(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 527 900 A1**

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
21.08.2019 Bulletin 2019/34

(21) Application number: **16918741.6**

(22) Date of filing: **11.10.2016**

(51) Int Cl.:
F24F 7/013 *(2006.01)*

(86) International application number:
PCT/JP2016/080121

(87) International publication number:
WO 2018/069963 (19.04.2018 Gazette 2018/16)

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
MA MD

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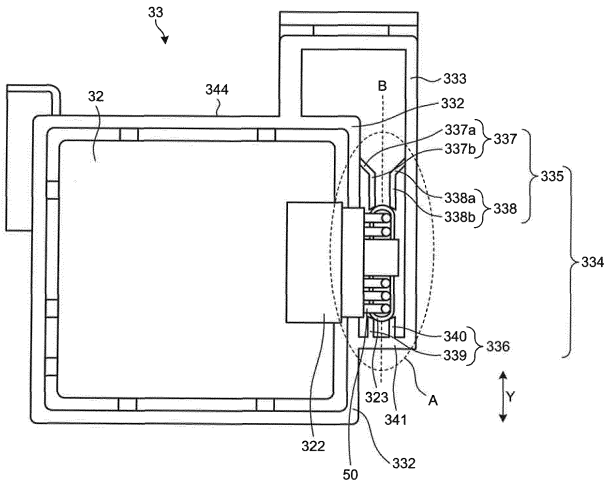
(54) **VENTILATION DEVICE**

(57) A ventilator apparatus includes a ventilator body, a case that houses the ventilator body, an operation display unit housed in the case, a control circuit unit housed in the case, and a lead (50) interconnecting the operation display unit and the control circuit unit. The operation display unit includes a unit case forming a housing, a display substrate (32) housed in the unit case, and a protection wall (333) to protect the lead (50), the protection wall being disposed outside one lateral face (332) of the unit case, in a spaced relationship with the one lateral face (332). The lead (50) drawn from the display substrate (32) to the outside of the one lateral face (332) is inserted through a gap between the one lateral face (332) and the protection wall (333), and drawn out of the operation display unit.

FIG.4



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Description

Field

[0001] The present invention relates to a ventilator apparatus including an operation display unit and a control circuit unit.

Background

[0002] A conventionally used ventilator apparatus includes a ventilator body having an air supply line, an air outlet line, and a heat exchanger formed therein, and provides ventilation while effecting heat exchange between an air supply flow flowing through the air supply line and an air outlet flow flowing through the air outlet line.

[0003] Such a ventilator apparatus, which is disclosed in Patent Literature 1, includes an operation display unit and a control circuit unit provided separately from the operation display unit. The operation display unit has a device such as a lamp for displaying an operating status on a front panel disposed on a front face of a case that houses the ventilator body. The control circuit unit controls the content displayed by the operation display unit, and controls the operating status of the ventilator body. The operation display unit and the control circuit unit are connected to each other by a flexible lead.

Citation List

Patent Literature

[0004] Patent Literature 1: Japanese Patent No. 4850546

Summary

Technical Problem

[0005] In order to prevent damage to the sheath of the lead interconnecting the operation display unit and the control circuit unit during assembling of the ventilator apparatus, the ventilator apparatus of Patent Literature 1 described above is required to prevent exposure of the lead. Thus, in order to protect the exposed lead, it is necessary to take measures such as covering the lead with another component, which results in a problem of an increase in the number of components.

[0006] In addition, when plural leads are used, a sheet bundles these plural leads together. Such a sheet for bundling the leads is thin enough to keep the flexibility of the lead from deteriorating. Such a thin sheet for bundling the leads together fails to provide an effect of preventing damage to the leads during assembling of the ventilator apparatus. Thus, there is a need for another dedicated component for protecting the leads.

[0007] The present invention has been made in view of the foregoing, and it is an object of the present invention to provide a ventilator apparatus that can protect a lead interconnecting internal component units without increasing the number of components.

Solution to Problem

[0008] To solve the above problem and achieve the object, a ventilator apparatus according to the present invention comprises: a ventilator body; a case to house therein the ventilator body; a first unit housed in the case; a second unit housed in the case; and a lead interconnecting the first unit and the second unit, wherein the first unit includes a unit case defining a housing, a functional unit housed in the unit case to perform a function of the first unit, and a protection wall to protect the lead, the protection wall being disposed outside one lateral face of the unit case in a spaced relationship with the one lateral face, and the lead drawn from the functional unit to an outside of the one lateral face is inserted through a gap between the one lateral face and the protection wall and drawn out of the first unit.

Advantageous Effects of Invention

[0009] A ventilator apparatus according to the present invention provides an advantageous effect of protecting a lead interconnecting between internal component units without increasing the number of components.

Brief Description of Drawings

[0010]

FIG. 1 is a perspective view illustrating a ventilator apparatus according to an embodiment of the present invention.

FIG. 2 is an exploded perspective view illustrating a configuration of the operation display unit of the ventilator apparatus according to the embodiment of the present invention.

FIG. 3 is a conceptual diagram illustrating the operation display unit and the control circuit unit connected to each other by a set of leads in a case of the ventilator apparatus according to the embodiment of the present invention.

FIG. 4 is a front view illustrating a state in which the set of leads interconnecting the operation display unit and the control circuit unit in the ventilator apparatus according to the embodiment of the present invention is held by a lead-holding fastener provided in the operation display unit.

FIG. 5 is an enlarged view of a main portion of FIG. 4.

FIG. 6 is a perspective view illustrating an operation display case of the ventilator apparatus according to the embodiment of the present invention.

Description of Embodiment

[0011] A ventilator apparatus according to an embodiment of the present invention will be described in detail below with reference to the drawings. Note that the embodiment is not intended to limit the scope of the present invention.

Embodiment

[0012] FIG. 1 is a perspective view illustrating a ventilator apparatus 100 according to an embodiment of the present invention. The ventilator apparatus 100 illustrated in FIG. 1 has an elongated shape extending in a horizontal direction, and is installed on an upper portion of a wall (not illustrated) in a room. FIG. 1 illustrates the ventilator apparatus 100 as viewed from the lower right.

