



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
17.03.2010 Bulletin 2010/11

(51) Int Cl.:
D06F 58/24 ^(2006.01) **F24F 3/14** ^(2006.01)
F28D 7/00 ^(2006.01)

(21) Application number: **09161352.1**

(22) Date of filing: **28.05.2009**

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

(30) Priority: **11.09.2008 JP 2008233610**

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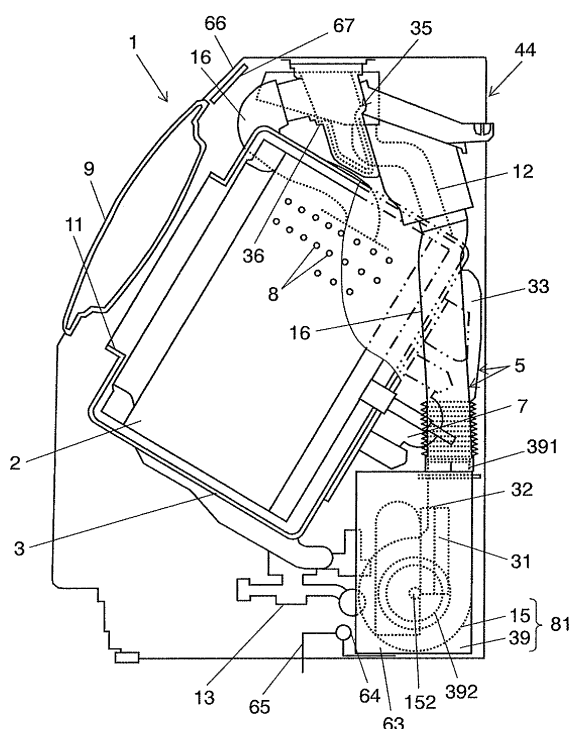
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(54) **Air conditioning unit**

(57) There is provided an air conditioning unit (39) in which an evaporator (31) and a condenser (32) located in the middle of an air passage (5) from a suction inlet port (391) to a suction outlet port (392) for dehumidifying and heating a circulating air, and a compressor (37) for circulating a cooling medium therethrough are build inside a unit case (38) having the suction inlet port (391) and the suction outlet port (392), wherein the evaporator and the condenser compose a heat exchanger (395) in which each other's fins are aligned in parallel, and the heat exchanger is installed inside the air passage of the unit case in which a suction outlet port surface formed by the suction outlet port is opposed to an opening surface of the evaporator or the condenser so as to form an angle (θ) smaller than a right angle.

FIG. 1



Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to an air conditioning unit which is installed in an equipment such as a drum type washer-dryer, and conditions a circulating air.

2. Description of the Related Art

[0002] A conventional air conditioning unit is built inside a drum type washer-dryer through use of a dead space in a rear portion of its tub or the like, and is connected to the middle of a circulating air passage having a blowing fan. Thereby, the circulating air passage sucks in and discharges an air inside the tub by the drive of the blowing fan, introduces the air to an air conditioning unit from its suction inlet port, and subjects the air to dehumidification by an evaporator and heating by a condenser, to give a dry high-temperature air. Thereafter, the circulating air passage discharges the air from a suction outlet port, sends the air to the tub side so as to return it into the tub, and dries laundry inside a rotating drum. The above operations are repeated to execute a drying process after a washing process and a rinsing process.

[0003] For this purpose, the conventional air conditioning unit partitions, by use of a partition wall, an air passage that is installed with the evaporator and the condenser in a unit case and located between the suction inlet port and the suction outlet port, and an accommodating area that accommodates a compressor for circulating a cooling medium through the evaporator and the condenser. The evaporator and condenser are sequentially disposed in the air passage on the upstream side and the downstream side in a mutually isolated manner with an interval therebetween, so as to sequentially perform heat exchange with the circulating air having been sucked and introduced from the suction inlet port and passing toward the suction outlet port for dehumidifying and heating the air, and get the air sucked and discharged from the suction outlet port. It is to be noted that this technical content is disclosed in Unexamined Japanese Patent Publication No. 2008-79861.

[0004] However, with the structure as the conventional one where the evaporator and condenser are sequentially disposed on the upstream side and the downstream side in a mutually isolated manner with an interval therebetween and the circulating air is passed therethrough, an installation area for the evaporator and the condenser is increased in size by as large as a volume of the isolated space therebetween. This is disadvantageous in improving drying performance by increasing a size of a heat exchange equipment such as the compressor, evaporator or the condenser. Further, a flow of the circulating air intending to be headed in the shortest distance from the suction inlet port side to the suction outlet port side, which

are located at both ends of the air passage, is introduced among the fins of the evaporator so as to be once trapped in a direction of the fins, and the flow is released in the isolated space between the evaporator and the condenser. Hence the flow of the circulating air again approaches the suction outlet port side and is introduced to the suction outlet port side of the condenser with a great force. Then, a bypass tendency to weaken the introduction on the opposite side to the suction outlet port is indicated, with which an effective area is decreased, to increase air resistance of the circulating air flow, intending to be headed in the shortest distance from the suction inlet port side to the suction outlet port side, with respect to orientations of the fins of the evaporator and the condenser. Further, heat exchange efficiency and drying efficiency decrease, and drying noise increases.

SUMMARY OF THE INVENTION

[0005] The present invention provides an air conditioning unit which is advantageous in improvement in reducing an installation area for an evaporator and a condenser, and moreover, in drying performance as being capable of enhancing dehumidification efficiency, heating efficiency and drying efficiency.

[0006] The air conditioning unit of the present invention is an air conditioning unit in which an evaporator and a condenser located in the middle of an air passage from a suction inlet port to a suction outlet port for dehumidifying and heating a circulating air, and a compressor for circulating a cooling medium through these evaporator and condenser are built inside a unit case having the suction inlet port of the circulating air and the suction outlet port of the circulating air, wherein the evaporator and the condenser compose a heat exchanger in which each other's fins are aligned in parallel, and the heat exchanger is installed inside the air passage of the unit case in which a suction outlet port surface formed by the suction outlet port is opposed to an opening surface of the evaporator or the condenser so as to form an angle smaller than a right angle.

[0007] With such a configuration, the cooling medium is circulated through the evaporator and the condenser by the drive of the compressor, to activate the evaporator and the condenser, and suction thus acts on a suction outlet port side of the unit case. By this action, the suction reaches the suction inlet port of the unit case through the air passage, to form a flow of a circulating air that passes through the air passage from the suction inlet port and is discharged from the suction outlet port. The circulating air is then passed through the evaporator and the condenser in the middle of the air passage and can thus be continuously sent as a high-temperature air having been dehumidified, heated and dried. In particular, by the heat exchanger with each other's fins of the evaporator and the condenser aligned in parallel, it is possible to avoid formation of an isolated space between the evaporator and the condenser, which is a wasted space and causes

bypassing of the flow of the circulating air to the suction outlet port side. Further, with respect to the circulating air from the suction inlet port to the suction outlet port, due to installation of opening surfaces of the evaporator and the condenser in mutually opposed manner so as to form an angle smaller than a right angle, orientations of the fins with respect to a flowing direction of the circulating air headed in the shortest distance from the suction inlet port side to the suction outlet port side becomes smaller than a right angle, and passage resistance of the circulating air decreases by as much as the orientations are smaller than a right angle.

[0008] Further, the air conditioning unit of the present invention is an air conditioning unit in which an evaporator and a condenser located in the middle of an air passage from a suction inlet port to a suction outlet port for dehumidifying and heating a circulating air, and a compressor for circulating a cooling medium through these evaporator and condenser are built inside a unit case having the suction inlet port of the circulating air and the suction outlet port of the circulating air, wherein the evaporator and the condenser compose a heat exchanger formed by integration of each other's fins having a minute thermally isolated gap, and the heat exchanger is installed inside the air passage of the unit case in which a suction outlet port surface formed by the suction outlet port is opposed to an opening surface of the evaporator or the condenser so as to form an angle smaller than a right angle.

[0009] With such a configuration, the cooling medium is circulated through the evaporator and the condenser by the drive of the compressor, to activate the evaporator and the condenser, and suction thus acts on a suction outlet port side of the unit case. By this action, the suction reaches the suction inlet port of the unit case through the air passage, to form a flow of a circulating air that passes through the air passage from the suction inlet port and is discharged from the suction outlet port. The circulating air is then passed through the evaporator and the condenser in the middle of the air passage and can thus be continuously sent as a high-temperature air having been dehumidified, heated and dried. In particular, since the evaporator and the condenser compose the heat exchanger formed by integration of each other's fins having the minute thermally isolated gap, it is possible to further reduce the space and pass the circulating air all at once with less bypassing. Moreover, with respect to the circulating air from the suction inlet port to the suction outlet port, due to installation of opening surfaces of the evaporator and the condenser in mutually opposed manner so as to form an angle smaller than a right angle, the orientations of the fins with respect to a flowing direction of the circulating air headed in the shortest distance from the suction inlet port side to the suction outlet port side become smaller than a right angle, and passage resistance of the circulating air decreases by as much as the orientations are smaller than a right angle.

