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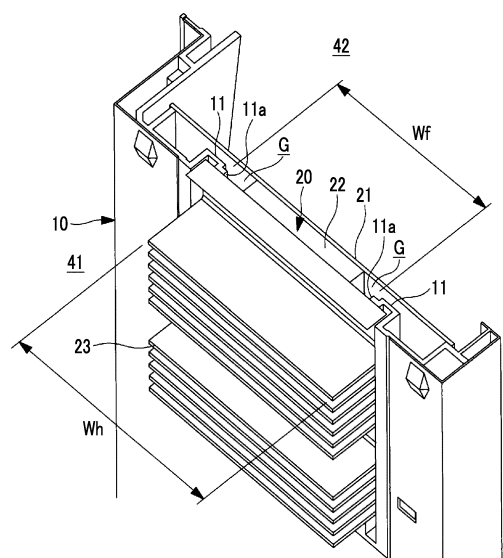
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(54) **OUTDOOR UNIT**

(57) Provided is an outdoor unit in which a waterproof structure can be installed between a heat exchange room and a machine room. The present invention comprises: a control box (10) that has two flange portions (11) with edges (11a) facing each other; and a substrate assembly (20) that has a plate-shaped substrate (21) and radiation fins (23) arranged at a gap (G) to the installation surface of the substrate (21) in the out-of-plane direction. The substrate assembly (20) is installed in the control box (10) in a state in which the flange portions (11) are interposed in the gap (G) between the substrate (21) and the radiation fins (23).

FIG. 5



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Description

Technical Field

[0001] The present disclosure relates to an outdoor unit that is included in an air conditioner for home use.

Background Art

[0002] In an outdoor unit that is included in an air conditioner for home use, a circuit substrate for control is provided between a heat exchange room and a machine room.

[0003] In the event of a substrate failure, it is necessary to replace the substrate on site. However, since the substrate is connected to a component such as a compressor or an electromagnetic valve by a wire and is surrounded by a plurality of panels, it takes time and effort to mount and dismount the substrate. Therefore, it is preferable to assemble the substrate with a simple configuration to improve the workability of mounting and dismounting.

[0004] In this respect, for example, PTL 1 discloses a configuration in which a substrate and a heat sink are integrated with a substrate holder and provided to be capable of being drawn upward along a guide rail.

Citation List

Patent Literature

[0005] [PTL 1] Japanese Unexamined Patent Application Publication No. 2012-241939

Summary of Invention

Technical Problem

[0006] Incidentally, in such a substrate configuration, rainwater or the like that has entered a heat exchange room from the outside of an outdoor unit may be repelled toward a machine room side by a rotating fan. If the rainwater enters the machine room side and touches the substrate, it may cause a failure.

[0007] The present disclosure has been made in view of such circumstances, and has an object to provide an outdoor unit in which a water shielding structure can be provided between a heat exchange room and a machine room.

Solution to Problem

[0008] In order to solve the above problem, the outdoor unit of the present disclosure adopts the following means.

[0009] That is, an outdoor unit according to an aspect of the present disclosure includes a housing having two flange portions with edges facing each other, and a substrate assembly having a plate-like substrate and a component provided with a gap in an out-of-plane direction

with respect to an installation surface of the substrate, in which the substrate assembly is provided in the housing in a state where each of the flange portions is interposed in the gap between the substrate and the component.

Advantageous Effects of Invention

[0010] According to the present disclosure, it is possible to provide a water shielding structure between the heat exchange room and the machine room.

Brief Description of Drawings

[0011]

Fig. 1 is a perspective view of an outdoor unit according to an embodiment of the present disclosure. Fig. 2 is a perspective view of the outdoor unit in a state where a top panel is removed.

Fig. 3 is a perspective view of the outdoor unit in a state where the top panel and a lid are removed.

Fig. 4 is a perspective view of a control box on which a substrate assembly is mounted.

Fig. 5 is a cross-sectional view taken along a cutting line V-V shown in Fig. 4.

Fig. 6 is a perspective view of the substrate assembly.

Fig. 7 is a partially enlarged view of Fig. 4.

Fig. 8 is a plan view of Fig. 7.

Fig. 9 is a plan view showing a modification example of the substrate assembly.

Description of Embodiments

[0012] Hereinafter, an outdoor unit according to an embodiment of the present disclosure will be described with reference to the drawings.

[0013] As shown in Figs. 1 and 2, an outdoor unit 1 includes an outdoor unit housing 31, a top panel 32, an outdoor heat exchanger 34, a fan 35, a control box (housing) 10, and a substrate assembly 20.

[0014] As shown in Fig. 2, the outdoor unit housing 31 is a box-shaped member having an open upper portion.

[0015] A discharge outlet 31a is formed on the front surface of the outdoor unit housing 31. The discharge outlet 31a has a substantially circular shape and is a portion through which air after heat exchange is blown out.

[0016] As shown in Fig. 1, the top panel 32 is mounted on the upper portion of the outdoor unit housing 31. The top panel 32 is a plate-like member and closes the open upper portion of the outdoor unit housing 31.

[0017] As shown in Fig. 2, a heat exchange room 41 and a machine room 42 are defined inside the outdoor unit housing 31.

[0018] Devices such as the outdoor heat exchanger 34 and the fan 35 are installed in the heat exchange room 41.

[0019] The outdoor heat exchanger 34 is a heat ex-

changer formed in a substantially L shape from the left side surface to the back surface inside the outdoor unit housing 31. A suction port (not shown) is formed in the outdoor unit housing 31 on the back surface side of the outdoor heat exchanger 34.

[0020] The fan 35 is disposed inside the outdoor unit housing 31 so as to face the discharge outlet 31a. The fan 35 is rotationally driven by an electric motor (not shown). In this way, the air outside the outdoor unit 1 is taken into the heat exchange room 41 through the suction port, and the air that has undergone heat exchange in the outdoor heat exchanger 34 is blown out through the discharge outlet 31a.

[0021] On the other hand, devices such as a compressor, an expansion valve, and an electromagnetic valve, which are not shown, are installed in the machine room 42 adjacent to the heat exchange room 41.

[0022] As shown in Figs. 2 and 3, the control box 10 is installed between the heat exchange room 41 and the machine room 42.

