and may be a non-patterned surface.

Due to the AR coating, when light reaches the first surface, an amount of the light which does not pass through the first surface and is reflected from the first surface and emitted to the outside is reduced.

Here, the first surface and the second surface may be AR-coated, or only the first surface may be AR-coated.

More preferably, the first surface on which a pattern is not formed is AR-coated, thereby uniformly forming the thickness of the glass.

The light (sunlight) may sequentially pass through the first surface and the second surface of the glass to be incident on the solar battery.

In addition, a certain pattern may be formed on the second surface of the glass **1101**. As an example, the certain pattern may be an embossed pattern forming an unevenness on the second surface (not shown).

The certain pattern formed on the second surface of the glass scatters incident light and serves to scatter light reflected from the solar battery or the back sheet to allow the reflected light to be incident again.

That is, due to the certain pattern, incident light is scattered, light reflected from the solar battery is not immediately emitted to the outside, and the reflected light toward the outside is scattered and incident again, thereby increasing an amount of power generated by the solar battery.

Here, when the certain pattern is formed on the first surface, the pattern is vulnerable to contamination such as dust, and thus the pattern may be formed only on the second surface, but the present invention is not limited thereto.

The glass **1101** may be low iron tempered glass but is not limited thereto.

Here, the glass **1101** may be manufactured using a thermal strengthening method, but when the glass **1101** is manufactured using chemical strengthening, the glass **1101** having a thickness of 1 mm or less may be manufactured.

The solar battery may be manufactured by serially connecting cells, which are cut in half corresponding to a size of a conventional louver blade, through the cell string **1103**.

For example, like a general battery, in the case of P-type solar cells, a surface on which light is incident forms a negative pole, and a surface opposite thereto forms a positive pole. In this case, in order to arrange solar cells in a row to connect a positive pole and a negative pole to each other, a ribbon (electrode wire) attached to an upper surface (negative surface) of a solar cell is attached and connected in series to a rear surface (positive surface) of an adjacent solar cell to form a cell string that is one line in which the solar cell and the solar cell are connected, thereby forming a solar battery (solar cell string).

In addition, the encapsulants **1102** and **1104** surround the solar battery and are positioned between the glass **1101** and the back sheet **1105**, thereby serving to mitigate a direct impact transmitted to the solar battery and prevent moisture or contaminants from directly affecting the solar battery.

In addition, like the glass **1101**, the back sheet **1105** serves to protect the solar battery from an external environment.

FIG. **8** shows views illustrating a state in which the plurality of solar cell modules of FIG. **2** are electrically connected.

Referring to FIG. **8**, the plurality of solar cell modules **10** each include the solar cell panel unit **100** including the one pair of terminal portions **111** provided at both end portions thereof, the one pair of first electrode terminals **270** electrically connected to the terminal portions **111**, and the one pair of first caps **200** mounted on the solar cell panel unit **100** to surround the first electrode terminals **270**.

More specifically, the solar cell panel unit **100** includes the solar cell panel **110** including the one pair of terminal portions **111** provided at both end portions of the solar cell panel **110** and a blade frame **120** on which the solar cell panel is mounted.

In addition, the solar cell panel unit **100** further includes a bypass diode **160** electrically connected to the solar cell panel **110**.

Here, the bypass diode **160** may be an element for preventing power loss due to a shadow generated on the solar cell panel **110**.

The solar cell modules **10** include a first solar cell module **11** and a second solar cell module **12**.

The first solar cell module **11** includes the solar cell panel unit **100** including the one pair of terminal portions **111** provided at both end portions thereof, the one pair of first electrode terminals **270** electrically connected to the terminal portions **111**, and the one pair of first caps **200** mounted on the solar cell panel unit **100** to surround the first electrode terminals **270**.

In addition, the second solar cell module **12** includes the solar cell panel unit **100** including the one pair of terminal portions **111** provided at both end portions thereof, the one pair of first electrode terminals **270** electrically connected to the terminal portions **111**, and the one pair of first caps **200** mounted on the solar cell panel unit **100** to surround the first electrode terminals **270**.

Here, in the one pair of terminal portions of the first solar cell module **11**, the first terminal **111***a* of a first end portion (left end portion of FIG. **8**) has negative polarity, and the second terminal **111***b* of a second end portion (right end portion of FIG. **8**) has positive polarity.

In this case, in the one pair of terminal portions of the second solar cell module **12**, the first terminal **111***a* of a first end portion (left end portion of FIG. **8**) has positive polarity, and the second terminal **111***b* of a second end portion (right end portion of FIG. **8**) has negative polarity.

In other words, when the first terminal **111***a* of the first solar cell module **11** has any one polarity of positive polarity and negative polarity, the first terminal **111***a* of the second solar cell module **12** is disposed to have the other polarity of positive polarity and negative polarity.

The first solar cell modules **11** and the second solar cell modules **12** may be alternately disposed in the length direction (vertical direction) of the inner frame **500**.

That is, when the plurality of solar cell modules **10** are each disposed in the length direction (vertical direction) of the inner frame **500**, terminal portions of two solar cell modules adjacent to each other in the vertical direction may be disposed to have different polarities.

Accordingly, the terminal portions of the first solar cell module **11** and the second solar cell module **12** may be disposed to have different polarities in the vertical direction so that the first solar cell module **11** and the second solar cell module **12** may be connected in series through the connector part **70**.

FIG. **9** shows a perspective view and a side cross-sectional view of the blade frame **120** on which the solar cell panel **110** is mounted according to the first embodiment of the present invention.

Referring to FIG. **9**, the blade frame **120** is formed to extend in a length direction (horizontal direction) and includes a base frame **121** for supporting the solar cell panel **110**.

The base frame **121** includes a plurality of first partition members **122** which partition the interior of the base frame such that each of first to third hollow chambers **1211**, **1212**, and **1213** having a certain space therein is formed.

In addition, the blade frame **120** includes fixing grooves **130** formed such that the solar cell panel **110** is fixedly inserted therein.

The fixing groove **130** may be formed to have both open ends in a length direction (horizontal direction) such that the solar cell panel **110** may be slide-inserted through a side of the fixing groove **130**, and a cross-sectional shape thereof may be formed in an approximately "c" shape so that the solar cell panel **110** may be fit-assembled to the fixing groove **130**.

The fixing grooves **130** may be formed in portions protruding from both side end portions of the base frame **121** in the vertical direction, that is, portions protruding from upper and lower side portions of the base frame.

In addition, in an upper end portion of the blade frame **120**, first and second grooves **123** and **124**, which are recessed inward from a front surface to a rear surface of the base frame **121**, may be formed apart from each other by a certain interval in the vertical direction.

Here, the first and second grooves **123** and **124** may be recessed inward in a length direction (horizontal direction).

At a lower end portion of the blade frame **120**, first and second protrusions **125** and **126** to be inserted into (seated in) the first and second grooves **123** and **124** of another blade frame may be provided apart from each other by a certain interval in the vertical direction.

The first and second protrusions **125** and **126** may be provided to protrude outward from the base frame in a length direction (horizontal direction).

Here, the first and second protrusions **125** and **126** may be provided to correspond to positions of the first and second grooves **123** and **124** of another adjacent blade frame in the vertical direction.

In addition, the base frame **121** in an area of the second hollow chamber **1212** includes a bypass diode insertion portion **140** formed such that the bypass diode is inserted therein.

The bypass diode insertion portion **140** may be formed to be recessed to a certain depth inward from the front surface to the rear surface in a length direction (horizontal direction).

The bypass diode **160** may be disposed in the bypass diode insertion portion **140** to be electrically connected to the solar cell panel **110**.

In particular, bypass diode connection portions **112** to which the bypass diode is electrically connected may be provided at both end portions of the solar cell panel **110**.

In addition, the blade frame **120** includes a first mounting groove **150** for mounting a blade gasket **170** provided to shield a partial area of the fixing groove of another blade frame disposed adjacent to the lower portion thereof.

The first mounting groove **150** may be formed as a certain groove at one end portion (lower end portion) of the blade frame **120** such that the blade gasket **170** formed to extend in a length direction (horizontal direction) is insertion-mounted therein.

In particular, the blade gasket **170** may be provided such that one side thereof is mounted in the first mounting groove **150** and the other side thereof is in contact with the fixing groove at an upper portion of another blade frame disposed adjacent to a lower portion thereof to cover the fixing groove.

An amount of air flow between the solar cell modules is suppressed by the blade gasket **170**, thereby improving the airtightness of a solar cell louver assembly.

When the solar cell panel **110** is mounted in the fixing groove **130** of the blade frame **120**, at least partial areas of the solar cell panel **110** may be mounted to protrude further than both end portions of the blade frame **120** in a length direction.

That is, a length of the solar cell panel **110** in the length direction may be formed to be greater than a length of the blade frame **120** in the length direction.

In particular, partial areas of the solar cell panel **110**, in which the first and second terminals **111***a* and **111***b* and the bypass diode connection portions **112** are provided, may be provided to protrude outward from both end portions of the blade frame **120**.

FIG. **10** shows perspective views and a side cross-sectional view illustrating a state in which the blade frames **120** are disposed in the vertical direction according to the first embodiment of the present invention.

Referring to FIG. **10**, when the two blade frames **120** (**120***a* and **120***b*) are disposed adjacent to each other in the vertical direction, for convenience of description, it will be described that the blade frame at an upper side is referred to as a first blade frame **120***a*, and the blade frame disposed at a lower side is referred to as a second blade frame **120***b*.

The first and second protrusions **125** and **126** of the first blade frame **120***a* may be provided to be respectively inserted into the first and second grooves **123** and **124** of the second blade frame **120***b* so that the base frames **121** of the first and second blade frames **120***a* and **120***b* may be positioned to be approximately coplanar with each other in the vertical direction.

FIG. **11** shows views illustrating the first cap **200** provided with the first electrode terminal **270** according to the first embodiment of the present invention.

Referring to FIGS. **2** and **11**, the one pair of first caps **200** may be mounted at both vertical end portions of the solar cell panel unit **100**.

Specifically, each of the first caps **200** has a first surface **201** facing the solar cell panel unit **100** and a second surface **202** in a direction opposite to the first surface.

The first cap **200** includes a first protruding member **210** formed to protrude to a certain height from the first surface **201** and provided to be inserted into at least a partial area of the second hollow chamber **1212**.

In addition, the first cap **200** includes a second protruding member **211** formed to protrude to a certain height from the first surface **201** and provided to be inserted into at least a partial area of the bypass diode insertion portion **140**.

In addition, the first cap **200** includes a third protruding member **212** formed to protrude to a certain height from the first surface **201** and provided to be inserted into at least a partial area of the second hollow chamber **1212**.

Here, the first protruding member **210** may be inserted into an upper portion of the second hollow chamber **1212**, and the third protruding member **210** or **212** may be inserted into a lower portion of the second hollow chamber **1212**.

That is, the first protruding member **210** and the third protruding member **212** may be inserted into the second hollow chamber **1212** with the bypass diode insertion portion **140** interposed therebetween.

The first to third protruding members **210**, **211**, and **212** may be respectively inserted into a partial area of the second hollow chamber **1212**, the bypass diode insertion portion **140**, and the remaining partial area of the second hollow chamber **1212** so that the first cap **200** may be fixed to the solar cell panel unit **100**.

In addition, a first insertion groove **220**, into which at least a partial area of the solar cell panel **110** mounted in the fixing groove **130** is inserted, is formed in the first surface **201** of the first cap **200**.

The first insertion groove **220** may be provided to be recessed inward from the first surface **201** toward the second surface **202**.

In addition, third and fourth grooves **231** and **232**, which are formed to be recessed inward and correspond to the first and second grooves **123** and **124** of the upper end portion of the blade frame **120**, may be formed in an upper end portion of the first cap **200**.

Furthermore, third and fourth protrusions **233** and **234**, which are formed to protrude outward and correspond to the first and second protrusions **125** and **126** of the lower end portion of the blade frame **120**, may be provided at a lower end portion of the first cap **200**.