[0010] In the above, further, the unit case may be

formed in almost rectangular shape, in which an accommodating area of the compressor is installed on one end side of a longitudinal direction of the unit case, and the other end side from the accommodating area is partitioned from the accommodating area as the air passage, the suction inlet port may be provided upward in a rear portion of a ceiling wall of the air passage, and the suction outlet port may be provided closer to a front portion of an end wall of the other end of the unit case.

[0011] With such a configuration, in addition to the above, the unit case is formed in almost rectangular shape, and is provided with the accommodating area of the compressor on one end side of its longitudinal direction, and with the heat exchanger as an air passage on the other end side from this accommodating area. Thereby, while the heat exchange equipment is accommodated and disposed with a relatively small dead space, the suction inlet port is located in a rear portion of a ceiling wall of the air passage and introduces a sucked air, and the flow of the circulating air headed in the shortest direction for the suction outlet port, located closer to a front portion of the end wall of the other end of the unit case, is directed with inclination, from the one-end-side rear portion to the other-end-side front portion. Hence, even in the case of aiming at forming the heat exchanger in flat shape or some other shape in the forward and backward direction of the unit case while disposing the heat exchanger in an orientation consistent with the longitudinal of the unit case, it becomes easier to set an angle of the flow of the circulating air with respect to the fins to smaller than a right angle. Further, when the heat exchanger is disposed with inclination in the air passage formed by the unit case from the front portion side to the rear portion side and from the suction inlet port side to the suction outlet port side with respect to the longitudinal directions of the unit case and the air passage, the angle with respect to the fins can be reduced from a right angle by half, thereby enabling significant reduction in size of the heat exchanger.

[0012] In the above, further, a length of the evaporator or the condenser may be maximized by means of an angle, formed between the suction outlet port surface formed by the suction outlet port and the opening surface of the evaporator or the condenser.

[0013] With such a configuration, the length of the evaporator or the condenser can be maximized by means of an installation angle of the evaporator or the condenser, the angle being formed by efficiently employing the shapes of the unit case, the air passage and the heat exchange area.

[0014] In the air conditioning unit of the present invention, it is possible to suppress a size increase as a whole by as large as a space saved by the heat exchanger having no isolated space formed by parallel alignment of the each other's fins in the evaporator and the condenser, the space being a wasted space and causing bypassing of the flow of the circulating air to the suction outlet port side, so as to seek for high performance due to a size

increase of the equipment, and also for improvement in dehumidification efficiency as well as heating efficiency. Further, passage resistance of the circulating air sucked and introduced and then sucked and discharged is smaller by as much as the orientations of the fins are smaller than a right angle with respect to the flowing direction of the circulating air headed in the shortest direction from the suction inlet port side to the suction outlet port side, and the volume of the heat exchange air can thus be increased. This leads to improvement in air conditioning performance and drying performance at the time of mounting in the washer-dryer.

[0015] In the air conditioning unit of the present invention, further, since the evaporator and the condenser compose the heat exchanger formed by integration of each other's fins having the minute thermally isolated gap, it is possible to further reduce the space and pass the circulating air all at once with less bypassing.

[0016] Moreover, while the unit case is installed with the accommodating area of the compressor on one end of the unit case almost in rectangular shape and with the heat exchanger as the air passage on the other end side from this accommodating area, to accommodate and dispose the heat exchange equipment with a small dead space, the flowing direction of the circulating air headed in the shortest distance from the suction inlet port to the suction outlet port is directed with inclination from the one end side rear portion to the other end side front portion of the air passage, so as to facilitate setting of the flow of the circulating air with respect to the fins to smaller than a right angle. Furthermore, when the heat exchanger is disposed with inclination in the air passage formed by the unit case from the front portion side to the rear side portion and from the suction inlet port side to the suction outlet port side with respect to the longitudinal directions of the unit case and the air passage, the angle with respect to the fins can be reduced from a right angle by half, thereby enabling significant reduction in size of the heat exchanger.

BRIEF DESCRIPTION OF DRAWINGS

[0017]

Fig. 1 is a side view of an air conditioning unit according to an embodiment of the present invention, which is mounted in a drum type washer-dryer;

Fig. 2 is a rear view of the air conditioning unit according to the embodiment of the present invention, which is mounted in the drum type washer-dryer;

Fig. 3 is a sectional view showing an air-conditioning fan unit in which a blowing fan is connected to the air conditioning unit according to the embodiment of the present invention;

Fig. 4 is a cross sectional view of an accommodating area of a compressor, as well as a one-end-side posterior area as part of an air passage which is partitioned from the accommodating area, of the air con-

ditioning unit according to the embodiment of the present invention;

Fig. 5 is a cross sectional view of a heat exchange area of the air conditioning unit according to the embodiment of the present invention;

Fig. 6 is a plan view of the air conditioning unit according to the embodiment of the present invention when an upper divided portion of a unit case is removed;

Fig. 7 is a perspective view of the air conditioning unit according to the embodiment of the present invention in the state of Fig. 6 when viewed from an oblique angle;

Fig. 8 is an external perspective view of the air conditioning unit according to the embodiment of the present invention when viewed from the front side;

Fig. 9 is an external plan view of the air conditioning unit according to the embodiment of the present invention when viewed from above;

Fig. 10 is a plan view of a lower divided portion of the unit case of the air conditioning unit according to the embodiment of the present invention;

Fig. 11 is a perspective view of the lower divided portion of Fig. 10;

Fig. 12 is a bottom view of the upper divided portion of the unit case of the air conditioning unit according to the embodiment of the present invention;

Fig. 13 is a perspective view showing a combined state of an elastic base and the compressor built in the air conditioning unit according to the embodiment of the present invention;

Fig. 14 is a partial perspective view of the air conditioning unit according to the embodiment of the present invention when viewed from obliquely above in the state of Fig. 6; and

Fig. 15 is a side view of the air conditioning unit according to the embodiment of the present invention when viewed from the accommodating area side.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0018] An air conditioning unit according to an embodiment of the present invention is described below with reference to Figs. 1 to 15 for making the present invention understood. The following descriptions are specific examples of the present invention and do not restrict the contents of the claims.

[0019] Figs. 1 and 2 are views of an air conditioning unit according to an embodiment of the present invention, which is mounted in a drum type washer-dryer. In Figs. 1 and 2, in drum type washer-dryer 1, tub 3 is installed in a floating state inside washer-dryer body 44 by a suspension structure not shown, and rotating drum 2 formed in a bottomed cylindrical shape inside tub 3 is installed with its axial directed downward with inclination from the front surface side to the rear surface side. Laundry loading-unloading opening 11 communicating with an open

end of rotating drum 2 is formed on the front surface side of tub 3, and by opening door 9 that openably/closably closes an opening provided on an upward inclined surface formed on the front surface side of washer-dryer body 44, laundry can be put into and take out of rotating drum 2 through laundry loading-unloading opening 11. With door 9 provided on the upward inclined surface, an operation of putting in and taking out the laundry can be conducted without bending one's back.

[0020] A large number of through holes 8 communicating with the inside of tub 3 are formed on the circumferential surface of rotating drum 2, and agitating protections (not shown) are provided in a plurality of positions on the inner circumferential surface in a circumferential direction. This rotating drum 2 is rotated and driven in forward and backward rotational directions by motor 7 fitted on the rear surface side of tub 3. Further, water filling pipe 12 and drainage pipe 13 are piped and connected in tub 3, and inject and discharge water into and from tub 3 by control of a water injection valve and water discharge valve, not shown.

[0021] Door 9 is opened, and laundry and detergent are put into rotating drum 2. Then, when an operation of drum type washer-dryer 1 is then started through control by control board 67 provided inside control panel 66 or the like, on the basis of an operation performed on control panel 66 provided for example on the upper portion of the front surface of drum type washer-dryer 1, a predetermined volume of water is injected from water filling pipe 12 into tub 3, and rotating drum 2 is rotated and driven by motor 7, to start a washing process. By the rotation of rotating drum 2, the laundry accommodated inside rotating drum 2 is repeatedly subjected to an agitation operation of bringing up the laundry in the rotating direction and dropping the laundry from an appropriate height to which the laundry has been brought up by the agitating projections provided on the inner circumferential wall of rotating drum 2, and thereby, a beat-washing action is exerted on the laundry for washing. After the lapse of predetermined washing time, waste washing water is discharged from drainage pipe 13, and the washing water included in the laundry is removed by a dehydration operation of rotating rotating drum 2 at high speed. Thereafter, water is injected from water filling pipe 12 into tub 3 to carry out a rinsing process. Also in this rinsing process, the laundry accommodated inside rotating drum 2 is repeatedly subjected to the agitation operation of bringing up the laundry and dropping the laundry by the agitating projections on the basis of rotation of rotating drum 2, and thereby, beat-washing is acted on the laundry for rinsing.