[0023] A lid 33 is provided above the control box 10 (refer to Fig. 2), and the control box 10 and the substrate assembly 20 can be easily accessed by removing the lid 33 (refer to Fig. 3).

[0024] As shown in Figs. 4 and 5, flange portions 11 having edges 11a are formed on both sides of the control box 10.

[0025] The edges 11a extend in a vertical direction (an up-down direction shown in the drawings) and face each other in a horizontal direction. In this case, the distance between the edges 11a (the width dimension of an opening) is W_f .

[0026] The substrate assembly 20 as shown in Fig. 6 is mounted on the control box 10 configured in this manner.

[0027] The substrate assembly 20 includes a substrate 21, a bracket 22, and radiation fins (components) 23.

[0028] The substrate 21 is a plate-like circuit substrate, and various electronic components required for control and operation are mounted on the mounting surface thereof.

[0029] The dimension of the substrate 21 in a width direction (a direction that coincides with the horizontal direction) is larger than the distance (the width W_f) between the flange portions 11.

[0030] The mounting surface is the surface on the machine room 42 side of the substrate 21.

[0031] The bracket 22 is a member provided on the installation surface of the substrate 21 and is a member for mounting the radiation fins 23 on the substrate 21.

[0032] The dimension in the width direction of the bracket 22 is smaller than the width W_f .

[0033] The installation surface is the surface on the heat exchange room 41 side of the substrate 21 and is the surface located on the side opposite to the mounting surface.

[0034] The radiation fins 23 are metallic members for cooling the substrate 21. The dimension (width W_h) in

the width direction of each of the radiation fins 23 is larger than the width W_f .

[0035] The radiation fins 23 are mounted on the installation surface of the substrate 21 through the bracket 22.

5 Therefore, the radiation fins 23 are separated from the installation surface by the amount corresponding to the thickness of the bracket 22 in the out-of-plane direction of the installation surface. That is, due to the bracket 22, gaps G are created between the radiation fins 23 and the substrate 21 in regions on both sides of the bracket 22.

10 **[0036]** The out-of-plane direction is the direction normal to a plane.

[0037] As shown in Figs. 5, 7, and 8, the substrate assembly 20 is mounted on the control box 10 in a form in which the flange portions 11 are inserted into the gaps G. That is, the substrate assembly 20 is mounted on the control box 10 in a state where the flange portions 11 are interposed between the substrate 21 and the radiation fins 23.

20 **[0038]** In this way, the control box 10 on which the substrate assembly 20 is mounted has a triple structure composed of the radiation fins 23, the flange portion 11, and the substrate 21.

[0039] The triple structure functions like a labyrinth structure at the boundary between the control box 10 and the substrate assembly 20. Accordingly, even if water flies from the heat exchange room 41, the water is blocked to reduce the possibility of the water entering the inside (the machine room 42 side) of the control box 10.

30 **[0040]** In the control box 10 and the substrate assembly 20 configured as described above, the gap G between the substrate 21 and the radiation fins 23 functions like a guide groove for the flange portion 11. Therefore, the substrate assembly 20 can be slid along the flange portions 11. In this way, a worker can easily mount and dismount the substrate assembly 20 with respect to the control box 10.

35 **[0041]** Another flange portion may be provided so as to connect the lower end of the flange portion 11 on one side and the lower end of the flange portion 11 on the other side. In this case, the other flange portion extends in the horizontal direction. The other flange portion is interposed between the substrate 21 and the radiation fins 23 similarly to the flange portions 11. Accordingly, a water shielding structure can be configured even with the other flange portion.

[0042] Further, the other flange portion may be brought into contact with a bottom portion of the bracket 22. Accordingly, the substrate assembly 20 can be positioned in the vertical direction.

50 **[0043]** The present embodiment has the following effects.

[0044] The outdoor unit 1 includes the control box 10 having the two flange portions 11 with the edges 11a facing each other, and the substrate assembly 20 having the plate-like substrate 21 and the radiation fins 23 provided with the gaps G in the out-of-plane direction with respect to the installation surface of the substrate 21, in

which the substrate assembly 20 is provided in the control box 10 in a state where each of the flange portions 11 is interposed in each of the gaps G between the substrate 21 and the radiation fins 23. Therefore, a triple structure in which the radiation fins 23, the flange portion 11, and the substrate 21 are arranged in order from the radiation fins 23 side is configured. Accordingly, even if water flies from the heat exchange room 41 side, the possibility of the water entering the machine room 42 side can be reduced. That is, a water shielding structure can be provided by the triple structure composed of the radiation fins 23, the flange portion 11, and the substrate 21 between the heat exchange room 41 and the machine room 42.

[0045] Further, since the edge 11a of each of the flange portions 11 extends in the vertical direction, the substrate assembly 20 can be mounted and dismounted with respect to the control box 10 only by sliding it in the vertical direction with the flange portions 11 interposed in the gaps G between the substrate 21 of the substrate assembly 20 and the radiation fins 23.

[0046] Further, since the control box 10 has another flange portion connected to the two flange portions 11 facing each other and the substrate assembly 20 is provided in the control box 10 in a state where the other flange portion is interposed in the gap G between the substrate 21 and the radiation fins 23, a water shielding structure can be configured even with the other flange portion.

[0047] Further, for example, in a case where the two flange portions 11 extend in the vertical direction, the other flange portion extends in the horizontal direction so as to connect the lower ends of the flange portions 11. At this time, the substrate assembly 20 can be positioned in the vertical direction by bringing the bottom portion of the bracket 22 into contact with the other flange portion.

[0048] Further, since the gap G is formed by the combination of the substrate 21 and the radiation fins 23, the radiation fins 23 which have been provided in the past can be used as a member for configuring the water shielding structure.

[Modification Example]

[0049] The component forming the gap G is not limited to the combination of the substrate 21 and the radiation fins 23.

[0050] For example, as shown in Fig. 9, the shape of the bracket 22 may be modified to form the gap G by combining the substrate 21 and the bracket 22.

[0051] The embodiment described above can be understood as follows, for example.

[0052] That is, an outdoor unit (1) according to an aspect of the present disclosure includes a housing (10) having two flange portions (11) with edges (11a) facing each other, and a substrate assembly (20) having a plate-like substrate (21) and a component (23) provided with

a gap (G) in an out-of-plane direction with respect to an installation surface of the substrate, in which the substrate assembly is provided in the housing in a state where each of the flange portions is interposed in the gap between the substrate and the component.