[0013] The ventilator apparatus 100 includes a ventilator body 10, an elongated-box-shaped case 20, an operation display unit 30, and a control circuit unit 40. The case 20 houses therein the ventilator body 10. The operation display unit 30 is housed in the case 20 together with the ventilator body 10. The operation display unit 30, which controls the operation of the ventilator apparatus 100 and displays the operating status of the ventilator apparatus 100, is disposed such that the operation display unit 30 is viewable through a view window 25 provided on the case 20. The control circuit unit 40, which is electrically connected to the operation display unit 30, is capable of communicating with the operation display unit 30. The control circuit unit 40 is a functional unit that outputs a control signal to the operation display unit 30. That is, the ventilator apparatus 100 has the operation display unit 30 that is a first unit housed in the case 20, and the control circuit unit 40 that is a second unit housed in the case 20 separately from the operation display unit 30.

[0014] The ventilator body 10 includes a fan, a motor, a heat exchanger, an air duct, and the like, all not illustrated, to ventilate the room. The case 20 is made up of a front case 21 and a main case 22. The front case 21 covers the front face of the main case 22. The main case 22 houses therein the ventilator body 10 and the control circuit unit 40. An inlet port 23 that takes in air from the room is provided on a bottom face of the front case 21 is. An outlet port 24 that blows fresh air out of the ventilator body 10 into the room is provided on one end portion of the front face of the front case 21. The view window 25 that allows the operation display unit 30 to be inserted therethrough is provided on a lower portion of the other end portion of the front face of the front case 21.

[0015] FIG. 2 is an exploded perspective view illustrating a configuration of the operation display unit 30 of the ventilator apparatus 100 according to the embodiment of the present invention. FIG. 3 is a conceptual diagram illustrating the operation display unit 30 and the control circuit unit 40 connected to each other by a set of leads 50 in the case 20 of the ventilator apparatus 100 according to the embodiment of the present invention. In FIGS. 2 and 3, the X-direction is defined as the depth direction of the ventilator apparatus 100 and the operation display unit 30. FIG. 4 is a front view illustrating a state in which the set of leads 50 interconnecting the operation display unit 30 and the control circuit unit 40 in the ventilator apparatus 100 according to the embodiment of the present invention is held by a lead-holding fastener 334 provided in the operation display unit 30. FIG. 5 is an enlarged view of a portion A of FIG. 4. FIG. 6 is a perspective view illustrating an operation display case 33 of the ventilator apparatus 100 according to the embodiment of the present invention.

[0016] The operation display unit 30 includes an operation display portion 31, a display substrate 32, and the operation display case 33. The operation display portion 31, which acts as a functional unit to perform a function of the operation display unit 30, controls the operation of the ventilator apparatus 100 and displays the operating status of the ventilator apparatus 100. The display substrate 32, which acts as another functional unit to perform a function of the operation display unit 30, includes lamps 321 for displaying the operating status of the ventilator apparatus 100. The operation display case 33 houses the display substrate 32 therein. The operation display case 33 has, on its front face, an opening for attachment of the operation display portion 31 therein.

[0017] The operation display portion 31 includes a button operation portion 311, a light receiving portion 312, and lamp display portions 313. The button operation portion 311 includes an operational button for operating the ventilator apparatus 100. The light receiving portion 312 receives an infrared optical operational signal from the outside. The lamp display portions 313 display the operating status of the ventilator apparatus 100 on the front face viewable through the view window 25. The operation display portion 31 is attached in the opening of the operation display case 33 to thereby provide a part of the housing of the operation display unit 30.

[0018] The light receiving portion 312 is a portion that receives an infrared optical operational signal emitted from an external device not illustrated, such as a remote controller. For the light receiving portion 312 to effectively receive an optical operational signal from an obliquely downward direction, the light receiving portion 312 has, in front of a light-receiving element (not illustrated) that receives infrared radiation, a cover that blocks an optical signal from a direction other than the obliquely downward direction.

[0019] The lamp display portions 313 have openings through which light of the lamps 321 of the display substrate 32 described later is viewable. The plural lamps 321 are viewable through the openings, and one of the lamps 321 that corresponds to the operating status is lit to thereby indicate the operating status. The plural lamps 321 are lit in different colors.

[0020] The display substrate 32 includes the lamps 321 of plural colors protruding toward the operation display

portion 31. The lamps 321 have their different colors set for the different operating statuses of the ventilator apparatus 100. The display substrate 32 includes a connector unit 322 connected to a set of signal lines that interconnects the operation display unit 30 and the control circuit unit 40. More specifically, the connector unit 322 is connected to a set of leads 50 that is the set of signal lines interconnecting the display substrate 32 the control circuit unit 40. The connector unit 322 is connected to the lamps 321, the button operation portion 311, and the light receiving portion 312 through wiring not illustrated. The set of leads 50 has one end connected to the connector unit 322, and has the other end drawn out from the operation display unit 30 and connected to the control circuit unit 40. The connector unit 322 is connected to the set of plural leads 50 arranged in a line. Thus, the lamps 321, the button operation portion 311, and the light receiving portion 312 are electrically connected to the control circuit unit 40 through wiring (not illustrated) and the set of leads 50 and thus capable of communicating with the control circuit unit 40. Note that FIG. 2 illustrates only one end of the set of leads 50.

[0021] The operation display case 33, which is a part of the housing of the operation display unit 30, is formed of a resin material and has a hollow rectangular parallelepiped shape having one face opened. The rectangular parallelepiped shape of the operation display case 33 has the front face facing the operation display portion 31, and the front face defines an opening 331 through which the display substrate 32 can be received inside the operation display case 33. The operation display portion 31 is attached in the opening 331 defined by the front face of the operation display case 33. That is, the operation display case 33 and the operation display portion 31 jointly form a unit case that serves as the housing of the operation display unit 30.

[0022] The operation display case 33 has one lateral face 332 corresponding to the side where the connector unit 322 of the display substrate 32 is disposed. The operation display case 33 also has a protection wall 333 disposed outside one lateral face 332 for protecting the set of leads 50. The protection wall 333 is spaced apart from the one lateral face 332 by a predetermined interval, in parallel with the one lateral face 332. That is, the protection wall 333, which is provided outside the one lateral face 332 in a spaced relation with the one lateral face 332, protects the set of leads 50. The protection wall 333 is joined through a lower joining face 341 to the one lateral face 332 of the operation display case 33. In addition, the protection wall 333 is joined through a bent, upper joining face 343 to a top face 344 of the operation display case 33.

