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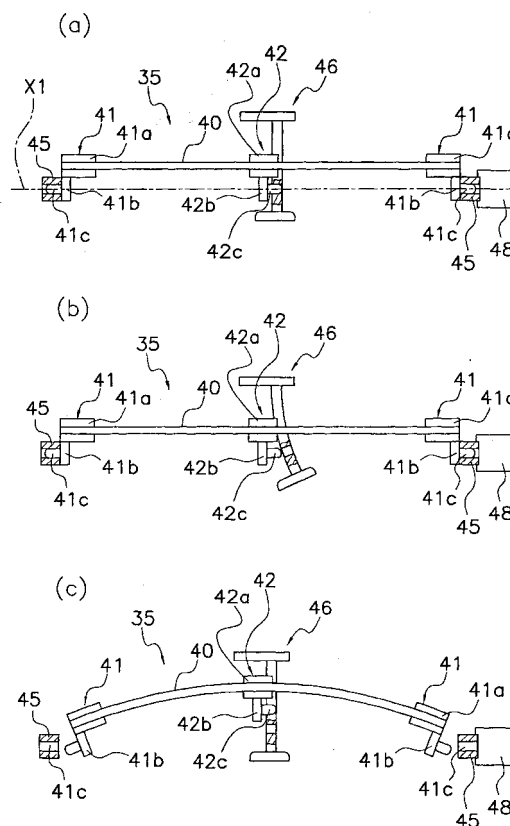
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(54) **AIR CONDITIONER**

(57) An indoor unit 10 used for air conditioning includes an approximately rectangular discharge port 21, a first flap 35, and a support bracket 46. The first flap 35 is elastic, arranged along the longitudinal direction of the discharge port 21, and supported by the discharge port 21 on both ends thereof and in the central portion thereof. The support bracket 46 is elastic, supports the central portion of the first flap 35, and is fixed on a first end thereof to a first position along the length of the discharge port 21.

Fig. 4



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Description

TECHNICAL FIELD

[0001] The present invention relates to an air conditioner, and more particularly to an air conditioner that has an approximately rectangular discharge port.

BACKGROUND ART

[0002] Indoor air conditioning units that are hung from the ceiling are wellknown in the prior art. These types of ceiling hung indoor units are typically provided with a main casing that can be hung from the ceiling and include an approximately rectangular discharge port on the front surface thereof, a multi-van fan that draws in air and discharges it, and a heat exchanger.

[0003] The main casing further includes a top panel, a bottom panel which is disposed opposite the top panel, and plastic ornamentation that serves to cover the front, bottom and both side surfaces thereof. The top panel can be hung from the ceiling by means of a metal fixture. The ornamentation can be attached to the main casing by means of screws.

[0004] One or more air direction vanes that pivot up and down are provided in the discharge port. Both ends of each air direction vane are supported on the main casing by, for example, bearings that has been bolted thereto, and are freelypivotable thereon. When the discharge port is long in the longitudinal direction, the air direction vanes will also be made long. When the air direction vanes are long, they are not only supported on both ends, but are also supported in the middle by a central support member bolted to the main casing. The central support member also allows the air direction vanes to freely pivot.

[0005] By rotating the fan in this type of indoor unit, air is introduced into the interior of the main casing from the intake port formed therein, heat exchange occurs in the heat exchanger between the air and refrigerant in the heat exchanger such that the temperature of the air is regulated, and the temperature regulated air is then discharged from the discharge port into the indoor space. In addition, the direction of the air can be changed up or down by pivoting the air direction vanes.

[0006] With this type of indoor unit, there will be times when the air direction vanes will be dismantled in order to perform maintenance. Conventionally, when the air direction blades are to be dismantled, the screws securing the ornamentation on both side panels will be removed with a screwdriver, the screws securing the bearings will then be removed, and the air direction vanes will then be shifted left or right and dismantled.

[0007] With these types of conventional air conditioners, both the ornamentation on the side panels of the indoor unit and the bearings thereon must be removed in order to dismantle the air direction vanes. Thus, in order to remove the screws on the side panels and the

bearings, there needs to be space on the sides of the indoor unit that will allow a screwdriver to be used. In addition, a screwdriver needs to be prepared in order to remove the side panels and the bearings, and the side panels and bearings need to be removed. Thus, the indoor unit can be placed in only a limited number of locations, and the task of installing and removing the air direction vanes is quite troublesome.

[0008] Thus, it is an object of the present invention to simplify the installation and removal of the air direction vanes in an air conditioner having a rectangular discharge port, and to reduce to limitations on the places in which the air condition can be hung.

DISCLOSURE OF THE INVENTION

[0009] An air conditioner according to the present invention is a device having an approximately rectangular discharge port, and is comprised of an air direction vane and a central support member. The air direction vane is elastic, disposed along the longitudinal direction in the discharge port, and is supported by the discharge port on both ends thereof in the longitudinal direction and on a central portion thereof between the two ends. The central support member is elastic, supports the central portion of the air direction vane, and a first end thereof is fixed to a first position along the length of the discharge port.

