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(54) **HUMIDIFIER**

(57) Provided is a humidifier in which a water tray can be kept clean using a simple mechanism. A streamer discharge unit (18) generates active species by streamer discharge. A humidification rotor (50) humidifies air using water in the water tray (40). A Sirocco fan (16) blows air humidified by the humidification rotor (50) into an indoor

space. Some of the air that is blown out is extracted as a branch flow (13a). Using ventilation flow generated by the Sirocco fan (16), a branch flow (13d) supplied with the active species in the streamer discharge unit (18) is thereby ventilated to a space (Sp1) above the water in the water tray (40), and the active species are sent into the space (Sp1) above the water tray (40).

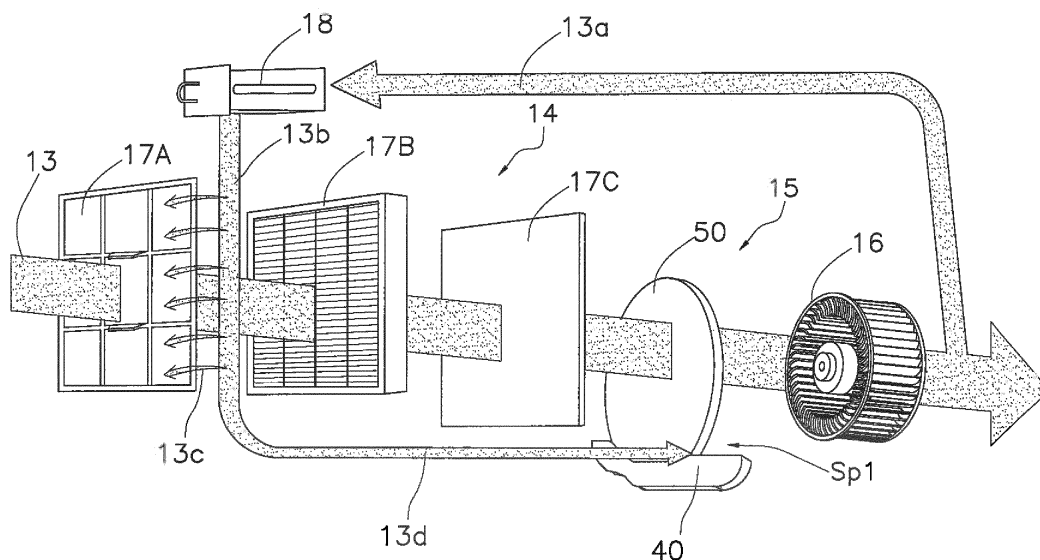


FIG. 3

Description

TECHNICAL FIELD

[0001] This invention relates to a humidifier, and particularly to a humidifier in which water for humidification is fed using a water tray.

BACKGROUND ART

[0002] Conventionally, there exist air purifiers which remove or break down odoriferous components, dust, bacteria, viruses and the like floating in air in indoor spaces and thereby clean the air. Air purifiers of such description include those having not only an air-cleaning function but also a humidifying function for increasing the humidity of indoor air. A humidifying function of such description is obtained, e.g., by using a circular disc-shaped humidification rotor such as that disclosed in Patent Document 1 (JP-A 2009-148305). The air purifier according to Patent Document 1, which has a humidifying function of such description, is a type of humidifier, and is provided with a water tray for storing water and a circular disc-shaped humidification rotor for releasing the water in the water tray into the air. The humidification rotor is caused to rotate while water from the water tray is fed to a part thereof. Indoor air drawn into the interior of the air purifier is humidified when passing through the humidification rotor. Conventional air purifiers generally require cleaning of the water tray and other maintenance, and are therefore generally configured so that the water tray can be attached/detached with respect to the air purifier.

[0003] With regards to use of air purifiers, there are periods in which humidification is performed regularly and periods in which the humidification function is seldom used. During periods in which humidification is performed regularly, the water tray tends to be frequently attached/detached and cleaned, and the water tray is more likely to be kept relatively clean.

[0004] However, during periods in which the humidification function is seldom used, the frequency in which the water tray is cleaned tends to decrease, and unused water may remain in the water tray for a relatively long period of time. In such an instance, situations that are problematic in terms of hygiene may occur, such as bacterial growth or occurrence of sliminess in the water tray.

SUMMARY OF THE INVENTION

<Technical problem>

[0005] Therefore, as disclosed in Patent Document 1, air containing active species generated in a discharge treatment unit is fed using a ventilation pump into the water in the water tank. Using active species thus inhibits sliminess and/or bacterial growth.

[0006] However, use of a ventilation pump or similar means results in a large-scale mechanism being re-

quired, causing an increase in the size of the device and/or in manufacturing cost.

[0007] The present invention addresses the problem of providing a humidifier in which the water tray can be kept clean using a simple mechanism.

<Solution to Problem>

[0008] A humidifier according to a first aspect of the present invention comprises a discharge unit, a humidification unit, a fan, and a flow channel. The discharge unit generates active species by plasma discharge. The humidification unit has a water tray and humidifies air using water in the water tray. The fan blows air humidified in the humidification unit into an indoor space. The flow channel sends the active species from the discharge unit to a space above the water in the water tray using ventilation flow generated by the fan.

[0009] According to the humidifier of the first aspect, the active species can be sent to the space above the water in the water tray using a simple mechanism of flow channels in which ventilation flow generated by the fan is used.

[0010] A humidifier according to a second aspect of the present invention is the humidifier according to the first aspect, wherein the fan is arranged on the downstream side of the humidification unit. The discharge unit is arranged on the downstream side of the fan in the flow channel. The humidification unit is arranged on the downstream side of the discharge unit in the flow channel.

[0011] According to the humidifier of the second aspect, arranging the discharge unit and the humidification unit on the flow channel in sequence on the downstream side of the fan makes it possible to create a flow of air to the humidification unit using only the blowing-out of air from the fan.

[0012] A humidifier according to a third aspect of the present invention is the humidifier according to the first or the second aspects, further provided with a filter unit for removing dust in the air fed to the humidification unit. The flow channel has an active species supply region which passes through at least a part of the surroundings of the filter unit on a downstream side of the discharge unit, the active species supply region being provided with a hole for supplying the filter unit with the active species.

[0013] According to the humidifier of the third aspect, it is possible to also supply the active species to the filter unit by shared use of the flow channel for sending the active species to the water tray.

[0014] A humidifier according to a fourth aspect of the present invention is the humidifier according to the first or the second aspects, further provided with a filter unit for removing dust in the air fed to the humidification unit. The discharge unit and the flow channel are arranged on a side surface of the filter unit.

[0015] According to the humidifier of the fourth aspect, arranging the discharge unit and the flow channel on the side surface of the filter unit makes it possible to utilize

the space in the humidifier in an effective manner.

[0016] A humidifier according to a fifth aspect of the present invention is the humidifier according to any of the first through fourth aspects, further provided with a tank for feeding water to the water tray of the humidification unit. The water tray is provided with a partition part for partitioning a humidification space in which air is humidified and an external space from each other, the partition wall having formed therein an opening for guiding water in the tank arranged in the external space into the humidification space.

[0017] According to the humidifier of the fifth aspect, the water tray has a partition part. Therefore, it is possible to partition the space in which the tank is present and the space surrounding the humidification unit from each other using the partition part, and the arrangement can be applied to a humidifier that has a tank.

[0018] A humidifier according to a sixth aspect of the present invention is the humidifier according to the fifth aspect, wherein the flow channel has a delivery port in the vicinity of the water tray in the external space, the active species being delivered through the delivery port.

[0019] According to the humidifier of the sixth aspect, the delivery port is provided on the external-space side; therefore, the effect of the humidification space on the flow of air can be reduced.

<Advantageous Effects of Invention>

[0020] According to the humidifier of the first aspect of the present invention, the water tray can be kept clean using a simple mechanism.

[0021] According to the humidifier of the second aspect of the present invention, a flow of air for sending active species into the water tray can be obtained using a simple configuration.

[0022] According to the humidifier of the third aspect of the present invention, the size of a humidifier having a function for generating active species can be reduced.

[0023] According to the humidifier of the fourth aspect of the present invention, space can be utilized in an effective manner, and the size of the humidifier can be readily reduced.

[0024] According to the humidifier of the fifth aspect of the present invention, the arrangement can be applied to a humidifier that has a tank, and there is greater versatility.

[0025] According to the humidifier of the sixth aspect of the present invention, the effect of providing a flow channel on the flow of air in the humidification space can be reduced, and a decrease in humidification performance can be prevented.

BRIEF DESCRIPTION OF THE DRAWINGS

[0026]

FIG. 1 is a perspective view showing the exterior of

a humidifier according to an embodiment.

FIG 2 is a perspective view showing the exterior of the humidifier according to the embodiment.

FIG 3 is a conceptual diagram showing the path of ventilation flow in the humidifier.

FIG 4 is a perspective view showing the exterior of the humidifier in a state in which the left side plate is open.

FIG 5 is a perspective view showing the exterior of the humidifier in a state in which the water tank, the water tray, and the fan casing have been removed. FIG 6 is a perspective view illustrating the interior of the main body casing.

FIG 7 is a perspective view illustrating the interior of the main body casing.

FIG 8(a) is a top view of a component constituting the water tray, (b) is a front view of the component constituting the water tray, and (c) illustrates the partition wall of the water tray.

FIG 9 is a perspective view illustrating the state in which the water tray is fitted to the fan casing.

FIG. 10 is a perspective view showing the exterior of the humidifier from which the front lid has been detached.

FIG 11 is a front view showing the exterior of the humidifier from which the front lid has been detached.

FIG 12 is a cross-section view along line I-I in FIG 11.

FIG 13(a) is a front view of a filter support member, (b) is a rear view of the filter support member, and (c) is a side view of the filter support member.

DESCRIPTION OF EMBODIMENTS

[0027] A description will now be given for an air purifier having a humidification function as an example of a humidifier to which the present invention is applied. However, an air purification function is not a required configuration for the present invention, and the present invention can also be applied to a humidifier that does not have an air purification function.