[0053] According to the outdoor unit according to this aspect, the outdoor unit includes the housing having the two flange portions with the edges facing each other, and the substrate assembly having the plate-like substrate and the component provided with the gap in the out-of-plane direction with respect to the installation surface of the substrate, in which the substrate assembly is provided in the housing in a state where each of the flange portions is interposed in the gap between the substrate and the component. Therefore, a triple structure in which the component, the flange portion, and the substrate are arranged in order from the component side is configured. Accordingly, even if water flies from the component side (for example, the heat exchange room side), the possibility of the water entering the inside of the housing (for example, the machine room side) can be reduced. That is, a water shielding structure can be provided by the triple structure composed of the component, the flange portion, and the substrate between the heat exchange room and the machine room.

[0054] Further, in the outdoor unit according to an aspect of the present disclosure, the edge portion of each of the flange portions extends in the vertical direction.

[0055] According to the outdoor unit according to this aspect, since the edge portion of each of the flange portions extends in the vertical direction, the substrate assembly can be mounted and dismounted with respect to the housing only by sliding it in the vertical direction with the flange portions interposed in the gaps between the substrate of the substrate assembly and the component.

[0056] Further, in the outdoor unit according to an aspect of the present disclosure, the housing has another flange portion connected to the two flange portion facing each other, and the substrate assembly is provided in the housing in a state where the other flange portion is interposed in the gap between the substrate and the component.

[0057] According to the outdoor unit according to this aspect, since the housing has another flange portion connected to the two flange portions facing each other and the substrate assembly is provided in the housing in a state where the other flange portion is interposed in the gap between the substrate and the component, a water shielding structure can be configured even with the other flange portion.

[0058] Further, for example, in a case where the two flange portions extend in the vertical direction, the other flange portion extends in the horizontal direction so as to connect the lower ends of the flange portions. At this time, the substrate assembly can be positioned in the vertical direction by bringing the bottom portion of the component configuring the substrate assembly into contact with the other flange portion.

[0059] Further, in the outdoor unit according to an aspect of the present disclosure, the component is a radiation fin (23).

[0060] According to the outdoor unit according to this aspect, since the component is the radiation fin, the component (radiation fin) that has been provided in the past can be used as a member for configuring the water shielding structure.

to 3, wherein the component is a radiation fin.

Reference Signs List

[0061]

1: outdoor unit	
10: control box (housing)	15
11: flange portion	
11a: edge	
20: substrate assembly	
21: substrate	
22: bracket	20
23: radiation fin (component)	
31: outdoor unit housing	
31a: discharge outlet	
32: top panel	
33: lid	25
34: outdoor heat exchanger	
35: fan	
41: heat exchange room	
42: machine room	30

Claims

1. An outdoor unit comprising:
 - a housing having two flange portions with edges facing each other; and
 - a substrate assembly having a plate-like substrate and a component provided with a gap in an out-of-plane direction with respect to an installation surface of the substrate, wherein the substrate assembly is provided in the housing in a state where each of the flange portions is interposed in the gap between the substrate and the component.
2. The outdoor unit according to Claim 1, wherein the edge of each of the flange portions extends in a vertical direction.
3. The outdoor unit according to Claim 1 or 2, wherein the housing has another flange portion connected to the two flange portions facing each other, and the substrate assembly is provided in the housing in a state where the other flange portion is interposed in the gap between the substrate and the component.
4. The outdoor unit according to any one of Claims 1