[0010] In this device, when the air direction vane is to be removed, a second end of the central support member is flexed, and a central member on the air direction vane is disengaged from the central support member. Then, the air direction vane is flexed, and support members on both ends thereof are dismantled. Because the first end of the central support member is fixed, the second end thereof can be flexed. In addition, because the central support member and the air direction vane are elastic, even if both are flexed, problems such as deformation or damage will rarely occur.

[0011] Here, because the first end of the central support member is fixed, and the central support member and the air direction vane are elastic, the central support member and the air direction vane can be flexed without creating problems therewith. Because of this, the installation and removal of the air direction vane does not require tools such as screwdrivers and the like, and the side panels need not be disassembled. Thus, the air direction vane can be easily installed and removed, and the limitations on the locations where the device can be hung can be reduced.

[0012] A receiving member that forms a gap with respect to a second position on the discharge port may be provided on the second end of the central support member. In this case, even if the device is transported upside down and a load is applied to the discharge port, because the gap between the receiving member and the second position on the discharge port will be eliminated and the receiving member will support the load, the de-

formation to the device can be limited to that within its range of elasticity even if a load is applied to it during transport. In addition, because a gap is opened between second end of the central support member and the second position along the length of the discharge port, the central support member can be easily flexed.

[0013] Brackets that each extend perpendicular to the longitudinal direction, and support shafts that are each extend from the tips of the brackets, are respectively provided on both ends of the air direction vane and the central portion thereof. The support shafts on both ends of the air direction vane each project outward in opposite directions, and the support shaft on the central portion thereof projects in one direction along the longitudinal direction. In this situation, the support shafts on both ends of the air direction vane project in different directions, and the support shaft on the central portion of the air direction vane projects in either direction. Thus, because at least one support shaft projects in a direction different from the other support shafts, it will be difficult for the air direction vane to fall out of the discharge port.

[0014] In an air conditioner according to another aspect of the present invention, the device includes an approximately rectangular discharge port, an air direction vane, and a central support member. The air direction vane is elastic, disposed along the longitudinal direction of the discharge port, and is supported by the discharge port on approximately both ends thereof in the longitudinal direction and on the central portion thereof between both ends. The central support member supports the central portion of the air direction member, and is movable along the longitudinal direction.

[0015] In this device, when the air direction vane is to be dismounted, the central support member is moved laterally and the central portion of the air direction vane is removed. Then, the air direction vane is flexed, and both ends of the support member are dismounted. Because the central support member is movable along the longitudinal direction, it can be easily moved along the axial direction. In addition, because the air direction vane is elastic, even if it is flexed, problems such as deformation and damage will rarely occur.

[0016] Here, because the central support member is moveable along the longitudinal direction and the air direction vane is elastic, the air direction vane can be flexed and the occurrence of problems will be eliminated. Because of this, the installation and removal of the air direction vane does not require the use of tools such as a screwdriver and the like, and the side panels need not be disassembled. Thus, like with the invention of claim 1, the air direction vane can be easily installed or removed and the limitations on where the unit can be located can be reduced.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017]

Fig. 1 is a cross-sectional lateral view of a ceiling hung indoor unit for an air conditioner according to a first embodiment of the present invention.

Fig. 2 is a cross-sectional plan view of the indoor unit.

Fig. 3 is an enlarged partial view of the front portion of the indoor unit.

Fig. 4 is a front view of the installation and removal procedures or the first flap.

15 BEST MODE FOR CARRYING OUT THE INVENTION

[0018] Figs. 1 and 2 show a ceiling hung indoor unit 10 for an air conditioner according to a first embodiment of the present invention. Fig. 1 is a cross-sectional lateral view thereof, and Fig. 2 is a cross-sectional plan view thereof.

[0019] The indoor unit 10 includes a thin and generally rectangular main casing 11. Four fans 12, a heat exchanger 13, and a motor 14 for driving the fans 12 are arranged inside the main casing 11.

[0020] The main casing 11 is thin and generally rectangular in shape, and the lower surface of the front portion thereof is formed such that the width of the front portion becomes progressively narrower. Intake ports 20 that take in air are provided in a lower surface of the rear portion of the main casing 11, and a discharge port 21 that discharges heat exchanged air into the interior space is provided in a front surface of the main casing 11.

[0021] The main casing 11 further includes a ceiling member 22 that is capable of being hung from the ceiling, a bottom plate 24 that is disposed such that it faces the front portion of the ceiling plate 22, and a grill cover 25 that is disposed such that it faces the rear portion of the ceiling plate 22. The ceiling plate 22 is a metal plate member that has been turned such that it has a pair of side surfaces and a rear surface. The grill cover 25 is mounted on the ceiling member 22 such that it can be freely opened and closed, and forms the intake ports 20. In addition, a fan partition 26 is disposed longitudinally along the length of the main casing 11 between the bottom plate 24 of the main casing 11 and the grill cover 25, and serves to mount the fans 12 in the main casing 11. The interior space of the main casing 11 is divided into a front space and a rear space by means of the fan partition 26.