(1) Overview of configuration and operation of air purifier

[0028] An overview of the overall configuration of an air purifier according to an embodiment of the present invention is shown in FIGS. 1 and 2. FIG 1 is a perspective view as viewed from the upper right facing the front of the air purifier, and FIG 2 is a perspective view as viewed from the upper left facing the rear of the air purifier.

[0029] The air purifier 10 has intakes 11 for drawing in indoor air, and an outlet 12 for discharging humidified air. The intakes 11 comprise a front lower intake 11a and side intakes 11b.

[0030] FIG 3 is a conceptual diagram illustrating the concept of dust removal and/or breakdown and humidification in the air purifier. A Sirocco fan 16 generates an airflow 13 extending from the intakes 11 to the outlet 12.

Indoor air suctioned from the intakes 11 is filtered in a filter unit 14 to remove dust and/or odor components, and humidified in a humidification unit 15. After being humidified and purified, the air is discharged from the Sirocco fan 16.

[0031] The filter unit 14 comprises a pre-filter 17A, a high-efficiency particulate air (HEPA) filter 17B, and a deodorizing element 17C. First, the pre-filter 17A provided to the air purifier 10 removes large dust particles. Next, the HEPA filter 17B removes smaller dust particles. In the air that has passed through the HEPA filter 17B, formaldehyde, odor components, and/or other substances are broken down or adsorbed by the deodorizing element 17C containing active carbon and other substances.

[0032] The humidification unit 15 comprises a humidification rotor 50, a water tray 40, and other components. Air that has passed through the deodorizing element 17C passes through the humidification rotor 50 of the humidification unit 15. When air passes through the humidification rotor 50, water is released into the air from the humidification rotor 50. In order to compensate for the water lost by being discharged, the humidification rotor 50 is fed water from the water tray 40.

[0033] A branch flow 13a of ventilation flow blown out from the Sirocco fan 16 is channeled to a streamer discharge unit 18. When the branch flow 13a of the ventilation flow passes through the streamer discharge unit 18, active species are supplied by streamer discharge. Some of a branch flow 13b to which active species have been supplied separates and forms a plurality of branch flows 13c, which are blown from small openings to the front of the pre-filter 17A. The branch flows 13c join indoor air suctioned from the pre-filter 17A and reach the deodorizing element 17C. The active species reaching the deodorizing element 17C boost the deodorizing effect.

[0034] A branch flow 13d resulting when the branch flows 13c have been separated from the branch flow 13b is channelled to a space Sp1 above the water in the water tray 40. The active species in the branch flows 13c inhibits bacterial growth and/or occurrence of sliminess in the water tray 40 and keeps the interior of the water tray 40 clean.

[0035] The operation of the air purifier 10 having a humidification function of such description is switched using a control panel 19 provided to an upper section of the air purifier 10. The control panel 19 is provided with a switch for controlling the ON/OFF states of humidification operation in addition to the ON/OFF states of the operation of the air purifier 10. An operation mode in which only air purification is performed without humidification, and an operation mode in which humidification is performed at the same time as air purification, are thereby provided.

[0036] In the operation mode in which only air purification is performed, the rotation of the humidification rotor 50 is in a stopped state, and no water is fed to the humidification rotor 50. As a result, release of water into the air stops once the humidification rotor 50 has dried.

(2) Detailed configuration

(2-1) Water tank

[0037] As shown in FIG. 4, a water tank 30 is housed in a left side section of the air purifier 10. The exterior of the air purifier 10 is covered by a main body casing 20. The main body casing 20 is configured so that a left side plate 21 can be detached, and the water tank 30 is attached to the left side plate 21. Although not shown, a water port is provided to the lower section of the water tank 30.

[0038] With regards to the main body casing 20, a lower left side plate 22, which is curved so as to reduce the width of the lower section of the air purifier 10, is arranged below the left side plate 21. The lower left side plate 22 is attached to the water tray 40. When the water tank 30 is fitted, water in the water tank 30 pours into the water tray 40 from the water port at the lower section of the water tank 30.

[0039] A fan casing 70 housing the Sirocco fan 16 shown in FIG. 3 is arranged to the right of the water tank 30 in the main body casing 20. The fan casing 70 extends upwards towards the outlet 12, and an outlet of the fan casing 70 coincides with the outlet 12 of the main body casing 20.

(2-2) Water tray

[0040] The state shown in FIG 5 is a state in which the left side plate 21, the water tank 30, and the water tray 40 have been removed; and also in which the Sirocco fan has been removed with the fan casing 70, from the state shown in FIG. 4. The water tray 40 is fitted from the external space Sp1 shown in FIG. 5. In FIG. 5, the front-side member having honeycomb-shaped openings is a filter support member 80. The pre-filter 17A, the HEPA filter 17B, and the deodorizing element 17C shown in FIG. 3 are attached to the filter support member 80.

[0041] A delivery port 81 is provided to the filter support member 80 so as to face the space above the water tray 40 of the space Sp1. The air containing active species is blown out from the delivery port 81.

[0042] FIGS. 6 and 7 show a state in which the water tank 30, the filter support member 80, and the main body casing 20 excluding the lower left side plate 22 have been removed from the state shown in FIG. 4. FIG. 6 is a perspective view as viewed from the diagonally upper-left on the front side of the air purifier 10, and FIG. 7 is a perspective view as viewed from the diagonally upper-left on the rear side of the air purifier 10.

[0043] The water tray 40 primarily comprises: a water-receiving part 41 arranged below the water tank 30; a rotor immersion part 42 at which the lower section of the humidification rotor 50 is immersed in water; a partition wall 43; a bearing 44; and a partition board 45. The bearing 44 for receiving the shaft of the humidification rotor 50 is attached on top of a side wall of the water tray

40 forming the rotor immersion part 42.

[0044] The water-receiving part 41 and the rotor immersion part 42 are partitioned from each other by the partition wall 43 for partitioning water stored in the water tray 40. An opening, through which the water-receiving part 41 communicates with the rotor immersion part 42, is provided to the lower section of the partition wall 43 hidden by the lower left side plate 22 and other components in FIG. 7. In a state in which water is present in the water tray 40, the opening is blocked by the water, and the water-receiving part 41 and the rotor immersion part 42 are separated.

[0045] The partition board 45 extends upwards from the top of the partition wall 43 without any gap present therebetween. In a state in which the water tray 40 is fitted, the partition board 45 joins with the fan casing 70 without any gap present therebetween. In the state shown in FIG. 6, the water tray 40 is locked to the fan casing 70 by a locking mechanism.

[0046] The space Sp2 housing the humidification rotor 50 is a space in the interior of a housing formed by the fan casing 70 and the filter support member 80. The space Sp2 is surrounded by a side wall 71, an upper wall 72, a lower wall 73, a rear wall 74, the partition board 45, and the filter support member 80. The space Sp2 is thereby partitioned from the external space Sp1, and paths linking the external space Sp1 and the space Sp2 with each other are limited to specific paths such as the intakes 11 and/or the outlet 12. The housing does not have an opening other than the honeycomb-shaped opening formed on the filter support member 80 and the opening provided to the rear wall 74. Therefore, the same amount of air as that fed from the filter support member 80 to the space Sp2 is fed from the space Sp2 through the rear wall 74 to the Sirocco fan 16.

[0047] Some of the air blown out upwards from the Sirocco fan 16 forms the branch flow 13a. The branch flow 13a is channelled from an opening 79 of the fan casing 70 towards the streamer discharge unit 18. The flow channel channelling the branch flow 13a is surrounded by the main body casing 20 and the fan casing 70, and communicates only with the opening 79 and the streamer discharge unit 18. Therefore, air will not flow in from the external space, and the branch flow 13a will not leak out to the external space. The branch flow 13b, which has been imparted with active species at the streamer discharge unit 18, is blown out from the streamer discharge unit 18 towards the water tray 40 further below.

[0048] FIG. 8 shows the configuration of a component obtained by integrally forming the rotor immersion part 42, the partition wall 43, and the water-receiving part 41 of the water tray. FIG. 8(a) is a top view of this component; FIG. 8(b) is a front view of this component; and FIG. 8(c) is a side view of the partition wall.

[0049] Screws for securing the partition board 45 are screwed into two screw holes 40a near the water-receiving part 41 and the partition wall 43. Screws for securing the bearing 44 are screwed into two screw holes 40b and

two screw holes 40c provided respectively to a front side wall 42a and a rear side wall 42b of the rotor immersion part 42.

[0050] As can be seen from FIG. 8(b), a partition part 40d protrudes below the water tray 40. The partition part 40d extends longitudinally below the water tray 40. The partition part 40d comes into contact with a lower wall 73 below the water tray 40, and partitions the space Sp2 of the housing and the space in the exterior of the housing from each other.

[0051] As shown in FIG. 8(c), an opening 43a is provided to the partition wall 43. The opening 43a links the water-receiving part 41 and the rotor immersion part 42. Therefore, water fed from the water tank 30 to the water-receiving part 41 passes through the opening 43a and flows into the rotor immersion part 42. The water level when water is remaining in the water tank 30 is indicated by a dashed two-dotted line 43b. When the water level rises to this height, the opening 43a is blocked by water, and the opening 43a will therefore not act as a bypass air path.

(2-3) Humidification rotor

[0052] The humidification rotor 50 shown in FIG 6 has a structure in which a porous evaporation filter 51 is attached to a ring-shaped frame 52. The humidification rotor 50 causes water to evaporate from the evaporation filter 51 and performs humidification. Therefore, the humidification rotor 50 is designed so that the lower section of the evaporation filter 51, which is dry, enters the water in the rotor immersion part 42 with the rotation of the humidification rotor 50. In order to assist feeding of water to the evaporation filter 51, a configuration is present so that water can be scooped up by a water storage part 53 and water can be fed to the evaporation filter 51 in the inside periphery of the ring-shaped frame 52 from the water storage part 53 through a hole (not shown) in the ring-shaped frame 52. Although not shown, the humidification rotor 50 is caused to rotate by a motor.