[0022] This drum type washer-dryer 1 is provided with a function of drying the laundry accommodated inside rotating drum 2. Therefore, as already described, in drum type washer-dryer 1, air-conditioning unit 39 and circulating air passage 5 for sucking and discharging an air inside tub 3 to introduce the air to air-conditioning unit 39 and again sending a dry high-temperature air, subjected

to dehumidification and heating, are built and blowing fan 15 is provided on the downstream of air-conditioning unit 39 of circulating air passage 5.

[0023] When this blowing fan 15 is rotationally driven, the flow of the air is generated in circulating air passage 5, and a wet air inside rotating drum 2 accommodating the laundry is sucked and discharged by circulating air inlet pipe 16, which introduces the air from tub 3 to blowing fan 15 side, through through holes 8. This discharged wet air is introduced from suction inlet port 391 into the air passage of air-conditioning unit 39 which is located on the upstream side of blowing fan 15 by being direct connected thereto or the like. The air is then dehumidified by formation of dew from moisture in the air in evaporator 31 located in the middle of the air passage, and heated by heat exchange with condenser 32, so as to be constantly made a dry high-temperature air. This dry high-temperature air is sucked to blowing fan 15 through suction outlet port 392, and then sent to blower tube 33 guiding to tub 3, to be sent into tub 3. The dry high-temperature air sent into tub 3 enters into rotating drum 2 through through holes 8, passes through rotating drum 2 to tub 3 while being exposed to the laundry such as clothes, and is introduced again to circulating air inlet pipe 16. A drying process is conducted by repetition of the circulation of the air in circulating air passage 5.

[0024] It should be noted that in this drying process through use of circulating air passage 5, a foreign matter, such as lint, generated from laundry primarily like clothes is apt to be mixed into the air being circulated in circulating air passage 5, to obstruct performance of the drying process by clogging in evaporator 31 and condenser 32, biting in a rotating portion of blowing fan 15, and accumulation on the inner surface of blowing fan 15, thereby necessitating frequent performance of troublesome maintenance. Therefore, generally, in the middle of circulating air passage 5, specifically on the upstream side of evaporator 31, condenser 32 and blowing fan 15, and thus in the middle of above-mentioned circulating air inlet pipe 16, filter room 36 accommodating filter 35 for removing a foreign matter in the circulating air is provided. Thereby, even if a foreign matter is mixed into the air after drying of the laundry and introduced to circulating air inlet pipe 16 side of evaporator 31 side, the foreign matter is captured in filter 35 when passing through filter room 36, and is thus not mixed into the circulating air flowing to the downstream side. Hence functions of evaporator 31, condenser 32, and blowing fan 15 are maintained over the long term. On the other hand, captured foreign matters are accumulated on filter 35 inside filter room 36, to cause passage resistance of the circulating air to gradually increase, leading to deterioration in drying function and thereby, filter 35 is detachably provided as in the general case. Further, air-conditioning unit 39 is directly connected with blowing fan 15 to constitute air-conditioning fan unit 81 that can be handled as a single body, but the configuration is not restricted to this.

[0025] Here, evaporator 31 in which dew condensation

water is generated forms the heat exchanger together with condenser 32, and reservoir 63 of dew condensation water is provided in a range corresponding to a dehumidification area of the bottom portion of unit case 38 of the heat exchanger. Reservoir 63 is connected with drainage pipe 65 having drainage pump 64, and water is discharged in proper volume based upon detection of a water level by use of a water-level sensor, not shown. However, when the water level abnormally increases due to some drainage abnormality, the reserved dew condensation water might flow to another portion of circulating air passage 5. In consideration of these, the heat exchanger is provided so as to be located at the lowest level portion of circulating air passage 5.

[0026] As thus described, since air-conditioning unit 39 that operates as mounted in a variety of equipment has an influence on a size increase, a product price, time and effort for maintenance, and running cost of the equipment installed with air-conditioning unit 39, it is desired to reduce the size, the number of parts, the number of assembly processes, and the number of replacement parts.

[0027] Fig. 3 is a sectional view showing an air-conditioning fan unit in which a blowing fan is connected to the air conditioning unit according to the embodiment of the present invention. Fig. 4 is a cross sectional view of an accommodating area of the compressor, as well as a one-end-side posterior area as part of the air passage which is partitioned from the accommodating area, of the air conditioning unit according to the embodiment of the present invention. Fig. 5 is a cross sectional view of the heat exchange area of the air conditioning unit according to the embodiment of the present invention. Fig. 6 is a plan view of the air conditioning unit according to the embodiment of the present invention when an upper divided portion of the unit case is removed. Fig. 7 is a perspective view of the air conditioning unit according to the embodiment of the present invention in the state of Fig. 6 when viewed from an oblique angle.

[0028] In Figs. 3 to 7, air-conditioning unit 39 of the present embodiment has a basic configuration where heat exchanger 395 made up of evaporator 31 and condenser 32 that are located in the middle of air passage 393 from suction inlet port 391 to suction outlet port 392 and dehumidify and heat the circulating air, and compressor 37 that circulates the cooling medium through this heat exchanger 395 are built inside unit case 38 having suction inlet port 391 and suction outlet port 392. In this basic configuration, unit case 38 is made up of a plurality of divided portions 381, 382 (specifically two, upper and lower, divided portions), sealing material 384 is continuously held in scored line 383 formed by divided portions 381, 382 bordering the outer surface of unit case 38, to make the inside and the outside of unit case 38 air-tight, and on the outer wall of the water collecting portion typified by already-mentioned reservoir 63 of unit case 38, drain mechanism 101 is provided which is opened by collected water and discharges the collected

water while inhibiting suction of outside air (cf. Figs. 4 and 5).

[0029] In this manner, unit case 38 is made up of the plurality of divided portions 381, 382, and in the simple configuration where sealing material 384 is held in scored line 383 formed by divided portions 381, 382 bordering the outer surface of unit case 38, to make the inside and the outside of unit case 38 air-tight, even when air passage 393 from suction inlet port 391 to suction outlet port 392 is communicated with accommodating area 394 side of compressor 37, the suction action does not actively reach and thus has no influence on accommodating area 394 that serve as an air reservoir, whereby it is possible to ensure functions of circulation of a sucked air and the functions of dehumidification and heating. Further, with air passage 393 and accommodating area 394 not separated from each other through use of mutual communication therebetween, in case of abrupt water collection, drain mechanism 101 provided in reservoir 63 of unit case 38 or the like is opened by collected water and discharge the collected water so as to deal with the water collection, and meanwhile, drain mechanism 101 inhibits suction of the outside air so as to ensure its function of introducing the circulating air, performing heat exchange, and discharging the water.

[0030] Consequently, since the number of parts, the number of assembly processes and the number of replacement parts are reduced by as much as the sealing place is smaller than the conventional ones, the production cost and the running costs are both reduced. Especially when unit case 38 is made up of two divided portions 381, 382 as in the present embodiment, the number of parts, the number of assembly processes and the number of replacement parts are further reduced.

[0031] As thus described, without the sealing configuration, even when air passage 393 is connected with accommodating area 394 side in both partition portions, the suction action hardly reaches accommodating area 394 due to combination with the partition effect. It is thereby possible to reliably ensure the functions of circulation of the sucked air, dehumidification and heating, so as to enhance performance. Partition portion 386 makes a partition by a confronting structure of upper and lower partition walls 386a, 386b integrally formed in both upper and lower divided portions 381, 382, and thus realizes the partition by a simple configuration formed of two portions while unit case 38 is a complicated space shaped body having partitioned accommodating area 394 and air passage 393. Furthermore, in place of upper and lower partition walls 386a, 386b, a single partition wall formed in one of divided portions 381, 382 can be used as partition portion 386.

[0032] Valve mechanism 101 serves as drain hole 101a provided on the outer wall of the water collecting portion such as reservoir 63 and check valve 101b for closing this drain hole 101a from the outside by pulling pressure inside unit case 38. Only at the time of operation when the pulling pressure exerts inside unit case 38,

drain mechanism 101 closes drain hole 101a provided on the outer wall of the water collecting portion such as reservoir 63 by the pulling pressure, to block the outside air with high air-tightness, so as to maintain the function of air-conditioning unit 39. In case of a large volume of water collection, water pushes the valve with its own weight to open the valve and can then be discharged, and at the time of non-operation, check valve 101b is not necessarily closed, and can thus be realized by a simple flap-type valve piece having no closing trait (cf. Figs. 4, 5). Specifically, as check valve 101b made of a rubber piece, the valve can be easily mounted in such a manner that hook 101c integrally formed in the top of check valve 101b is elastically engaged into mounting hole 101d provided in the upper portion of drain hole 101a, and even with frequent closing and closing-release in response to suction and suction-release, the action stroke of check valve 101b is minute and does not promote fatigue, and hence check valve 101b is extremely rarely a replacement part in maintenance.