[0023] The protection wall 333 is formed of a resin material, and is formed integrally with the operation display case 33. That is, the protection wall 333 is formed concurrently with formation of the operation display case 33; thus, it is not necessary to individually provide a step for forming the protection wall 333 and a step for attaching the protection wall 333.

[0024] When the operation display unit 30 is assembled, that is, when the display substrate 32 is housed in the operation display case 33, the set of leads 50 has the other end portion thereof drawn out of the operation display unit 30. The set of leads 50 extending from the operation display unit 30 is routed inside the main case 22 along a predetermined route between components of the ventilator body 10, and is then connected to the control circuit unit 40.

[0025] In the present embodiment, as illustrated in FIGS. 2, 4, and 5, the protection wall 333 is provided outside the one lateral face 332 of the operation display case 33 of the operation display unit 30. The gap between the one lateral face 332 and the protection wall 333 communicates with the outside of the operation display unit 30 to allow the set of leads 50 to pass therethrough. That is, the gap between the one lateral face 332 and the protection wall 333, which extends from the inside of the operation display unit 30 to the outside of the operation display unit 30, defines an insertion passageway through which the set of leads 50 connected to the display substrate 32, i.e., the set of leads 50 connected to the connector unit 322 is insertable.

[0026] The set of leads 50 connected to the display substrate 32, i.e., the set of leads 50 connected to the connector unit 322, which is arranged in a line, is bundled by a thin sheet 323. The other end portion of the set of leads 50 passes through the gap between the one lateral face 332 and the protection wall 333 of the operation display case 33, and is drawn out of the operation display unit 30 through the back of the operation display case 33 in the depth direction as illustrated in FIG. 3. When the operation display unit 30 is assembled, the protection wall 333 is provided over a range from the connector unit 322 to the rear end portion of the operation display case 33 in the depth direction of the operation display case 33. The depth direction of the operation display unit 30 and of the operation display case 33 is the same as the depth direction of the ventilator apparatus 100, and is the X-direction in FIGS. 2 and 3.

[0027] Since the operation display unit 30 includes the protection wall 333 outside the one lateral face 332 of the operation display case 33, the set of leads 50 facing the one lateral face 332 of the operation display unit 30 is protected by the protection wall 333 without being exposed. That is, the set of leads 50 drawn from the display substrate 32 to the outside of the one lateral face 332 passes through the gap between the one lateral face 332 and the protection wall 333 and is then drawn out of the operation display unit 30. Since the set of leads 50 drawn out of the one lateral face 332 and facing the one lateral face 332 is not exposed externally, it becomes possible to prevent the set of leads 50 from being damaged and other component from pinching the set of leads 50 during assembling of the ventilator apparatus 100. Moreover, it is not necessary to provide an additional dedicated component for protecting the set of exposed leads 50, thereby

reducing the cost.

[0028] If the operation display unit 30 does not include the protection wall 333, the other end portion of the set of leads 50 would remain exposed outside the one lateral face 332 of the operation display case 33. This may damage the set of leads 50 and/or cause other component to pinch the set of leads 50 during assembling of the ventilator apparatus 100. In order to prevent the set of leads 50 from being damaged and other component from pinching the set of leads 50, an additional dedicated component for protecting the set of exposed leads 50 would be required, which would increase the number of components.

[0029] In contrast, the present embodiment eliminates the need to provide the additional dedicated component since the operation display unit 30 includes the protection wall 333 outside the one lateral face 332 of the operation display case 33. Thus, it becomes possible to protect the set of leads 50 without increasing the number of components.

[0030] As illustrated in FIGS. 4 and 5, the operation display unit 30 also includes the lead-holding fastener 334 having a slot shape. The lead-holding fastener 334 presses and secures, in the vertical direction, the set of leads 50 passing through the gap between the one lateral face 332 and the protection wall 333. The vertical direction herein corresponds to the direction in which the plural leads 50 bundled together by the thin sheet 323 are arranged in a line, and also corresponds to the Y-direction in FIGS. 2 to 5. Being bundled by the thin sheet 323 and secured by the lead-holding fastener 334, the set of leads 50 passes through the gap between the one lateral face 332 and the protection wall 333 and is drawn out of the operation display unit 30.

[0031] The lead-holding fastener 334 is provided along the depth direction of the operation display case 33, that is, along the X-direction in FIGS. 2 and 3. The lead-holding fastener 334 presses and secures the set of leads 50 in the vertical direction. That is, the lead-holding fastener 334 is made up of an upper lead-holding fastener part 335 and a lower lead-holding fastener part 336. The upper lead-holding fastener part 335 is disposed above the set of leads 50 in the gap between the one lateral face 332 of the operation display case 33 and the protection wall 333. The lower lead-holding fastener part 336 is disposed below the set of leads 50 in the gap between the one lateral face 332 of the operation display case 33 and the protection wall 333.

[0032] Insertion of the set of leads 50 between the upper lead-holding fastener part 335 and the lower lead-holding fastener part 336 causes the upper lead-holding fastener part 335 and the lower lead-holding fastener part 336 to press and thus secure the set of leads 50 in the vertical direction. That is, the upper lead-holding fastener part 335 limits the vertical movement of the uppermost lead 50 of the plural leads 50 bundled together by the thin sheet 323, and thus secures the plural leads 50. Moreover, the lower lead-holding fastener part 336 limits the vertical movement of the lowermost lead 50 of the plural leads 50 bundled together by the thin sheet 323, and thus secures the plural leads 50. Note that the upper lead-holding fastener part 335 and the lower lead-holding fastener part 336 each have a slot shape having a gap smaller than the thickness of the plural leads 50 bundled together by the thin sheet 323.