(2-4) Sirocco fan and fan casing

[0053] FIG 9 shows a state in which the humidification rotor 50 and the bearing 44 are removed from the state shown in FIG 6. Removing the humidification rotor 50 reveals the Sirocco fan 16 located on the downstream side of the humidification rotor 50. Humidified air is fed from an opening 76 in the rear wall 74 of the housing to the Sirocco fan 16.

(3) Flow channel for supplying active species

[0054] A description will now be given for the flow channel for channelling the branch flows 13a, 13b, 13c, and 13d shown in FIG. 3 with reference to the drawings. FIGS. 10 and 11 are a perspective view and a front view of the air purifier 10 in a state in which the front lid 23 of the

main body casing 20 shown in FIG. 1 has been removed. FIG 12 shows the cross-section along line I - I in FIG 11. A mesh portion of the pre-filter 17A is indicated by a dotted line in FIG 12. FIGS. 13 and 14 illustrate the configuration of a filter support member. FIG 13(a) is a front view of the filter support member, FIG 13(b) is a rear view of the filter support member, and FIG. 13(c) is a side view of the filter support member.

[0055] The flow channel channelling the branch flow 13a has already been illustrated in FIG 7. The flow channel channelling the branch flow 13a is a flow channel extending from the opening 79 of the fan casing 70 to the streamer discharge unit 18, and is formed so as to be surrounded by the main body casing 20 and the fan casing 70.

[0056] The branch flow 13b, to which active species have been supplied in the streamer discharge unit 18, is blown out downwards from the streamer discharge unit 18 as shown in FIG 7. As shown in FIGS. 13(a) and 13 (b), with regards to the streamer discharge unit 18, a housing part 82 for housing the streamer discharge unit 18 is formed on the upper left section of the filter support member 80 so as to penetrate from the rear side to the front side. A hollow portion extends downwards from the housing part 82 and forms a flow channel 83. As can be seen in FIG. 12, the hollow portion constituting the flow channel 83 is formed by causing a front-side component 80a and a rear-side component 80b constituting the filter support member 80 to engage with each other.

[0057] Multiple holes 84 arranged vertically in a row are formed on the flow channel 83. The holes 84 are formed along the side intake 11b. As a result, the branch flows 13c blown out of the holes 84 turn into a flow heading towards the pre-filter 17A.

[0058] The delivery port 81 is formed below the flow channel 83. The delivery port 81 is positioned further above the top end of the lower left side plate 22 as shown in FIG. 5, i.e., positioned in the space above the water tray 40. The delivery port 81 is positioned above the water-receiving part 41 of the water tray 40. It is possible to deliver active species into the water-receiving part 41 from the delivery port 81 and inhibit bacterial growth and occurrence of sliminess in the water-receiving part 41. When the water level in the water-receiving part 41 is low, active species are delivered through the opening 43a shown in FIG 8 into the rotor immersion part 42.

(4) Characteristics

[0059]

(4-1) As shown in FIG. 3, some of the air that has been blown out by the Sirocco fan 16 from the opening 79 in the fan casing 70 forms the branch flow 13a, and is ultimately blown out from the delivery port 81 located in the space above the water tray 40. No fans or similar elements are provided partway therealong; the air is blown out by the wind pressure

from the Sirocco fan 16 only. As a result, active species generated by streamer discharge (plasma discharge) in the streamer discharge unit 18 (discharge unit) can be delivered into the space above the water in the water tray 40 using a simple configuration comprising only the path (flow channel) for guiding air, such as the flow channel 83. It is thereby possible to keep the water-receiving part 41 of the water tray 40 clean. Also, in a situation in which the water level has fallen and active species can be delivered to the rotor immersion part 42 through the opening 43a in the partition wall 43, the rotor immersion part 42 can also be kept clean by the active species.

(4-2) As illustrated in FIG. 9 and other drawings, the Sirocco fan 16 is arranged on the downstream side of the humidification unit 15 including the water tray 40, the humidification rotor 50, and other elements. The streamer discharge unit 18 (discharge unit) is provided between the opening 79 of the fan casing 70 and the flow channel 83 of the filter support member 80, and is arranged on the downstream side of the Sirocco fan 16. The water tray 40 in the vicinity of the delivery port 81 of the flow channel 83 is arranged, on the flow channel, on the downstream side of the streamer discharge unit 18. Thus, a flow channel for creating the flow of air containing active species to the space above the water tray 40 using only the blowing-out of air from the Sirocco fan 16 is obtained using a simple configuration.

(4-3) As shown in FIG. 12, a flow channel 83 is provided to the side surface of the filter unit 14, i.e., the left-side-surface side of the filter support member 80. The branch flow 13b containing active species flow through the flow channel 83. Multiple holes 84 are formed in the region Ar (active species supply region) of the flow channel 83. Active species can be supplied, together with the indoor air suctioned from the side-surface intake 11b, to the pre-filter 17A, the HEPA filter 17B, and the deodorizing element 17C. Thus, active species can also be supplied to the deodorizing element 17C and similar elements of the filter unit 14 by shared use of the flow channel 83 for sending active species to the water tray 40, and the size of the air purifier 10 (humidifier) in which active species are used can be reduced.

(4-4) As shown in FIGS. 11 and 12, the streamer discharge unit 18 (discharge unit) and the flow channel 83 are provided to the left-side-surface side of the filter support member 80 using the thickness of the filter unit 14. Thus providing the flow channel 83 and the housing part 82 for housing the streamer discharge unit 18 using the thickness of the filter support member 80 supporting the HEPA filter and other elements makes it possible to reduce the size of the air purifier 10 (humidifier).

(4-5) As shown in FIG. 8(a), the water tray 40 has a partition wall 43 (partition part) for partitioning the water-receiving part 41 and the rotor immersion part

42 from each other. The partition wall 43 plays a partial role in partitioning the space Sp2 (humidification space) and the external space Sp1 from each other as shown in FIGS. 6 and 7. Having the partition wall 43 present makes it possible to position the water tank 30 with respect to the water tray 40 from the external space Sp1. It is thereby possible to minimize creation of a bypass between the space Sp2 and the external space Sp1, even in applications related to an air purifier 10 (humidifier) having a water tank 30. (4-6) As shown in FIG 7, a delivery port 81 shown in FIG 5 is provided in the external space Sp1 in the vicinity of the water tray 40. The external space Sp1 is partitioned from the space Sp2 (humidification space) shown in FIG 7 as described above; therefore, it is possible to reduce the effect of the space Sp2 on the flow of air and prevent a decrease in humidification performance.

(5) Modification example

(5-1) Modification example 1A

[0060] In the abovementioned embodiment, some of the air blown out from the Sirocco fan 16 is extracted as the branch flow 13a, and active species generated by the streamer discharge unit 18 is guided to the vicinity of the water tray 40 without newly providing a fan and/or a pump. However the method for creating the flow of air of such description is not limited to ventilation flow blown out by the Sirocco fan 16. The flow of air sucked into the Sirocco fan 16 can be used to guide the active species to the vicinity of the water tray 40. In such an instance, a path may be provided so as to guide the active species to the vicinity of the rotor immersion part 42 of the water tray 40 on the side of the space Sp2.

(5-2) Modification example 2A

[0061] In the abovementioned embodiment, the streamer discharge unit 18 was mentioned as an example of a discharge unit. However, the discharge unit for performing plasma discharge is not limited to a streamer discharge unit, and may be another type of plasma discharge unit.

(5-3) Modification example 3A

[0062] In the abovementioned embodiment, an example was given for an evaporation humidification method in which the humidification rotor 50 is used for the humidification unit 15. However, it is possible to use, for the humidification unit 15, another humidification method in which a humidification rotor 50 is not used, such as a heater humidification method or an ultrasonic humidification method.

(5-4) Modification example 4A

[0063] In the abovementioned embodiment, an example was given for an instance in which the Sirocco fan 16 is used as the fan. However, a turbo fan, a crossflow fan, or another type of fan can be used as the fan.

(5-5) Modification example 5A

[0064] In the abovementioned embodiment, a description was given for an instance in which the filter unit 14 comprises the pre-filter 17A, the HEPA filter 17B, and the deodorizing element 17C. However, it is also possible to combine an electrostatic dust collector filter or another type of filter, or combine an element supporting a photocatalytic titanium apatite or another element.

(5-6) Modification example 6A

[0065] In the abovementioned embodiment, as shown in FIG. 12, a description was given for an example in which the left-side-surface side of the filter support member 80 is the side surface of the filter unit 14 to which the discharge unit 18 and the flow channel 83 are provided. However, the side surface of the filter unit 14, to which the discharge unit 18 and the flow channel 83 are provided, is not limited to the left-side-surface side, and the side surface to which the discharge unit and the flow channel are provided may be the upper side surface, lower side surface, or the right-side side surface. A configuration is also possible in which the discharge unit 18 and the flow channel 83 is provided to two or more side surfaces from among the upper side surface, lower side surface, left-side side surface, and the right-side side surface, e.g., to the left-side-surface side and the right-side-surface side, instead of one side surface only. The side surface to which the discharge unit 18 and the flow channel 83 may also be different. For example, a configuration is also possible in which the discharge unit 18 is provided to the upper side surface and/or the lower side surface of the filter unit 14, and the flow channel 83 is provided to the left-side side surface and/or the right-side side surface. Alternatively, for example, a configuration is also possible in which the flow channel 83 is provided to the upper side surface and/or the lower side surface of the filter unit 14, and the discharge unit 18 is provided to the left-side side surface and/or the right-side side surface.

REFERENCE SIGNS LIST

[0066]

10	Air purifier
20	Main body casing
30	Water tank
40	Water tray
50	Humidification rotor

(continued)

70 Fan casing
80 Filter support member

CITATION LIST**PATENT LITERATURE**

[0067] <Patent Document 1> JP-A 2009-148305

Claims

1. A humidifier, comprising:

a discharge unit (18) for generating active species by plasma discharge;
a humidification unit (15) having a water tray (40), the humidification unit humidifying air using water in the water tray;
a fan (16) for blowing air humidified in the humidification unit into an indoor space; and
a flow channel (20, 70, 83) for sending the active species from the discharge unit to a space above the water in the water tray using ventilation flow generated by the fan.