Since the first surface **201** of the first cap **200** is formed to have an approximately flat surface, the first surface may be provided to shield an open side surface of the blade frame in a state in which at least a partial area of the solar cell panel is mounted in the first insertion groove **220**.

In a state in which the first cap **200** is mounted on the solar cell panel unit **100**, any one of the first terminal and the second terminal of the solar cell panel and a bypass diode terminal portion may be positioned inside the first insertion groove **220**.

In addition, a first coupling part **240** provided to be coupled to the second cap may be provided on the second surface **202** of the first cap **200**.

A certain first hollow portion **241** may be formed inside the first coupling part **240** such that a least a partial area of the first electrode terminal **270** and at least a partial area of the second electrode terminal **310** are each accommodated therein and electrically connected.

One side of the first hollow portion **241** may be open such that the second electrode terminal **310** provided in the second cap **30** is inserted therein.

That is, the first hollow portion may be open toward one end portion **240***a* (lower side) of the first coupling part **240**.

In addition, first coupling grooves **250**, which are recessed inward from both side surfaces of the first cap **200** by a certain degree, may be formed in both sides of the first coupling part **240** in a width direction.

In addition, the first cap **200** includes a fourth protruding member **260** provided to protrude outward from a side surface thereof by a certain angle.

The fourth protruding member **260** may be provided at the lower end portion of the first cap **200** and may be provided to protrude outward from a side surface at a rear surface thereof.

The first connection portion **272** and the second connection portion **273** of the first electrode terminal **270** are positioned to be exposed at a space inside the fixing groove **220**, and the plurality of first electrode rods **271** are positioned to be exposed at a space inside the first hollow portion **241** of the first coupling part **240**.

Accordingly, when each of the first caps **200** is mounted on the solar cell panel unit **100**, the terminal portion **111** and the bypass diode connection portion **112** of the solar cell panel are inserted into the fixing groove **220**, and the first connection portion and the second connection portion positioned in the fixing groove **220** of the first cap **200** are electrically connected to the terminal portion **111** and the bypass diode connection portion **112** of the solar cell panel, respectively.

Meanwhile, FIG. **11** shows views illustrating the second cap **30** according to the first embodiment of the present invention.

Referring to FIG. **11**, the second cap **30** of the present invention may accommodate the first electrode terminal **270** and the second electrode terminal **310** electrically connected to the first electrode terminal **270**, and may be provided as a plurality of second caps **30** such that the first caps **200** are mounted thereon.

The second cap **30** has a first surface **31** facing the first cap **200** and a second surface **32** in a direction opposite to the first surface.

In addition, the second cap **30** includes a first mounting part **320** having a certain space therein such that the first cap **200** is slide-insertion-mounted therein.

The first mounting part **320** may be formed to protrude to a certain height from the first surface such that both end portions thereof in a width direction w surround at least a partial area of the first cap, and both end portions thereof in a length direction may be open.

The first mounting part **320** includes one pair of first coupling protrusions **321** provided to be fixedly slide-inserted into the first coupling grooves **250** of the first cap **200**.

The first mounting part **320** may include a stepped portion **323** protruding to a certain height outward from the first surface such that the one end portion **240***a* of the first coupling part **240** of the first cap **200** is fixedly caught thereon when the first cap **200** is slide-inserted in a length direction of the second cap **30**.

In addition, the first mounting part **320** includes a first coupling member **325** provided to be fixedly inserted into the first hollow portion **241** of the first cap **200**.

The first coupling member **325** may be formed to protrude upward from the first stepped portion **323**, and a certain through-path may be formed therein.

In particular, at least a partial area of the second electrode terminal **310** may be exposed to the outside through the certain through-path of the first coupling member **325**.

In addition, a first O-ring **327** for improving a fixing force may be fit-coupled to the first coupling member **325** when the first coupling member **325** is fixedly inserted into the first hollow portion **241**.

A fitting groove **328**, which is formed in a side surface of the first mounting part **320** such that the fourth protruding member **260** of the first cap is fixedly inserted thereinto, may be formed in a corresponding shape at a position corresponding to the fourth protruding member **260**.

In addition, the second cap **30** includes a second mounting part **340** which is mounted on the frame unit **50** and is provided such that the connector part **70** is mounted thereon.

The second mounting part **340** includes a rotation member **350** having a certain second hollow portion **341** therein.

The rotation member **350** includes a second stepped portion **351** formed to protrude from the second surface **32** and one pair of first fixing pieces **352** further protruding from the second stepped portion.

The second hollow portion of the second mounting part **340** may be formed inside between the one pair of first fixing pieces **352**, and the third electrode terminal may be provided to be inserted into the second hollow portion.

In particular, at least a partial area of the second electrode terminal may be provided to be positioned in the second hollow portion **341** of the second mounting part.

Specifically, the plurality of second electrode rods **311** of the second electrode terminal **310** may be positioned to be exposed at a space inside the second hollow portion **341** of the second mounting part, and the third connection portion **312** may be positioned to pass through the certain hollow of the first coupling member **325** and be exposed to the outside.

Accordingly, when the first cap **200** is mounted on the second cap, the first coupling member **325** of the second cap may be inserted into at least a partial area of the first hollow portion **241** of the first cap **200**, and the plurality of first electrode rods **271** positioned in the first hollow portion **241** may be electrically connected to the third connection portion **312** passing through the first coupling member **325** to be exposed to the outside.

Meanwhile, FIG. **12** shows views illustrating a fixing member **400** according to the first embodiment of the present invention.

Referring to FIGS. **12**, the second cap **30** includes the fixing member **400** mounted at a side of the second mounting part **340** of the second cap **30** and provided to rotatably support the second cap **30**.

The fixing member **400** may be insertion-mounted in a frame through-hole **510** of the inner frame **500** to be described below to rotatably support the second cap **30**.

The fixing member **400** is inserted into the frame through-hole **510** to assist the second cap **30** in rotating when the second cap **30** rotates and concurrently serve to reduce friction.

As an example, when the fixing member **400** is not mounted, the second cap **30** made of plastic may be easily worn due to friction with the frame through-hole of the inner frame made of aluminum.

The fixing member **400** may include a third stepped portion **410** fixedly inserted into the frame through-hole **510** to correspond to a shape of the frame through-hole **510** of the inner frame **500** and may have a first through-hole **420** passing through a central portion of the third stepped portion such that the rotation member **350** of the second cap **30** is insertion-mounted therein.

The third stepped portion **410** of the fixing member **400** may be mounted to pass through the frame through-hole **510** of the inner frame **500** to be exposed to the outside.

In this case, the second mounting part **340** of the second cap **30** may be mounted in the fixing member **400**, and the first fixing pieces **352** pass through the first through-hole **420** to be exposed at the space between the inner frame **500** and the outer frame **600**.

That is, the one pair of first fixing pieces **352** may be positioned in the space between the inner frame and the outer frame.

In addition, the fixing member **400** may surround and support at least partial areas of the second stepped portion **351** and the first fixing piece **352**.

Meanwhile, FIGS. **13** and **14** show views illustrating the frame unit **50** according to the first embodiment of the present invention.

Referring to FIGS. **13** and **14**, the frame unit **50** includes the inner frame **500** provided such that each of the plurality of second caps **30** is rotatably mounted in the length direction and the outer frame **600** surrounding the inner frame **500**.

The frame unit **50** may have a certain space, and the plurality of solar cell modules **10** may each disposed in the certain space in the length direction and may be rotatably mounted.

More specifically, the inner frame **500** is formed to extend in the length direction (vertical direction) and includes a plurality of frame through-holes **510** formed apart from each other by a certain interval in the length direction.

The inner frame **500** may be provided at each end portion of the solar cell module **10**.

Here, one pair of rod bars (not shown) may be provided at both sides of the inner frame **500** with the frame through-holes **510** therebetween to rotate the solar cell module **10**, and a plurality of protruding bar fixing holes (not shown), which are formed such that one pair of protruding bars **739** provided in the connector part **70** are fixedly inserted therein, may be formed at positions corresponding to the one pair of protruding bars **739**.

The inner frame **500** may have one pair of first fitting grooves **520** formed to extend in the length direction.

The one pair of first fitting grooves **520** may be formed in both end portions of the inner frame **500** in a width direction.

The outer frame **600** includes one pair of side frames **610** formed to extend in a length direction and provided to surround side surfaces of the inner frames and upper and lower frames **620** and **630** connecting both end portions of the one pair of side frames **610** in the length direction.

Each of the side frames **610** may include first insertion protrusions **611** inserted into the first fitting grooves **520**.

Each of the side frames **610** may be provided with a certain space **601** such that the connector part **70** may be disposed therein in a state in which the inner frame **500** is mounted.

In addition, the outer frame **600** includes assembly members **650** for connecting the side frame and the upper frame or the side frame and the lower frame.

The assembly member **650** may be provided with an approximately "]" shape, at least a partial area thereof may be inserted into the upper frame or the lower frame, and the remaining partial area thereof may be inserted into the side frame to connect the upper frame and the side frame or the lower frame and the side frame.

In addition, the outer frame **600** includes one pair of guide members **660** mounted on the upper and lower frames **620** and **630** and one pair of guide slit members **670** mounted on the guide members **660**.

The upper and lower frames **620** and **630** each include one pair of second insertion protrusions **640** provided such that the guide members **660** are fit-coupled thereto.

The one pair of guide members **660** each have a second fitting groove **661** into which each of the one pair of second insertion protrusions **640** is inserted and a third fitting groove **662** into which the guide slit member **670** is inserted and fit-coupled thereto.

The first and second fitting grooves **520** and **661** may be slide-insertion-coupled to the first and second insertion protrusions **620** and **640**, respectively.

Each of the guide slit members **670** may be provided with third and fourth grooves **671** and **672** having shapes corresponding to the first and second grooves of the blade frame.

In a state in which the plurality of solar cell modules **10** are mounted on the frame unit **50**, the guide slit member **670** may be provided in contact with each of an upper end portion of the solar cell panel unit **100** positioned at an uppermost side and a lower end portion of the solar cell panel unit **100** positioned at a lowermost side.

In particular, the first and second protrusions **125** and **126** of the blade frame may be insertion-mounted in the third and fourth grooves of the guide slit member mounted on the lower frame.

In addition, the outer frame **600** may include an external connector **680** for outputting electricity output through the connector part **70** to an external unit.

The external connector **680** may be fixedly mounted, for example, on the side frame and may be provided to be electrically connected to the connector part **70**.

FIG. **15** shows perspective views illustrating the connector part **70** according to the first embodiment of the present invention.

Referring to FIG. **15**, the one pair of mounting members **730** each have one pair of second through-holes **731** formed such that the one pair of first fixing pieces **352** of the rotation member are insertion-mounted therein.

In addition, the one pair of mounting members **730** each include a second coupling member **732** provided between the one pair of second through-holes **731** and provided to be inserted into the second hollow portion **341** of the second mounting part **340**.

The second coupling member **732** may have a certain through-path formed therein so that the fourth connection portion **711** of the third electrode terminal **710** is exposed to the outside through the through-path.

The second coupling member **732** may be provided to be connected to the connection member **720** surrounding the fifth connection portion **712**.

The connection member **720** may electrically connect the fifth connection portions of the third electrode terminals to electrically connect two adjacent solar cell modules **10**.

In addition, a second O-ring **734** for improving a fixing force may be fit-coupled to the second coupling member **732** when the second coupling member **732** is fixedly inserted into to the second hollow portion **341**.

When the connector part **70** is mounted on the second cap, the second coupling member **732** may be fixedly inserted into the second hollow portion **341** of the second cap, and the plurality of second electrode rods **311** of the second electrode terminal **310** and the fourth connection portion **711**, which are exposed at the second hollow portion **341**, may be electrically connected.

In addition, the connector part **70** includes one pair of protruding bars **739** provided to rotate the solar cell module **10** at a certain angle.

The one pair of protruding bars **739** are provided to protrude outward from the mounting member **730** and may be positioned apart from each other by a certain interval so as to face each other with the second coupling member **732** interposed therebetween.

