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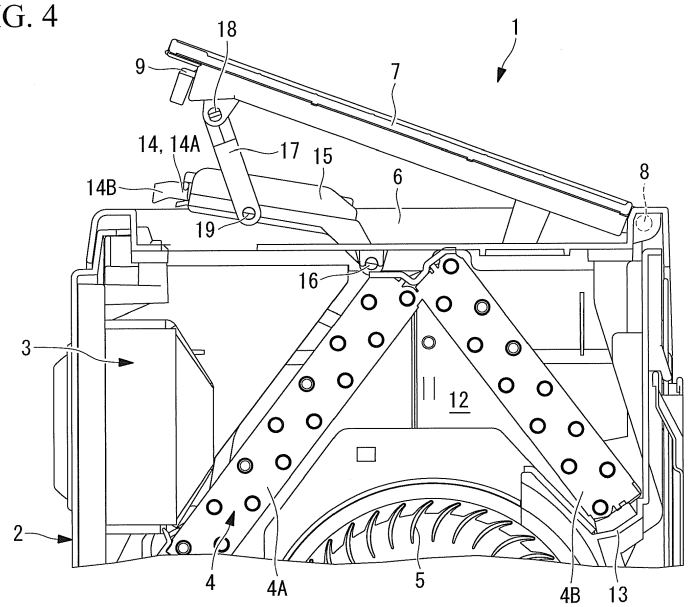
(54) AIR CONDITIONER

(57) An air conditioner that allows maintenance and replacement of an air-purifying filter disposed in an air passage to be easily performed at the position of an opening of an air inlet provided in the top surface of a main unit is provided. In an air conditioner (1) in which an air inlet (6) provided with an inlet grille (7) is formed in the top surface of a main unit (2) and in which a pre-filter (9), a heat exchanger (4), and a blowing fan (5) are disposed, in this order, in an air passage (12) extending from the air inlet (6) to an air outlet, the inlet grille (7) is disposed such that a front end thereof can be rotated upward about a rear end thereof, an air-purifying filter (14) is disposed in the air passage (12) between the heat exchanger (4) and the pre-filter (9) disposed on the rear side of the inlet grille (7), and the air-purifying filter (14) is joined to the inlet grille (7) so that it can be brought to the position of the opening of the air inlet (6) in response to the upward rotation of the front end of the inlet grille (7).

FIG. 4



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Description

Technical Field

[0001] The present invention relates to an air conditioner provided with an air inlet and an inlet grille in the top surface of a main unit.

Background Art

[0002] Wall-mounted air conditioners have a configuration in which an air inlet and an inlet grille are provided in the front surface and/or the top surface of a main unit, and a pre-filter and an air-purifying filter are provided, in this order, on the rear side of the inlet grille. As disclosed in, for example, PTL 1, these air conditioners are typically configured such that an inlet grille on the front side or a front panel can be opened and closed in the top-bottom or right-left direction to enable maintenance and replacement of the pre-filter and the air-purifying filter from the front side of the main unit.

[0003] On the other hand, as disclosed in PTLs 2 and 3, in integrated air conditioners that are configured to take in air from the front surface and blow heated/cooled air from the upper part, including the top surface, or the lower part or that are configured to take in air from the lower part or the upper part of the front surface and blow heated/cooled air from the upper part or the lower part of the front surface, the inlet grille is provided on the front side, and the filters are provided on the rear side thereof. Hence, an increase in height of the main unit to some extent does not affect the serviceability of the filters. However, some air conditioners available these days are configured such that the air inlet and the inlet grille are provided only in the top surface of the main unit, and heated/cooled air is blown from the front surface of the main unit.

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[0004]

{PTL 1} Japanese Unexamined Patent Application, Publication No. 2003-74895
{PTL 2} Japanese Unexamined Patent Application, Publication No. Hei 5-149579
{PTL 3} Japanese Examined Utility Model Application, Publication No Sho 62-40261

Summary of Invention

Technical Problem

[0005] In the above-described air conditioners that have the air inlet and the inlet grille only in the top surface of the main unit, when the height of the main unit is increased or when the main unit is used at a high place due to being mounted on a wall etc., maintenance of the pre-filter, which is disposed on the rear side of the inlet grille, can be relatively easily performed by opening and closing the inlet grille. However, the air-purifying filter, which is disposed in the air passage on the downstream side of the pre-filter, is difficult to reach, and the serviceability, such as the ease of maintenance and replacement, may be deteriorated.

[0006] The present invention has been made in view of the above-described circumstances, and an object thereof is to provide an air conditioner that allows maintenance and replacement of an air-purifying filter disposed in an air passage on the downstream side of a pre-filter to be easily performed at the position of an opening of an air inlet provided in the top surface of a main unit.