[0022] The front surface, side surfaces and the lower surface of the main casing 11 are covered by a plurality of plastic ornamental members 27. A discharge port 21 that is approximately rectangular in shape is formed along the front portion of the ornamental member 27 covering the front surface of the main casing 11. An insulating material 30 such as polystyrene foam is mount-

ed in a forward upper interior space located inside of the discharge port 21, and runs along approximately the entire length thereof. In addition, a drain pan 31 formed from a material such as polystyrene foam is mounted on the inside of the bottom plate 24. The discharge port 21 is formed by the front surface of the main casing 11, an ornamentation member 27, the front portion of the insulating material 30, and the front portion of the drain pan 31. A first flap 35 that pivots up and down (one example of an air direction vane), and a plurality of second flaps 36 that pivot from left to right, are provided in the discharge port 21.

[0023] As shown in Figs. 3 and 4, the first flap 35 includes a plastic flap main body 40 that is elastic, a pair of tip members that are fixed on each approximate end of the flap main body 40, and a central member 42 that is fixed to the central portion of the flap main body 40. The flap main body 40 is a flat member which has a slightly convex shape from the front to rear thereof along its length. The tip members 41 and the central member 42 are disposed on the lower portion of the flap main body 40, and serve to mount the flap main body 40 to the main casing 11 such that it is freely pivotable around a first axis X1 that extends in the longitudinal direction along the length of the discharge port 21. The tip members 41 and the central member 42 include U shaped grasping members 41a, 42a into which the ends of the flap main body 40 are inserted, arm members 41b, 42b that extend downward from the grasping members 41a, 42a, and support shafts 41c, 42c that project out from the ends of the arm members 41b, 42b in the direction of the first axis X1. Here, a pair of support shafts 41c each project outward in opposite directions. The support shaft 42c projects outward in the same direction as the support shaft 41c on the right side. Thus, because the directions in which the support shafts 41c, 42c project are different, the first flap 35 cannot fall out of the main casing 11.

[0024] The pair of support shafts 41c are supported by a pair of bearings 45 that are provided on the inner sides of both ends of the main casing 11. A pivot drive mechanism 48 is provided on the bearing 45 located on the right side of Fig. 4, and serves to pivot the first flap 35 around the first axis X1. The pivot drive mechanism 48 includes a link mechanism that is connected to the tip member 41 located on the right side of Fig. 4, and a motor. The first flap 35 is pivoted by rotating the motor.

[0025] The support shaft 42c is supported by a support bracket 46 (one example of a central support member) that is fixed to the main casing 11 such that it is suspended therefrom. The support bracket 46 is an elastic plastic member, and is fixed at one end thereof to the discharge port 21 by means of an attachment fitting 47 embedded into the insulating material 30. The support bracket 46 includes a fixing member 46a which has a first end thereof screwed to the attachment fitting 47, a leg 46b that extends downward (in Fig. 3) from the fixing member 46a, an arm 46c that extends forward from the

leg 46b, and a receiving member 46d that is formed on the lower end (the second end) of the leg 46b. The fixing member 46a is a plate member and fixed to the front portion of the insulating material 30 that forms part of the discharge port 21. The leg 46b extends backward and downward from the fixing member 46a in a curved manner. The arm 46c extends forward from the lower portion of the leg 46b, and has a cylindrical bearing 46e formed in the tip thereof that supports the support shaft 42c. The receiving member 46d is a rectangular shaped member that is disposed such that there is a small gap between it and the front portion of the drain pan 31 that forms part of the discharge port 21. More specifically, the receiving member 46d is disposed such that there is a gap between 2 mm and 10 mm in height between it and the front portion of the drain pan 31. Here, the gap formed between the receiving member 46d and the front portion of the drain pan 31 serves to allow the leg 46b to be flexed when the first blade 35 is installed or removed. By forming the receiving member in this manner, even if a load is applied to the discharge port 21 while the indoor unit 10 is being transported upside down, the discharge port 21 will not deform and can support the load if the gap formed between it and the support bracket 46 disappears. Because of this, the indoor unit 10 is difficult to damage during transport, even though the discharge port 21 extends along the length thereof.

[0026] The first flap 35 is designed such that it can be easily removed during maintenance without the use of any tools. In other words, as shown in Fig. 4(b), when the first flap 35 is to be removed, the tip of the leg 46b of the support bracket 46, i.e., the receiving member 46d, will be grasped and flexed to the right (in Fig. 4), and the support shaft 42c will be removed from the bearing 46e. Then, the central portion of the flap main body 40 is grasped, flexed upward, and the support shafts 41c on both ends thereof are removed from the bearings 45. Thus, because all of the support shafts 41c, 42c have been removed, the first flap 35 can be removed from the main casing 11. Here, because the support bracket 46 is fixed on only one end thereof, and the first flap 35 and the support bracket 46 are formed from an elastic material, the support bracket 46 and the first flap 35 can be flexed and problems such as the deformation and damage thereof will rarely occur even if they are flexed. Because of this, the first flap 35 can be easily installed and removed without the use of tools.