FIG. **16** shows views illustrating a state in which the solar cell module is mounted on the second cap and the connector part is mounted on the second cap according to the first embodiment of the present invention. FIG. **17** is a view illustrating a state in which a solar cell louver assembly is connected in series according to the first embodiment of the present invention.

Referring to FIG. **16**, the second cap **30** may be in a state of being rotated at a certain angle in a state of being mounted on the inner frame **50**.

In the above state, the solar cell module **10** may be slide-insertion-mounted on the second cap **30** downward.

That is, the first electrode terminal **270** and the second electrode terminal **310** may be provided to be inserted in the length direction of the inner frame.

In a state in which the solar cell module is mounted on the second cap as described above, the connector part **70** may be mounted to the rotation member of the second cap.

The connector part **70** of the present invention is a component for connecting the solar cell modules **10** in series, and an arrangement of the connector part **70** for connecting the solar cell modules **10** in series is as follows.

Referring to FIGS. **1**, **13**, and **16**, for convenience of description, when the first solar cell module **11** and the second solar cell module **12** are alternately disposed in a vertical direction of the frame unit, the first solar cell module **11** disposed under the second solar cell module **12** may be referred to as a third solar cell module, and the second solar cell module disposed under the third solar cell module may be referred to as a fourth solar cell module.

In this case, based on a direction from the top to the bottom, connections of right end portions and left end portions of the first to fourth solar cell modules will be described.

For example, in order for a plurality of solar cell modules **10** and **10'** to be electrically connected to each other and connected in series, the connector part **70** is disposed at the right end portions of the first solar cell module **11** and the second solar cell module **12** to electrically connect the right end portions of the first and second solar cell modules.

In this case, the connector part **70** is disposed at left end portions of the second solar cell module **12** and another first solar cell module (third solar cell module **11'**) positioned under the second solar cell module to electrically connect the left end portions of the second solar cell module **12** and the third solar cell module **11'**.

In addition, the connector part **70** is disposed at right end portions of the third solar cell module **11'** and a fourth solar cell module **12'** to electrically connect the right end portions of the third and fourth solar cell modules.

Such a configuration is repeated to install the connector parts, thereby electrically connecting the plurality of solar cell modules in series.

That is, the connector parts **70** may be alternatively connected to the left end portion and the right end portion for serial connection.

Since such connection can be made in the space between the inner frame and the outer frame, electrical wires are not exposed to the outside.

In addition, since the louver assembly of the present invention can be assembled in the same manner as in a conventional louver window, assembly is easier.

In addition, the louver assembly can serve as a louver window, and concurrently, the series-connected solar cell panels can generate electricity.

Hereinafter, the louver assembly **1** according to the second embodiment of the present invention will be described with reference to the accompanying FIGS. **18** to **46**.

FIG. **18** shows perspective views illustrating a front surface and a rear surface of the louver assembly **1** according to the second embodiment of the present invention. FIG. **19** is an exploded perspective view illustrating a solar cell module according to the second embodiment of the present invention. FIG. **20** is an exploded perspective view illustrating the solar cell module and second caps according to the second embodiment of the present invention. FIG. **21** is a partial perspective view illustrating electrical connections of a terminal portion of a solar cell panel and first to third electrode terminals according to the second embodiment of the present invention. FIG. **22** is an exploded perspective view of the first to third electrode terminals according to the second embodiment of the present invention. FIG. **23** is an exploded perspective view illustrating the second electrode terminal and a terminal housing of FIG. **22**. FIG. **24** is a perspective view illustrating a configuration in which solar cell modules are electrically connected in series by a connector part according to the second embodiment of the present invention.

Referring to FIGS. **18** to **24**, the louver assembly **1** on which a solar cell panel is mounted (hereinafter, referred to as "louver assembly") according to one embodiment of the present invention includes one or more solar cell modules **10**, second caps **30**, a frame unit **50**, and connector parts **70**.

Specifically, referring to FIGS. **19** to **21**, the one or more solar cell modules **10** each include a solar cell panel unit **100** including one pair of terminal portions **111** (**111***a* and **111***b*) provided at both end portions thereof, one pair of first electrode terminals **270** electrically connected to the terminal portions **111**, and one pair of first caps **200** mounted on the solar cell panel unit **100** to surround the first electrode terminals **270**.

The solar cell panel unit **100** includes a solar cell panel **110** provided to generate electricity using incident light and a blade frame **120** on which the solar cell panel is mounted.

That is, the blade frame **120** may support the solar cell panel.

The first cap **200** includes the first electrode terminal **270** electrically connected to the terminal portion **111**.

Here, each of the first electrode terminals **270** may be detachably mounted inside one of the first caps **200**. That is, the first electrode terminal **270** may be assembled and mounted inside the first cap **200**.

In addition, referring to FIG. **3**, the second cap **30** includes a second electrode terminal **310** electrically connected to the first electrode terminal **270** and a terminal housing **312** surrounding at least a portion of the second electrode terminal **310**.

Here, the second electrode terminal **310** may be formed integrally with the terminal housing **312** through insert injection molding and may be detachably mounted inside the second cap **30**.

In the present document, insert injection molding refers to commonly used insert injection molding (insert molding) and means that a certain insert member is installed in an insert injection molding device in advance, and then a molten resin is injected onto the insert member to manufacture an insert-molded product as a final product.

That is, the second electrode terminal formed integrally with the terminal housing may be manufactured by injecting a molten resin onto the second electrode terminal **310** as an insert member to surround at least a portion of the second electrode terminal.

In other words, the second electrode terminal **310** may be insert-molded into the terminal housing **312** and formed integrally with the terminal housing **312** through insert injection molding.

The first cap **200** includes a first mounting part **200***a* provided to be mounted on the solar cell panel unit **100** and a second mounting part **200***b* provided in a direction opposite to the first mounting part **200***a* and mounted on the second cap **30**.

Here, the first mounting part **200***a* of the first cap **200** refers to a part facing the solar cell panel unit **100**, and the second mounting part **200***b* of the first cap **200** refers to a part facing the second cap **30**.

The second cap **30** includes a third mounting part **320** on which the second mounting part **200***b* of the first cap **200** is mounted and a fourth mounting part **340** which is provided in a direction opposite to the third mounting part **320** and in which the connector part **70** is mounted.

In addition, the frame unit **50** may be provided such that each of the plurality of second caps **30** is rotatably mounted thereon.

Specifically, the frame unit **50** includes an inner frame **500** provided such that each of the plurality of second caps **30** is rotatably mounted thereon and an outer frame **600** surrounding the inner frame **500**.

The plurality of second caps **30** may be mounted in a length direction of the inner frame **500**.

In addition, the connector part **70** is disposed in a space between the inner frame **500** and the outer frame **600** and includes one pair of third electrode terminals **710** for electrically connecting the second electrode terminals **310** of two solar cell modules **10** (**11** and **12**) adjacent to each other in the length direction of the inner frame when the plurality of solar cell modules **10** are mounted on the frame unit **50**.

More specifically, referring to FIGS. **19** to **22**, when the first cap **200** is mounted on the second cap **30**, the second electrode terminal **310** may be provided in contact with the first electrode terminal **270**, and when the connector part **70** is mounted on the second cap **30**, the third electrode terminal **710** may be provided in contact with the second electrode terminal **310**.

That is, the second electrode terminal **310** may be in physical contact (direct contact) with and electrically connected to the first electrode terminal **270**, and the third electrode terminal **710** may be in physical contact (direct contact) with and electrically connected to the second electrode terminal **310**. Thus, the first electrode terminal **270** and the third electrode terminal **710** may be electrically connected.

In addition, the first electrode terminal **270** may be physical contact (direct contact) with and electrically connected to the terminal portion **111** of the solar cell panel, and thus, the terminal portion **111** and the third electrode terminal **710** may be electrically connected.

In particular, two solar cell modules **10** adjacent to each other in a vertical direction may be electrically connected by the third electrode terminals mounted inside each of one pair of connector parts **70** and electrically connected.

Here, in a state in which the second cap **30** including the second electrode terminal **310** is mounted on the inner frame

500, the first electrode terminal 270 may be provided to be mounted in the length direction of the inner frame 500, and the third electrode terminal 710 may be provided to be mounted in a direction perpendicular to the length direction of the inner frame 500.

In addition, one terminal of the first and second electrode terminals 270 and 310 may be provided with a space into which the other terminal is inserted, and when the first cap 200 is mounted on the second cap 30, one terminal of the first and second electrode terminals 270 and 310 may be inserted into the other terminal thereof.

In addition, one terminal of the second and third electrode terminals 310 and 710 may be provided with a space into which the other terminal thereof is inserted, and when the connector part 70 is mounted on the second cap 30, one terminal of the second and third electrode terminals 310 and 710 may be inserted into the other terminal thereof.

Referring to FIG. 22, the first electrode terminal 270 includes a first terminal portion 271 electrically connected to the terminal portion 111 of the solar cell panel 110, a second terminal portion 272 electrically connected to the second electrode terminal 310, and a third terminal portion 273 connecting the first terminal portion 271 and the second terminal portion 272.

More specifically, referring to FIGS. 22 to 24, the first terminal portion 271 may be provided to be in physical contact (direct contact) with the terminal portion 111 of the solar cell panel unit 100.

In addition, the second terminal portion 272 may be formed apart from the first terminal portion 272 by a certain interval, and a first space S1 into which the second electrode terminal 310 is inserted may be formed.

In a state in which the first electrode terminal 270 is assembled in the first cap 200, the first terminal portion 271 may have a certain space 2711 formed therein to press the terminal portion 111 of the solar cell panel unit to be in contact therewith and may be formed to protrude outward.

In particular, the first terminal portion 271 may be formed to have a certain inclined surface when the space 2711 is formed therein.

When the first cap 200 is mounted on the solar cell panel unit 100, the first terminal portion 271 may be in contact with the terminal portion 111 and press the terminal portion 111 through the certain inclined surface and concurrently may be slidably inserted into the terminal portion 111 of the solar cell panel unit 100. Thus, the assembly and electrical connection (direct contact) of the terminal portions become easier.

As an example, the first terminal portion 271 may be formed to have the space 2711 therein by an end portion of the first terminal portion 271 being bent inward, but the present invention is not limited thereto.

In addition, the second terminal portion 272 may have an approximately "U" shape

by both end portions of the second terminal portion 272 being bent inward in a width direction.

In this case, the both end portions of the second terminal portion 272 may be provided apart from each other by a certain interval and may form the first space S1 into which the second electrode terminal 310 is inserted.

In a state in which the second electrode terminal 310 is inserted into the first space S1 of the second terminal portion, the second terminal portion 272 may surround at least a partial area of the second electrode terminal 310 and may be in physical contact (direct contact) with and electrically connected to the second electrode terminal 310.

The third terminal portion 273 of the first electrode terminal 270 may be provided with a certain width W and a certain length L so as to be assembled by being fit-coupled inside the first cap 200 and may have an approximately "c" shape with an open lower side.

In addition, one end portion 273*a* of the third terminal portion 273 may be formed to extend downward from the first terminal portion 271. Here, the first to third terminal portions 271, 272, and 273 may be formed integrally.

In addition, in a state in which the second electrode terminal 310 is formed integrally with the terminal housing 312 through insert injection molding, the second electrode terminal 310 includes a fourth terminal portion 3101 of which at least a partial area is exposed to the outside toward the second terminal portion 272 of the first electrode terminal 270.

The fourth terminal portion 3101 may be formed to have a flat surface with an approximately flat plate shape so as to be easily inserted into the first space S1.

In addition, the second electrode terminal 310 includes a fifth terminal portion 3102 which is formed to extend from the fourth terminal portion 3101 and of which at least a partial area is exposed to the outside toward the third electrode terminal 710.

At least a partial area (also referred to as "first area") of the fourth terminal portion 3101 may be exposed to the outside, and the remaining area (also referred to as "second area") thereof may be positioned inside the terminal housing 312.

As an example, the fourth terminal portion 3101 may have an approximately "U" shape, the first area of the fourth terminal portion 3101 may be positioned at one end portion of the fourth terminal portion, and the fifth terminal portion 3102 may be formed to protrude toward the third electrode terminal 710 from the other end portion in a direction opposite to one end portion of the fourth terminal portion.