Solution to Problem

[0007] To overcome the above-described problems, an air conditioner of the present invention provides the following solutions.

[0008] More specifically, an air conditioner according to an aspect of the present invention is an air conditioner in which an air inlet provided with an inlet grille is formed in a top surface of a main unit and in which a pre-filter, a heat exchanger, and a blowing fan are disposed, in this order, in an air passage extending from the air inlet to an air outlet, wherein the inlet grille is disposed such that a front end thereof can be rotated upward about a rear end thereof, an air-purifying filter is disposed in the air passage between the heat exchanger and the pre-filter disposed on the rear side of the inlet grille, and the air-purifying filter is joined to the inlet grille so that it can be brought to the position of an opening of the air inlet in response to the upward rotation of the front end of the inlet grille.

[0009] According to the above-described aspect of the present invention, the inlet grille is disposed in the air inlet provided in the top surface of the main unit; the inlet grille is disposed such that the front end thereof can be rotated upward about the rear end thereof; the air-purifying filter is disposed in the air passage between the pre-filter, which is disposed on the rear side of the inlet grille, and the heat exchanger disposed on the downstream side thereof; and the air-purifying filter is joined to the inlet grille so that it can be brought to the position of the opening of the air inlet in response to the upward rotation of the front end of the inlet grille. Hence, even when the main unit is mounted at a high place or even when the height of the main unit is increased, the air-purifying filter, which is joined to the inlet grille and disposed in the air passage in the main unit, can be brought to the position of the opening of the air inlet in response to the rotational movement when lifting the front end of the inlet grille upward. Thus, maintenance and replacement of the air-purifying filter disposed in the air passage in the main unit can be facilitated.

[0010] Furthermore, the air conditioner according to the above-described aspect may be configured such that the air-purifying filter in the above-described air conditioner is disposed in the air passage formed on the upper front side of the heat exchanger, which is disposed inside the main unit so as to extend diagonally from the front side to the upper rear side.

[0011] In this configuration, the air-purifying filter is disposed in the air passage formed on the upper front side of the heat exchanger, which is disposed inside the main unit so as to extend diagonally from the front side to the upper rear side. Hence, the air-purifying filter does not block the flow of air introduced from the air inlet provided in the top surface of the main unit, and thus, a decrease in the amount of introduced indoor air due to the air-purifying filter causing pressure loss at the air inlet can be suppressed. Accordingly, a decrease in air flow due to the air-purifying filter can be suppressed to maintain high performance of the air conditioner.

[0012] Furthermore, the air conditioner according to the above-described aspect may be configured such that, in any one of the above-described air conditioners, the air-purifying filter is disposed such that the rear end thereof is pivotably supported so as to be rotatable and such that the front end thereof is joined to the front end of the inlet grille via a link.

[0013] In this configuration, the air-purifying filter is disposed such that the rear end thereof is pivotably supported so as to be rotatable and such that the front end thereof is joined to the front end of the inlet grille via a link. Hence, by lifting upward and rotating the front end of the inlet grille, thereby bringing the front end of the air-purifying filter, which is joined to the front end thereof via a link, upward about the rear end thereof, the air-purifying filter disposed in the air passage in the main unit can be brought to the position of the opening of the air inlet. Accordingly, maintenance or replacement of the air-purifying filter can be easily performed at the position of the opening of the air inlet.

[0014] Furthermore, the air conditioner according to the above-described aspect may be configured such that, in any one of the above-described air conditioners, the air-purifying filter is installed via a holder and can be attached to or removed from the holder in a state in which it is brought to the position of the opening of the air inlet.

[0015] In this configuration, the air-purifying filter is installed via a holder and can be attached to or removed from the holder in a state in which it is brought to the position of the opening of the air inlet. Therefore, when the air-purifying filter, serving as a filter including a deodorization filter, various sterilization filters, an allergen inactivating filter, and a HEPA filter, is checked or replaced, the air-purifying filter can be easily checked or replaced by being attached to or removed from the holder, which is joined to the main unit and the inlet grille inside the main unit. Accordingly, the serviceability of the air-purifying filter can be maintained and ensured. Advantageous Effects of Invention

[0016] According to the present invention, even when the main unit is mounted at a high place or even when the height of the main unit is increased, the air-purifying filter, which is joined to the inlet grille and disposed in the air passage in the main unit, can be brought to the position of the opening of the air inlet in response to the rotational movement when lifting the front end of the inlet grille upward. Thus, maintenance and replacement of the air-purifying filter disposed in the air passage in the main unit can be facilitated.

Brief Description of Drawings

[0017]

{FIG. 1} FIG. 1 is an external perspective view of an upper part of an air conditioner according to an embodiment of the present invention.

{FIG. 2} FIG. 2 is an external perspective view of the above air conditioner with an inlet grille open.