[0033] The upper lead-holding fastener part 335 is made up of a first upper lead-holding fastener section 337 and a second upper lead-holding fastener section 338. The first upper lead-holding fastener section 337 and the second upper lead-holding fastener section 338 are disposed correspondingly to each other between the one lateral face 332 of the operation display case 33 and the inner surface of the protection wall 333 in a planar direction of the protection wall 333. The first upper lead-holding fastener section 337 and the second upper lead-holding fastener section 338 are symmetric about an imaginary plane B. The imaginary plane B extends in parallel to the planar direction of the protection wall 333 and is located midway between the first upper lead-holding fastener section 337 and the second upper lead-holding fastener section 338.

[0034] The first upper lead-holding fastener section 337 is made up of an upper first projection portion 337a and an upper first parallel portion 337b. The upper first projection portion 337a has one end side connected to the one lateral face 332 of the operation display case 33 and projects toward the protection wall 333. The upper first parallel portion 337b extends downward from the other end side of the upper first projection portion 337a in parallel to the one lateral face 332 of the operation display case 33. The second upper lead-holding fastener section 338 is made up of an upper second projection portion 338a and an upper second parallel portion 338b. The upper second projection portion 338a has one end side connected to the inner surface of the protection wall 333 and projects toward the one lateral face 332 of the operation display case 33. The upper second parallel portion 338b extends downward from the other end side of the upper second projection portion 338a in parallel to the inner surface of the protection wall 333.

[0035] The upper first parallel portion 337b and the upper second parallel portion 338b are disposed spaced apart from each other by a predetermined interval smaller than the thickness of the leads 50 and thin sheet 323. An interval L1 between the upper first parallel portion and the upper second parallel portion is smaller than the thickness L3 of the leads and sheet 323, such that the set of leads 50 and the thin sheet 323 do not enter the interval between the upper first parallel portion 337b and the upper second parallel portion 338b. As a result, the plural leads 50 bundled together by the thin sheet 323 is held without moving upward and thus can be secured.

[0036] Note that if the plural leads not bundled by the thin sheet 323 is inserted through the gap between the one lateral face 332 of the operation display case 33 and the protection wall 333, the upper first parallel portion

337b and the upper second parallel portion 338b are disposed spaced apart from each other by a predetermined interval smaller than the thickness of each of the leads 50. Since the interval L1 between the upper first parallel portion and the upper second parallel portion is smaller than the thickness of the leads 50, the set of leads 50 does not enter the gap between the upper first parallel portion 337b and the upper second parallel portion 338b. As a result, the set of leads 50 is held without moving upward and thus can be secured.

[0037] Similarly, the lower lead-holding fastener part 336 is made up of a first lower lead-holding fastener section 339 and a second lower lead-holding fastener section 340. The first lower lead-holding fastener section 339 and the second lower lead-holding fastener section 340 are disposed correspondingly to each other between the one lateral face 332 of the operation display case 33 and the inner surface of the protection wall 333 in the planar direction of the protection wall 333. The first lower lead-holding fastener section 339 and the second lower lead-holding fastener section 340 are symmetric about the imaginary plane that extends in parallel to the planar direction of the protection wall 333 and is located midway between the first lower lead-holding fastener section 339 and the second lower lead-holding fastener section 340.

[0038] The first lower lead-holding fastener section 339, which is located closer to the one lateral face 332 than to the protection wall 333 between the one lateral face 332 of the operation display case 33 and the protection wall 333, projects upward from an inner surface of the joining face 341 in parallel to the planar direction of the protection wall 333. The second lower lead-holding fastener section 340, which is located closer to the protection wall 333 than to the one lateral face 332 between the one lateral face 332 of the operation display case 33 and the protection wall 333, projects upward from the inner surface of the joining face 341 in parallel to the planar direction of the protection wall 333. The joining face 341 interconnects the one lateral face 332 of the operation display case 33 and the protection wall 333.

[0039] The first lower lead-holding fastener section 339 and the second lower lead-holding fastener section 340 are disposed spaced apart from each other by a predetermined interval smaller than the thickness of the leads 50 and thin sheet 323. The interval L2 between the first lower lead-holding fastener section and the second lower lead-holding fastener section is smaller than the thickness L3 of the leads and sheet, such that the set of leads 50 and the thin sheet 323 do not enter the gap between the first lower lead-holding fastener section 339 and the second lower lead-holding fastener section 340. As a result, the plural leads 50 bundled together by the thin sheet 323 are held without moving downward and thus can be secured.

[0040] Note that if the plural leads not bundled by the thin sheet 323 is inserted through the interval between the one lateral face 332 of the operation display case 33 and the protection wall 333, the first lower lead-holding fastener section 339 and the second lower lead-holding fastener section 340 are disposed spaced apart from each other by a predetermined interval smaller than the thickness of the leads 50. Since the interval between the first lower lead-holding fastener section 339 and the second lower lead-holding fastener section 340 is smaller than the thickness of the leads 50, the set of leads 50 does not enter the interval between the first lower lead-holding fastener section 339 and the second lower lead-holding fastener section 340. As a result, the set of leads 50 is held without moving downward and thus can be secured.

[0041] Note that the configuration of the lead-holding fastener 334 is not limited to that described above as long as the uppermost lead 50 of the plural leads 50 bundled together by the thin sheet 323 can be retained at a same position in the vertical direction.

[0042] The operation display case 33 also includes a fitting portion 342 at an end portion 332a of the one lateral face 332. The fitting portion 342 corresponds to the side of the display substrate 32 where the connector unit 322 is disposed on the display substrate 32. The set of leads 50 drawn from the display substrate 32 passes through the fitting portion 342. The fitting portion 342 is a positioning cut-out for helping identify the position where the set of leads 50 is connected to the display substrate 32. That is, the fitting portion 342 is the cut-out portion for positioning, on the end portion 332a of the one lateral face 332, the set of leads 50 drawn from the display substrate 32 to the outside of the one lateral face 332.

[0043] Providing the end portion 332a of the one lateral face 332 with the fitting portion 342 helps identify the connection position for connecting the set of leads 50 to the connector unit 322 of the display substrate 32 housed in the operation display case 33. That is, the provision of the fitting portion 34 facilitates identifying the connection position for connecting a male connector defined by one portion of the connector unit 322 of the display substrate 32 to a female connector defined by another portion of the connector unit 322. The male connector is connected to one end of the set of leads 50. This facilitates positioning of the set of leads 50. Although in the present embodiment the connector unit 322 bundles the one end side of the plural leads 50, if the connector unit 322 is not used, the advantageous effect of facilitating the positioning of the set of leads 50 can be achieved.