The terminal housing 312 includes a first housing portion 3121 surrounding a partial area of the fourth terminal portion 3101, a second housing portion 3122 formed to extend from the first housing portion 3121 and surrounding the remaining area of the fourth terminal portion, and a head portion 3123 formed to extend from the second housing portion 3122 and surrounding at least a partial area of the fifth terminal portion.

The first and second housing portions 3121 and 3122 may have a shape corresponding to the fourth terminal portion 3101 and may have an approximately "U" shape.

In addition, one terminal portion of the second terminal portion 272 of the first electrode terminal 270 and the fourth terminal portion 3101 of the second electrode terminal 310 may be provided with a space into which the other terminal portion thereof is inserted, and when the first cap 200 is mounted on the second cap 30, one terminal portion of the second terminal portion 272 and the fourth terminal portion 3101 may be inserted into the other terminal portion thereof.

In addition, the first housing portion 3121 includes a first O-ring mounting portion 3124 which is recessed inward in at least a partial area thereof in a circumferential direction such that a first O-ring is mounted thereon.

Therefore, when an O-ring O1 is mounted on the first O-ring mounting portion 3124 and the first housing portion 3121 is inserted into a first hollow portion 241 of the first cap 200, a sealing force can be improved.

In addition, a mounting groove 3125 is formed in at least a partial area of the second housing portion 3122 to be recessed inward such that the second housing portion 3122 is fixedly inserted into the second cap.

In addition, the head portion **3123** includes a second O-ring mounting portion **3126** which is recessed inward in at least a partial area thereof in a circumferential direction such that a second O-ring is mounted thereon.

Here, when a second O-ring O**2** is mounted on the second O-ring mounting portion **3126** and the second electrode terminal **310** is assembled inside the second cap, a sealing force in the second cap **30** can be improved.

Meanwhile, as another embodiment, although not shown in the drawings, the fourth terminal portion **3101** may be provided with a space, into which the second terminal portion **272** of the first electrode terminal is inserted, formed therein.

That is, the first area of the fourth terminal portion **3101** (at least a partial area of the fourth terminal portion) may be provided with an approximately "U" shape by both end portions thereof in a width direction being bent inward to be provided with a certain space therein.

Accordingly, the second terminal portion **272** inserted into the space formed inside the fourth terminal portion may be formed to have a flat surface with an approximately flat plate shape.

In addition, one terminal of the second and third electrode terminals **310** and **710** may be provided with a space into which the other terminal thereof is inserted, and when the connector part **70** is mounted on the second cap **30**, one terminal of the second and third electrode terminals **310** and **710** may be inserted into the other terminal thereof.

Specifically, one of the fifth terminal portion **3102** of the second electrode terminal **310** and a sixth terminal portion **711** of the third electrode terminal **710** may be provided with a space into which the other thereof is inserted, and when the connector part **70** is mounted on the second cap **30**, one of the fifth terminal portion **3102** and the sixth terminal portion **711** may be inserted into the other thereof.

More specifically, the sixth terminal portion **711** of the third electrode terminal **710** mounted in the connector part **70** may be formed to have a certain second space S**2** therein such that the fifth terminal portion **3102** of the second electrode terminal **310** is inserted therein.

That is, in a state in which the fifth terminal portion **3102** is inserted into the second space S**2** of the sixth terminal portion **711**, the sixth terminal portion **711** may be provided to surround at least a partial area of the fifth terminal portion **3102**.

As an example, the sixth terminal portion **711** may have an hollow cylindrical shape and may be provided such that a diameter thereof decreases toward one end portion thereof (toward the fifth terminal portion), but the present invention is not limited thereto.

Accordingly, the second electrode terminal and the third electrode terminal may be in physical contact (direct contact) with and electrically connected to each other.

In addition, the fifth terminal portion **3102** may have an approximately cylindrical shape to be easily inserted into the second space S**2** inside the third electrode terminal **710**, and an end portion thereof may be formed to be round.

Meanwhile, as another embodiment, although not shown in the drawings, the fifth terminal portion **3102** may be provided with a space, into which the third electrode terminal **710** is inserted, formed therein.

That is, at least a partial area of the fifth terminal portion **3102**, which is exposed to the outside from a space inside a fifth hollow portion of the second cap **30**, may be provided with a certain space formed therein so that the third electrode terminal **710** may be inserted therein.

In addition, when the second cap **30** is mounted on the inner frame **500**, the fifth terminal portion **3102** of the second electrode terminal **310** may be provided such that at least a partial area thereof is exposed at the space between the inner frame **500** and the outer frame **600**.

In addition, the third electrode terminal **710** includes a seventh terminal portion **712** formed to extend from the sixth terminal portion **711**.

That is, the third electrode terminal **710** includes the sixth terminal portion **711** having the certain second space S**2** therein and the seventh terminal portion **712** formed to extend from the sixth terminal portion **711**.

In addition, the third electrode terminal **710** additionally includes a connection portion **720** for electrically connecting two solar cell modules **10** (**11** and **12**) adjacent to each other in the length direction of the inner frame **500**.

Specifically, the connection portion **720** may electrically connect two third electrode terminals **710** adjacent to each other in the length direction of the inner frame **500**.

The seventh terminal portion **712** includes a certain space formed such that at least a partial area of the connection portion **720** is inserted therein.

That is, the connection portion **720** electrically connecting the two third electrode terminals **710** adjacent to each other in the length direction of the inner frame **500** may be inserted into the certain space formed inside the seventh terminal portion **712** to electrically connect two adjacent solar cell modules **10**.

Here, the connection portion **720** may be provided to be flexible and may be, for example, an electrical wire.

In addition, one pair of sealing portions **722** are included in at least partial areas of the connection portion **720** to seal the third electrode terminals **710** insertion-mounted in the connector parts **70**.

In addition, the connector part **70** includes one pair of mounting members **730** which surround the third electrode terminals **710** and provided to be mounted on the second cap **30**.

The one pair of mounting members **730** and the third electrode terminals **710** electrically connecting the mounting members **730** may be provided to electrically connect two solar cell modules **10** (**11** and **12**) which are adjacent vertically.

Due to such a configuration, the first to third electrode terminals can be more stable and can be electrically connected while effectively preventing the penetration of moisture.

FIGS. **25**A and **25**B illustrate a state in which the solar cell modules **10** are electrically connected according to the second embodiment of the present invention, and FIG. **25**C is a view illustrating components of the solar cell panel **110** according to the second embodiment of the present invention.

Referring to FIGS. **19**, **24**, and **25**, the plurality of solar cell modules **10** each include the solar cell panel unit **100** including the one pair of terminal portions **111** provided at both end portions thereof, the one pair of first electrode terminals **270** electrically connected to the terminal portions **111**, and the one pair of first caps **200** mounted on the solar cell panel unit **100** to surround the first electrode terminals **270**.

More specifically, the solar cell panel unit **100** includes the solar cell panel **110** including the one pair of terminal portions **111** provided at both end portions of the solar cell panel **110** and the blade frame **120** on which the solar cell panel is mounted.

The solar cell panel **110** (also referred to as "photovoltaic module") is provided to extend in a length direction and includes first and second terminals **111***a* and **111***b* at both end portions thereof (first and second end portions).

The first terminal **111***a* may have any one of positive polarity and negative polarity, and the second terminal **111***b* may have the other one of positive polarity and negative polarity.

In addition, the solar cell panel may include, for example, a glass **1101**, one or more encapsulants (EVA) **1102** and **1104**, solar cells **1100**, and a back sheet **1105**.

Here, the solar cells **1100** may be connected in series through a cell string **1103** to constitute a solar battery (also referred to as "solar cell string").

That is, the solar battery may be manufactured by serially connecting one or more solar cells **1100** through the cell string **1103**.

The glass **1101** may be a surface on which sunlight is incident and may serve to protect the solar battery disposed thereunder from an external environment and to scatter light to allow reflected light to be incident again.

As an example, the glass may protect the solar battery, which is easily broken when external hail or fire occurs, from an impact and an external flame.

Here, although a thickness of the glass may be 2.8 mm, the present invention is not limited thereto, and the thickness of the glass may be 2.8 mm or less or less than 2.8 mm.

Specifically, the thickness of the glass may be in a range of 0.1 mm to 2.8 mm, 0.2 mm to 2.7 mm, 0.3 mm to 2.6 mm, 0.4 mm to 2.5 mm, 0.5 mm to 2.4 mm, 0.6 mm to 2.3 mm, 0.7 mm to 2.2 mm, 0.8 mm to 2.1 mm, 0.9 mm to 2.0 mm, 1.0 mm to 1.9 mm, 1.1 mm to 1.8 mm, 1.2 mm to 1.7 mm, 1.3 mm to 1.6 mm, or 1.4 mm to 1.5 mm, but the present invention is not limited thereto.

More specifically, the glass **1101** of the solar cell panel **110** may have a first surface on which light is incident and a second surface which faces the solar battery in a direction opposite to the first surface. The first surface may be a surface that is anti-reflection-coated (AR-coated) and may be a non-patterned surface.

Due to the AR coating, when light reaches the first surface, an amount of the light which does not pass through the first surface and is reflected from the first surface and emitted to the outside is reduced.

Here, the first surface and the second surface may be AR-coated, or only the first surface may be AR-coated.

More preferably, the first surface on which a pattern is not formed is AR-coated, thereby uniformly forming the thickness of the glass.

The light (sunlight) may sequentially pass through the first surface and the second surface of the glass to be incident on the solar battery.

In addition, a certain pattern may be formed on the second surface of the glass **1101**. As an example, the certain pattern may be an embossed pattern forming an unevenness on the second surface (not shown).

The certain pattern formed on the second surface of the glass scatters incident light and serves to scatter light reflected from the solar battery or the back sheet to allow to the reflected light to be incident again.

That is, due to the certain pattern, incident light is scattered, light reflected from the solar battery is not immediately emitted to the outside, and reflected light emitted to the outside is scattered and incident again, thereby increasing an amount of power generated by the solar battery.

Here, when the certain pattern is formed on the first surface, the pattern is vulnerable to contamination such as dust, and thus the pattern may be formed only on the second surface, but the present invention is not limited thereto.

The glass **1101** may be low iron tempered glass but is not limited thereto.

Here, the glass **1101** may be manufactured using a thermal strengthening method, but when the glass **1101** is manufactured using chemical strengthening, the glass **1101** having a thickness of 1 mm or less may be manufactured.

The solar battery may be manufactured by serially connecting cells, which are cut in half corresponding to a size of a conventional louver blade, through the cell string **1103**.

For example, like a general battery, in the case of P-type solar cells, a surface on which light is incident forms a negative pole, and a surface opposite thereto forms a positive pole. In this case, in order to arrange solar cells in a row to connect a positive pole and a negative pole to each other, a ribbon (electrode wire) attached to an upper surface (negative surface) of a solar cell is attached and connected in series to a rear surface (positive surface) of an adjacent solar cell to form a cell string that is one line in which the solar cell and the solar cell are connected, thereby forming a solar battery (solar cell string).

In addition, the encapsulants **1102** and **1104** surround the solar battery and are positioned between the glass **1101** and the back sheet **1105**, thereby serving to mitigate a direct impact transmitted to the solar battery and prevent moisture or contaminants from directly affecting the solar battery.

In addition, in the solar cell panel, the glass, the encapsulant, the solar cell, the encapsulant, and the back sheet may be sequentially disposed based on a side on which light is incident.

In addition, like the glass **1101**, the back sheet **1105** serves to protect the solar battery from an external environment.

Referring to FIG. **25**, the solar cell modules **10** includes a first solar cell module **11** and a second solar cell module **12**.

The first solar cell module **11** includes the solar cell panel unit **100** including the one pair of terminal portions **111** provided at both end portions thereof, the one pair of first electrode terminals **270** electrically connected to the terminal portions **111**, and the one pair of first caps **200** mounted on the solar cell panel unit **100** to surround the first electrode terminals **270**.