{FIG. 3} FIG. 3 is a longitudinal cross-section of the air conditioner shown in FIG. 1 with the inlet grille closed.

{FIG. 4} FIG. 4 is a longitudinal cross-section showing a state in which the inlet grille shown in FIG. 2 is open. Description of Embodiments

[0018] An embodiment of the present invention will be described with reference to FIGS. 1 to 4.

[0019] FIG. 1 shows an external perspective view of an upper part of an air conditioner according to an embodiment of the present invention, FIG. 2 shows an external perspective view showing a state in which an inlet grille thereof is open, FIG. 3 shows a longitudinal cross-section showing a state in which the inlet grille is closed, and FIG. 4 shows a longitudinal cross-section showing a state in which the inlet grille is open.

[0020] An air conditioner 1 is an integrated air conditioner of a type for use in a state being mounted on a floor or a wall at a position slightly higher than the floor. The lower half of the main unit 2 serves as an outdoor unit, and the upper half serves as an indoor unit 3.

[0021] As is known, the outdoor unit accommodates outdoor components, such as a compressor, an outdoor heat exchanger, an outdoor fan, etc., whereas the indoor unit 3 accommodates indoor components, such as an indoor heat exchanger (heat exchanger) 4, an indoor fan (blowing fan) 5, etc. An air inlet 6 for introducing indoor air is provided in the top surface of the main unit 2, and an inlet grille 7 is disposed in the air inlet 6. The inlet grille 7 is pivotably supported by the main unit 2 via a shaft 8 at the rear end thereof and, as illustrated in FIG. 2, is configured such that it is rotated and opened or closed when the front end thereof is lifted upward.

[0022] Pre-filters 9 that collect dust contained in the intake air and are divided into two (right and left) segments are disposed, in an independently removable manner, on the rear (back) side of the inlet grille 7 so as

to cover the entire area of the back surface of the inlet grille 7. The pre-filters 9 are formed of an appropriately designed mesh portion and a filter flame and can be inserted or extracted along filter guides provided on the back surface of the inlet grille 7. The pre-filters 9 are configured to be attached or removed by being held at a tab provided on the front end, so that the collected dust can be appropriately washed away and removed.

[0023] An air outlet 11 that is provided with a wind-direction adjusting mechanism 10 and blows out heated/cooled air into the room is provided at a lower part of the indoor unit 3. Furthermore, an air passage 12 extending from the air inlet 6 to the air outlet 11 is formed inside the indoor unit 3. The above-described indoor heat exchanger 4, an indoor fan 5, etc., are disposed, in this order, in the air passage 12. The indoor heat exchanger 4 is formed of a fin-tube heat exchanger and is disposed on the downstream side of the inlet grille 7 and the pre-filters 9 so as to be bent in an inverted V shape, as illustrated in FIGS. 3 and 4.

[0024] A front-side heat exchanger 4A of the bent indoor heat exchanger 4 is disposed diagonally so as to extend from the lower part of the front surface to the center part of the top surface, as illustrated in FIGS. 3 and 4, and a rear-side heat exchanger 4B is disposed diagonally so as to extend from the center part of the top surface to the lower part of the back surface. Drain pans 13 are provided below the front-side heat exchanger 4A and the rear-side heat exchanger 4B (the drain pan corresponding to the front-side heat exchanger 4A is not shown).

[0025] The indoor fan 5, which is formed of a cross-flow fan having multiple blades arranged in a cylindrical shape, is disposed on the downstream side of the indoor heat exchanger 4 so as to be rotatable about a horizontal shaft, and the indoor fan 5 can be rotated by a motor (not shown). The indoor fan 5 introduces indoor air through the air inlet 6 and blows out heated/cooled air, which is air cooled or heated by the indoor heat exchanger 4, into the room from the air outlet 11 to cool or heat the room.

[0026] Furthermore, right and left air-purifying filters 14, serving as a filter including a deodorization filter, various sterilization filters, an allergen inactivating filter, and a HEPA filter, are disposed in pairs in the air passage 12 between the downstream side of the pre-filters 9, which is disposed on the rear side of the inlet grille 7, and the indoor heat exchanger 4. The pair of right and left air-purifying filters 14 have a horizontally elongated rectangular shape and, in a state in which they are stored in storage cases 14A, are removably accommodated and disposed in corresponding holders 15. The storage case 14A has a tab 14B on the front side thereof. The storage case 14A can be fitted to or removed from the holder 15 by being held at the tab 14B and inserted or extracted.

[0027] Each holder 15 is disposed diagonally on the upper front side of the front-side heat exchanger 4A of the indoor heat exchanger 4 and is configured such that the rear end thereof is pivotably supported by the main unit 2 via a shaft 16 near the upper end of the front-side heat exchanger 4A and such that the front end thereof is joined to the front end of the inlet grille 7 via a pair of right and left links 17. The ends of the links 17 are pivotably joined to the inlet grille 7 and the holder 15 with pins 18 and 19, by pin connection.