[0033] In the present embodiment, in association with the possibility that abrupt water collection may reach accommodating area 394 relative to the communication structure of air passage 393 and accommodating area 394, the bottom portion of the accommodating area 394 is made as water reservoir 396 like reservoir 63 according to heat exchanger 395 and provided with drain mechanism 101. Thereby, even in a case where the water collection having once reached accommodating area 394 side due to the high-low relation or the like between air passage 393 and accommodating area 394 cannot be completely cleared in reservoir 63 side of air passage 393 side, the water can be discharged on accommodating area 394 side.

[0034] Fig. 8 is an external perspective view of the air conditioning unit according to the embodiment of the present invention when viewed from the front side. Fig. 9 is an external plan view of the air conditioning unit according to the embodiment of the present invention when viewed from above. In Figs. 8 and 9, unit case 38 is formed in almost rectangular shape, in which suction inlet port 391 is provided at the rear portion of the ceiling wall of one end of the longitudinal direction of unit case 38, and suction outlet port 392 is provided on the end wall of the other end. With compressor 37 accommodated in accommodating area 394 closer to the front portion of the one end side inside unit case 38, unit case 38 is partitioned by this accommodating area 394, air passage 393 expanding to the rear portion side and the other end side inside unit case 38 with respect to accommodating area 394, and upper and lower partition walls 386a, 386b extending from both divided portions 381, 382 forming unit case 38 to form partition portion 386 or the divided wall extending from one of the divided portions (cf. Fig. 7). Further, evaporator 31 and condenser 32 are provided as partitioned between the suction inlet side and suction outlet side in the front and rear portions of heat exchange area 393a located between partition portion 386 and the

end wall which are mutually opposed in the longitudinal direction of unit case 38. Moreover, suction inlet port 391 opens upward at a higher position than the ceiling wall of heat exchange area 393a of unit case 38, and as shown in Figs. 4 and 7, suction inlet port 391 is provided in such size as to stretch, in a plan view, from a position overlapping the rear portion side of accommodating area 394, and from heat exchange area 393a in air passage 393 to the top of one-end-side posterior area 393b extended to the rear portion of accommodating area 394 on one end side of unit case 38, without an increase in volume to the outside of unit case 38.

[0035] Air passage 393 further includes vertical curved area 393c that smoothly expands from a base opening of suction inlet port 391 to one-end-side posterior area 393b to guide the circulating air downward, and upwardly expanded posterior area 393d formed by upwardly expanding the posterior suction inlet side of heat exchange area 393a from suction inlet port 391 to the other end side of unit case 38 at a position not higher than suction inlet port 391.

[0036] Thereby, in air passage 393, which is located between suction inlet port 391 provided in the rear portion of the ceiling wall on one end of the longitudinal direction of unit case 38 and suction outlet port 392 provided in the end wall of the other end, and almost fully uses the longitudinal direction of unit case 38 except for accommodating area 394 accommodating compressor 37 closer to the front portion of one end of unit case 38 and partitioned by partition portion 386, the circulating air can be naturally sucked and introduced from suction inlet port 391, smoothly subjected to heat exchange in heat exchanger 395, and sucked and discharged to suction outlet port 392. At this time, as shown with arrows in Fig. 7, air passage 393 takes the circulating air introduced from suction inlet port 391 into one-end-side posterior area 393b located off heat exchange area 393a provided to the side of accommodating area 394 toward the one end side of unit case 38, and upwardly expanded posterior area 393d placed off the rear portion of heat exchange area 393a upward. While the taken circulating airs are converged on the suction and introduction side as the rear portion of heat exchange area 393a, a heat exchange flow passing almost uniformly through almost the entire areas of evaporator 31 and condenser 32 from the rear portion to the front portion without deviation can be generated with the help of a filling effect of heat exchanger 395 installed in heat exchange area 393a due to uniform passage resistance by means of evaporator 31 and condenser 32. Accordingly, the heat exchange efficiency improves, so that the air conditioning function can be enhanced.

[0037] In this case, with suction inlet port 391 having a size, in a plan view, almost overlapping one-end-side posterior area 393b in air passage 393 from a position overlapping the rear portion side of accommodating area 394 of compressor 37, while air passage 393 increases a volume of the circulating air introduced and the flow of

the circulating air to one-end-side posterior area 393b with a smaller longitudinal width than that of suction inlet port 391 is narrowed, the air can be smoothly introduced by the guide of vertical curved area 393c without irregular variation or pressure drop and guided to the rear suction inlet side of heat exchange area 393a, and in addition, the flow of the introduced air from suction inlet port 391 to upwardly expanded posterior area 393d side extending to the other end side of unit case 38 is facilitated by as much as the above-mentioned narrowing. This results in more promotion of uniform expansion of the circulating air introduced to air passage 393 to the backward suction face 395a of heat exchanger 395, so as to further enhance the heat exchange efficiency. Moreover, in vertical curved area 393c, with the flow of the sucked and introduced air bent as shown in Fig. 4, moisture removed from accompanying laundry and a detergent component and a fabric conditioner component that might be mixed into the air can be centrifuged, and in clearance portion 393c1 shown with a virtual line that avoids interference with the upper end of compressor 37, the air is also subjected to a collision-separation action.

[0038] Here, as shown in Figs. 4 to 7, the already described reservoir 63 is formed by forming upwardly open, plate-shaped heat exchanger tray 393a1 that has almost a consistent shape with a rectangular shape, in a plan view, of heat exchanger 395 in heat exchange area 393a, and is mounted with heat exchanger 395. Heat exchanger 395 installed and mounted on heat exchanger tray 393a1 forms a unit made by mutual integration of evaporator 31, condenser 32 with each other's fins 395c having a minute gap (not shown). With the thermally separated gap, heat movement from condenser 32 side to evaporator 31 side is suppressed to such a degree that growth of frost or ice in evaporator 31 is suppressed and the frost is melt with increase in temperature of the cooling medium even with the outside air being at low temperature so as to ensure high drying efficiency. Thereby, while the isolated space conventionally provided between evaporator 31 and condenser 32 is omitted to reduce the installation space, bypass passage caused by a play in the isolated space to suction outlet port 392 side can be suppressed to keep an effective area large so as to enhance the heat exchange efficiency and the drying efficiency, and also seek for reduction in drying noise.

[0039] Furthermore, heat exchanger 395 is installed such that the suction outlet port surface formed by suction outlet port 391 and the opening surface of evaporator 31 or condenser 32, such as suction face 395a or exhaust surface 395b are opposed to each other with an angle therebetween being smaller than a right angle. Specifically, heat exchanger 395 is oriented with inclination with respect to the longitudinal of unit case 38 as shown in Figs. 6 and 7 such that an opposed distance between backward suction face 395a and the suction-inlet-side posterior wall of heat exchange area 393a of unit case 38 opposed to backward suction face 395a decreases from one-end-side posterior area 393b side connected

to suction inlet port 391 to the other end side of unit case 38. Thereby, with respect to the shortest direction A oriented with inclination from one-end-side posterior area 393b side to suction outlet port 392, shown in Fig. 6, an inclination angle θ of the orientation of fin 395c of heat exchanger 395 becomes smaller in proportion to the case of disposing heat exchanger 395 in the longitudinal direction of unit case 38. The air resistance is reduced as much as the inclination angle becomes smaller, and a distribution of the air passing through heat exchanger 395 is made uniform, thereby further improving both the dehumidification efficiency and the heating efficiency, so as to enhance the drying efficiency and make the sound quiet.

[0040] Here, the best installation orientation of heat exchanger 395 is to be consistent as possible with the inclined direction A headed in the shortest distance from one-end-side posterior area 393b to suction outlet port 392 in heat exchange area 393a.

[0041] Fig. 10 is a plan view of a lower divided portion of the unit case of the air conditioning unit according to the embodiment of the present invention. Fig. 11 is a perspective view of the lower divided portion of Fig. 10. In Figs. 10 and 11, heat exchange area 393a is formed having a bottom shape of unit case 38 in which heat exchanger tray 393a1 and the suction outlet side of heat exchanger 395 are low as reservoir 63 and the air suction inlet side of heat exchanger 395 is high, and as shown in Fig. 4, accommodating area 394 is formed having the bottom shape of unit case 38 so as to be further lower than reservoir 63. This allows suppression of height at which compressor 37 is installed is suppressed, and lowering of the center of gravity.

[0042] As shown in Fig. 3, heat exchanger 395 is directly placed and mounted on heat exchanger tray 393a1 without a filter interposed therebetween. A portion mounted with evaporator 31 is regarded as dew condensation water discharging tray 21 for taking dew condensation water generated in evaporator 31 and discharging water. A portion mounted with condenser 32 of heat exchanger 395 is partitioned from the portion mounted with condenser 32, regarded as separated water discharging tray 23 for separating and taking moisture removed from accompanying laundry and a detergent component and a fabric conditioner component, which might be mixed into the circulation system, before passage of the air through heat exchanger 395 and then discharging water. Dew condensation water discharging tray 21 and separated water discharging tray 23 are roughly partitioned by partition wall 28 getting them mutually partitioned. However, drain hole 22 is provided in dew condensation water discharging tray 21 so that separated water discharging tray 23 discharges water through dew condensation water discharging tray 21.