In addition, the second solar cell module **12** includes the solar cell panel unit **100** including the one pair of terminal portions **111** provided at both end portions thereof, the one pair of first electrode terminals **270** electrically connected to the terminal portions **111**, and the one pair of first caps **200** mounted on the solar cell panel unit **100** to surround the first electrode terminals **270**.

Here, in the one pair of terminal portions of the first solar cell module **11**, the first terminal **111***a* of a first end portion (left end portion of FIG. **8**) has negative polarity, and the second terminal **111***b* of a second end portion (right end portion of FIG. **8**) has positive polarity.

In this case, in the one pair of terminal portions of the second solar cell module **12**, the first terminal **111***a* of a first end portion (left end portion of FIG. **8**) has positive polarity, and the second terminal **111***b* of a second end portion (right end portion of FIG. **8**) has negative polarity.

In other words, when the first terminal **111***a* of the first solar cell module **11** has any one polarity of positive polarity and negative polarity, the first terminal **111***a* of the second solar cell module **12** is disposed to have the other polarity of positive polarity and negative polarity.

The first solar cell module **11** and the second solar cell module **12** may be alternately disposed in the length direction (vertical direction) of the inner frame **500**.

That is, when the plurality of solar cell modules **10** are each disposed in the length direction (vertical direction) of the inner frame **500**, terminal portions of two solar cell modules adjacent to each other in the vertical direction may be disposed to have different polarities.

Accordingly, the terminal portions of the first solar cell module **11** and the second solar cell module **12** may be disposed to have different polarities in the vertical direction so that the first solar cell module **11** and the second solar cell module **12** may be connected in series through the connector part **70**.

FIG. **26** shows perspective views and a side cross-sectional view of the blade frame **120** on which the solar cell panel **110** is mounted according to the second embodiment of the present invention.

Referring to FIG. **26**, the blade frame **120** is formed to extend in a length direction (horizontal direction) and includes a base frame **121** for supporting the solar cell panel **110**.

The base frame **121** includes one or more first partition members **122** which partition the interior of the base frame such that each of first to third hollow chambers **1211**, **1212**, and **1213** having a certain space therein is formed

In addition, the blade frame **120** includes fixing grooves **130** formed such that the solar cell panel **110** is fixedly inserted therein.

In the fixing groove **130**, both end portions thereof in a length direction may be formed to be open, and a cross-sectional shape of both end portions thereof in a width direction may be formed as an approximately "c" shape so that the solar cell panel **110** may be fit-assembled into the fixing groove **130**.

The fixing grooves **130** may be formed to protrude from both end portions of the base frame **121** in the vertical direction, wherein both of the end portions are upper and lower portions of the base frame.

In addition, in an upper end portion of the blade frame **120**, first and second grooves **123** and **124**, which are recessed inward from a front surface to a rear surface of the base frame **121**, may be formed apart from each other by a certain interval in the vertical direction.

Here, the first and second grooves **123** and **124** may be recessed inward in a length direction (horizontal direction).

At a lower end portion of the blade frame **120**, first and second protrusions **125** and **126** to be inserted into (seated in) the first and second grooves **123** and **124** of another blade frame may be provided apart from each other by a certain interval in the vertical direction.

The first and second protrusions **125** and **126** may be provided to protrude outward from the base frame in a length direction (horizontal direction).

Here, the first and second protrusions **125** and **126** may be formed to extend in the vertical direction and may be provided to correspond to positions of the first and second grooves **123** and **124** of another adjacent blade frame.

In addition, the base frame **121** may include a screw fixing portion **2431** in which a screw portion **2430** provided to fix the first cap **200** to the blade frame **120** is mounted.

Specifically, the screw fixing portion **2431** may be provided in the base frame in an area in which the second hollow chamber **1212** is positioned.

The screw fixing portion **2431** may have a first through-hole **2431***a* formed therein such that the screw portion **2430** is fixedly inserted therein, and the screw portion **2430** may pass through the first cap **200** to be fixedly fit-coupled in the first through-hole **2431***a*.

In addition, the blade frame **120** includes a blade gasket mounting groove **150** for mounting a blade gasket **170** provided in contact with and shield a partial area of the fixing groove of another blade frame disposed adjacent to the lower portion thereof in the vertical direction.

The blade gasket mounting groove **150** may be formed as a certain groove at one end portion (lower end portion) of the blade frame **120** in a width direction such that the blade gasket **170** formed to extend in a length direction (horizontal direction) is insertion-mounted therein.

In particular, the blade gasket **170** may be provided such that one side thereof is mounted in the first mounting groove **150** and the other side thereof is in contact with an outer peripheral surface of the fixing groove at an upper portion of another blade frame disposed adjacent to a lower portion thereof to cover at least a partial area of the fixing groove.

An amount of air flow between the solar cell modules is suppressed by the blade gasket **170**, thereby improving the airtightness of a solar cell louver assembly.

When the solar cell panel **110** is mounted in the fixing groove **130** of the blade frame **120**, at least partial areas of the solar cell panel **110** may be mounted to protrude further than both end portions of the blade frame **120** in a length direction.

That is, a length of the solar cell panel **110** in the length direction may be formed to be greater than a length of the blade frame **120** in the length direction.

In particular, partial areas of the solar cell panel **110**, in which the first and second terminals **111***a* and **111***b* are provided, may be provided to protrude outward from both end portions of the blade frame **120**.

In addition, when the two blade frames **120** (**120***a* and **120***b*) are disposed adjacent to each other in the vertical direction, for convenience of description, it will be described that the blade frame at an upper side is referred to as a first blade frame **120***a*, and the blade frame disposed at a lower side is referred to as a second blade frame **120***b*.

The first and second protrusions **125** and **126** of the first blade frame **120***a* may be provided to be respectively inserted into the first and second grooves **123** and **124** of the second blade frame **120***b* so that the base frames **121** of the first and second blade frames **120***a* and **120***b* may be positioned to be approximately coplanar with each other in the vertical direction.

FIG. **27** shows views illustrating a sequence in which the solar cell panel unit **100** is mounted on the blade frame **120** according to the second embodiment of the present invention.

First, silicone or waterproof insulating silicone may be applied on at least a partial area of the base frame **121** on the front surface of the blade frame **120**, and then the solar cell panel **110** may be insertion-mounted in the fixing groove **130**.

After the solar cell panel **110** is inserted as shown in FIG. **27**C (see the order of the numbers), silicone is cured to fix the solar cell panel **110** to the blade frame **120**.

FIGS. **28** and **29** shows views illustrating the first cap **200** in which the first electrode terminal **270** is detachably mounted according to the second embodiment of the present invention.

Referring to FIGS. **28** and **29**, the one pair of first caps **200** may be mounted on both end portions of the solar cell panel unit **100**.

In addition, the one pair of first caps **200** each include a first gasket **113** for sealing a space between the solar cell panel unit **100** and the first cap **200** in a state in which the first electrode terminal **270** is insertion-mounted in the first cap **200**.

In addition, each of the one pair of first caps **200** additionally includes the screw portion **2430** for firmly fixing the first cap **200** to the solar cell panel unit **100**.

Here, the screw portion **2430** may be, for example, a flat head tapping screw but is not limited thereto.

Specifically, the first mounting part **200***a* of each first cap **200** has a first surface **201** facing the solar cell panel unit **100** and a second surface **202** in a direction opposite to the first surface.

The first mounting part **200***a* of the first cap **200** includes a first protruding member **210** formed to protrude to a certain height from the first surface **201** and provided to be inserted into at least a partial area of the first hollow chamber **1211**.

In addition, the first mounting part **200***a* of the first cap **200** includes a second protruding member **211** formed to protrude to a certain height from the first surface **201** and provided to be inserted into at least a partial area of the second hollow chamber **1212**.

Furthermore, the first mounting part **200***a* of the first cap **200** includes a third protruding member **212** formed to protrude to a certain height from the first surface **201** and provided to be inserted into at least a partial area of the third hollow chamber **1213**.

The first to third protruding members **210**, **211**, and **212** may be respectively inserted into the first hollow chamber **1211**, the second hollow chamber **1212**, and the third hollow chamber **1213** so that the first cap **200** may be fixed to the solar cell panel unit **100**.

Here, a second through-hole **243** passing through the first cap **200** may be formed between the first protruding member **210** and the second protruding member **211**.

The second through-hole **243** may be a through-hole into which the screw portion **2430** for fixing the first cap **200** to the blade frame **120** is inserted.

The second through-hole **243** may be formed at a position corresponding to the first through-hole **2431***a* of the screw fixing portion **2431** of the blade frame **120**.

In addition, the first cap **200** includes the second mounting part **200***b* formed to extend from the first mounting part **200***a* and coupled to the second cap.

The second mounting part **200***b* may be formed to be shorter than the first mounting part **200***a* in a length direction of the first mounting part **200***a*.

The second through-hole **243** may be a through-hole passing through the first and second mounting parts **200***a* and **200***b* of the first cap **200**.

Accordingly, the screw portion **2430** may sequentially pass through the second mounting part **200***b* of the first cap **200** and the second surface **2020** and the first surface **201** of the first mounting part to be inserted into the first through-hole **2431***a*, thereby firmly fixing the first cap **200** to the solar cell panel unit **100**.

In addition, a first insertion groove **220**, into which at least a partial area of the solar cell panel **110** mounted in the fixing groove **130** is inserted, is formed in the first surface **201** of the first mounting part **200***a*.

The first insertion groove **220** may be formed to be recessed inward from the first surface **201** toward the second surface **202**.

In addition, third and fourth grooves **231** and **232**, which are formed to be recessed inward and correspond to the first and second grooves **123** and **124** of the upper end portion of the blade frame **120**, may be formed in an upper end portion of the first cap **200**.

Furthermore, third and fourth protrusions **233** and **234**, which are formed to protrude outward and correspond to the first and second protrusions **125** and **126** of the lower end portion of the blade frame **120**, may be provided at a lower end portion of the first cap **200**.

The first insertion groove **220** includes a first terminal insertion portion **2201** having a certain space formed therein such that the first electrode terminal **270** is inserted therein.

In addition, the first insertion groove **220** includes a first terminal fixing portion **221** having an open side such that the first electrode terminal **270** is fit-coupled to be fixed in the first cap.

The first terminal fixing portion **221** may be provided at a position corresponding to the first terminal insertion portion **2201** so that, when the first electrode terminal **270** is mounted in the first terminal fixing portion **221**, at least a partial area of the first electrode terminal **270** may pass through the first terminal insertion portion **2201** to be positioned inside the second mounting part.

As an example, the first terminal fixing portion **221** may be positioned to be collinear with the first hollow portion **241** to be described below.

The first terminal fixing portion **221** may be formed to protrude to a certain height from a bottom surface **220***a* of the first insertion groove **220** at a position corresponding to the first terminal insertion portion **2201**.

In particular, a cross-sectional shape of both end portions of the first terminal fixing portion **221** may be formed as an approximately "c" shape, and thus, in a state in which the first electrode terminal **270** is fit-coupled to the first terminal fixing portion **221**, the both end portions of the first terminal fixing portion **221** may be provided to surround at least a partial area of both end portions **273***a* and **273***b* of the third terminal portion **273** of the first electrode terminal.

Here, the first gasket **113** may be inserted into the first insertion groove **220** and fit-coupled and assembled therein to shield at least a partial area thereof.

Since the first surface **201** of the first cap **200** is formed to have an approximately flat surface, in a state in which at least a partial area of the solar cell panel is mounted in the first insertion groove **220**, the first surface may be provided in close contact with and shield an open side surface of the blade frame.

In addition, the second mounting part **200***b* provided to be coupled to the second cap **30** may be provided on the second surface **202** of the first cap **200**.

The second mounting part **200***b* includes the first hollow portion **241** in which at least a partial area of the terminal housing is accommodated and a first hollow portion through-hole **2401** formed in an inner peripheral surface of the first hollow portion **241** such that the fourth terminal portion of the second electrode terminal is inserted therein.