[0028] This configuration enables the pair of right and left air-purifying filters 14, which are disposed between the downstream side of the pre-filters 9 and the indoor heat exchanger 4 in the space inside the air passage 12, to be moved between a normally disposed position and an extraction position, i.e., the position of the opening of the air inlet 6 to which the air-purifying filters 14 have been moved in response to the rotational movement when lifting the front end of the inlet grille 7 upward, as illustrated in FIGS. 3 and 4.

[0029] According to the above-described configuration, this embodiment provides the following advantages.

[0030] When the air conditioner 1 is driven, indoor air is introduced into the main unit 2 from the air inlet 6, provided in the top surface of the main unit 2, via the inlet grille 7, and dust contained in the air is collected and removed by the pre-filters 9. A portion of the air passing through the pre-filters 9 is further made to pass through the air-purifying filters 14 for purification and is then cooled or heated (i.e., adjusted in temperature) as it passes through the indoor heat exchanger 4, together with the other air. The thus-heated or cooled air is blown into the room from the blow-off port 11 via the indoor fan 5 to be used to heat or cool the room.

[0031] Because the dust collected by the pre-filters 9 accumulates on the surfaces of the filters with increasing operating time of the air conditioner 1 and serves as ventilation resistance, causing a decrease in operating efficiency of the air conditioner 1, such dust needs to be regularly removed by washing. At this time, as illustrated in FIG. 2, by lifting the front end of the inlet grille 7 upward and pulling the pre-filters 9 out for cleaning, the accumulated dust can be removed, and, by setting the pre-filters 9 in position again, the pre-filters 9 can be returned to a dust-free state.

[0032] Similarly, the performance of the air-purifying filters 14 disposed on the downstream side of the pre-filters 9 in the air passage 12 is also degraded after continuous use for a certain period of time. Hence, maintenance or replacement is required. Also in the maintenance or replacement of the air-purifying filters 14, the front end of the inlet grille 7 is lifted upward and rotated so that the air-purifying filters 14 are taken out from the holders 15, together with the storage cases 14A. When the inlet grille 7 is lifted upward and rotated, the air-purifying filters 14, together with the holders 15, can be taken to the position of the opening of the air inlet 6, as illustrated in FIGS. 2 and 4, because the holders 15 accommodating the air-purifying filters 14 are joined to the inlet grille 7 via the links 17.

[0033] More specifically, because the rear end of the holders 15 accommodating, in a removable manner, the storage cases 14A of the air-purifying filters 14 are piv-

otably supported so as to be rotatable by the main unit 2 via the shaft 16, and the front end of the holders 15 are joined to the inlet grille 7 via the links 17, when the front end of the inlet grille 7 is lifted upward and rotated, the front ends of the holders 15 joined to the front end of the inlet grille 7 via the links 17 are lifted upward about the pivotably supported rear ends thereof, in response to such movement. Thus, the air-purifying filters 14 disposed in the air passage 12 inside the main unit 2 can be moved to the position of the opening of the air inlet 6, together with the holders 15.

[0034] Therefore, even when the height of the main unit 2 is increased or even when the main unit 2 is mounted to a high place on a wall, by bringing the air-purifying filters 14 joined to the inlet grille 7 and disposed in the air passage 12 inside the main unit 2 to the position of the opening of the air inlet 6 in response to the rotational movement when lifting the front end of the inlet grille 7 upward, the air-purifying filters 14, together with the storage cases 14A, can be removed from the holders 15 at that position, by being held at the tabs 14B, for necessary maintenance and replacement.

[0035] Thus, it is possible to facilitate the maintenance and replacement of the air-purifying filters 14 disposed in the air passage 12 inside the main unit 2.

[0036] Furthermore, the air-purifying filters 14 are disposed in the air passage 12 formed on the upper front side of the front-side heat exchanger 4A, which is disposed diagonally in the main unit 2 so as to extend from the front side to the upper rear side. Hence, the air-purifying filters 14 do not block the flow of air introduced from the air inlet 6 provided in the top surface of the main unit 2, and thus, a decrease in the amount of introduced indoor air due to the air-purifying filters 14 causing pressure loss at the air inlet 6 can be suppressed.

[0037] Accordingly, it is possible to suppress a decrease in air flow due to the air-purifying filters 14 and to maintain high performance of the air conditioner 1.

[0038] Furthermore, in this embodiment, the air-purifying filters 14 are disposed with the holders 15 therebetween and can be attached to or removed from the holders 15 in a state in which they are brought to the position of the opening of the air inlet 6. Therefore, when the air-purifying filters 14, serving as a filter including a deodorization filter, various sterilization filters, an allergen inactivating filter, and a HEPA filter, are checked or replaced, the air-purifying filters 14 can be easily checked or replaced by being attached to or removed from the holders 15, which are joined to the main unit 2 and the inlet grille 7 inside the main unit 2.