[0043] The reason for this is as follows. Water in the circulating air is removed by passing through evaporator 31 as dew condensation water and discharged from dew condensation water discharging tray 21 without prob-

lems. However, when a highly viscous detergent component or fabric conditioner component that might be mixed into the circulating air gets into heat exchanger 395 or blowing fan 15, it adheres thereto to narrow or clog the air passage or increase the rotating resistance of blowing fan 15. Therefore, the air is subjected to gas-liquid separation before getting into heat exchanger 395, and the separated water is discharged from separated water discharging tray 23 through dew condensation water discharging tray 21 without burdening drainage pump 64. Objects of this gas-liquid separation naturally includes water accompanying the circulating air, and a highly viscous detergent component or fabric conditioner component subjected to the gas-liquid separation can be washed away or diluted by the water simultaneously separated by the gas-liquid separation, thereby to avoid burdening drainage pump 64, which is advantageous.

[0044] For this gas-liquid separation, on the air suction inlet side of heat exchange area 393a, such that the air flowing downward between backward suction face 395a of heat exchanger 395 and the posterior wall of unit case 38, from suction inlet port 391 including one-end-side posterior area 393b and upwardly expanded posterior area 393d, is once caught at the middle position of a height direction of heat exchanger 395 as shown in Figs. 4, 5 and 7, and guided to heat exchanger 395 side, the shelf portion 24 that almost horizontally extends from the posterior wall to the front portion side of unit case 38, and inclined portion 25 that is connected to shelf portion 24 as inclined obliquely downward from shelf portion 24 to heat exchanger tray 393a1 and guides the sucked and introduced air, having passed through shelf portion 24, to pass over backward suction face 395a of heat exchanger 395 installed and mounted on heat exchanger tray 393a1.

[0045] Accordingly, the sucked air introduced to air passage 393 is collided with shelf portion 24 in the middle of its flow downward from suction inlet port 391 and upwardly expanded posterior area 393d to heat exchanger 395, and guided to heat exchanger 395 side. With this collision, moisture removed from accompanying laundry and the detergent component and the fabric conditioner component which might be mixed into the circulation system can be collision-separated. The separated water, the detergent component and the fabric conditioner component, having been separated, shift in shelf portion 24 to inclined portion 25 side due partly to the flow of the sucked air, and drop with support of inclined portion 25. Specifically, the separated water is actively drifted to inclined portion 25 side and reaches inclined portion 25 side in the form of washing away the highly viscous detergent component and fabric conditioner component. Thereafter, the action of gravity is added to the flow of the sucked air, leading the separated water to drop with support of inclined portion 25. The separated water dropping with support of inclined portion 25 or the like is dammed up by rib 26 shown in Figs. 5 and 11 in the lower portion of inclined portion 25, then allowed to flow to communicat-

ing passage 27, shown in Figs. 3 and 11, whose one side, or accommodating area 394 side in the figures, is communicated to separated water discharging tray 23. The separated water then flows into separated water discharging tray 23.

[0046] Meanwhile, heat exchanger tray 393a1 and the entire bottom portion of reservoir 63 formed on the suction outlet side are arranged to get lower toward drain hole 22 provided in dew condensation water discharging tray 21. In accordance with this, separated water discharging tray 23 has minute communicating portion 29a in partition wall 29 for partition from the suction outlet side and minute communicating portion 28a in partition wall 28 for partition from dew condensation water discharging tray 21. Thereby, separated water or the like having flown into separated water discharging tray 23 flows into dew condensation water discharging tray 21 through communicating portion 28a, and then flows to drain hole 22 in dew condensation water discharging tray 21. Further, water in case of overflowing to the suction outlet side for the reason of operational failure of drainage pump 64 connected to drain hole 22 or for some other reason, or water that might be collected, flows into separated water discharging tray 23 through communicating portion 29a, and then flows to dew condensation water discharging tray 21 through communicating portion 28a, to reach drain hole 22.

[0047] For supporting the installation of heat exchanger 395 on heat exchanger tray 393a1 without provision of a filter, communicating portions 28a, 29a are set to have such a size as to allow water to smoothly pass there-through but not to allow highly viscous detergent component and fabric conditioner component to pass there-through as they are. Similarly, the middle of the flow passage of each of dew condensation water discharging tray 22 and separated water discharging tray 23 is also provided with communicating portion 41 not to allow lint, the detergent component and the fabric conditioner component to pass therethrough and the baffle projection 42. Even when these communicating portions 28a, 29a, 41 and baffle projection 42 catch the lint, a total volume of the lint caught is small, thus not affecting normal drainage. On the contrary, the caught lint helps catching the detergent component. Although catching the detergent component obstructs the flow of the water, the obstructed water dilutes the detergent while being collected, and finally washes away the diluted detergent to drain hole 22. Here, before passing through heat exchanger 395, the detergent component and fabric conditioner component are efficiently separated along with moisture removed from laundry accompanying the circulating air, and is further discharged after diluted, and thus neither burdens nor stops drainage pump 64. Furthermore, although communicating portion 41 is formed by cutting off the central part of barrier wall 41a crossing the flow passage in V shape and reliably restricts the passage of the detergent component and fabric conditioner component, even when a volume of the lint with its passage restricted

slightly increases to restrict the passage of the water, a volume of the water with its passage restricted becomes larger than that of the lint and communicating portion 41 expand upward to reduce the degree of restriction, thereby to facilitate the water with its passage restricted to flow onward along with a component such as the component of the diluted detergent.

[0048] Furthermore, above-mentioned shelf portion 24 and inclined portion 25 effectively act by narrowing an internal space of a posterior area of the lower half of unit case 38, and consequently, a recessed shape shown in Figs. 4 and 7 is added to the inside of the posterior wall of the lower half of unit case 38, to form an empty space S opened backward and downward below shelf portion 24. When air-conditioning unit 39 and air-conditioning fan unit 81 are installed along the posterior wall on the bottom portion of washer-dryer body 44 as shown in Fig. 3, the empty space S can be effectively utilized as a space for wire connection that is made outside air-conditioning unit 39 and air-conditioning fan unit 81, a space for installation of external equipment such as a sensor, or the like, as shown in Figs. 1 and 4.

[0049] It is to be noted that shelf portion 24 and inclined portion 25 are integrally formed on lower divided portion 382 side so as to facilitate the continuity thereof to be ensured, and shelf portion 24 is formed at a position slightly below the joint flange 382a that makes a joint between lower divided portion 382 and upper divided portion 381 while forming scored line 383. The joint flange 382a accommodates a circular sealing material 384 inside a concavity of its circumference, and seals a space with scored line 383 in a joint structure of sandwiching sealing material 384 by concavo-convex fitting in which a convexity of joint flange 381a of upper divided portion 381 is fitted in the above-mentioned concavity. With these joint and sealing, joint flange 381a and the joint flange 382a are mutually firmly held by screw fastening portion 68 as shown in Fig. 5 which uses fastening holes provided in large number in the circumferential direction as shown in Fig. 11.

[0050] Here, heat exchanger 395 has partition wall 52 that is a metal plate projecting forward and backward and corrosion-resistant, such as an aluminum-based metal plate, as shown in Figs. 4, 6 and 7, at an end fitted, while held from above and below, in opening 51 formed by air passage 393 and partition portion 386 of accommodating area 394 on accommodating area 394 side, as shown in Figs. 3 and 4. Inserting this partition wall 52 from above into guide trench 51a formed at an opening edge, especially a vertical opening edge, of opening 51 positions an end side on accommodating area 394 side, and also forms a rough sealing structure of suppressing the air flow at opening 51 portion of air passage 393 and accommodating area 394. Further, an end of heat exchanger 395 on the opposite side, namely an end on suction outlet port 392 side is roughly fitted for positioning from above between guides 53a, 53b, upwardly integrally formed in front and rear corner portions of the end on

suction outlet port 392 side of heat exchanger tray 393a1 of lower divided portion 382, as shown in Figs. 6 and 10. Positioning these both ends positions heat exchanger 395 in a predetermined position on heat exchanger tray 393a1.

[0051] Fig. 12 is a bottom view of the upper divided portion of the unit case of the air conditioning unit according to the embodiment of the present invention. In Fig. 12, since being in contact with the ribbed partition wall 54 formed downward from partition wall 386a over a space with the other end wall opposed to partition wall 386a on the rear surface of the ceiling wall of upper divided portion 381, heat exchanger 395 is prevented from floating from heat exchanger tray 393a1 in collaboration with the upper-portion opening edge of opening 51 of partition portion 386. Simultaneously, in heat exchange area 393a, the suction inlet air on the suction inlet side is prevented from bypassing from the circumference of heat exchanger 395 to the suction outlet side.