At least a partial area of the first electrode terminal **270** may be provided to be collinear with the first hollow portion **241**.

In particular, the fourth terminal portion of the second electrode terminal may sequentially pass through the first hollow portion **241** and the first hollow portion through-hole **2401** and may be inserted into the first space **S1** of the third terminal portion positioned inside the second mounting part and to be electrically connected to the third terminal portion.

That is, since the first hollow portion through-hole **2401** and the first space **S1** of the third terminal portion may be positioned to be collinear with each other, when the fourth

terminal portion is inserted, the fourth terminal portion is inserted into the first space **S1**, and thus the first electrode terminal and the second electrode terminal may to be electrically connected.

One side of the first hollow portion **241** may be open such that the second electrode terminal **310** provided in the second cap **30** is inserted therein.

That is, the first hollow portion may be open toward one end portion **200***ba* (lower side) of the second mounting part **200***b*.

Here, the first hollow portion through-hole **2401** may be connected to fluidly communicate with the first terminal insertion portion **2201** provided inside the first cap **200**.

Therefore, in a state in which the first electrode terminal **270** is inserted into the first terminal fixing portion **221**, the first terminal portion **271** is positioned to be exposed to the outside toward the solar cell panel **110**, and the third terminal portion **273** is positioned to not be exposed at a space inside the first hollow portion **241**.

In addition, first mounting grooves **250**, which are recessed inward from both side surfaces of the first cap **200** by a certain degree, may be formed in both sides of the second mounting part **200***b* in a width direction.

In addition, the first cap **200** includes a first mounting member **260** provided to protrude outward from a side surface thereof.

The first mounting member **260** may be provided at the lower end portion of the first cap **200** and may be provided to protrude outward from the side surface thereof.

The first mounting member **260** may be provided with a downward inclined surface.

In addition, the first cap **200** has a second mounting groove **261** recessed inward from a side surface thereof.

The second mounting groove **261** may be provided on a different side surface from the first mounting member **260** and may be bent one or more times to have an approximately "L" shape.

FIG. **30** shows views illustrating a state in which the first electrode terminal and the first gasket are mounted in the first cap according to the second embodiment of the present invention. FIG. **31** shows views for describing a state in which the first electrode terminal and the first gasket are mounted in the solar cell panel **110** according to the second embodiment of the present invention.

Referring to FIGS. **30** and **31**, the first gasket **113** includes a first sealing portion **1131** which is formed to extend in a length direction and has a length corresponding to the first insertion groove **220** and a second sealing portion **1133** which is formed to extend outward from the first sealing portion **1131** and is provided to surround the first terminal fixing portion **221**.

The first sealing portion **1131** of the first gasket **113** shields the bottom surface **220***a* of the first insertion groove **220** and includes a panel sealing groove **1132** which surrounds one end portion of the solar cell panel **110** in the length direction and is recessed inward such that the one end portion of the solar cell panel **110** is fit-coupled thereto.

A second terminal insertion portion **1134** may be formed to pass between the first sealing portion **1131** and the second sealing portion **1133** to fluidly communicate with the first terminal insertion portion **2201** into which the first electrode terminal **270** is inserted.

Accordingly, in the first cap **200**, in a state in which the first electrode terminal **270** is fixedly inserted into the first terminal fixing portion **221**, the first gasket **113** may be inserted into the first insertion groove **220** to more firmly fix the first electrode terminal in the first cap **200**.

In this case, the first terminal portion **271** of the first electrode terminal **270** may pass through the second terminal insertion portion **1134** of the first gasket **113** and positioned to be exposed to the outside.

In a state in which the first cap **200** is mounted on the solar cell panel unit **100**, the first terminal portion **271** exposed to the outside as described above may be in physical contact with and electrically connected to the terminal portion **111** of the solar cell panel **110**.

When the first gasket **113** formed as described above is mounted in the first cap **200** and fit-coupled to the solar cell panel unit **100**, four surfaces of the solar cell panel **110** and the solar cell panel unit **100** are sealed to improve waterproof performance, thereby improving the waterproof and sealing properties between the solar cell panel unit **100** and the first cap **200**.

In particular, when the first cap **200** is fixedly coupled to the solar cell panel unit **100**, a fixing force can be further improved by an additional fixing force of the screw portion.

Meanwhile, FIGS. **32** and **33** show views illustrating the second cap **30** according to the second embodiment of the present invention. FIG. **34** is a cross-sectional view illustrating electrical connections of the first to third electrode terminals in a state in which the first cap, the second cap, and the connector part are mounted on the solar cell module according to the second embodiment of the present invention.

Referring to FIGS. **32** to **34**, the second cap **30** may accommodate the first electrode terminal **270** and the second electrode terminal **310** electrically connected to first electrode terminal **270**, and may be provided as a plurality of second caps **30** such that the first caps **200** are mounted thereon.

Here, the second electrode terminal and the terminal housing **312** surrounding at least a partial area of the second electrode terminal may be detachably mounted in the second cap **30**.

The second cap **30** has a first surface **31** facing the first cap **200** and a second surface **32** in a direction opposite to the first surface.

In addition, the second cap **30** includes a third mounting part **320** having a certain space therein such that the first cap **200** is slide-insertion-mounted therein.

The third mounting part **320** may be formed to protrude to a certain height from the first surface such that both end portions thereof in a width direction surround at least a partial area of the first cap, and both end portions thereof in a length direction may be open.

The third mounting part **320** includes one pair of first coupling protrusions **321** provided to be fixedly slide-inserted into the first coupling grooves **250** of the first cap **200**.

The third mounting part **320** includes a second terminal fixing portion **330** for detachably fixing the second electrode terminal **310**.

When the first cap **200** is slide-inserted in a length direction of the second cap **30**, the second electrode terminal fixed to the second terminal fixing portion may be inserted into the first hollow portion **241** and the first hollow portion through-hole **2401** of the third mounting part **320** to be electrically connected to the first electrode terminal.

The second terminal fixing portion **330** is provided such that the terminal housing **312** formed integrally with the second electrode terminal **310** is detachably fit-inserted and fixed therein.

The second terminal fixing portion **330** includes one pair of first mounting protrusions **332** provided to be fit-inserted

into the mounting groove **3125** of the terminal housing **312** integrally formed with the second electrode terminal.

The one pair of first mounting protrusions **332** may be provided apart from each other by a certain interval and formed to protrude inward from the third mounting part **320** so as to have a certain space **331** (also referred to as "first insertion portion") therein.

In addition, the second terminal fixing portion **330** includes a second mounting protrusion **334** provided to surround and fix at least a partial area of the terminal housing **312**.

The second mounting protrusion **334** is formed to protrude outward from the first surface **31** of the second cap **30** and have a certain space **333** (also referred to as "second insertion portion") therein.

One side of each of the certain spaces **331** and **333** may be open so that the terminal housing **312** formed integrally with the second electrode terminal may be inserted into the spaces **331** and **333**.

In this case, the one pair of first mounting protrusions **332** may be fit-coupled to the mounting groove **3125** of the terminal housing **312** so that at least a partial area of the second housing portion **3122** may be fixedly seated in the first insertion portion **331**.

At the same time, the remaining partial area of the second housing portion **3122** of the terminal housing **312** and the head portion **3123** may be inserted into the second insertion portion **333** and fixed by the second mounting protrusion **334**.

Accordingly, the second electrode terminal **310** formed integrally with the terminal housing **312** may be detachably fixed in the second cap **30**.

In a state in which the second electrode terminal **310** is fixed in the second cap **30** as described above, the first area of the fourth terminal portion **3101** of the second electrode terminal **310** may be provided to be exposed to the outside.

In particular, in a state in which the second electrode terminal **310** is fixed in the second cap **30** as described above, when the first cap **200** is mounted on the second cap **30**, the first housing portion **3121** and the first area of the fourth terminal portion **3101** fixed in the second cap **30** may be inserted into the first hollow portion **241** of the first housing **3121** so that the second terminal portion **272** of the first electrode terminal and the fourth terminal portion **3101** of the second electrode terminal, which pass through the first hollow portion through-hole **2401** to be positioned inside the second mounting part, may be electrically connected.

In this case, a sealing force is improved by the first O-ring O1 mounted on the first O-ring mounting portion **3124** inserted into the first hollow portion **241** to prevent the penetration of moisture into the hollow portion **241** and the second mounting part, thereby improving waterproof performance.

A fitting groove **328** formed such that the first mounting member **260** of the first cap is fixedly inserted therein may be formed in a side surface of the third mounting part **320** at a position corresponding to the first mounting member **260**.

A second coupling protrusion **329**, which is inserted into the second mounting groove **261** of the first cap **200** to fix the first cap and the second cap, is included on a side surface of the third mounting part **320**.

The second coupling protrusion **329** may be provided to correspond to a shape of the second mounting groove **261** and may be provided in an approximately "L" shape, but the present invention is not limited thereto.

In addition, the second cap **30** includes the fourth mounting part **340** which is mounted on the frame unit **50** and is provided such that the connector part **70** is mounted thereon.

The fourth mounting part **340** includes a rotation member **350** having a certain fifth hollow portion **341** therein.

The rotation member **350** includes a first stepped portion **351** formed to protrude from the second surface **32** and a first fixing portion **352** further protruding from the first stepped portion **351**.

For example, the first fixing portion **352** may be provided in a hollow cylindrical shape.

The fifth hollow portion of the fourth mounting part **340** may be formed inside the first fixing portion **352**, and the third electrode terminal may be provided to be inserted into the fifth hollow portion.

In particular, at least a partial area of the second electrode terminal may be provided to be positioned in the fifth hollow portion **341** of the fourth mounting part.

Specifically, the head portion **3123** of the terminal housing formed integrally with the second electrode terminal **310** and the fifth terminal portion **3102** exposed outward from the head portion **3123** may be positioned to be exposed at a space inside the fifth hollow portion **341** of the fourth mounting part.

Meanwhile, FIG. **35** shows views illustrating a fixing member **400** according to the second embodiment of the present invention.

Referring to FIG. **35**, the second cap **30** includes the fixing member **400** mounted at a side of the fourth mounting part **340** of the second cap **30** and provided to rotatably support the second cap **30**.

The fixing member **400** may be insertion-mounted in a frame through-hole **510** of the inner frame **500** to be described below to rotatably support the second cap **30**.

The fixing member **400** is inserted into the frame through-hole **510** to assist the second cap **30** in rotating when the second cap **30** rotates and concurrently serve to reduce friction.

As an example, when the fixing member **400** is not mounted, the second cap **30** made of plastic may be easily worn due to friction with the frame through-hole of the inner frame made of aluminum.

The fixing member **400** may include a second stepped portion **410** fixedly inserted into the frame through-hole **510** to correspond to a shape of the frame through-hole **510** of the inner frame **500** and may have a fixing member through-hole **420** passing through a central portion of the second stepped portion such that the rotation member **350** of the second cap **30** is insertion-mounted therein.

The second stepped portion **410** of the fixing member **400** may be mounted to pass through the frame through-hole **510** of the inner frame **500** to be exposed to the outside.

In this case, the fourth mounting part **340** of the second cap **30** may be mounted to the fixing member **400**, and the first fixing portion **352** passes through the fixing member through-hole **420** to be exposed at the space between the inner frame **500** and the outer frame **600**.

That is, the first fixing portion **352** may be positioned in the space between the inner frame and the outer frame.

In addition, the fixing member **400** may surround and support at least partial areas of the first stepped portion **351** and the first fixing portion **352**.

Meanwhile, FIGS. **36** and **37** show views for describing the frame unit **50** according to the second embodiment of the present invention.

Referring to FIGS. **36** and **37**, the frame unit **50** includes the inner frame **500** provided such that each of the plurality

of second caps **30** is rotatably mounted in a length direction and the outer frame **600** surrounding the inner frame **500**.

The frame unit **50** may have a certain space, and the plurality of solar cell modules **10** may each disposed in the certain space in the length direction and may be rotatably mounted.

More specifically, the inner frame **500** is formed to extend in the length direction (vertical direction) and includes a plurality of frame through-holes **510** formed apart from each other by a certain interval in the length direction.