[0044] Since the set of leads 50 fits in the fitting portion 342, the connector unit 322 to which the set of leads 50 is connected is positioned and secured to thereby prevent the set of leads 50 from freely sliding. This can prevent a pinch on the set of leads 50 in forming the operation display unit 30 with the operation display portion 31 engaged with the operation display case 33; thus, operability in assembling the operation display unit 30 is improved.

[0045] Note that although the protection wall 333 has been described as being provided over a range from the connector unit 322 to the rear end portion of the operation

display case 33 in the depth direction of the operation display case 33, the protection wall 333 may be provided over a part of the range from the connector unit 322 to the rear end portion of the operation display case 33.

[0046] Although the ventilator apparatus 100 according to the present embodiment described above is a heat exchange ventilator apparatus including a heat exchanger, the configuration of the operation display unit 30 described above is applicable not only to a heat exchange ventilator apparatus, but also to a ventilator apparatus that performs only ventilation without a heat exchanger.

[0047] As described above, in the ventilator apparatus 100 according to the present embodiment, the operation display case 33 of the operation display unit 30 includes the protection wall 333 that protects the set of leads 50, the protection wall being disposed outside the route on which the set of leads 50 passes from the display substrate 32 to the outside of the operation display unit 30 along the one lateral face 332 of the operation display case 33. This can prevent damage to the sheaths of the leads 50 interconnecting the operation display unit 30 and the control circuit unit 40 during assembling of the ventilator apparatus 100, without adding another dedicated component for protecting the set of leads 50.

[0048] In addition, since the protection wall 333 is formed from resin concurrently with formation of the operation display case 33, it is not necessary to individually provide a step for forming the protection wall 333 and a step for attaching the protection wall 333.

[0049] The ventilator apparatus 100 includes the fitting portion 342 on the end portion 332a of the one lateral face 332 of the operation display case 33, the fitting portion 342 allowing the set of leads 50 drawn from the display substrate 32 to pass therethrough. This configuration can prevent a pinch on the set of leads 50 in forming the operation display unit 30 with the operation display portion 31 engaged with the operation display case 33; thus, operability in assembling of the operation display unit 30 is improved.

[0050] Thus, according to the ventilator apparatus 100 according to the present embodiment, the set of leads 50 interconnecting the operation display unit 30 and the control circuit unit 40, both of which are internal units of the ventilator apparatus 100, can be protected without an increase in the number of components.

[0051] The configurations described in the foregoing embodiment are merely examples of various aspects of the present invention. These configurations may be combined with a known other technology, and moreover, a part of such configurations may be omitted and/or modified without departing from the spirit of the present invention.

Reference Signs List

[0052] 10 ventilator body; 20 case; 21 front case; 22 main case; 23 inlet port; 24 outlet port; 25 view window; 30 operation display unit; 31 operation display portion; 32 display substrate; 33 operation display case; 40 control circuit unit; 50 lead; 100 ventilator apparatus; 311 button operation portion; 312 light receiving portion; 313 lamp display portion; 321 lamp; 322 connector unit; 323 sheet; 331 opening; 332 one lateral face; 332a end portion; 333 protection wall; 334 lead-holding fastener part; 335 upper lead-holding fastener part; 336 lower lead-holding fastener section; 337 first upper lead-holding fastener section; 337a upper first projection; 337b upper first parallel portion; 338 second upper lead-holding fastener section; 338a upper second projection; 338b upper first parallel portion; 339 first lower lead-holding fastener section; 340 second lower lead-holding fixture; 341 joining face; 342 fitting portion; L1 gap between the upper first parallel portion and the upper second parallel portion; L2 interval between the first lower lead-holding fixture and the second lower lead-holding fixture; L3 thickness of the leads and sheet.

Claims

1. A ventilator apparatus comprising:

a ventilator body;
a case to house therein the ventilator body;
a first unit housed in the case;
a second unit housed in the case; and
a lead interconnecting the first unit and the second unit,
wherein
the first unit includes

a unit case defining a housing,
a functional unit housed in the unit case to perform a function of the first unit, and
a protection wall to protect the lead, the protection wall being disposed outside one lateral face of the unit case in a spaced relationship with the one lateral face, and

the lead drawn from the functional unit to an outside of the one lateral face is inserted through a gap between the one lateral face and the protection wall and drawn out of the first unit.

2. The ventilator apparatus according to claim 1, wherein the first unit includes a holding fastener to press and secure the lead within the gap.

3. The ventilator apparatus according to claim 1 or 2, wherein the first unit includes a cut-out portion to position, on an end portion of the one lateral face, the lead drawn from the functional unit to the outside of the one lateral face.

4. The ventilator apparatus according to any one of claims 1 to 3,

wherein
the first unit is an operation display unit in which the functional unit controls an operation of the ventilator apparatus, and displays an operating status of the ventilator apparatus, and
the second unit is a control circuit unit to output a control signal to the operation display unit.