[0027] The plurality of second flaps 36 are supported by a support fitting (not shown in the figures) that is embedded in the front portion of the drain pan 31, and are freely pivotable around second axes X2 that are disposed to the rear of the first axis X1 and perpendicular thereto. The plurality of second flaps 36 are configured such that a group of flaps, three for example, are linked and pivot together independently of the other group.

[0028] The four fans 12 are each multi-vane sirocco fans, and are disposed such that they run parallel with the heat exchanger 13 and the discharge port 21. Each

fan 12 is fixed to the fan partition 26, and each is connected to and driven by the motor 14. The fans 12 introduce air taken in from the intake ports 20 in the main casing 11 to the interior of the main casing 11, and are arranged such that they discharge heat exchanged air from the discharge port 21. The motor 14 that drive the fans 12 is supported on the fan partition by a fan support mounting 14a.

[0029] A regulating plate 50 is provided below a discharge member 12a on each of the fans 12, more specifically below a tongue member 12b on each fan 12. The base portion of each regulating plate 50 is fixed to the fan partition 26, and each tip thereof extends toward the heat exchanger 13. Each regulating plate 50 is bent toward the lower portion of the heat exchanger 13 at a midpoint thereof, and extends down to a point that does not contact the heat exchanger 13. A space is formed below each regulating plate 50. The air that is discharged from the fans 12 and deflected back from the heat exchanger 13 is directed into these spaces, and is prevented from flowing back into the fans 12. Because of this, the amount of noise produced by the fans can be reduced.

[0030] The heat exchanger 13 is configured such that refrigerant circulates through the interior thereof, and is disposed such that it slants toward the discharge port 21. By disposing the heat exchanger 13 in a slanted position, the heat exchange surface area can be enlarged while reducing the width (from top to bottom) of the indoor unit 10. The heat exchanger 13 includes a refrigerant line 13a through which refrigerant passes through, and a plurality of fins 13b that are lined up parallel to each other and through which the refrigerant line passes. The refrigerant line 13a is formed from a copper pipe that includes hairpin shaped curves along the length thereof. The fins 13b are thin aluminum parallelograms, and tip portions 13c on the tops thereof, i.e., the angled tip portions 13c disposed along the length of the discharge port 21, are disposed on the top of the discharge port 21. The refrigerant line 13a is connected to an outdoor unit via an outdoor line (not shown in the figures).

[0031] A cover member 51 is mounted on the tip portions 13c on the fins 13b. The cover member 51 runs along the entire length of the heat exchanger 13 and has a protective function. The cover member 51 has a peak shaped cross section that is the same shape as the tip portions 13c, and is, for example, formed from extruded aluminum. The cover member 51 is arranged such that the tip portions 13c of the fins 13b cannot be seen from the discharge port 21. The cover member 51 is attached to the fins 13b by a seal member 52 that is attached to the upper portions of the fins 13b. The seal member 52 has a predetermined thickness, and is an adhesive tape in which the adhesive surface thereof is applied to the fins 13b. The seal member 52 is provided in order to seal the gap between the insulating material 30 and the heat exchanger 13.

[0032] By covering the tip portions 13c of the fins 13b

with the cover member 51, the heat exchanger 13 cannot be directly seen, even if the heat exchanger 13 is close to the discharge port 21 because of the small horizontal dimensions of the indoor unit 10. Because of this, even if the indoor unit 10 is designed to be small and lightweight, the heat exchanger 13 will not stand out. Moreover, if the cover member 51 is mounted on the tip portions 13c before the heat exchanger 13 is inserted into the main casing 11, the tip portions 13c on the heat exchanger 13 will be protected, and the tip portions 13c will not likely be damaged during installation.

[0033] With an indoor unit 10 constructed in such a manner, the fans 12 will rotate and air from the intake ports 20 will be taken in and discharged from the discharge port 21 into the interior space. While traveling through that route, the air will pass through the heat exchanger 13 and heat exchange will occur between it and the refrigerant. Then, by pivoting the first flap 35 up and down by means of the pivot drive mechanism 48, the direction in which the air is blown into the interior space can be varied, thus making the temperature in the interior space more uniform.