The inner frame **500** may be provided at each end portion of the solar cell module **10**.

Here, one pair of rod bars (not shown) may be provided at both sides of the inner frame **500** with the frame through-holes **510** therebetween to rotate the solar cell module **10**, and a plurality of protruding bar fixing holes (not shown), which are formed such that one pair of protruding bars **739** provided in the connector part **70** are fixedly inserted therein, may be formed at positions corresponding to the one pair of protruding bars **739**.

The inner frame **500** may have one pair of first fitting grooves **520** formed to extend in the length direction.

The one pair of first fitting grooves **520** may be formed in both end portions of the inner frame **500** in a width direction.

The outer frame **600** includes one pair of side frames **610** formed to extend in a length direction and provided to surround side surfaces of the inner frames and upper and lower frames **620** and **630** connecting both end portions of the one pair of side frames **610** in the length direction.

Each of the side frames **610** may include first insertion protrusions **611** inserted into the first fitting grooves **520**.

Each of the side frames **610** may be provided with a certain space **601** such that the connector part **70** may be disposed therein in a state in which the inner frame **500** is mounted.

In addition, the outer frame **600** includes assembly members **650** for connecting the side frame and the upper frame or the side frame and the lower frame.

The assembly member **650** may be provided with an approximately "]" shape, at least a partial area thereof may be inserted into the upper frame or the lower frame, and the remaining partial area thereof may be inserted into the side frame to connect the upper frame and the side frame or the lower frame and the side frame.

In addition, the outer frame **600** includes one pair of guide members **660** mounted on the upper and lower frames **620** and **630** and one pair of guide slit members **670** mounted on the guide members **660**.

The upper and lower frames **620** and **630** each include one pair of second insertion protrusions **640** provided such that the guide members **660** are fit-coupled thereto.

The one pair of guide members **660** each have a second fitting groove **661** into which each of the one pair of second insertion protrusions **640** is inserted and a third fitting groove **662** into which the guide slit member **670** is inserted and fit-coupled thereto.

The first and second fitting grooves **520** and **661** may be slide-insertion-coupled to the first and second insertion protrusions **620** and **640**, respectively.

Each of the guide slit members **670** may be provided with third and fourth grooves **671** and **672** having shapes corresponding to the first and second grooves of the blade frame.

In a state in which the plurality of solar cell modules **10** are mounted on the frame unit **50**, the guide slit member **670** may be provided in contact with each of an upper end portion of the solar cell panel unit **100** positioned at an uppermost side and a lower end portion of the solar cell panel unit **100** positioned at a lowermost side.

In particular, the first and second protrusions **125** and **126** of the blade frame may be insertion-mounted in the third and fourth grooves of the guide slit member mounted on the lower frame.

In addition, the outer frame **600** may include an external connector **680** for outputting electricity output through the connector part **70** to an external unit.

The external connector **680** may be fixedly mounted, for example, on the side frame and provided to be electrically connected to the connector part **70**.

In particular, the external connector **680** may be provided at each of an upper end portion and a lower end portion of the outer frame to be electrically connected to the solar cell module **10** positioned at the uppermost side and the solar cell module **10** positioned at the lowermost side.

In addition, in one or more solar cell modules **10**, since two adjacent solar cell modules **10** are connected in series by the connector part **70**, a final electrode may electrically connect the solar cell module **10** positioned at the uppermost side and the solar cell module **10** positioned at the lowermost side to obtain electricity through the external connector **680**.

FIGS. **38** and **39** show perspective views illustrating the connector part **70** according to the second embodiment of the present invention.

Referring to FIGS. **38** and **39**, the mounting member **730** includes a fifth mounting part **732** provided to be insertion-mounted in the fifth hollow portion **341** of the rotation member **350** of the second cap **30**.

A second through-hole **731** may be formed in a central portion of the fifth mounting part **732**, and one pair of first fixing pieces **7321** provided to be inserted into and fixedly caught in the first fixing portion **352** may be provided at both sides of the fifth mounting part **732** with the second through-hole **731** interposed therebetween.

Accordingly, a fixing groove (not shown) may be formed inside the first fixing portion **352** such that the one pair of first fixing pieces **7321** are fixedly caught therein.

In addition, the fifth mounting part **732** includes a third O-ring mounting portion **7322** which is recessed inward in a circumferential direction thereof to be inserted into the first fixing portion **352** and to improve a sealing force between the second cap **30** and the mounting member **730**.

Accordingly, a third O-ring O3 is mounted on the third O-ring mounting portion **7322** and fit-coupled inside the first fixing portion **352** of the second cap **30**, thereby improving a sealing force.

In addition, the mounting member **730** includes a sealing mounting part **760** which is connected to fluidly communicate with the second through-hole **731** of the fifth mounting part **732** and into which the sealing portion **722** of the third electrode terminal **710** is inserted.

The third electrode terminal **710** and at least a partial area of the connection portion **720** connected thereto may pass through the sealing mounting part **760** to be insertion-mounted in the second through-hole **731** inside the fifth mounting part **732**.

In a state in which the third electrode terminal **710** is mounted inside the fifth mounting part **732**, the sealing portion **722** of the third electrode terminal is inserted into the sealing mounting part **760**, thereby preventing the penetration of moisture into the mounting member **730**.

The connection portion **720** may electrically connect the one pair of third electrode terminals to electrically connect two adjacent solar cell modules **10**.

When the connector part **70** is mounted on the second cap, the fifth mounting part **732** may be fixedly inserted into the fifth hollow portion **341** of the second cap, and the fifth terminal portion **3102** of the second electrode terminal **310** exposed to the fifth hollow portion **341** may be inserted into the certain second space S2 inside the sixth terminal portion **711** of the third electrode terminal positioned inside the fifth mounting part **732** so that the second electrode terminal and the third electrode terminal may be electrically connected.

In this case, the second O-ring O2 may be fit-coupled to the fifth mounting part **732**.

In addition, the connector part **70** includes the one pair of protruding bars **739** provided to rotate the solar cell module **10** at a certain angle.

The one pair of protruding bars **739** are provided to protrude outward from a first surface **7301** of the mounting member **730** and may be positioned apart from each other by a certain interval so as to face each other with the fifth mounting part **732** interposed therebetween.

FIG. **40** shows views illustrating a sequence in which the solar cell module **10** is assembled (mounted) according to the second embodiment of the present invention.

First, in a state in which the first electrode terminal **270** is fixedly inserted into the first terminal fixing portion **221** provided in the first cap **200**, the first gasket **113** is mounted in the first insertion groove **220** of the first cap **200**.

As described above, in a state in which the first electrode terminal is mounted in the first cap **200**, the first cap **200** is mounted on the solar cell panel unit **100**, and the screw portion **2430** is allowed to pass through the second through-hole **243** formed in the first cap and is inserted into the screw fixing portion **2431** provided in the blade frame **120** to firmly fix the first cap **200** to the solar cell panel unit **100**, thereby completing the assembly of the solar cell module **10**.

FIG. **41** shows views illustrating a sequence in which the terminal housing and the injection-molded second electrode terminal are assembled (mounted) in the second cap **30** according to the second embodiment of the present invention.

The terminal housing and the injection-molded second electrode terminal are fixedly inserted into the second terminal fixing portion **330** provided in the second cap **30**.

After that, although not shown, the fixing member **400** is mounted to the rotation member **350** of the second cap **30** in which the second electrode terminal is mounted so that the rotation member **350** is mounted in the frame through-hole **510** of the inner frame **500**.

Here, after the fixing member **400** is mounted in the frame through-hole **510** of the inner frame **500**, the second cap **30** may be insertion-mounted in the fixing member through-hole **420** of the fixing member **400**.

Next, FIG. **42** shows views illustrating a sequence in which the connector part **70** is assembled according to the second embodiment of the present invention.

The third electrode terminals electrically connected to the connection portion **720** are inserted into the second through-holes **731** inside the one pair of mounting members **70**.

FIGS. **43** and **44** are views for describing a sequence in which the solar cell module **10** is mounted according to the second embodiment of the present invention. FIG. **45** is a view illustrating a state in which the solar cell module is mounted on the second cap and the connector part is mounted on the second cap according to the second embodiment of the present invention. FIG. **46** is a view illustrating a state in which a solar cell louver assembly is connected in series according to the second embodiment of the present invention.

Referring to FIGS. **43** to **46**, the second cap **30** may be in a state of being rotated at a certain angle in a state of being mounted on the inner frame **500**.

In the above state, the solar cell module **10** may be slide-insertion-mounted on the second cap **30** downward.

That is, the first electrode terminal **270** and the second electrode terminal **310** may be provided to be inserted in the length direction of the inner frame.

In a state in which the solar cell module is mounted on the second cap as described above, the connector part **70** may be mounted to the rotation member of the second cap.

The connector part **70** of the present invention is a component for connecting the solar cell modules **10** in series, and an arrangement of the connector part **70** for connecting the solar cell modules **10** in series is as follows.

Referring to FIGS. **18**, **35**, and **43** to **46**, for convenience of description, when the first solar cell module **11** and the second solar cell module **12** are alternately disposed in a vertical direction of the frame unit, the first solar cell module **11** disposed under the second solar cell module **12** may be referred to as a third solar cell module, and the second solar cell module disposed under the third solar cell module may be referred to as a fourth solar cell module.

In this case, based on a direction from the top to the bottom, a connection of a right end portion and a left end portion of the first to fourth solar cell modules will be described.

For example, in order for a plurality of solar cell modules **10** and **10'** to be electrically connected to each other and connected in series, the connector part **70** is disposed at the right end portions of the first solar cell module **11** and the second solar cell module **12** to electrically connect the right end portions of the first and second solar cell modules.

In this case, the connector part **70** is disposed at left end portions of the second solar cell module **12** and another first solar cell module (third solar cell module **11'**) positioned under the second solar cell module to electrically connect the left end portions of the second solar cell module **12** and the third solar cell module **11'**.

In addition, the connector part **70** is disposed at right end portions of the third solar cell module **11'** and a fourth solar cell module **12'** to electrically connect the right end portions of the third and fourth solar cell modules.

Such a configuration is repeated to install the connector parts, thereby electrically connecting the plurality of solar cell modules in series.

That is, the connector parts **70** may be alternatively connected to the left end portion and the right end portion for serial connection.

Since such connection can be made in the space between the inner frame and the outer frame, electrical wires are not exposed to the outside.

In addition, since the louver assembly of the present invention can be assembled in the same manner as in a conventional louver window, assembly is easier.

In addition, the louver assembly can serve as a louver window, and concurrently, the series-connected solar cell panels can generate electricity.

As described above, according to the present invention, in order to solve a problem in that, in a conventional louver assembly, productivity is lowered due to electrically connected electrode terminals being produced through insert injection molding, a structure of a first cap is provided such that a first electrode terminal is detachably assembled inside the first cap, a structure of a second cap is provided such that a terminal housing and an insert injection-molded second electrode terminal are detachably assembled inside the sec-

ond cap, and a third electrode terminal is provided to be detachably assembled in a connector part, thereby lowering the difficulty of insert injection molding to improve productivity.

In particular, a first gasket, an O-ring, and a sealing portion are used to improve a sealing force at portions to which electrode terminals are electrically connected, thereby further improving waterproof performance.

The invention claimed is:

1. A solar cell louver assembly comprising:

a plurality of solar cell modules which each include a solar cell panel unit including a first terminal provided at a first end portion thereof and a second terminal provided at a second end portion thereof, a pair of first electrode terminals, one of the pair of first electrode terminals being electrically connected to the first terminal and the other of the pair of the first electrode terminals being electrically connected to the second terminal, and a pair of first caps to surround the first electrode terminals, one of the pair of first caps being mounted on the first end portion of the solar cell panel unit and the other of the pair of first caps being mounted on the second end portion of the solar cell panel unit;

a plurality of second caps each including a second electrode terminal electrically connected to a respective one of the first electrode terminals;

a frame unit provided such that each of the plurality of second caps is rotatably mounted in a length direction; and

a plurality of connector parts for connecting the plurality of solar cell modules together in series;

wherein, the plurality of solar cell modules are arranged adjacently along the length direction within the frame unit,

wherein, in a state that the first and second end portions of each solar cell module are mounted on respective ones of the plurality of second caps mounted within the frame unit,

wherein, the connector parts each include a pair of third electrode terminals configured to electrically connect respective second electrode terminals of respective second caps mounted on two solar cell modules adjacent to each other along the length direction of the frame unit,

wherein, each of the first caps has a first surface facing the solar cell panel unit and a second surface in a direction opposite to the first surface, has a first insertion groove recessed inward from the first surface toward the second surface, into which at least a partial area of the solar cell panel unit is inserted.