2. The humidifier according to claim 1, wherein:

the fan is arranged on the downstream side of the humidification unit;
the discharge unit is arranged on the downstream side of the fan in the flow channel; and
the humidification unit is arranged on the downstream side of the discharge unit in the flow channel.

3. The humidifier according to claim 1 or 2, further provided with

a filter unit (14) for removing dust in the air fed to the humidification unit;
the flow channel having an active species supply region (Ar) which passes through at least a part of the surroundings of the filter unit on a downstream side of the discharge unit, the active species supply region being provided with a hole (84) for supplying the filter unit with the active species.

4. The humidifier according to claim 1 or 2, further provided with

a filter unit (14) for removing dust in the air fed to the humidification unit;
the discharge unit and the flow channel being arranged on a side surface of the filter unit.

5. The humidifier according to any of claims 1 through 4, further provided with

a tank (30) for feeding water to the water tray of the humidification unit;
the water tray being provided with a partition part (43) for partitioning a humidification space in which air is humidified and an external space from each other, the partition wall having formed therein an opening (43a) for guiding water in the tank arranged in the external space into the humidification space.

6. The humidifier according to claim 5, wherein the flow channel has a delivery port (81) in the vicinity of the water tray in the external space, the active species being delivered through the delivery port.

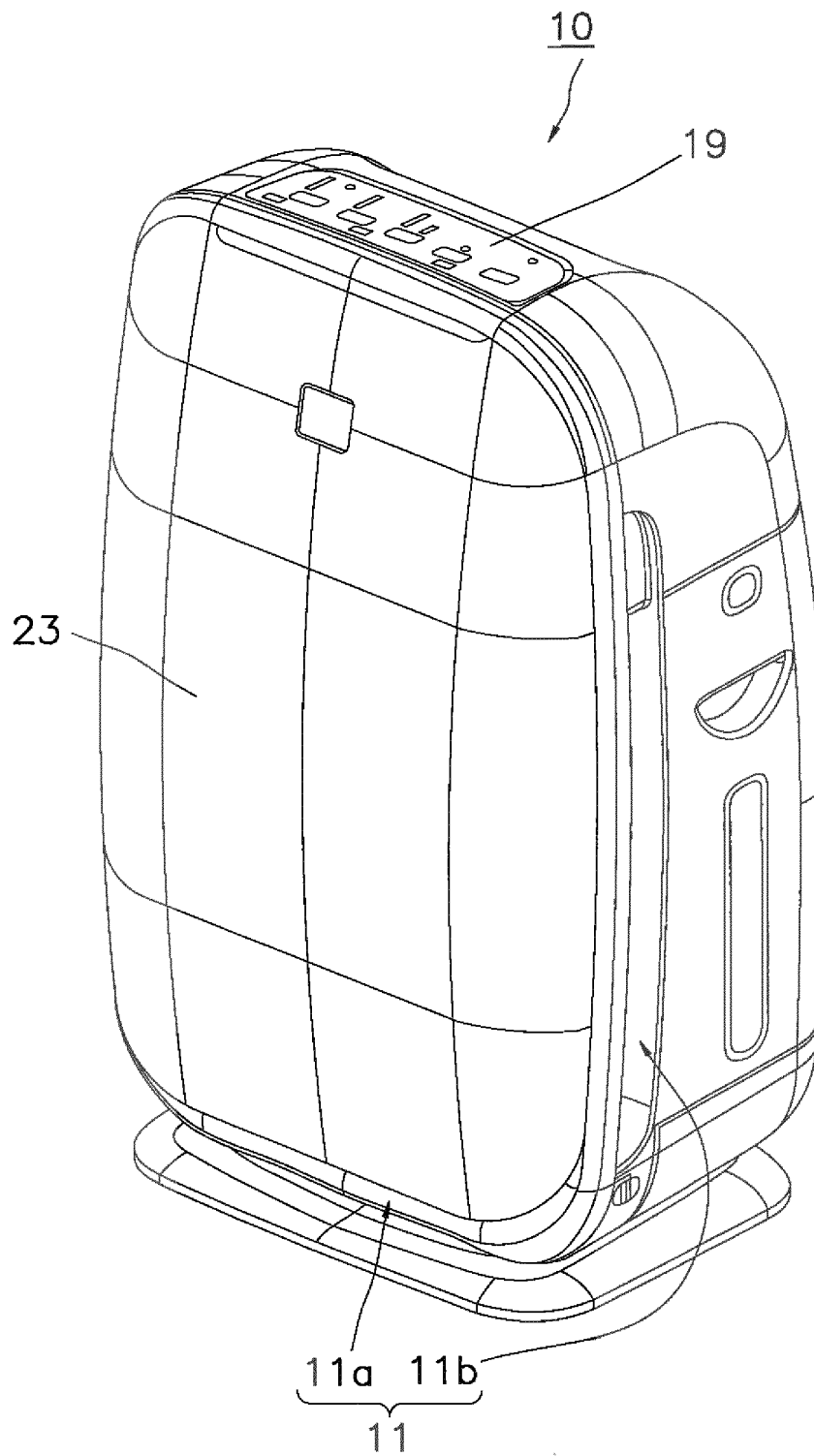


FIG. 1

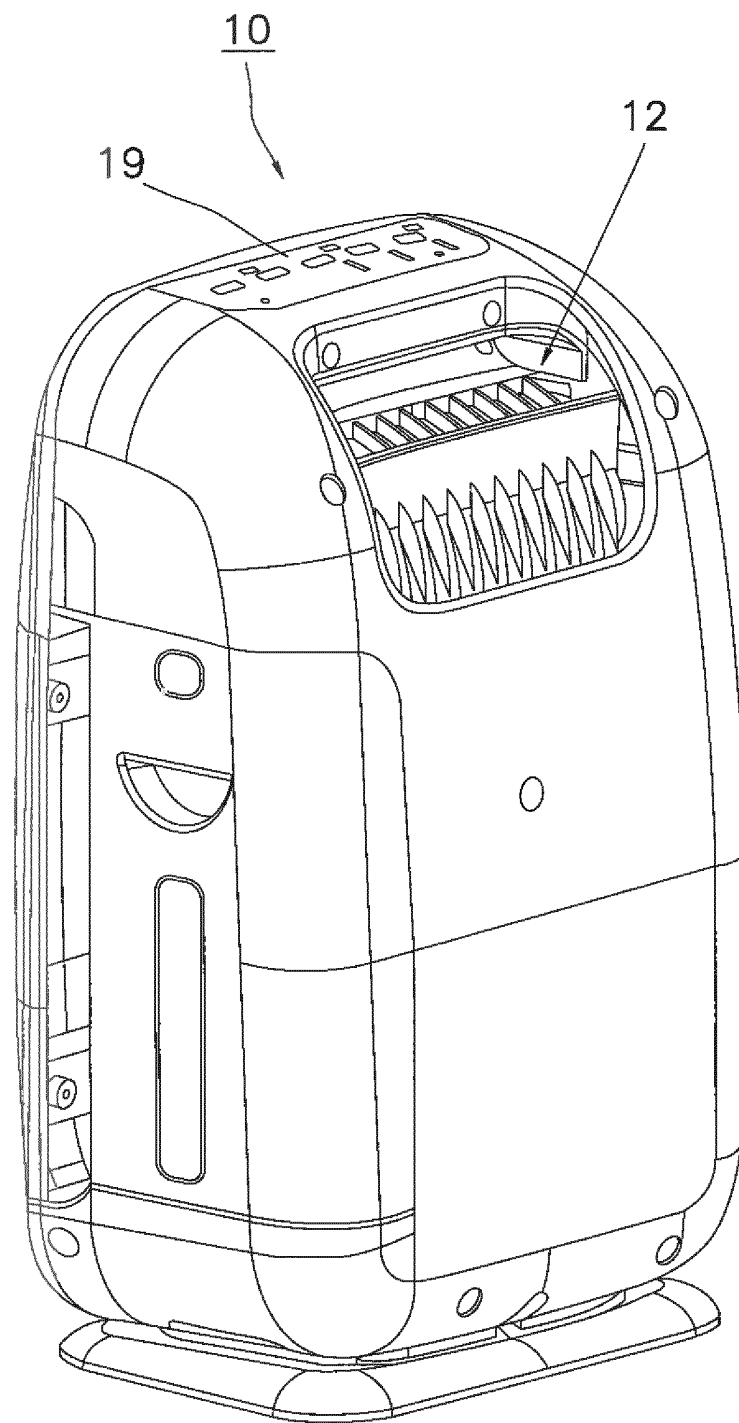


FIG. 2

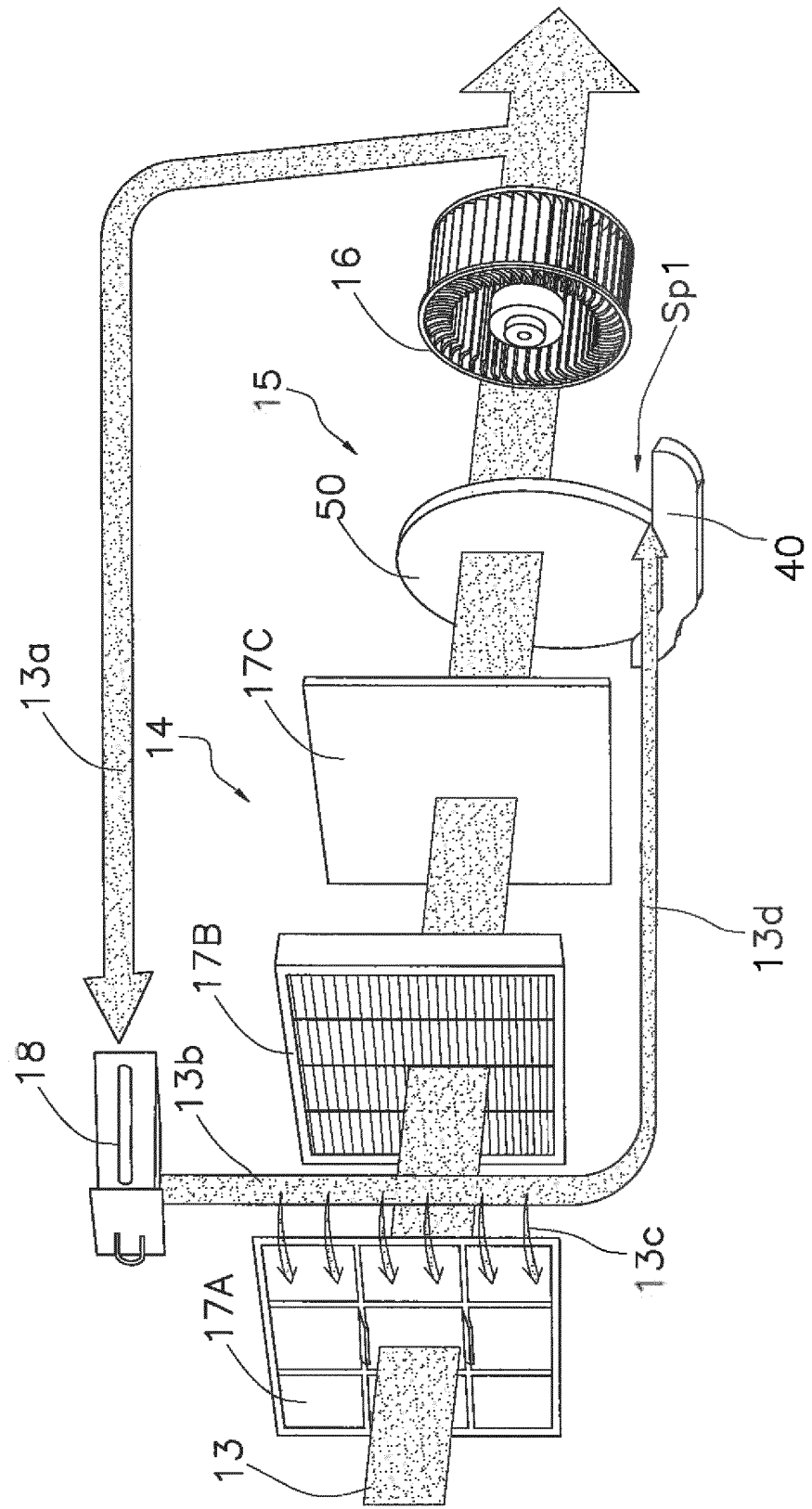


FIG. 3

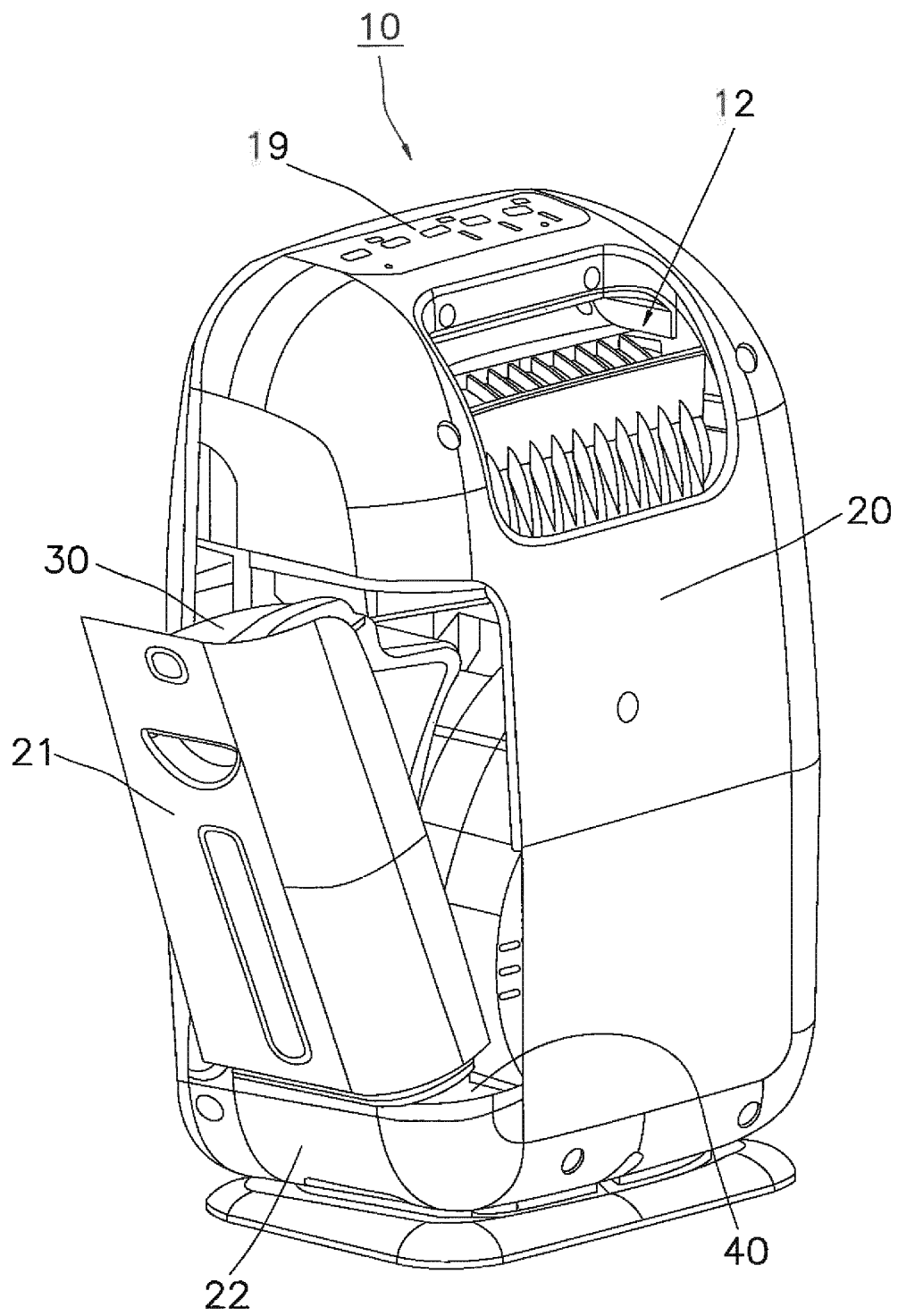


FIG. 4

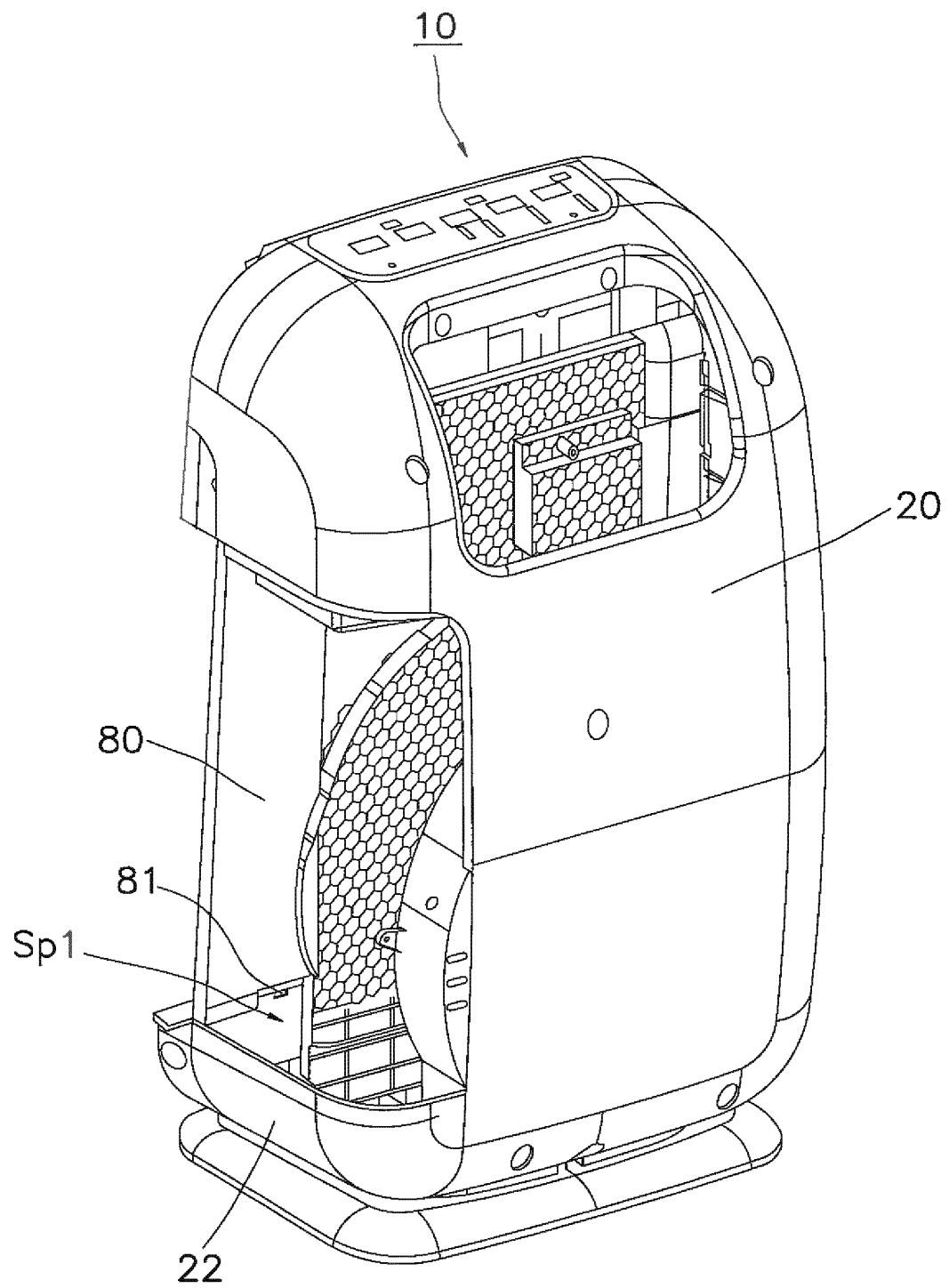


FIG. 5

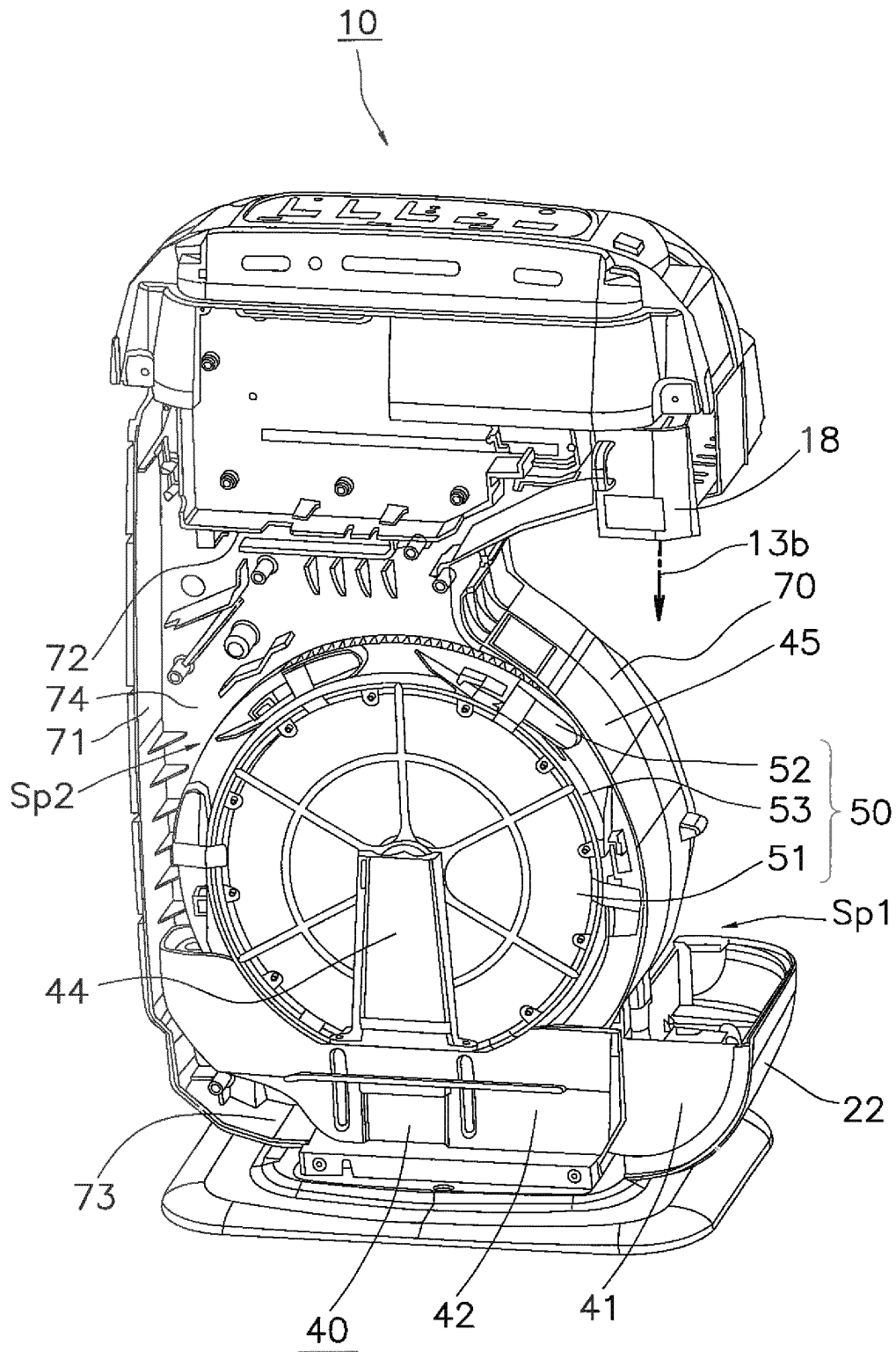


FIG. 6

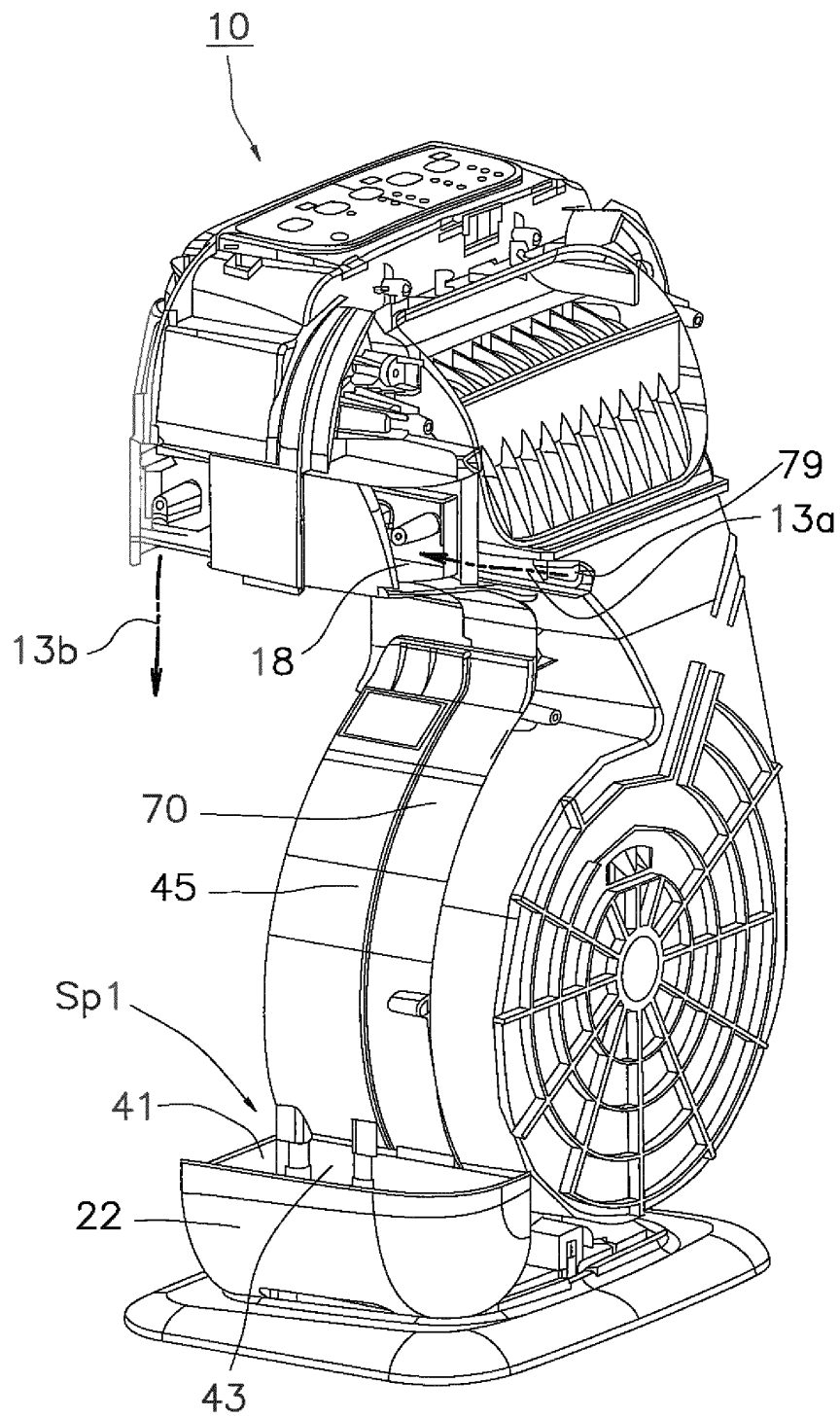
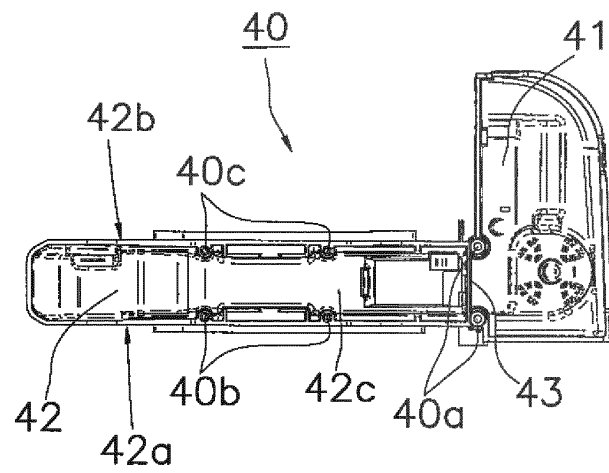
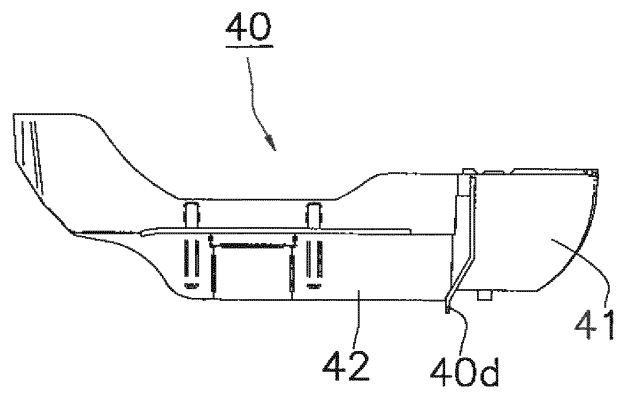


FIG. 7

(a)



(b)



(c)