FIG. 1

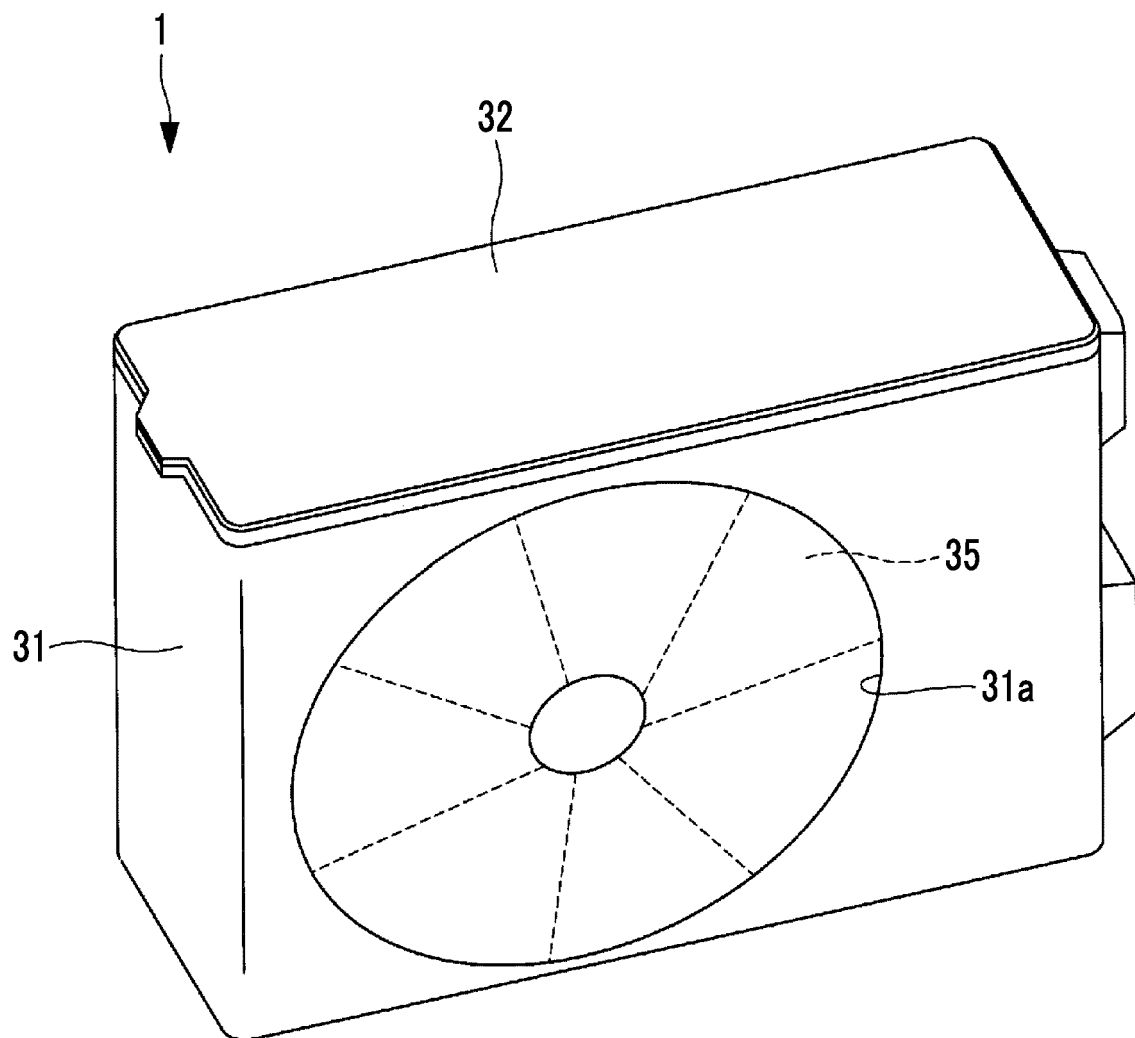


FIG. 2

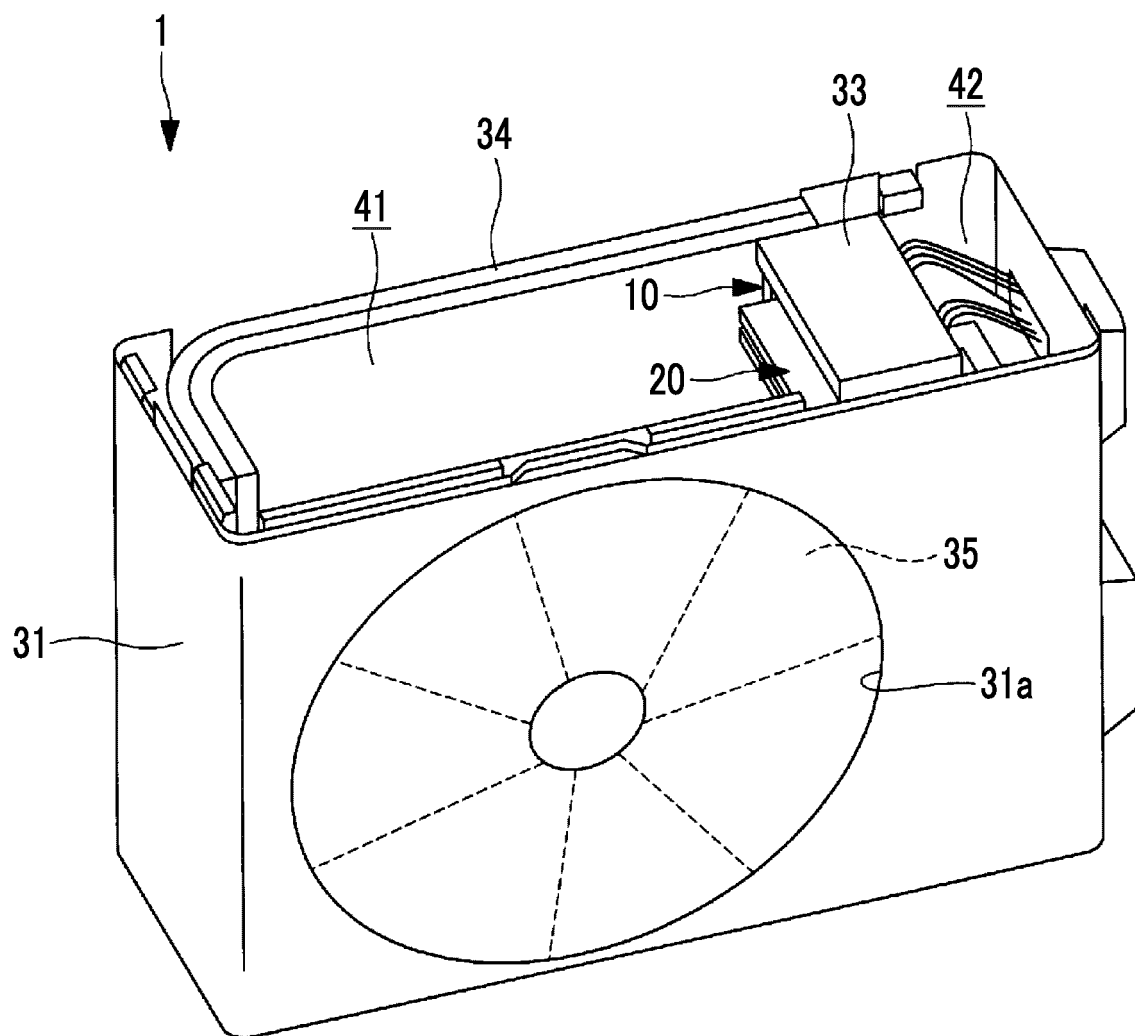


FIG. 3

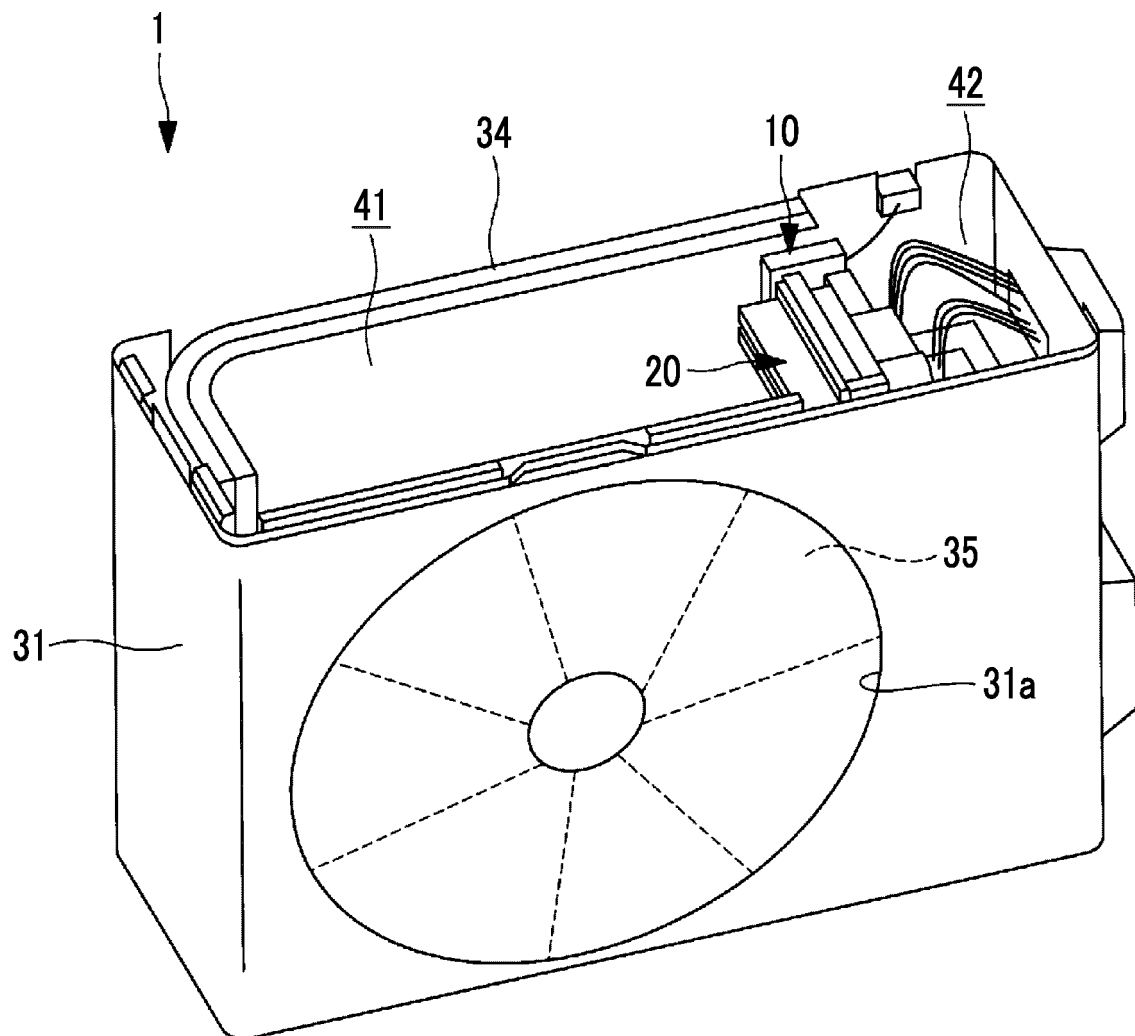


FIG. 4

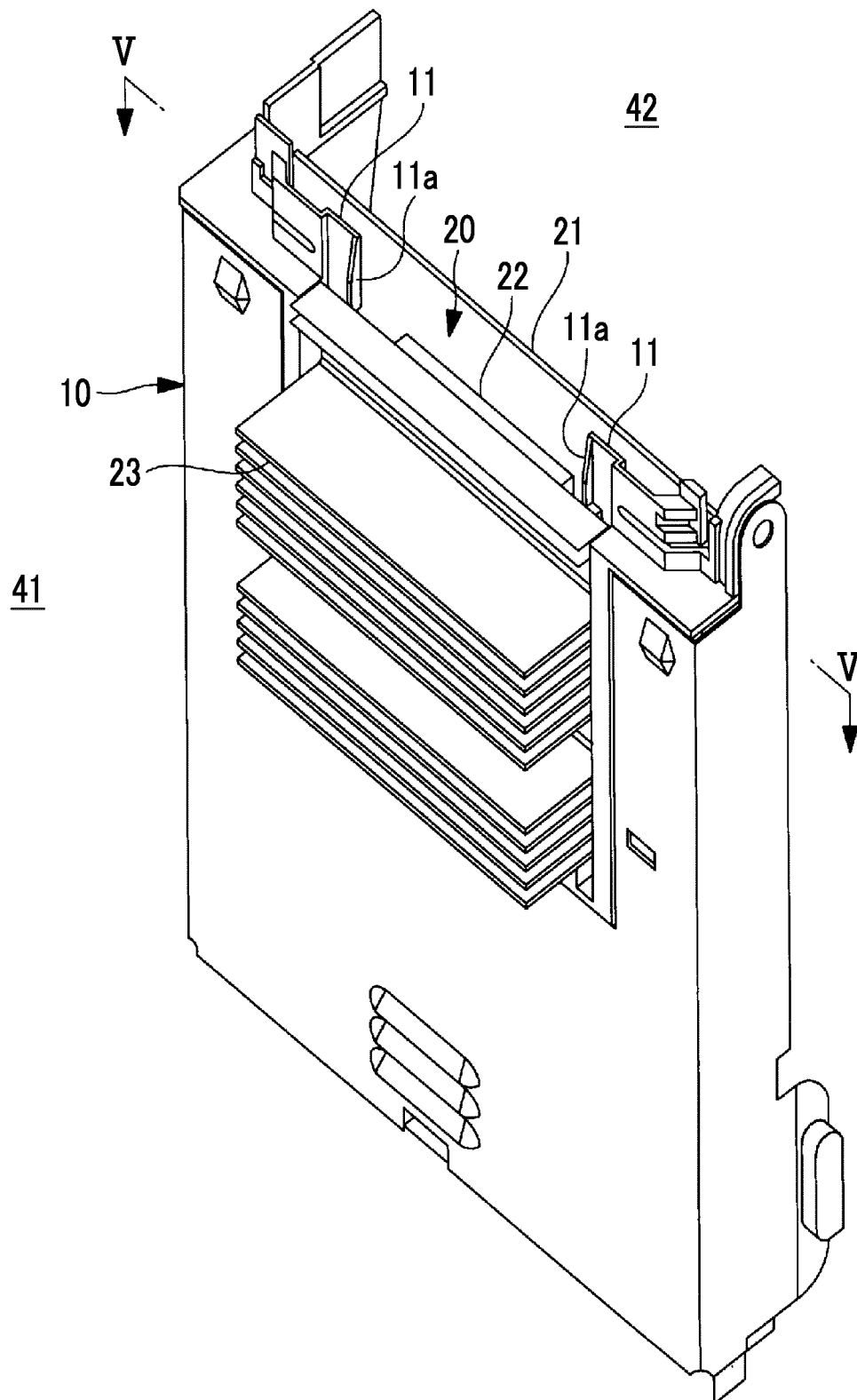


FIG. 5

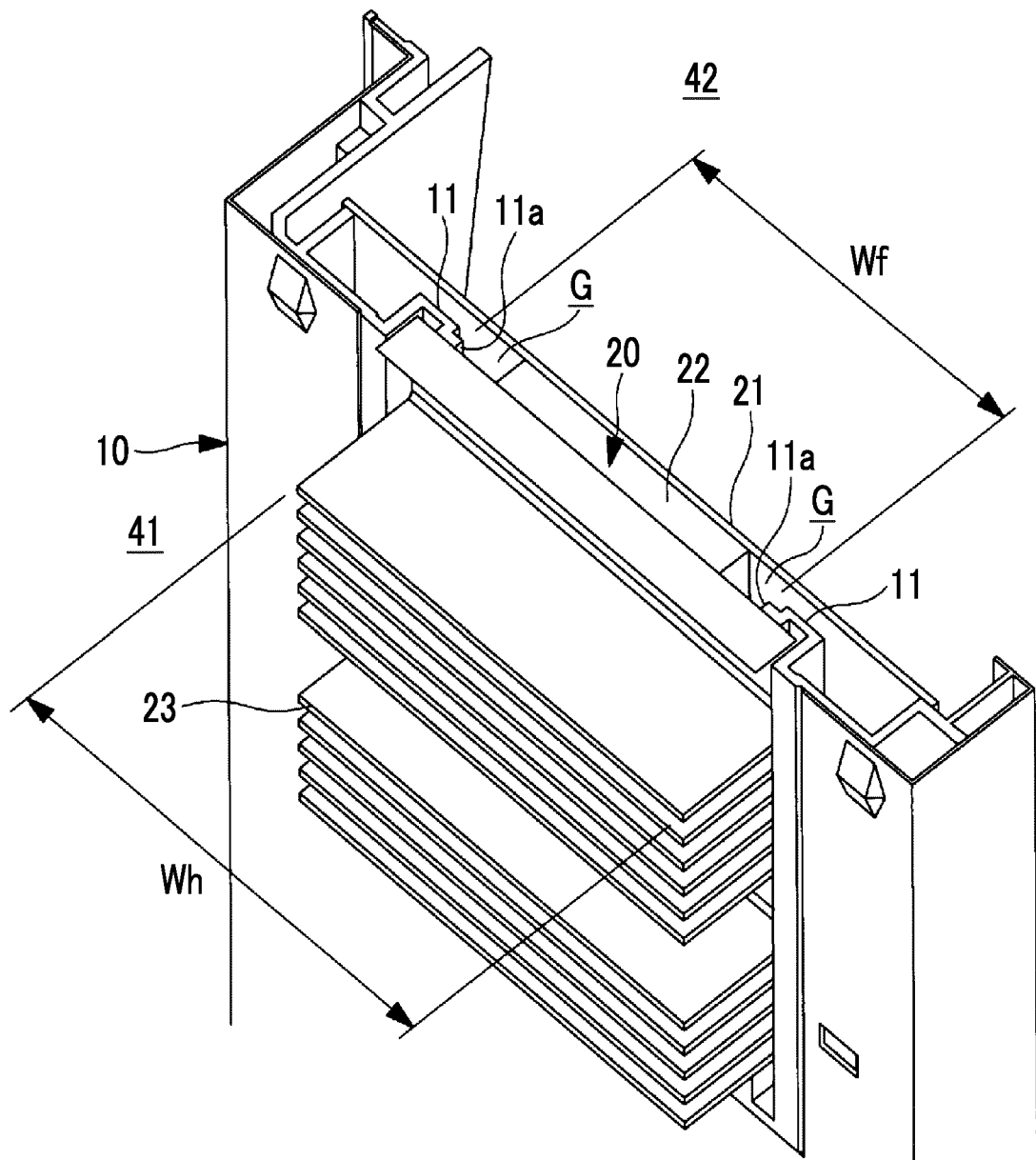


FIG. 6

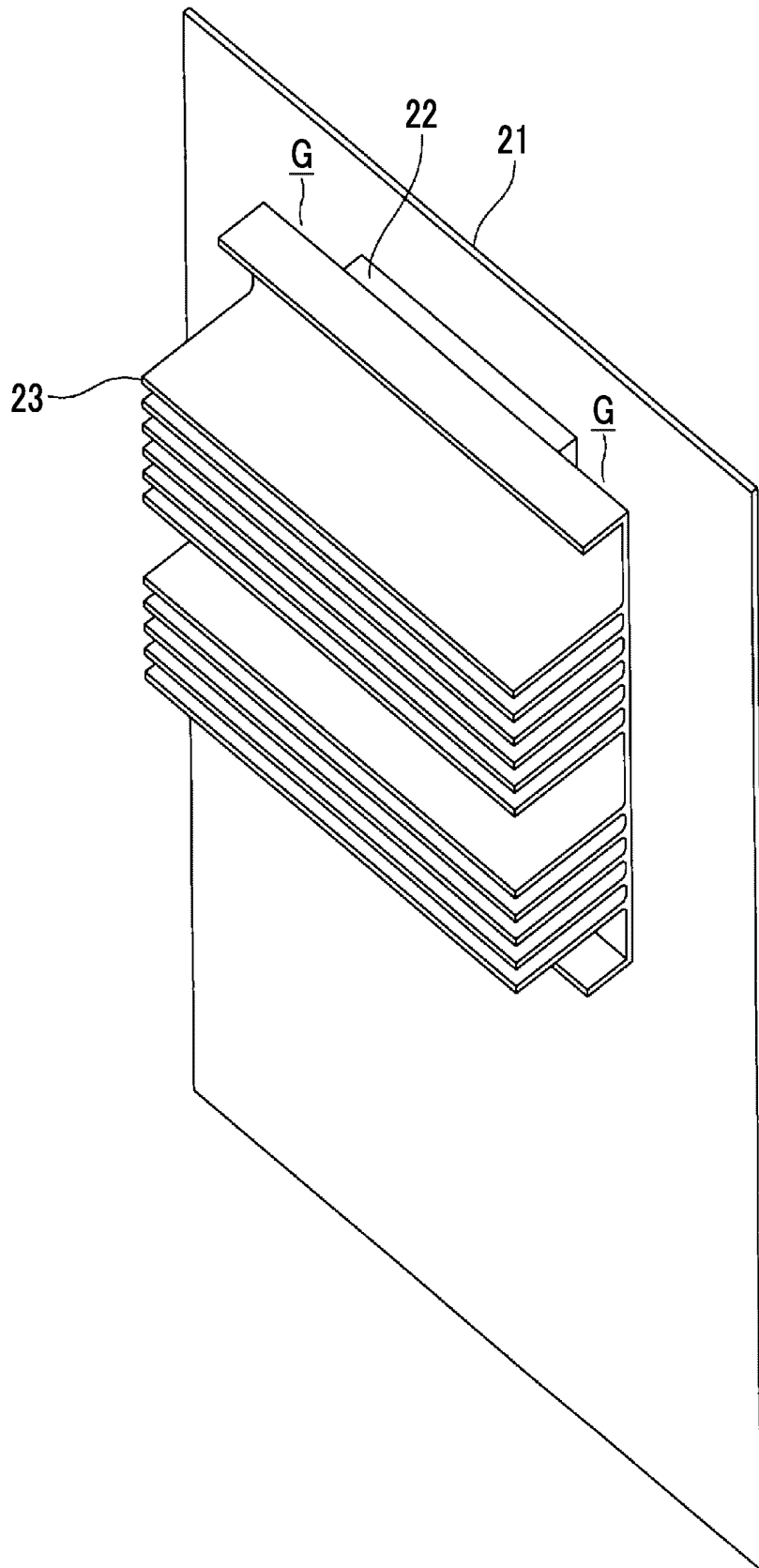


FIG. 7

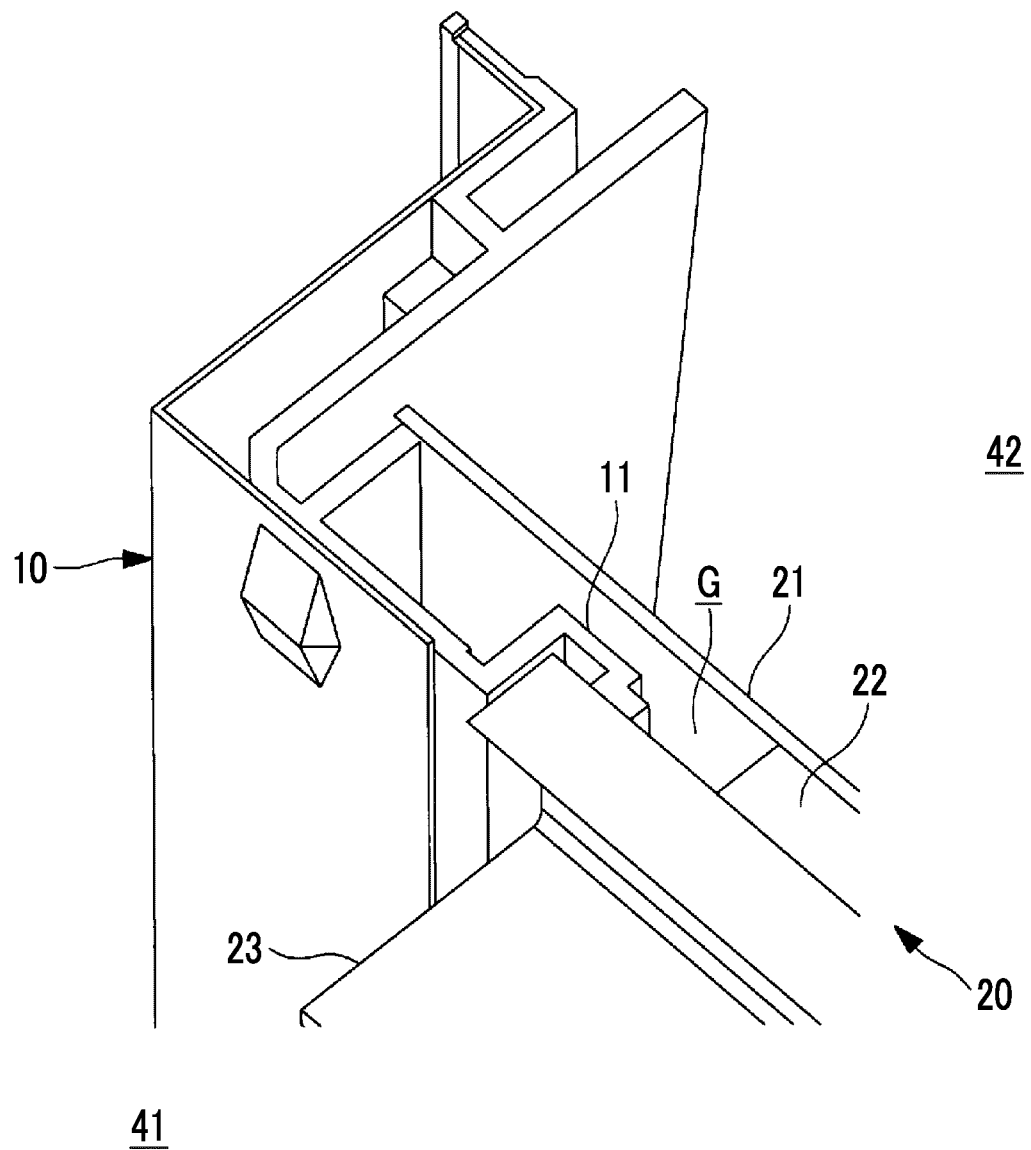


FIG. 8

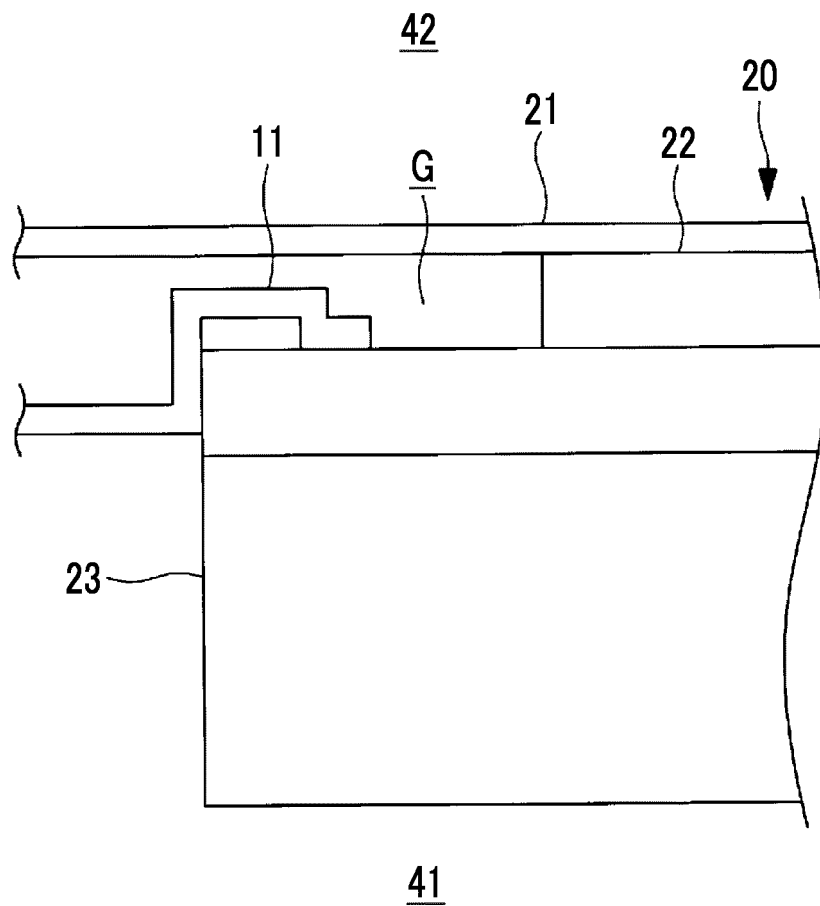
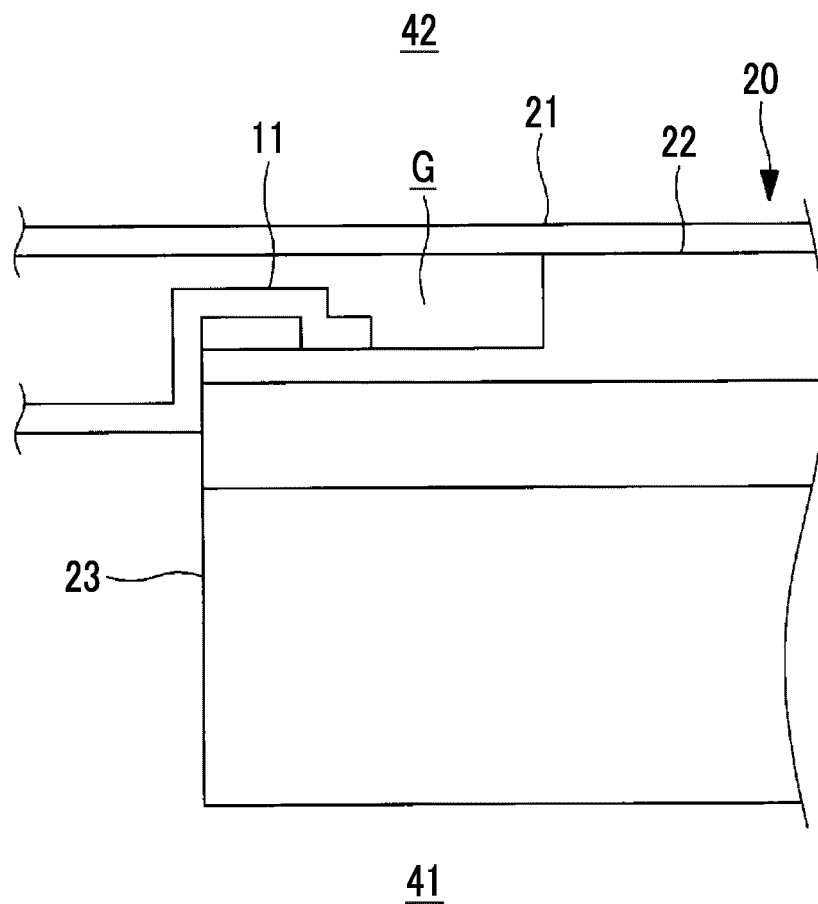