2. The solar cell louver assembly of claim **1**, wherein:

in a state in which one of the first caps is mounted on a respective one of the plurality of the second caps, the respective second electrode terminal is provided in contact with the respective first electrode terminal; and

in a state in which one of the connector parts is mounted on a respective pair of the second caps, the third electrode terminals are provided in contact with the respective second electrode terminals.

3. The solar cell louver assembly of claim **2**, wherein:

one terminal of the first and second electrode terminals is provided with a space into which the other terminal thereof is inserted; and

when one of the first caps is mounted on a respective one of the plurality of second caps, one terminal of the first and second electrode terminals is inserted into the other terminal thereof.

4. The solar cell louver assembly of claim **3**, wherein:

each first electrode terminal includes a plurality of first electrode rods forming a space into which the respective second electrode terminal is inserted;

at least one of the plurality of first electrode rods is bent one or more times; and

the respective second electrode terminal is provided in contact with a bent portion of the at least one of the plurality of first electrode rods or to be inserted into the space between bent portions of the at least one of the plurality of first electrode rods.

5. The solar cell louver assembly of claim **4**, wherein each first electrode terminal includes a first connection portion electrically connected to a solar cell panel unit and a second connection portion in contact with a bypass diode.

6. The solar cell louver assembly of claim **5**, wherein the plurality of first electrode rods, the first connection portion, and the second connection portion are formed integrally.

7. The solar cell louver assembly of claim **3**, wherein the first electrode terminal and the second electrode terminal are provided to be inserted in a length direction of an inner frame.

8. The solar cell louver assembly of claim **2**, wherein:

one terminal of the second and third electrode terminals is provided with a space into which the other terminal thereof is inserted; and

when one of the connector parts is mounted on a respective pair of the plurality of second caps, one terminal of the second and third electrode terminals is inserted into the other terminal thereof.

9. The solar cell louver assembly of claim **8**, wherein:

each second electrode terminal includes a plurality of second electrode rods forming a space into which the respective third electrode terminal is inserted;

at least one of the plurality of second electrode rods is bent one or more times; and

the respective third electrode terminal is provided in contact with a bent portion of the at least one of the plurality of second electrode rods or to be inserted into the space between the bent portions of the at least one of the plurality of second electrode rods.

10. The solar cell louver assembly of claim **9**, wherein:

the frame unit includes an inner frame on which each of the plurality of second caps is rotatably mounted in the length direction and an outer frame surrounding the inner frame; and

when each of the second caps is mounted on the inner frame, the respective plurality of second electrode rods are provided such that at least partial areas thereof are exposed at a space between the inner frame and the outer frame.

11. The solar cell louver assembly of claim **2**, wherein each connector part includes:

a connection member configured to surround each of the respective third electrode terminals; and

one pair of mounting members connected to the connection member, positioned at vertical end portions of the third electrode terminals to expose the third electrode terminals to the outside, and provided to be mounted in the second cap.

12. The solar cell louver assembly of claim **1**, wherein:

each of the first caps has a first coupling part provided on the second surface to be connected to a respective one of the plurality of second caps;

a first connection portion and a second connection portion of the first electrode terminal are positioned in the first insertion groove; and

a plurality of first electrode rods are provided to be positioned in the first coupling part.

13. The solar cell louver assembly of claim **1**, wherein:

each of the second caps includes a first mounting part having a certain space therein such that the respective first cap is slide-insertion-mounted therein and a second mounting part provided in a direction opposite to the first mounting part such that the respective connector part is mounted thereon;

each second electrode terminal includes a third connection portion formed to extend from a plurality of second electrode rods and electrically connected to a first electrode rod of the respective first electrode terminal;

the third connection portion is provided to be exposed outside the first mounting part; and

the plurality of second electrode rods are provided to be positioned in the second mounting part.

14. The solar cell louver assembly of claim **1**, wherein:

each third electrode terminal includes a fourth connection portion electrically connected to a second electrode rod of the respective second electrode terminal and a fifth connection portion formed to extend from the fourth connection portion and configured to electrically connect the two solar cell modules adjacent in a length direction of an inner frame;

the fourth connection portion is exposed to an outside toward a second mounting part; and

the fifth connection portion is provided to be positioned at a side of a connection member.

15. A solar cell louver assembly comprising:

a plurality of solar cell modules which each include a solar cell panel unit including a first terminal provided at a first end portion thereof and a second terminal provided at a second end portion thereof, a pair of first electrode terminals, one of the pair of first electrode terminals being electrically connected to the first terminal and the other of the pair of the first electrode terminals being electrically connected to the second terminal, and a pair of first caps to surround the first electrode terminals, one of the pair of first caps being mounted on the first end portion of the solar cell panel unit and the other of the pair of first caps being mounted on the second end portion of the solar cell panel unit;

a plurality of second caps each including a second electrode terminal electrically connected to a respective one of the first electrode terminals and a terminal housing configured to surround at least a partial area of the second electrode terminal;

a frame unit provided such that each of the plurality of second caps is rotatably mounted in a length direction; and

a plurality of connector parts for connecting each the plurality of solar cell modules together in series;

wherein, the plurality of solar cell modules are arranged adjacently along the length direction within the frame unit,

wherein, in a state that the first and second end portions of each solar cell module are mounted on one respective ones of the plurality of second caps mounted within the frame unit,

wherein, the connector parts each include a pair of third electrode terminals configured to electrically connect respective second electrode terminals of respective second caps mounted on two solar cell modules adjacent to each other along the length direction of the frame unit,

wherein:

each first electrode terminal is detachably mounted inside the respective first cap; and

each second electrode terminal is formed integrally with the respective terminal housing through insert injection molding and is detachably mounted inside the respective second cap,

wherein, each of the first caps has a first surface facing the solar cell panel unit and a second surface in a direction opposite to the first surface, has a first insertion groove recessed inward from the first surface toward the second surface, into which at least a partial area of the solar cell panel unit is inserted.

16. The solar cell louver assembly of claim **15**, wherein:

in a state in which one of the first caps is mounted on a respective one of the plurality of second caps, the respective second electrode terminal is provided in contact with the respective first electrode terminal; and

in a state in which one of the connector parts is mounted on a respective pair of the plurality of second caps, the third electrode terminals are provided in contact with the respective second electrode terminal.

17. The solar cell louver assembly of claim **16**, wherein:

one terminal of the first and second electrode terminals is provided with a space into which the other terminal thereof is inserted; and

when the first cap is mounted on the second cap, one terminal of the first and second electrode terminals is inserted into the other terminal thereof.

18. The solar cell louver assembly of claim **16**, wherein:

one terminal of the second and third electrode terminals is provided with a space into which the other terminal thereof is inserted; and

when one of the connector parts is mounted on a respective pair of the plurality of second caps, one terminal of the second and third electrode terminals is inserted into the other terminal thereof.

19. The solar cell louver assembly of claim **15**, wherein:

each of the first caps includes a first mounting part mounted on the respective solar cell panel unit and a second mounting part mounted on the respective second cap in a direction opposite to the first mounting part;

each solar cell panel unit includes a solar cell panel including the one pair of first and second terminal portions and a blade frame on which the solar cell panel is mounted;

the first mounting part has a first insertion groove into which at least a partial area of the respective solar cell panel is inserted; and

the first insertion groove includes a first terminal fixing portion provided such that the respective first electrode terminal is detachably inserted and fixed therein and a first terminal insertion portion is provided to connect the first terminal fixing portion and the second mounting part to communicate with each other.

20. The solar cell louver assembly of claim **19**, wherein each of the first caps further includes a first gasket that is detachably inserted into the first insertion groove to shield at least a partial area of the first insertion groove and is provided to surround and seal one end portion of the respective solar cell panel.

21. The solar cell louver assembly of claim **19**, wherein, in a state in which each first electrode terminal is fixedly inserted into the respective first terminal fixing portion, at least a partial area of the first electrode terminal is positioned to be exposed outside the first mounting part, and the remaining partial area of the first electrode terminal is

provided to be positioned in a space inside the second mounting part through the first terminal insertion portion.

22. The solar cell louver assembly of claim **19**, wherein:

each first electrode terminal includes a first terminal portion electrically connected to the respective terminal portion of the solar cell panel, a second terminal portion formed apart from the first terminal portion by a certain distance and electrically connected to the respective second electrode terminal, and a third terminal portion configured to connect the first terminal portion and the second terminal portion; and

in a state in which the first electrode terminal is inserted into the respective first terminal fixing portion, the first terminal portion is positioned to be exposed outside the first terminal fixing portion, and the second terminal portion is positioned to be exposed outside the second mounting part.

23. The solar cell louver assembly of claim **15**, wherein:

each of the second caps includes a third mounting part having a certain space therein such that the first cap is slide-insertion-mounted therein and a fourth mounting part provided in a direction opposite to the third mounting part such that the connector part is mounted thereon;

the third mounting part includes a second terminal fixing portion provided such that the second electrode terminal formed integrally with the terminal housing is detachably inserted and fixed therein; and

the fourth mounting part includes a rotation member which communicates with the third mounting part and is provided such that at least a partial area of the second electrode terminal fixed to the second terminal fixing portion is positioned therein.

24. The solar cell louver assembly of claim **23**, wherein, in a state in which each second electrode terminal is fixedly inserted into the respective second terminal fixing portion, at least a partial area of the second electrode terminal is positioned to be exposed to an outside, and the remaining partial area of the second electrode terminal is positioned to be exposed at a space inside the rotation member.

25. The solar cell louver assembly of claim **23**, wherein the second electrode terminal formed integrally with the terminal housing through the insert injection molding includes a fourth terminal portion of which at least a partial area is exposed to an outside toward a second terminal portion of the respective first electrode terminal and a fifth terminal portion which is formed to extend from the fourth terminal portion and of which at least a partial area is exposed to an outside toward the respective third electrode terminal; and

in a state in which the second electrode terminal is fixedly inserted into the second terminal fixing portion, the fourth terminal portion is positioned to be exposed outside the third mounting part, and the fifth terminal portion is positioned to be exposed outside the fourth mounting part.

26. The solar cell louver assembly of claim **15**, wherein:

each connector part includes one pair of mounting members configured to surround the respective third electrode terminals and provided to be mounted in the respective second cap;

each mounting member includes a fifth mounting part provided such that at least a partial area thereof is inserted into a rotation member of the second cap; and

the third electrode terminal includes a connection portion inserted into each of the fifth mounting parts to electrically connect the third electrode terminals so as to electrically connect two adjacent solar cell modules.

27. The solar cell louver assembly of claim **26**, wherein:

each third electrode terminal includes a sixth terminal portion electrically connected to a fifth terminal portion and a seventh terminal portion formed to extend from the sixth terminal portion and electrically connected to the respective connection portion; and

the third electrode terminal is positioned to be exposed at a space inside the fifth mounting part.

28. The solar cell louver assembly of claim **26**, wherein, in a state in which each second cap in which the respective second electrode terminal is assembled is mounted on an inner frame, the respective first electrode terminal is provided to be inserted in a length direction of the inner frame, and the respective third electrode terminal is provided to be inserted in a direction perpendicular to the length direction of the inner frame.

29. The solar cell louver assembly of claim **15**, wherein:

the frame unit includes an inner frame and an outer frame surrounding the inner frame; and

when the plurality of second caps are mounted on the inner frame, the respective connector parts are provided to be disposed in a space between the inner frame and the outer frame.

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