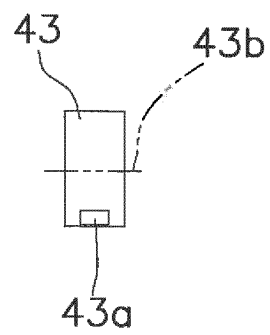


FIG. 8

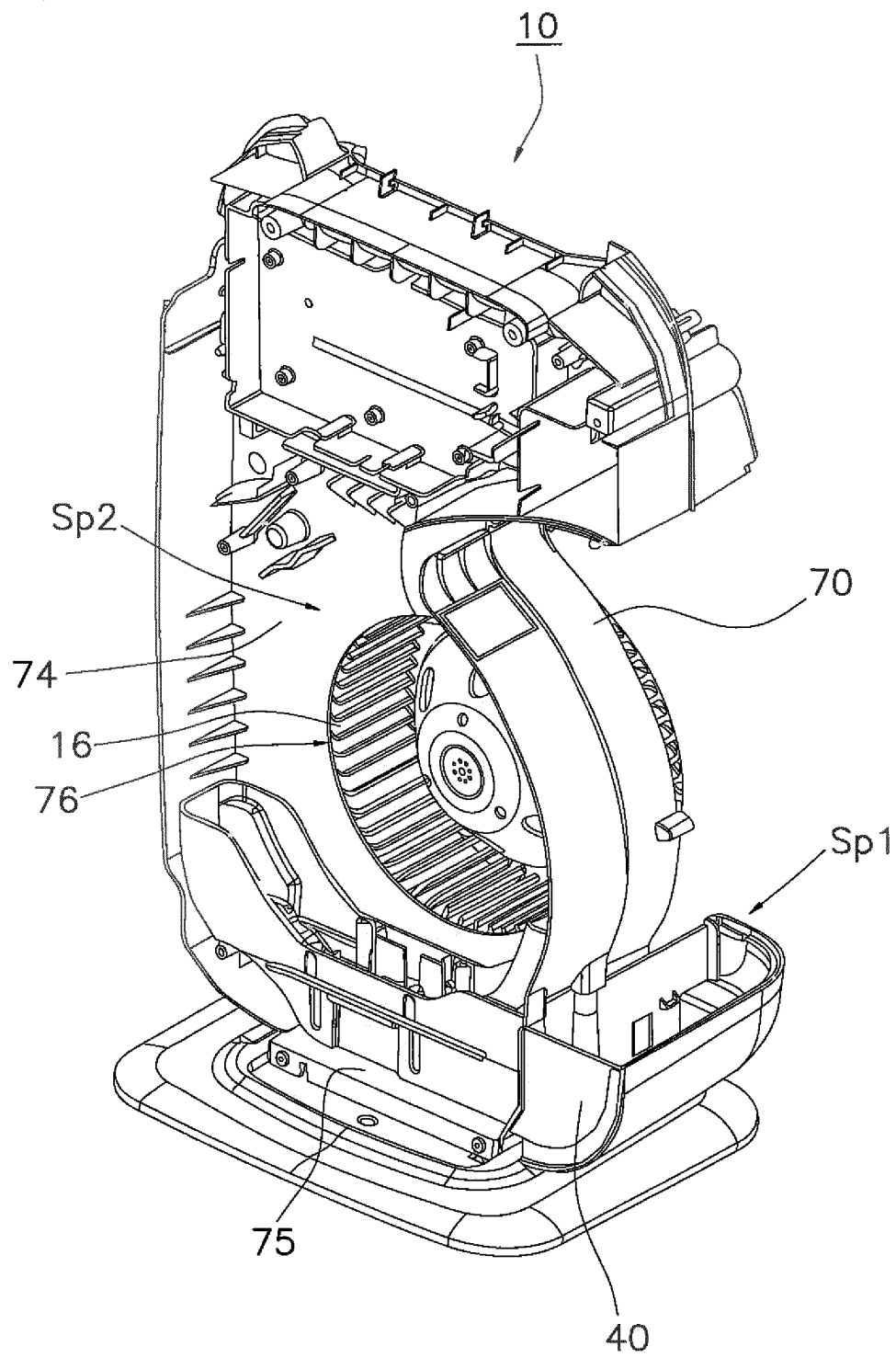


FIG. 9

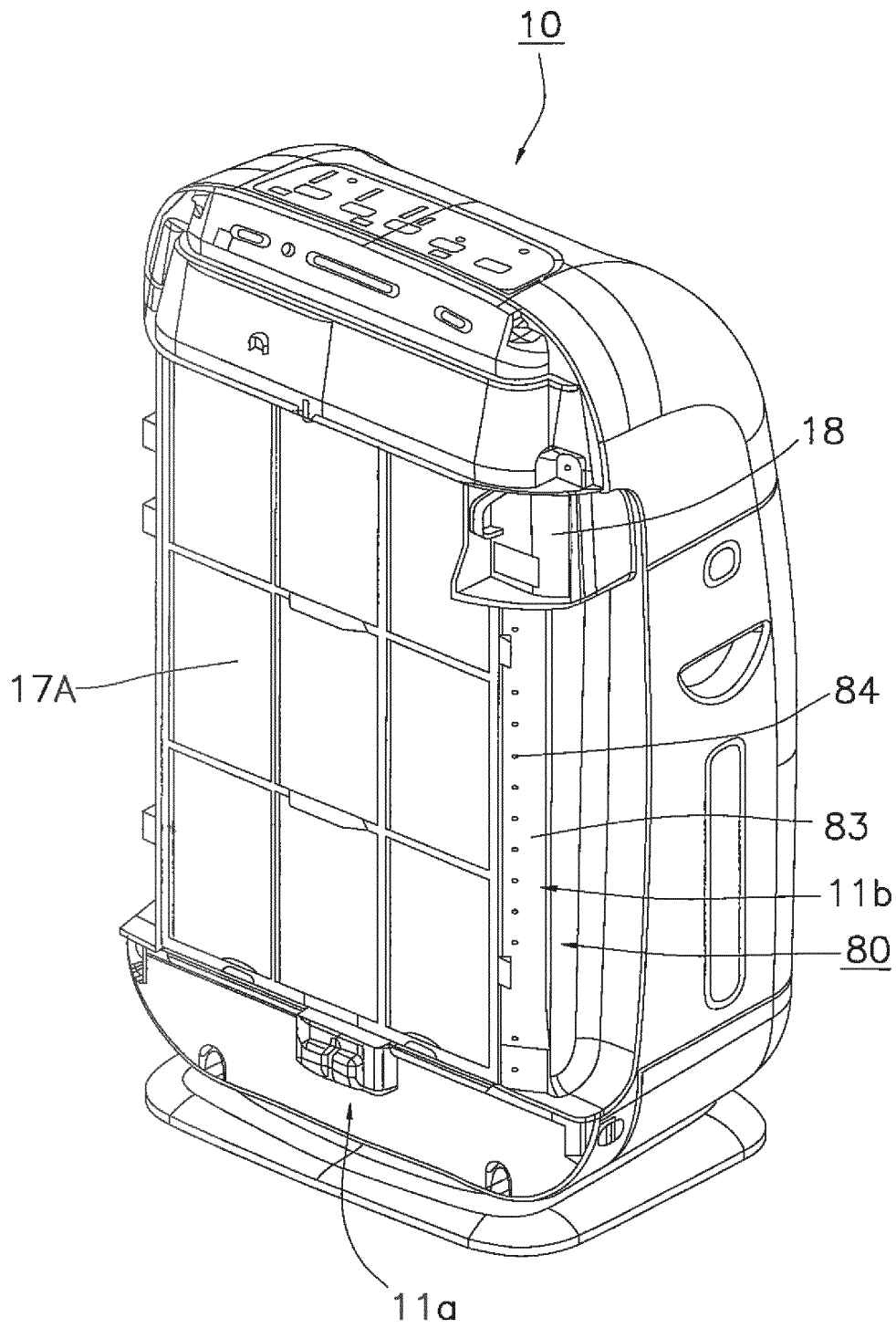


FIG. 10

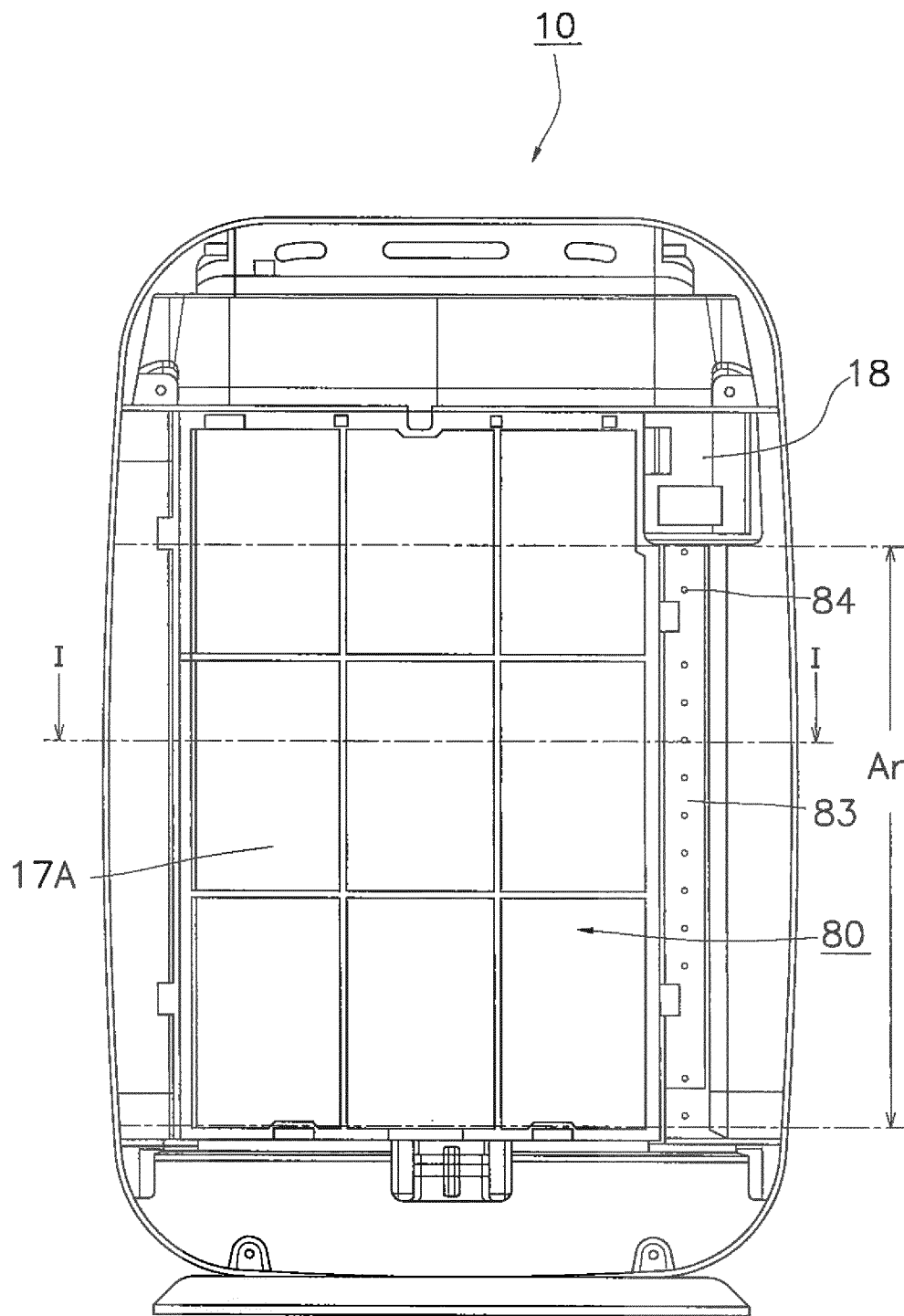


FIG. 11

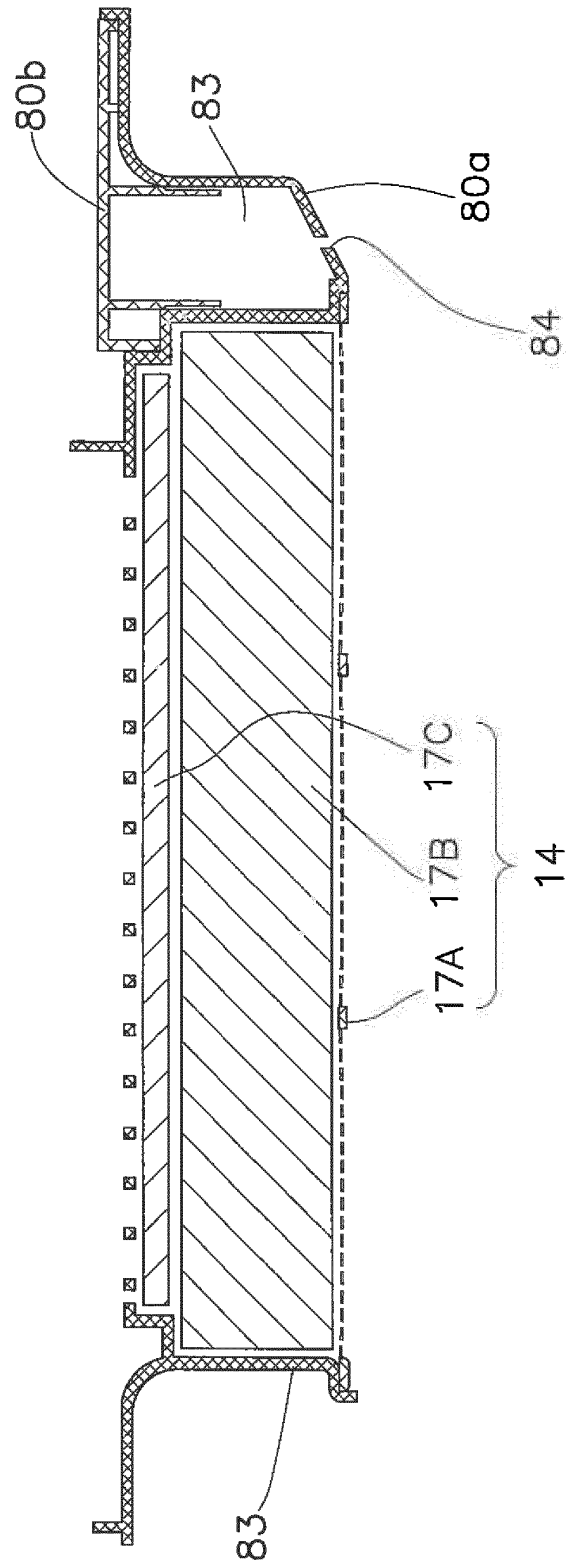


FIG. 12

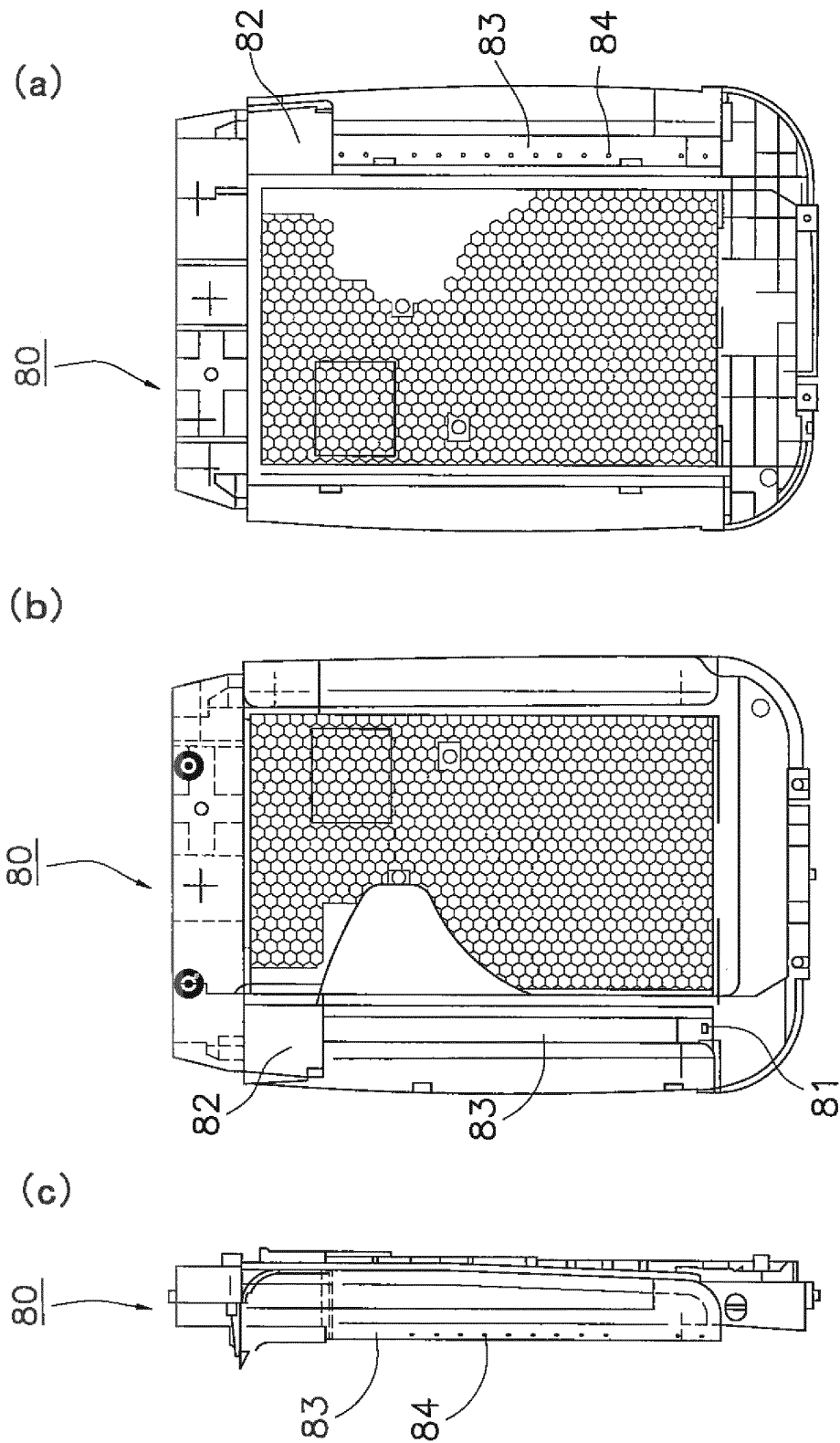


FIG. 13

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2011/065322

A. CLASSIFICATION OF SUBJECT MATTER <i>F24F6/00(2006.01) i, F24F6/06(2006.01) i</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) <i>F24F6/00, F24F6/06</i>		
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 1996-2011 Kokai Jitsuyo Shinan Koho 1971-2011 Toroku Jitsuyo Shinan Koho 1994-2011		
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.
X Y	WO 2010/004762 A1 (Daikin Industries, Ltd.), 14 January 2010 (14.01.2010), paragraphs [0043] to [0070], [0083] to [0085], [0095] to [0102]; fig. 2, 4, 7 & EP 2309195 A1 & CN 102077030 A	1, 2 3-6
Y	JP 2009-148305 A (Daikin Industries, Ltd.), 09 July 2009 (09.07.2009), paragraphs [0032] to [0040]; fig. 2, 4 (Family: none)	3-6
Y	JP 2009-30940 A (Sharp Corp.), 12 February 2009 (12.02.2009), paragraphs [0018] to [0021]; fig. 1 (Family: none)	5, 6
☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "I" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 06 October, 2011 (06.10.11)		Date of mailing of the international search report 18 October, 2011 (18.10.11)
Name and mailing address of the ISA/ Japanese Patent Office		Authorized officer
Facsimile No.		Telephone No.

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2011/065322

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2010-43833 A (Daikin Industries, Ltd.), 25 February 2010 (25.02.2010), entire text; all drawings & WO 2010/007766 A1	1-6
A	JP 4-48946 A (Toshiba Corp.), 18 February 1992 (18.02.1992), entire text; all drawings (Family: none)	1-6
A	JP 2006-153316 A (Dainichi Co., Ltd.), 15 June 2006 (15.06.2006), entire text; all drawings (Family: none)	1-6

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2009148305 A [0002] [0067]