[0039] Accordingly, the serviceability of the air-purifying filters 14 can be maintained and ensured.

[0040] Note that the present invention is not limited to the invention according to the above-described embodiment, and it may be appropriately modified within the scope of the present disclosure. For example, although an example in which the present invention is applied to an integrated air conditioner has been described in the above-described embodiment, the present invention is not limited thereto and may of course be equally applied to a separate type air conditioner, in which the indoor unit and the outdoor unit are separated. Furthermore, although an example in which the pre-filters 9 and the air-purifying filters 14 are divided into two (right and left) segments and disposed in pairs has been described in the above-described embodiment, the pre-filters 9 and the air-purifying filters 14 may be appropriately disposed in the form of a single member or in the form of segments, depending on the width of the unit; they are of course not limited to those made up of two segments.

[0041] Furthermore, although an example in which the holders 15 accommodating the air-purifying filters 14 are pivotably supported so as to be rotatable at ends and joined to the inlet grille 7 via the links 17 at the other ends so that the air-purifying filters 14 can be brought to the position of the opening of the air inlet 6 has been described in the above-described embodiment, a configuration in which the air-purifying filters 14 can be brought to the position of the opening of the air inlet 6 by using another connecting structure, such as wires instead of the links 17, is also possible.

Reference Signs List

[0042]

1	air conditioner
2	main unit
4	indoor heat exchanger (heat exchanger)
4A	front-side heat exchanger
5	indoor fan (blowing fan)
6	air inlet
7	inlet grille
9	pre-filter
11	air outlet
12	air passage
14	air-purifying filter
15	holder
17	link

Claims

1. An air conditioner (1) in which an air inlet (6) provided with an inlet grille (7) is formed in a top surface of a main unit (2) and in which a pre-filter (9), a heat exchanger (4), and a blowing fan (5) are disposed, in this order, in an air passage (12) extending from the air inlet (6) to an air outlet (11), wherein
the inlet grille (7) is disposed such that a front end thereof can be rotated upward about a rear end thereof,
an air-purifying filter (14) is disposed in the air passage (12) between the heat exchanger (4) and the pre-filter (9) disposed on the rear side of the inlet grille (7), and

the air-purifying filter (14) is joined to the inlet grille (7) so that it can be brought to the position of an opening of the air inlet (6) in response to the upward rotation of the front end of the inlet grille (7).

2. The air conditioner according to Claim 1, wherein the air-purifying filter (14) is disposed in the air passage (12) formed on the upper front side of the heat exchanger (4), which is disposed inside the main unit (2) so as to extend diagonally from the front side to the upper rear side.

3. The air conditioner according to Claim 1 or 2, wherein the air-purifying filter (14) is disposed such that the rear end thereof is pivotably supported so as to be rotatable and such that the front end thereof is joined to the front end of the inlet grille (7) via a link (17).

4. The air conditioner according to any one of Claims 1 to 3, wherein the air-purifying filter (14) is installed via a holder (15) and can be attached to or removed from the holder in a state in which it is brought to the position of the opening of the air inlet (7).