FIG.1

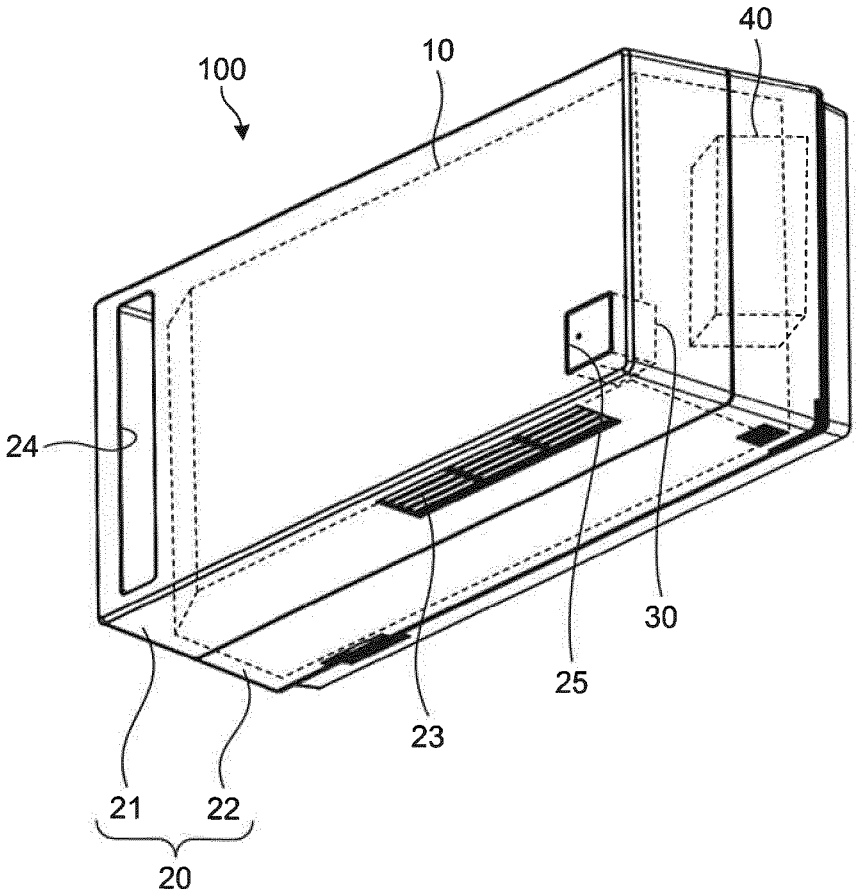


FIG.2

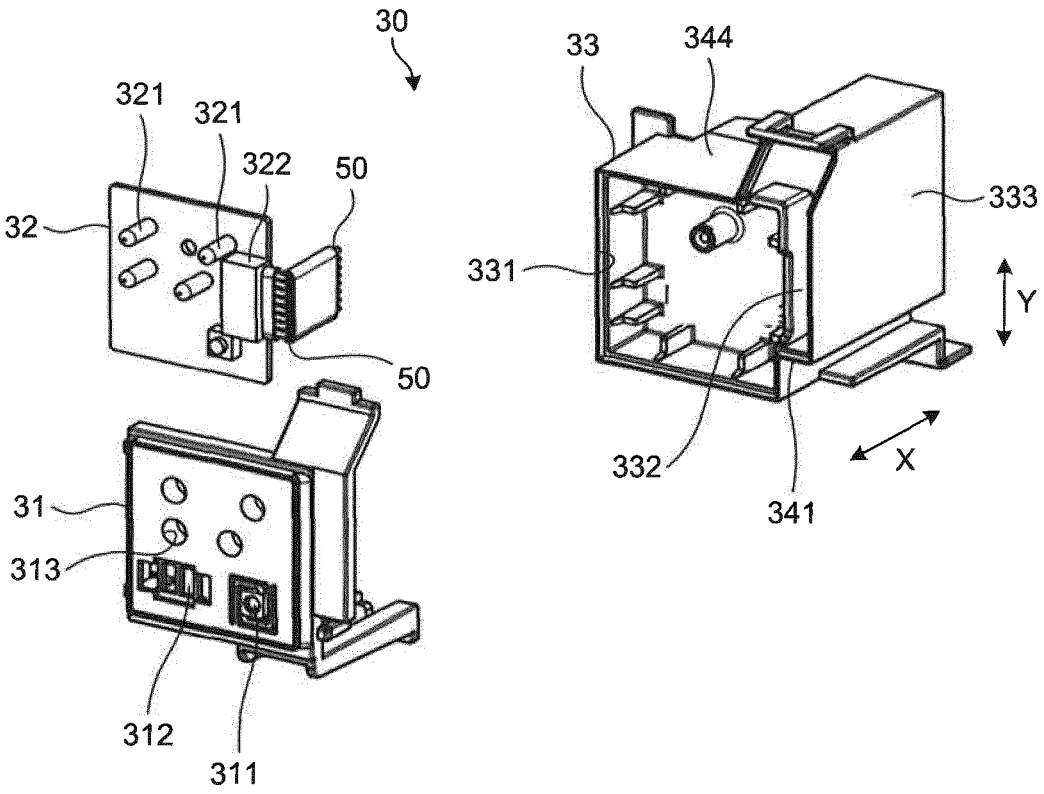


FIG.3

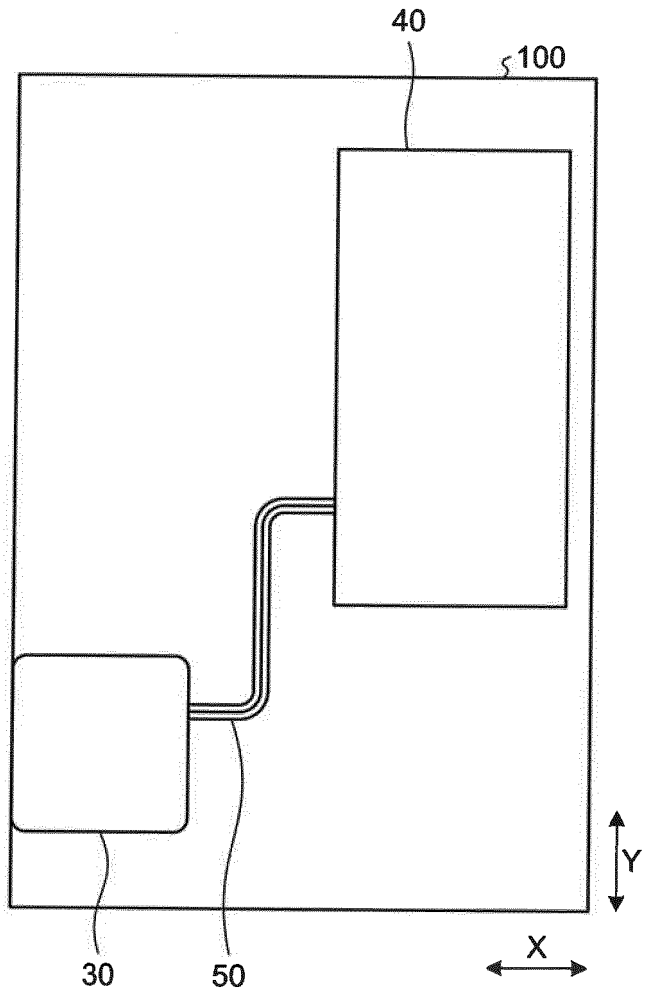
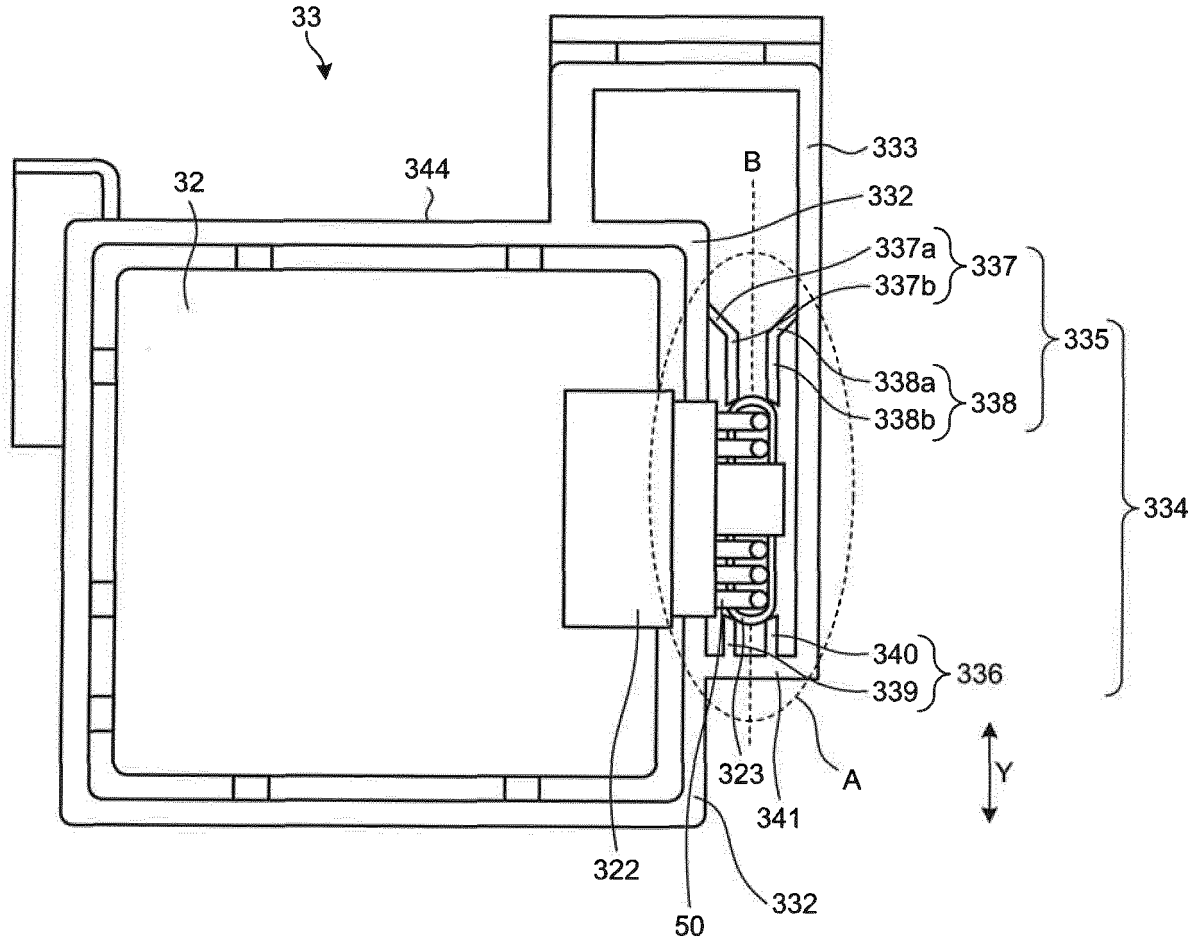