[0034] As noted above, when the first flap is dismounted during maintenance, the tip of the leg 46b on the support bracket 46 is grasped, flexed to the right in Fig. 4, and the support shaft 42c is removed from the bearing 46e. Then, the center of the flap main body 40 is grasped, flexed upward, and the support shaft 41c on both ends thereof are removed from the bearings 45. Thus, because all of the support shafts 41c, 42c are removed, the first flap 35 can be removed from the main casing 11. When installation is to occur, the center of the flap main body 40 is grasped, flexed upward, and the support shafts 41c on both ends thereof are inserted into the bearings 45. Then, the tip of the leg 46b on the support bracket 46 is grasped, flexed to the right in Fig. 4, and the support shaft 42c is inserted into the bearing 46e. Thus, the first flap 35 is mounted in the main casing 11.

[0035] Here, because only one end of the support bracket 46 is fixed, and the first flap 35 and the support bracket 46 are elastic, no problems will occur with the support bracket 46 and the first flap 35 and both can be flexed. Because of this, the first flap 35 can be installed or removed without using a screwdriver or other tools and the side panels of the indoor unit 10 do not have to be disassembled. Thus, the first flap 35 can be easily installed or removed, and the limitations on the locations in which the indoor unit 10 can be placed can be reduced.

[Other Embodiments]

[0036]

(a) The first embodiment described above was described as a ceiling hung indoor unit. However, the present invention can be applied to all air condition-

ers having a flap that is supported in the central portion thereof. For example, the present invention can be applied to indoor units that are hung from the wall or are embedded into the ceiling, or to stand alone air conditioners that are installed in windows. (b) In the first embodiment described above, the central member 42 was dismounted by flexing the support bracket 46. However, the support bracket may be arranged so that it can move along a length of the discharge port, in such a way that the central member 42 can be dismounted therefrom. In this situation, the support bracket is moved laterally when the central member 42 is to be dismounted. With this configuration, because the central support member is laterally movable and the air direction vane is elastic, the air direction vane can be flexed and thus problems therewith can be eliminated. In the same manner as noted earlier, the use of tools such as a screwdriver and the like can be eliminated, the side panels do not have to be disassembled, and the air direction vane can be installed and removed. Thus, the air direction vane can be easily installed and removed, and the limitations on where the indoor unit can be placed are reduced. (c) The first embodiment described above is configured such that a receiving member 46d is provided which supports a load applied to the discharge port 21. However, the receiving member 46d may be eliminated.

INDUSTRIAL APPLICABILITY

[0037] In the air conditioner according to the present invention, because only one end of the central support member is fixed, and the air direction vane and the central support member are elastic, no problems will occur with the central support member and the air direction vane and both can be flexed. Because of this, the air direction vane can be installed or removed without using a screwdriver or other tools and the side panels of the indoor unit do not have to be disassembled. Thus, the air direction vane can be easily installed or removed, and the limitations on the locations in which the unit can be placed can be reduced.

Claims

1. An air conditioner (10) having an approximately rectangular discharge port (21), the air conditioner (10) comprising:

an air direction vane (35) provided along a longitudinal direction of the discharge port (21), the air direction vane (35) having elasticity and supported by the discharge port (21) at approximately both ends thereof in the longitudinal direction and at a central portion thereof in be-

tween both ends, and
a central support member (46) that supports the central portion of the air direction vane (35), the central support member (46) having elasticity and fixed at a first end thereof to a first location along the length of the discharge port (21).

2. The air conditioner (10) according to claim 1, wherein a receiving member (46d) is provided on second end of the central support member (46), the receiving member (46d) forming a gap with respect to a second location on the discharge port (21).
3. The air conditioner (10) according to claim 1 or 2, wherein brackets (41b), (42b) that each extend perpendicular to the longitudinal direction, and support shafts (41c), (42c) that are each disposed on tips of the brackets (41b), (42b) and extend in the longitudinal direction, are provided on both ends of and the central portion of the air direction vane (35), the support shafts (41c) on both ends thereof each projecting outward in opposite directions, and the support shaft (42c) on the central portion thereof projecting in one direction.
4. An air conditioner (10) having an approximately rectangular discharge port (21), the air conditioner (10) comprising:

an air direction vane (35) provided along a longitudinal direction of the discharge port (21), the air direction vane (35) having elasticity and supported by the discharge port (21) at approximately both ends thereof in the longitudinal direction and at a central portion thereof in between both ends, and
a central support member (46) that supports the central portion of the air direction vane (35) and which is movable along the longitudinal direction.