[0052] Compressor 37 is elastically borne by being settled inside recess 394a of bottom portion 394c of accommodating area 394 through elastic base 43, so as to absorb shock and vibration. With such a configuration, it is possible to seek for reducing the size, weight and cost of compressor 37 itself. Further, due to the elastic bearing by being placed in recess 394a through elastic base 43, a vibration absorbing action is exerted on vibration of compressor 37, and further, a high buffering action is also exerted on lateral external vibration at the time of dewatering. For example, by as much as compressor 37 is reduced in size from a conventional size of the order of 140 mm to the order of 90 mm in a plan view, and a space required for accommodating area 394 is reduced, air passage 393 and heat exchanger 395 installed therein can be made larger, while remaining the unit case 38 unchanged from the conventional size, whereby it is possible to enhance the heat exchange efficiency, so as to enhance the air conditioning performance.

[0053] Fig. 13 is a perspective view showing a combined state of an elastic base and the compressor built in the air conditioning unit according to the embodiment of the present invention. In Fig. 13, compressor 37 is placed by means of elastic base 43 (cf. Fig. 3) covered and attached to the lower portion thereof, while having small gap 45 in a radial direction. In accordance with this, projection 145 projecting downward from the upper portion of upper divided portion 381 of unit case 38 as shown in Figs. 3 and 12 is opposed to the upper end of compressor 37 with predetermined gap 46 as shown in Fig. 3, so as to prevent a vent from recess 394a of compressor 37 which exceeds an allowable volume. Specifically, for example, gap 45 is set to the order of 0.5 mm and gap 46 is set to the order of 5 mm. Here, the allowable volume for the vent is in such a range as not to impair the vibration absorbing action and the buffering action on compressor 37.

[0054] Thereby, compressor 37 compresses elastic base 43 until balancing with elastic bearing force of elas-

tic base 43 with its weight, to be settled inside recess 394a, and is floating-borne radially and vertically with some degree of play. As shown in Figs. 3, 5 and 13, elastic base 43 has circular bottom rim 43a opposed to the lower-surface outer circumferential area of compressor 37 and elastically bearing compressor 37, and since not being immaculate, elastic base 43 enhances vibration absorbability against vibration of compressor 37. Further, with its radial movement restricted by fitting of its lower end into concentric, shallow second recess 394b inside recess 394a, bottom rim 43a of compressor 37 is arranged so as to allow some degree of swinging with bottom rim 43a of compressor 37 at the center by as much as a volume of above-mentioned gap 45, while enhancing radial bearing force to compressor 37 in its lower end. Elastic base 43 further has cap portion 43b that is connected with the upper end of bottom rim 43a and covers, with a slightly larger thickness, the lower portion outer circumference of compressor 37, as shown in Figs. 3, 6, 13. Even when swinging of compressor 37 exceeds gap 45 in any particular radial direction, elastic base 43 is compressed in a particular radial direction corresponding to cap portion 43b in the space with the inner circumference of recess 394a, thereby exerting the vibration absorbing action on vibratory swinging and allows reduction in collision sound made in transmission of vibration to unit case 38. Furthermore, with rib 43c in an axial-line direction circumferentially disposed on its outer circumference, cap portion 43b flexibly and naturally executes vibration absorption by compressing in the space with the inner circumference of recess 394a, and elastically bear compressor 37 so as to be located within a predetermined range inside recess 394a. Further, when an engagement recess such as one for being engaged in part of piping projecting from compressor 37 to the body side is previously formed on the circumferential wall of cap portion 43b, it can serve as a rotation stopper for elastic base 43 and compressor 37. Moreover, an engagement portion or fitting portion for a rotation stopper may also be provided between elastic base 43 and recess 394a. Furthermore, bottom rim 43a and cap portion 43b of elastic base 43 and the like may be arranged as partially different bodies. In short, a basic condition is that the space between recess 394a and the lower end of compressor 37 is filled with the elastic member.

[0055] As shown in Fig. 3, in accommodating area 394, bottom portion 394c forming recess 394a is set slightly higher than heat exchanger tray 393a1 and the bottom portion of suction outlet side 393a2 side, accommodating area 394 side and air passage 393 side are partitioned by partition portion 386 around opening 51 holding heat exchanger 395, and a concavity is provided in the lower portion of the opening edge of opening 51, to form communicating passage 47 below heat exchanger 395 of bottom portion 394c, which connects accommodating area 394 side to separated water discharging tray 23 on air passage 393 side, specifically through communicating passage 27. In accordance with this, an almost circular

rib 48 formed by extending the inner circumferential wall of recess 394a upward as shown in Figs. 3, 4, 6 and 10, is formed in bottom portion 394c. Further, part of bottom portion 394c corresponds to a dew condensation water dropping portion from cryogenic piping 37a around compressor 37, to take dropping dew condensation water. Consequently, dew condensation water constantly dropping from cryogenic piping 37a during operation even in small volume is taken in bottom portion 394c around recess 394a, passes through communicating passage 47 formed at the same level as bottom portion 394c in the opening-edge lower portion of opening 51 of partition portion 386, and flows and drops to separated water discharging tray 23 lower than bottom portion 394a, so as to be naturally discharged along with separated water, and does not flow into recess 394a by being obstructed by rib 48. Accordingly, the drainage channel can be reduced without the need for a drainage hole in recess 394a where compressor 37 is seated, and the outside air is not sucked, thus preventing deterioration in drying efficiency at the time of low temperature.

[0056] As already described, the inclined arrangement of heat exchanger 395 with respect to the longitudinal direction of unit case 38 does not make a difference to that the suction action reaching suction outlet port 392 from blowing fan 15 on the downstream exerts with a greater force on the closer side to suction outlet port 392 with respect to the entire area of exhaust surface 395b oriented to the front portion of heat exchanger 395. Therefore, on the suction outlet side of heat exchange area 393a, there is a concern that dew condensation water generated at the time of passage through evaporator 31 may be sucked from the closer side to suction outlet port 392 of front exhaust surface 395b of heat exchanger 395 to exhaust surface 395b side, and then sucked into blowing fan 15 through suction outlet port 392.

[0057] Fig. 14 is a partial perspective view of the air conditioning unit according to the embodiment of the present invention when viewed from obliquely above in the state of Fig. 6. Fig. 15 is a side view of the air conditioning unit according to the embodiment of the present invention when viewed from the accommodating area side. In Fig. 14, in the present embodiment, shielding wall 56 is formed which obstructs suction of dew condensation water due to a strong suction action from suction outlet port 392 through use of guide 53a extending upward on the front portion side of the end on suction outlet port 392 side of heat exchanger tray 393a1. Further, in Fig. 15, for supporting that the blowing fan 15 connected to suction outlet port 392 has scroll case 15b and is provided in a positional relation where blowout portion 15d thereof (cf. Fig. 12) arises upward in the rear portion so that the strong deviation of the suction action comes to a corner portion along the end edge on the lower half portion of suction outlet port 392 side of exhaust surface 395b of heat exchanger 395 and the front portion side of the lower end edge, as shown in Figs. 3, 8 and 11, shielding wall 56 in a simple shape formed stepwise including

guide 53a can cover exhaust surface 395b of heat exchanger 395 in minimum area required. Meanwhile, in order to minimize narrowing of a ventilation area of exhaust surface 395b caused by shielding wall 56, overhanging portion 56a from guide 53a is floated from exhaust surface 395b as shown in Fig. 6. In accordance with this, as shown in Fig. 11, in the suction outlet port 392 concentric to fan 15a of blowing fan 15, a suction restricting side where suction is restricted by shielding wall 56 is formed in a shape of having a vertical straight edge 392b that narrows the circular shape around the axis line of fan 15a of suction outlet port 392 to project on the axis line side, so as to facilitate prevention of suction of water from the side edge portion of suction outlet port 392 of heat exchanger 395. Similarly, the lower edge of suction outlet port 392 is formed into lateral straight edge 392c that narrows upward toward the axis line up to the same height as that of heat exchanger tray 393a1, so as to restrict suction of moisture from the bottom portion of reservoir 63.

[0058] As shown in Fig. 3, connection between suction outlet port 392 of unit case 38 and blowing fan 15 is made such that, while connecting tube 15c1 of suction port 15c of scroll case 15b accommodating fan 15a is fitted with the inner circumference of suction outlet port 392 with a play, the front edge of connecting tube 15c1 is press-welded to flange wall 392a on the inner circumference of suction outlet port 392, and joint 62 is provided where scroll case 15b and unit case 38 are screw-fastened at a plurality of places (e.g. more than three places) around the connecting portion of suction outlet port 392 and suction port 15c, to hold the above-mentioned press-welded state, thereby to easily seal the connecting portion. This allows omission of a sealing material that becomes a consumable, thereby to reduce running cost.

[0059] In addition, unit case 38 has an advantage that, when it has a configuration formed by three divided materials, each molded article can be made small in volume, and thus facilitate to deal with a complicated shape. In the case of applying this to the illustrative example, when this case is described with reference to Fig. 8, for example, upper divided portion 381 is divided with scored lines (chain double-dashed lines) 61 bordering the outer surface of unit case 38 on a simple plane between a part on and below the ceiling wall of the 303a1 and a part above the ceiling wall, namely upwardly expanded posterior area 393d, suction inlet port 391 and the upper portion of accommodating area 394, and a continuous sealing material is intervened between the scored lines 61 on the circumference to seal inside and outside of unit case 38, whereby it is possible to obtain a characteristic attributed to the configuration of three divided materials without impairing the characteristics obtained in the case of the above-mentioned embodiment of the two-divided structure.