FIG.4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338b
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A
Y
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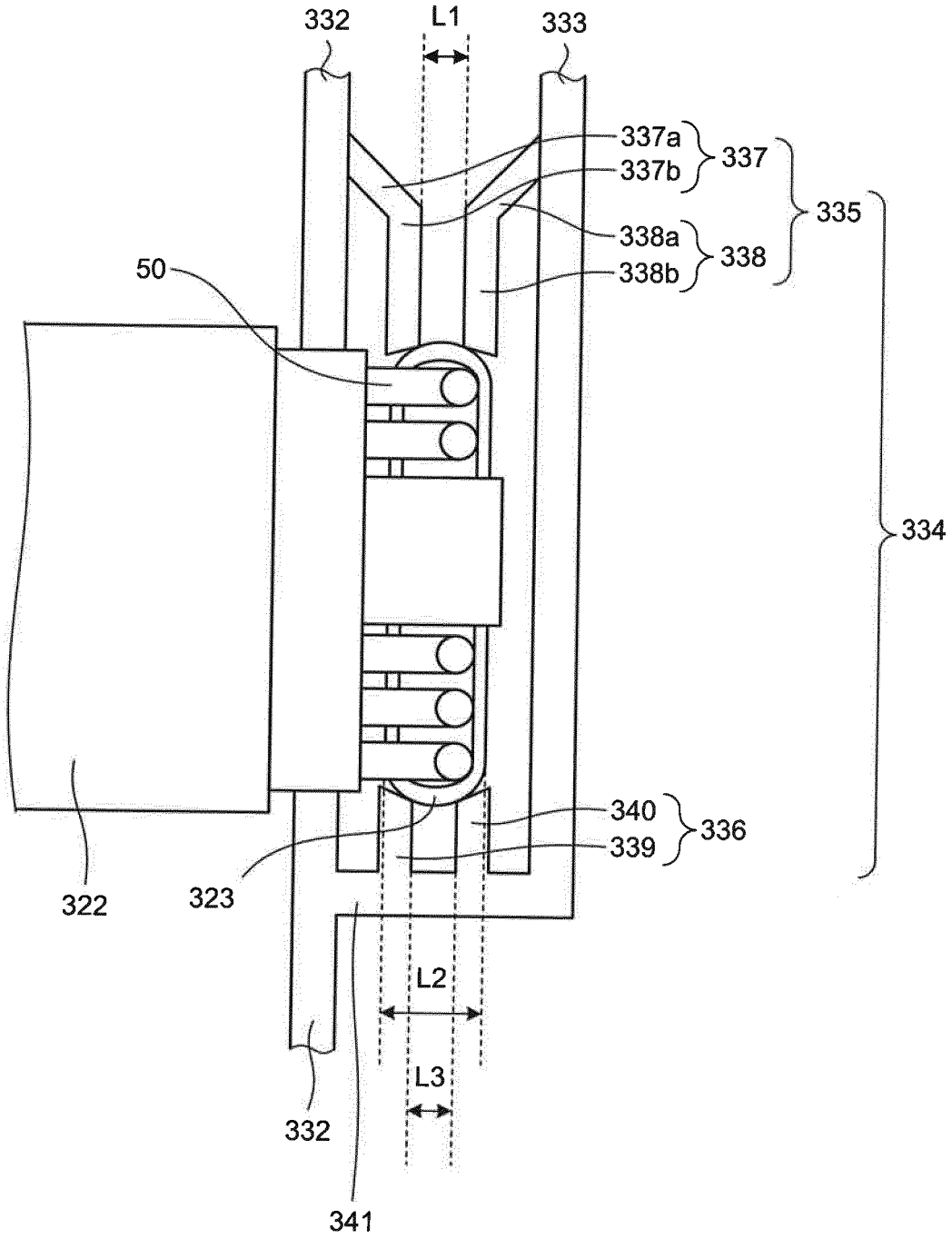
322
332
50