FIG. 9



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2022/005205

A. CLASSIFICATION OF SUBJECT MATTER <i>F24F 11/89</i> (2018.01)i; <i>F24F 1/22</i> (2011.01)i; <i>F24F 1/24</i> (2011.01)i FI: F24F1/22; F24F1/24; F24F11/89 According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) F24F11/89; F24F1/22; F24F1/24 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Published examined utility model applications of Japan 1922-1996 Published unexamined utility model applications of Japan 1971-2022 Registered utility model specifications of Japan 1996-2022 Published registered utility model applications of Japan 1994-2022 Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 08-320135 A (MITSUBISHI HEAVY IND LTD) 03 December 1996 (1996-12-03) paragraphs [0008]-[0014], fig. 1	1-4
Y	JP 2020-053649 A (PFU LTD) 02 April 2020 (2020-04-02) paragraphs [0010]-[0028], fig. 1-2	1-4
A	CN 110966688 A (GREE ELECTRIC APPLIANCES, INC. OF ZHUHAI) 07 April 2020 (2020-04-07) entire text, all drawings	1-4
☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
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Date of the actual completion of the international search 29 March 2022		Date of mailing of the international search report 12 April 2022
Name and mailing address of the ISA/JP Japan Patent Office (ISA/JP) 3-4-3 Kasumigaseki, Chiyoda-ku, Tokyo 100-8915 Japan		Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/JP2022/005205

Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
JP	08-320135	A	03 December 1996	(Family: none)	
JP	2020-053649	A	02 April 2020	(Family: none)	
CN	110966688	A	07 April 2020	(Family: none)	

REFERENCES CITED IN THE DESCRIPTION

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