[0060] According to the present invention, the structure for sealing the accommodating area of the compressor and the air passage installed with the evaporator and

the condenser is omitted, thereby to reduce both production cost and running cost.

5 Claims

1. An air conditioning unit in which an evaporator and a condenser located in the middle of an air passage from a suction inlet port to a suction outlet port for dehumidifying and heating a circulating air, and a compressor for circulating a cooling medium through the evaporator and the condenser are built inside a unit case having the suction inlet port of the circulating air and the suction outlet port of the circulating air, wherein the evaporator and the condenser compose a heat exchanger in which each other's fins are aligned in parallel, and the heat exchanger is installed inside the air passage of the unit case in which a suction outlet port surface formed by the suction outlet port is opposed to an opening surface of the evaporator or the condenser so as to form an angle smaller than a right angle.
2. An air conditioning unit in which an evaporator and a condenser located in the middle of an air passage from a suction inlet port to a suction outlet port for dehumidifying and heating a circulating air, and a compressor for circulating a cooling medium through the evaporator and the condenser are built inside a unit case having the suction inlet port of the circulating air and the suction outlet port of the circulating air, wherein the evaporator and the condenser compose a heat exchanger formed by integration of each other's fins having a minute thermally isolated gap, and the heat exchanger is installed inside the air passage of the unit case in which a suction outlet port surface formed by the suction outlet port is opposed to an opening surface of the evaporator or the condenser so as to form an angle smaller than a right angle.
3. The air conditioning unit according to either claim 1 or 2, wherein the unit case is formed in rectangular shape, in which an accommodating area of the compressor is installed on one end side of a longitudinal direction of the unit case, and the other end side from the accommodating area is partitioned from the accommodating area as the air passage, the suction inlet port is provided in a rear portion of a ceiling wall of the air passage, and the suction outlet port is provided closer to a front portion of an end wall of the other end of the unit case.
4. The air conditioning unit according to either claim 1 or 2, wherein, inside the air passage, the heat exchanger is set in an orientation consistent with a lon-

gitudinal direction of the unit case, or installed in an orientation inclined from the suction inlet port side to the suction outlet port side and from a front side to a rear side with respect to the longitudinal direction.

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5. The air conditioning unit according to either claim 1 or 2, wherein, inside the unit case, a length of the evaporator or the condenser is maximized by means of an angle formed between the suction outlet port surface formed by the suction outlet port and the opening surface of the evaporator or the condenser.