FIG.5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337b
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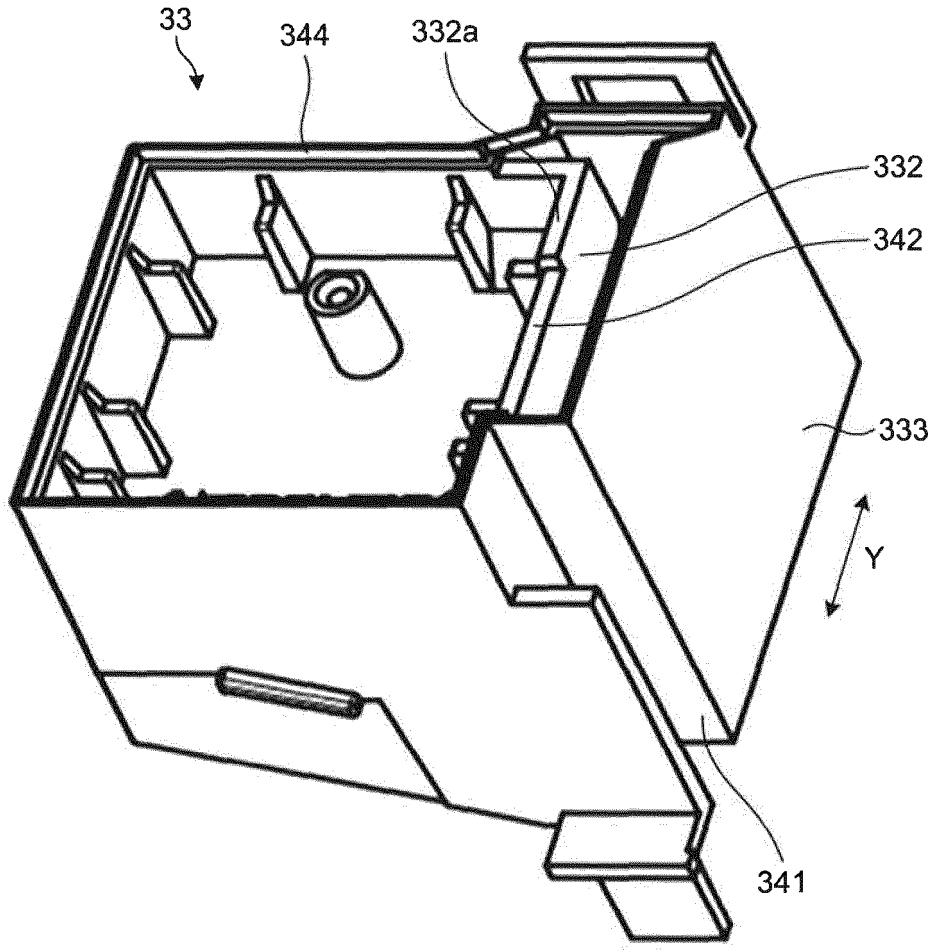
322
323
L2
L3
332
341

FIG.6



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2016/080121

A. CLASSIFICATION OF SUBJECT MATTER
F24F7/013(2006.01)i

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)
F24F7/013

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2016
Kokai Jitsuyo Shinan Koho 1971-2016 Toroku Jitsuyo Shinan Koho 1994-2016

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 4850546 B2 (Mitsubishi Electric Corp.), 11 January 2012 (11.01.2012), paragraphs [0010] to [0021]; fig. 1 to 6 & JP 2007-249070 A	1-4
Y	JP 2002-359913 A (Sumitomo Wiring Systems, Ltd.), 13 December 2002 (13.12.2002), paragraphs [0004] to [0019]; fig. 1 to 7 (Family: none)	1-4

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
07 December 2016 (07.12.16)	20 December 2016 (20.12.16)
Name and mailing address of the ISA/ Japan Patent Office 3-4-3,Kasumigaseki,Chiyoda-ku, Tokyo 100-8915,Japan	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2016/080121

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 74828/1988(Laid-open No. 180123/1989) (The Furukawa Electric Co., Ltd.), 25 December 1989 (25.12.1989), specification, page 3, line 10 to page 6, line 11; fig. 1 to 4 (Family: none)	1-4
A	KR 10-0748168 B1 (SAMSUNG ELECTRONICS CO., LTD.), 09 August 2007 (09.08.2007), page 3, line 24 to page 6, line 18; fig. 1 to 7 (Family: none)	1-4

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 4850546 B **[0004]**