FIG. 1

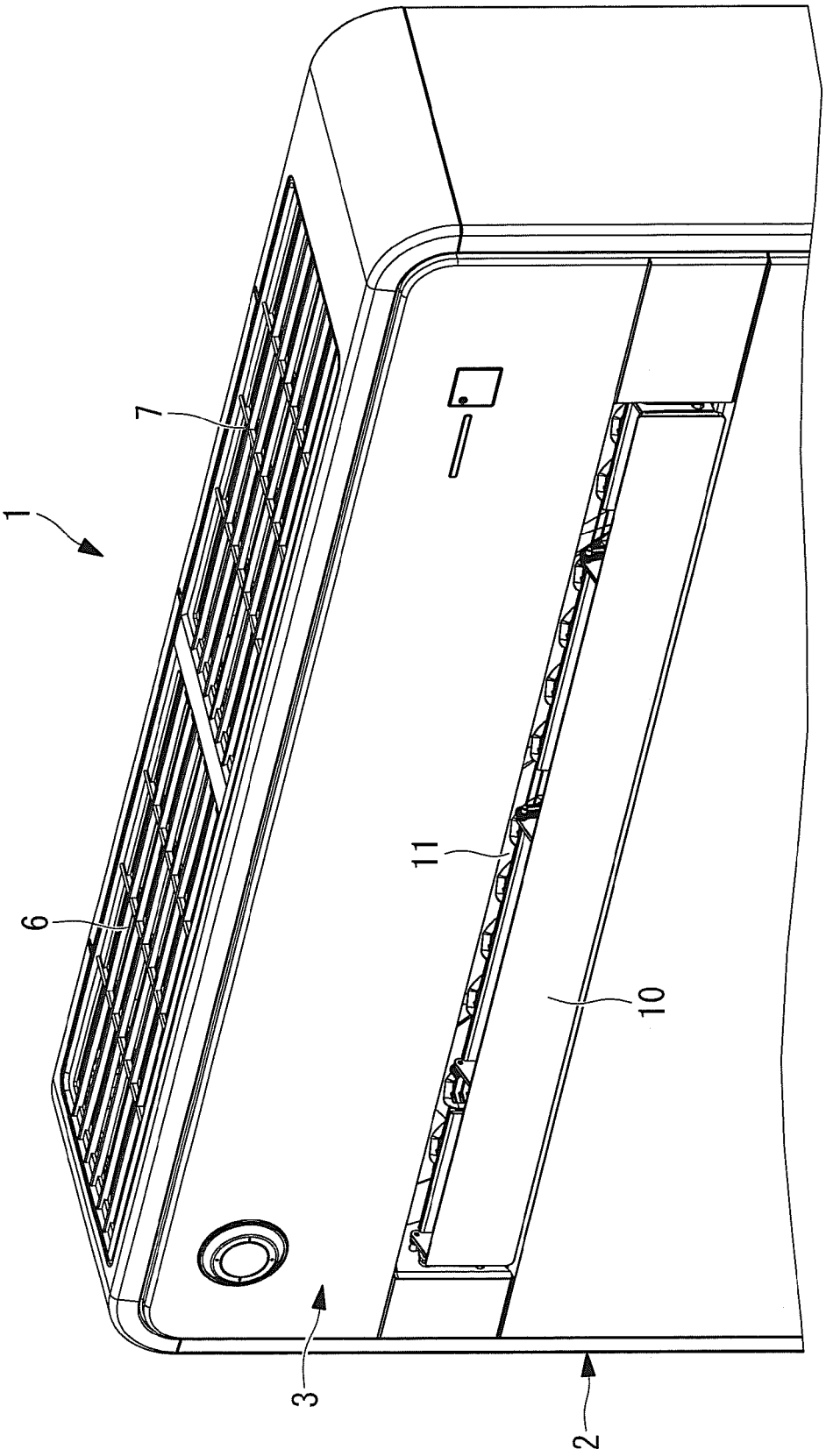


FIG. 2

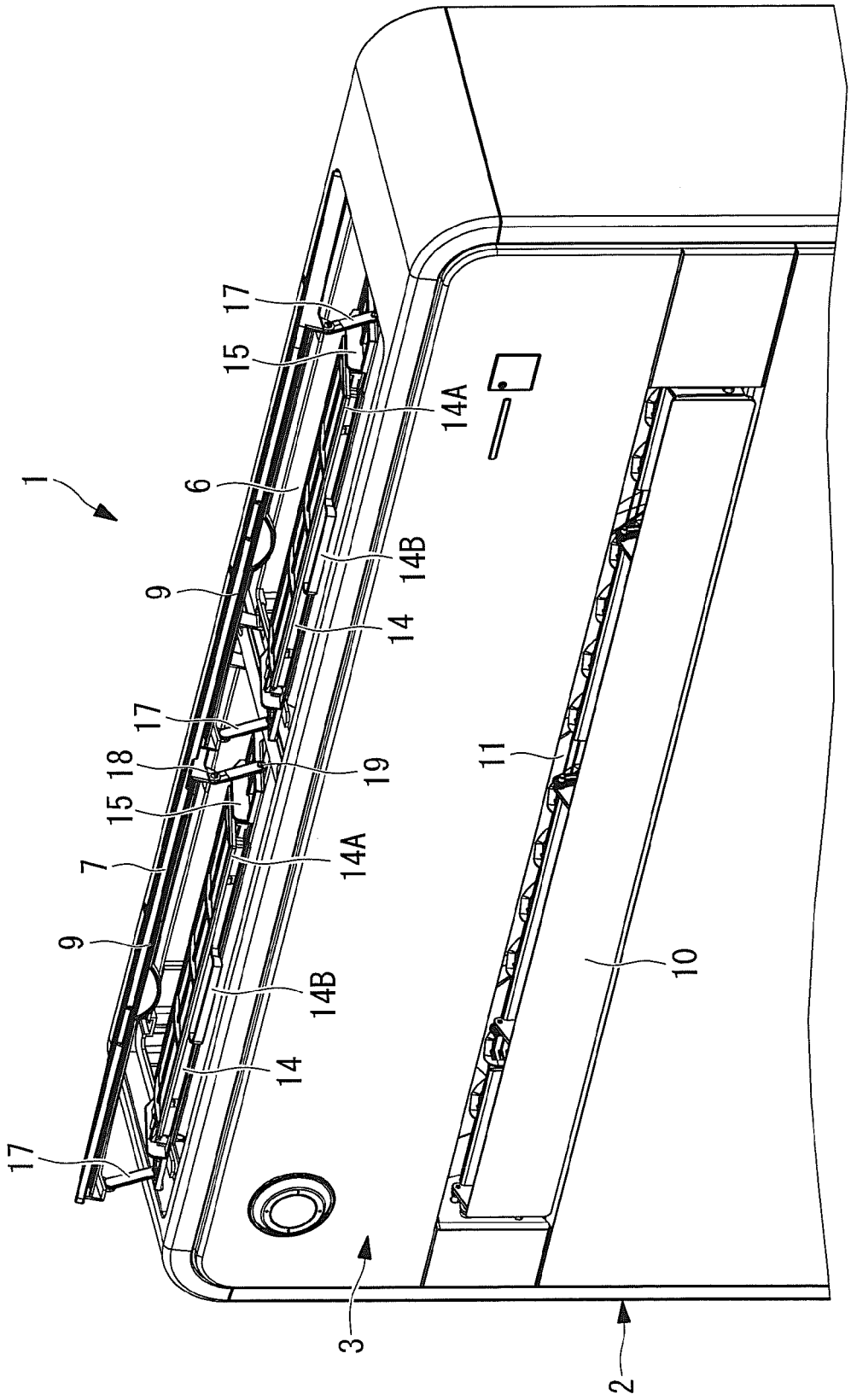


FIG. 3

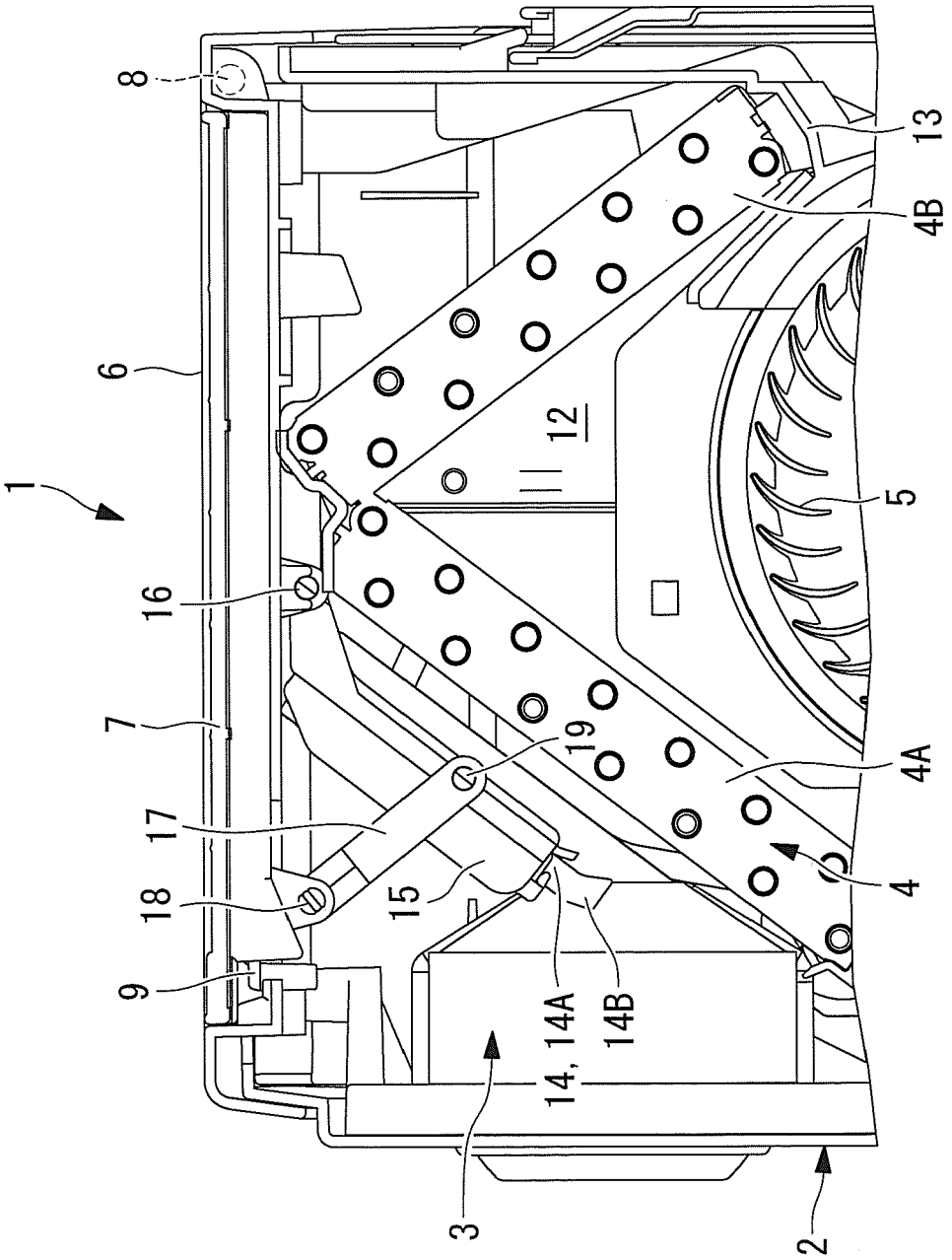
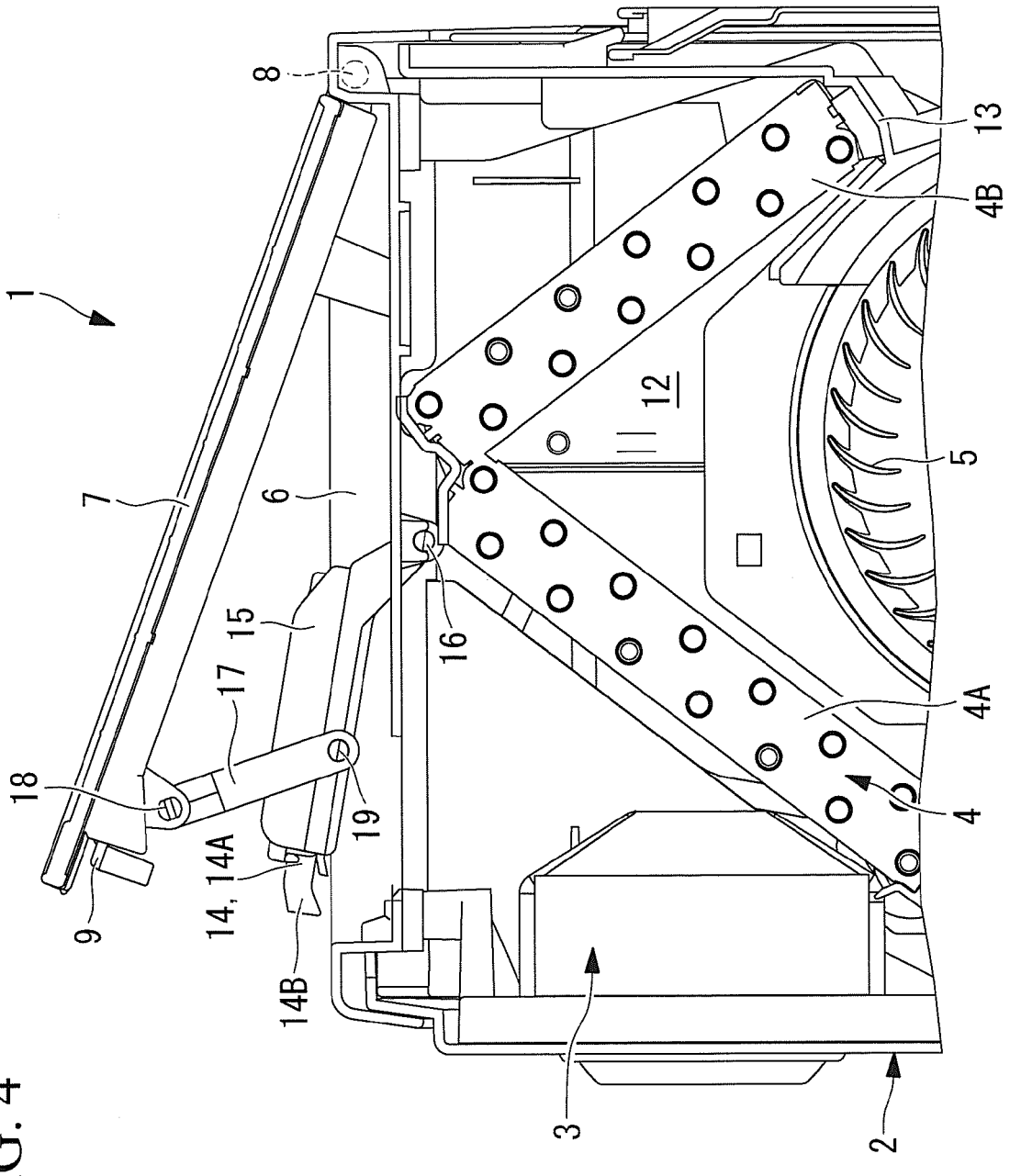


FIG. 4



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EUROPEAN SEARCH REPORT

Application Number
EP 15 15 7892

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	19 August 2015	Anconetani, Mirco

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 15 15 7892

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