Fig. 1

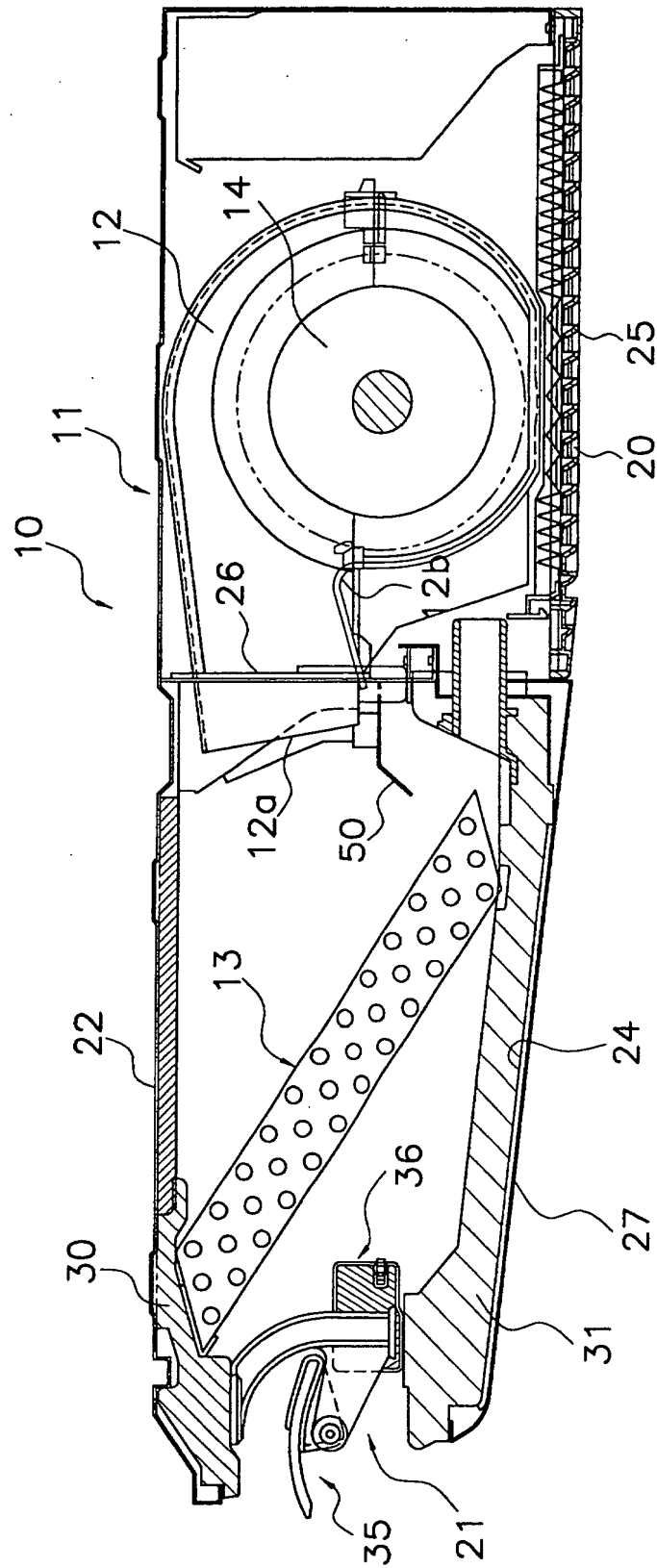


Fig. 2

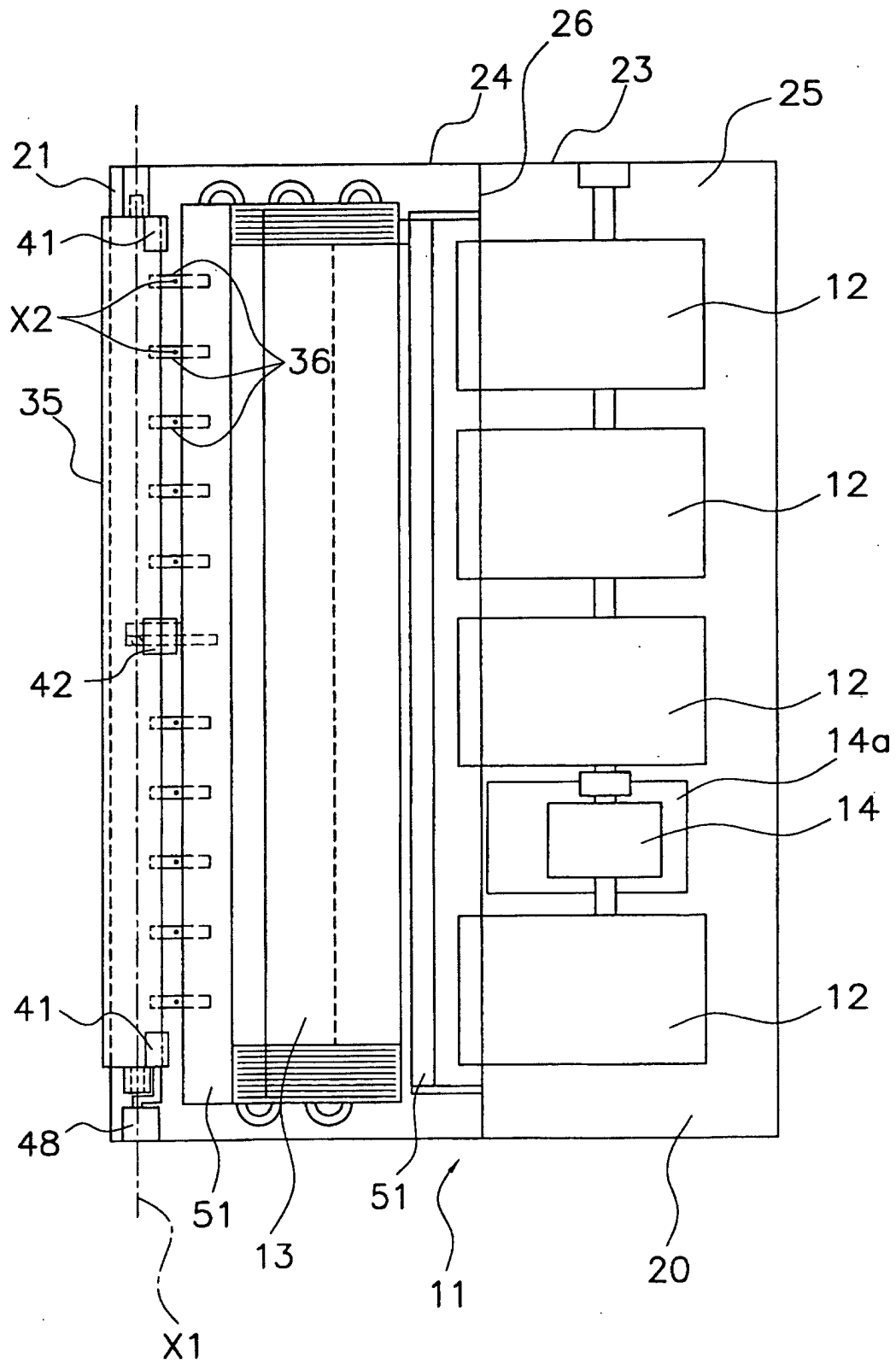


Fig. 3

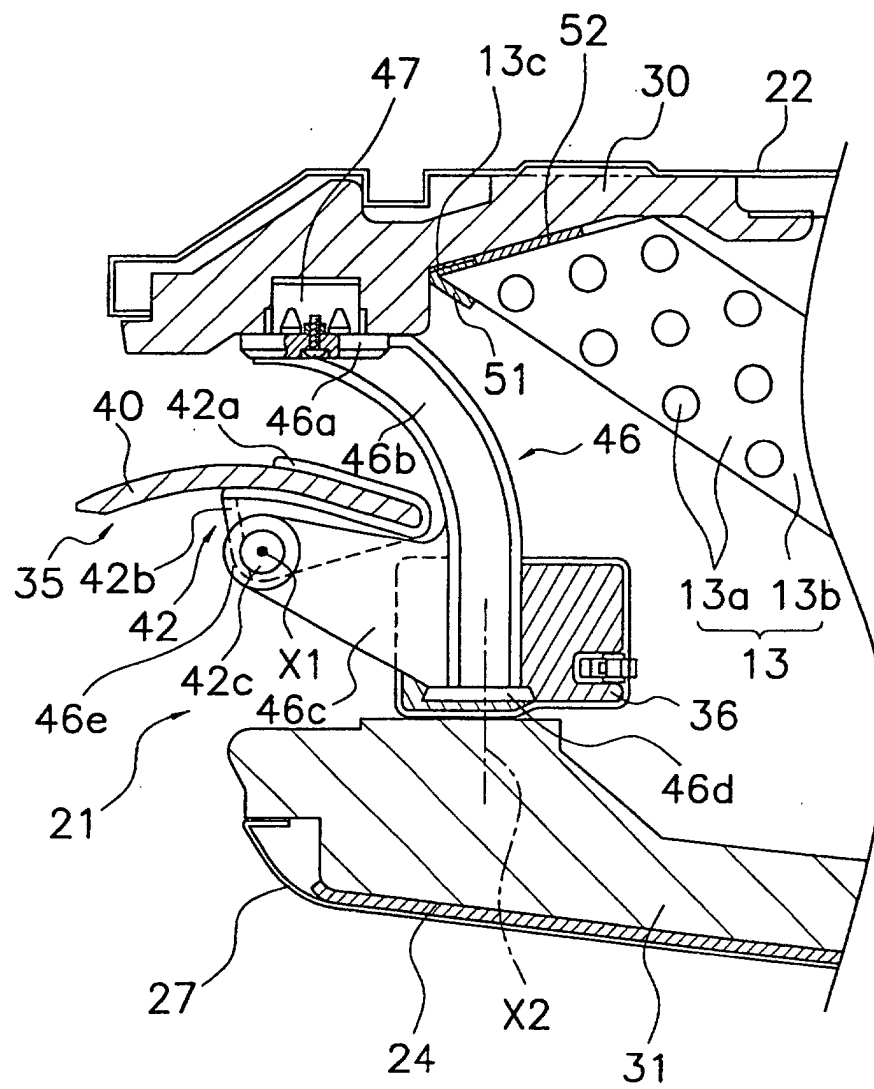
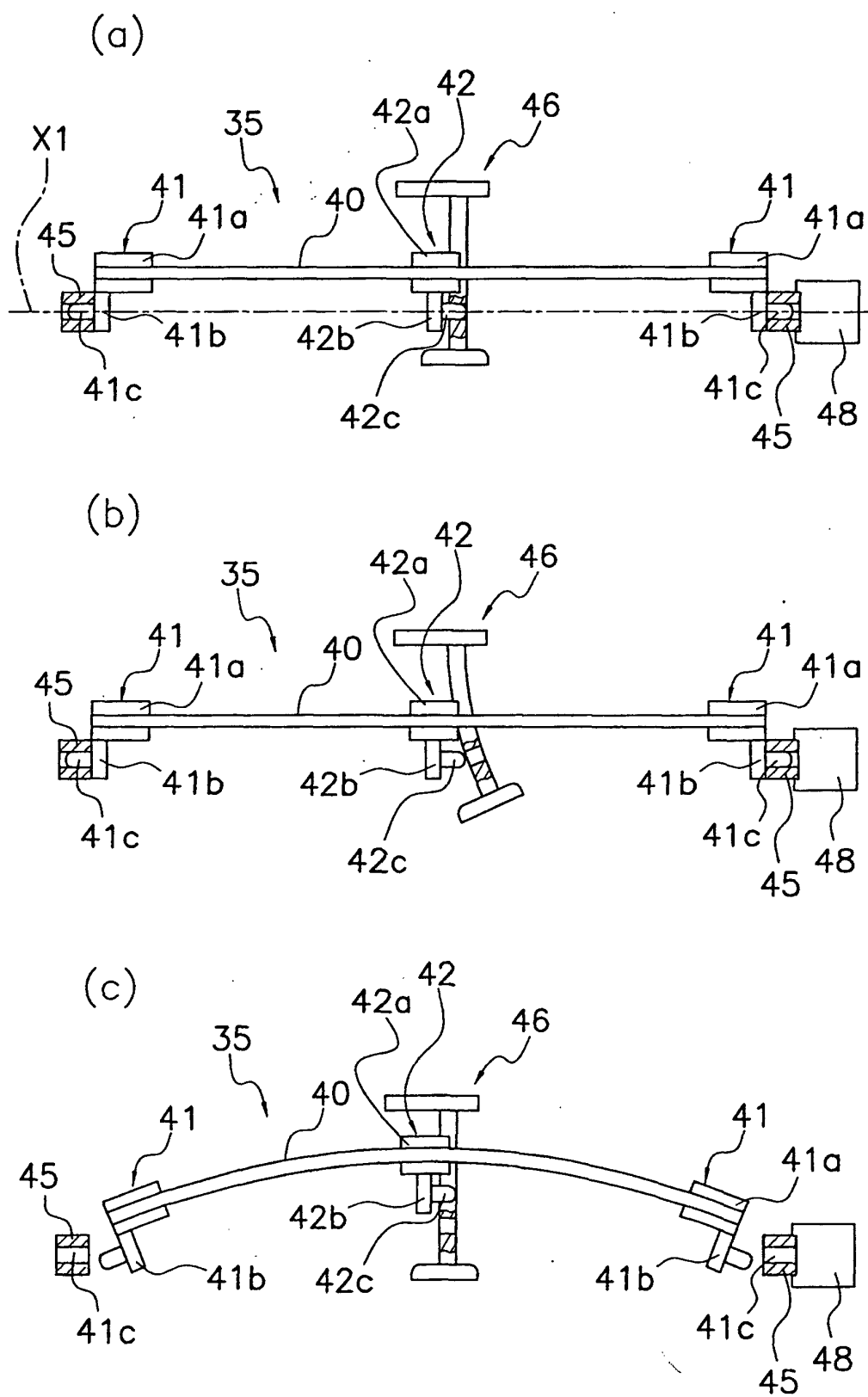


Fig. 4



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP01/06390

A. CLASSIFICATION OF SUBJECT MATTER Int.Cl. ⁷ F24F13/14		
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) Int.Cl. ⁷ F24F1/00, 13/14		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Jitsuyo Shinan Koho 1926-1996 Toroku Jitsuyo Shinan Koho 1994-2001 Kokai Jitsuyo Shinan Koho 1971-2001 Jitsuyo Shinan Toroku Koho 1996-2001		
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.
A	JP 11-270896 A (Toshiba Corporation), 05 October, 1999 (05.10.99), Full text; all drawings (Family: none)	1-4
A	JP 5-187708 A (Matsushita Electric Ind. Co., Ltd.), 27 July, 1993 (27.07.93), Full text; all drawings (Family: none)	1-4
☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.		
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Date of the actual completion of the international search 16 October, 2001 (16.10.01)		Date of mailing of the international search report 23 October, 2001 (23.10.01)
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