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FIG. 1

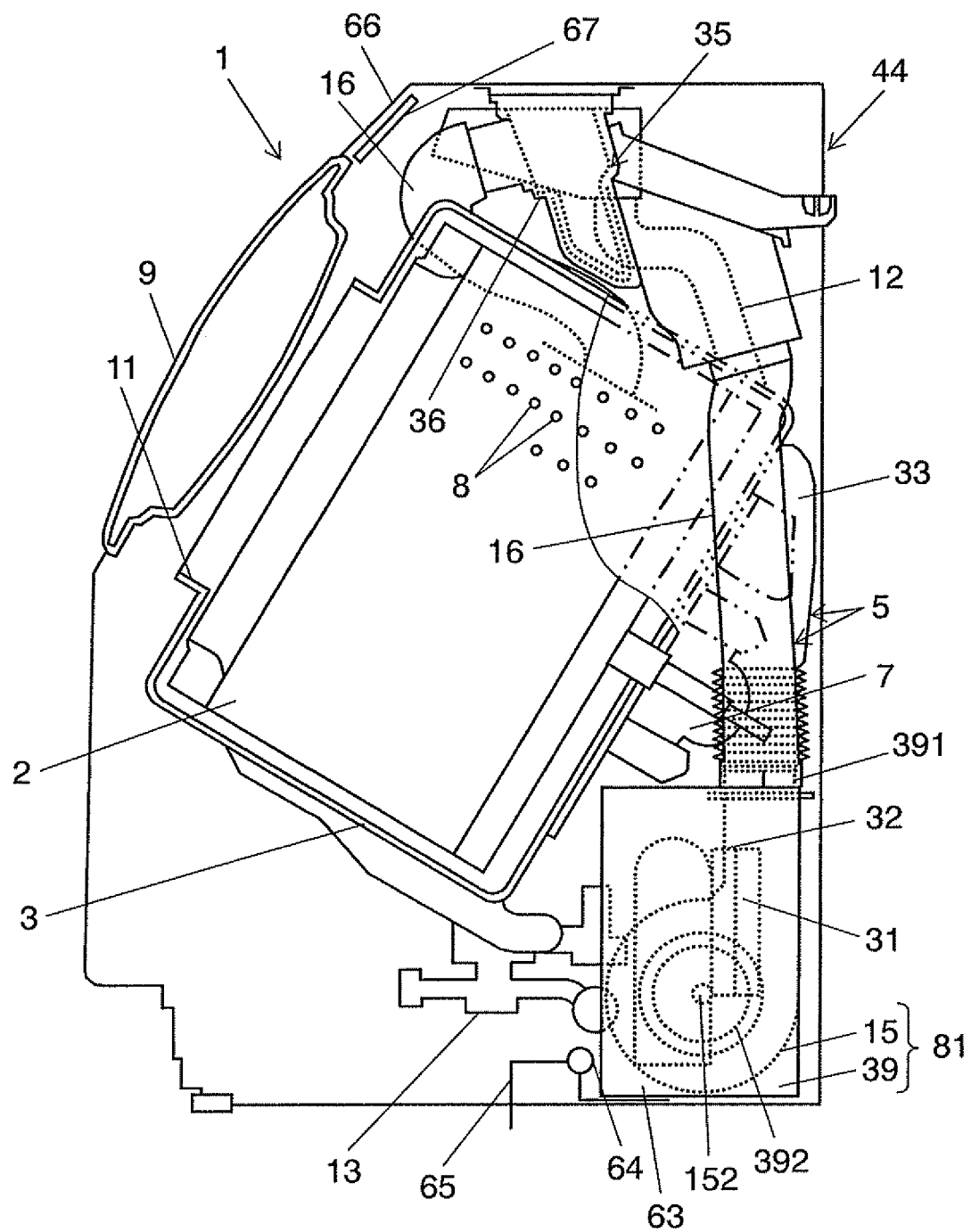


FIG. 2

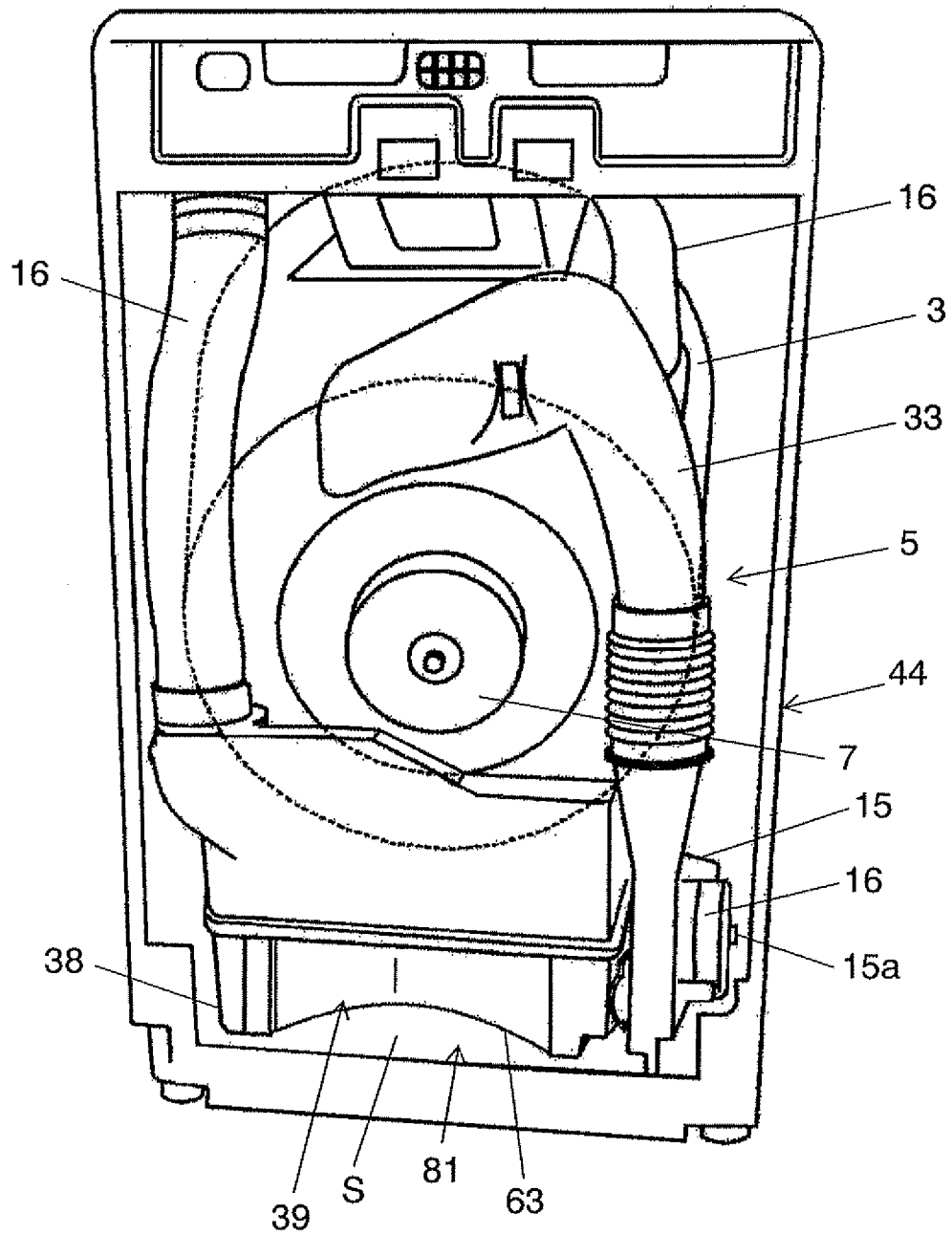


FIG. 3

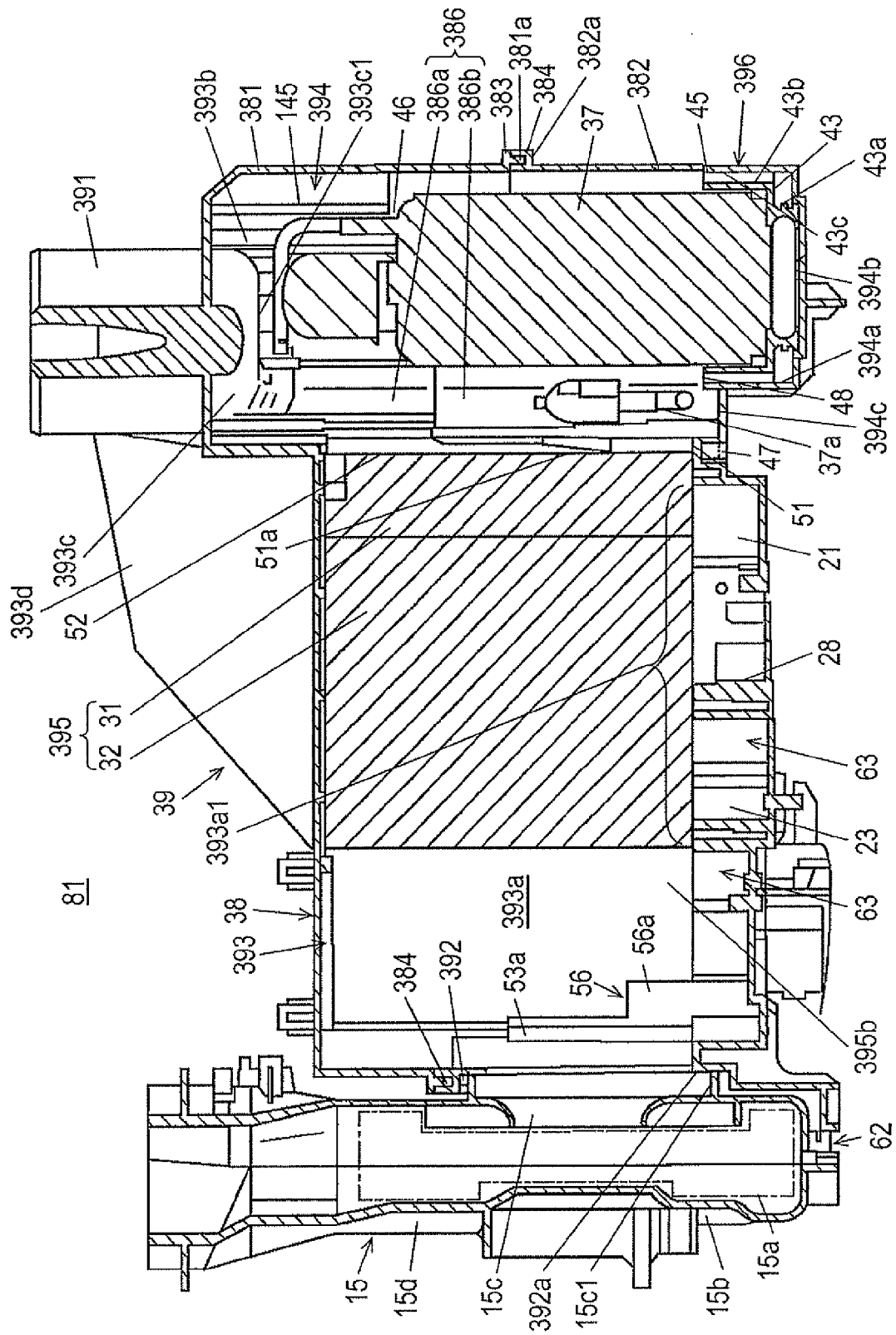


FIG. 4

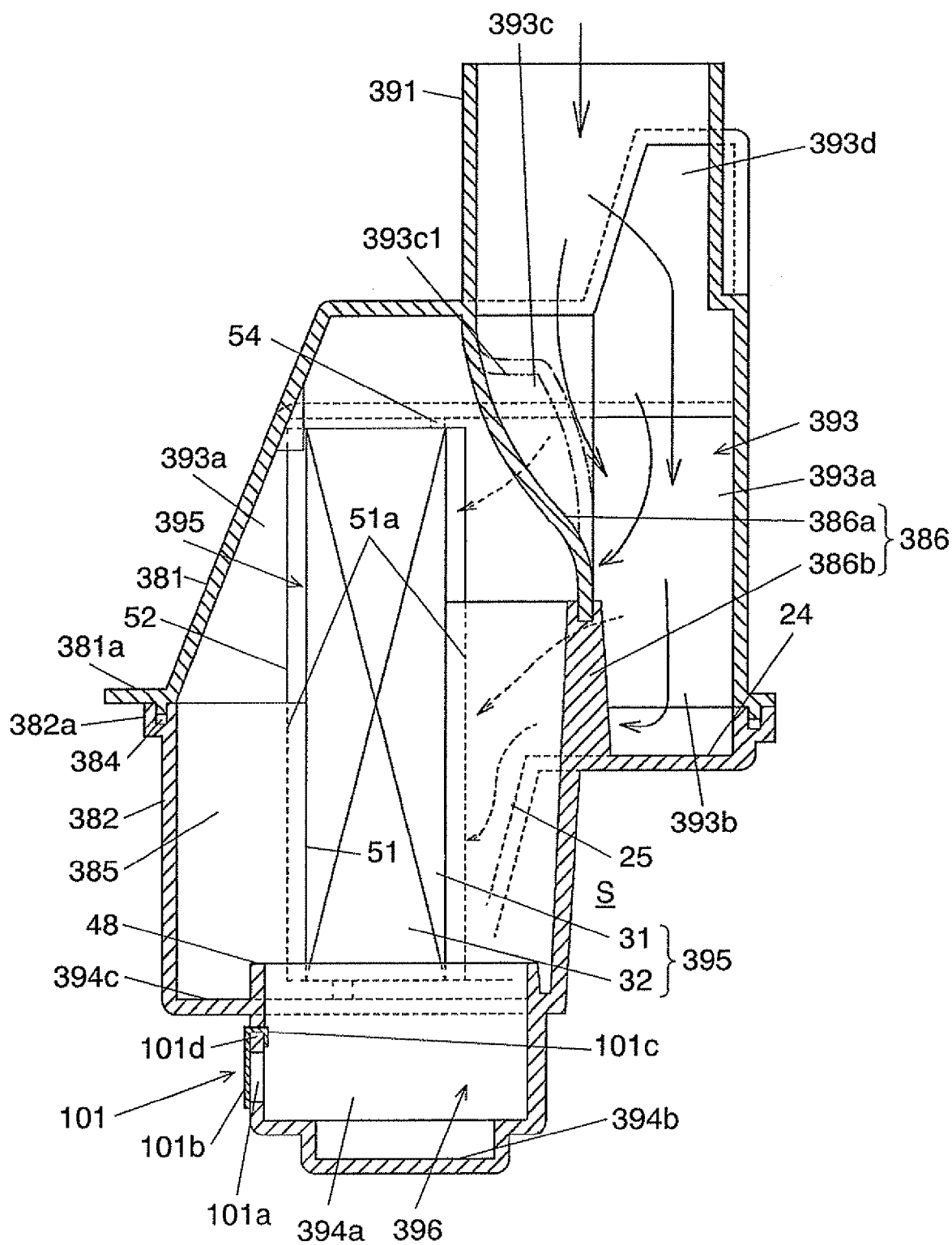


FIG. 5

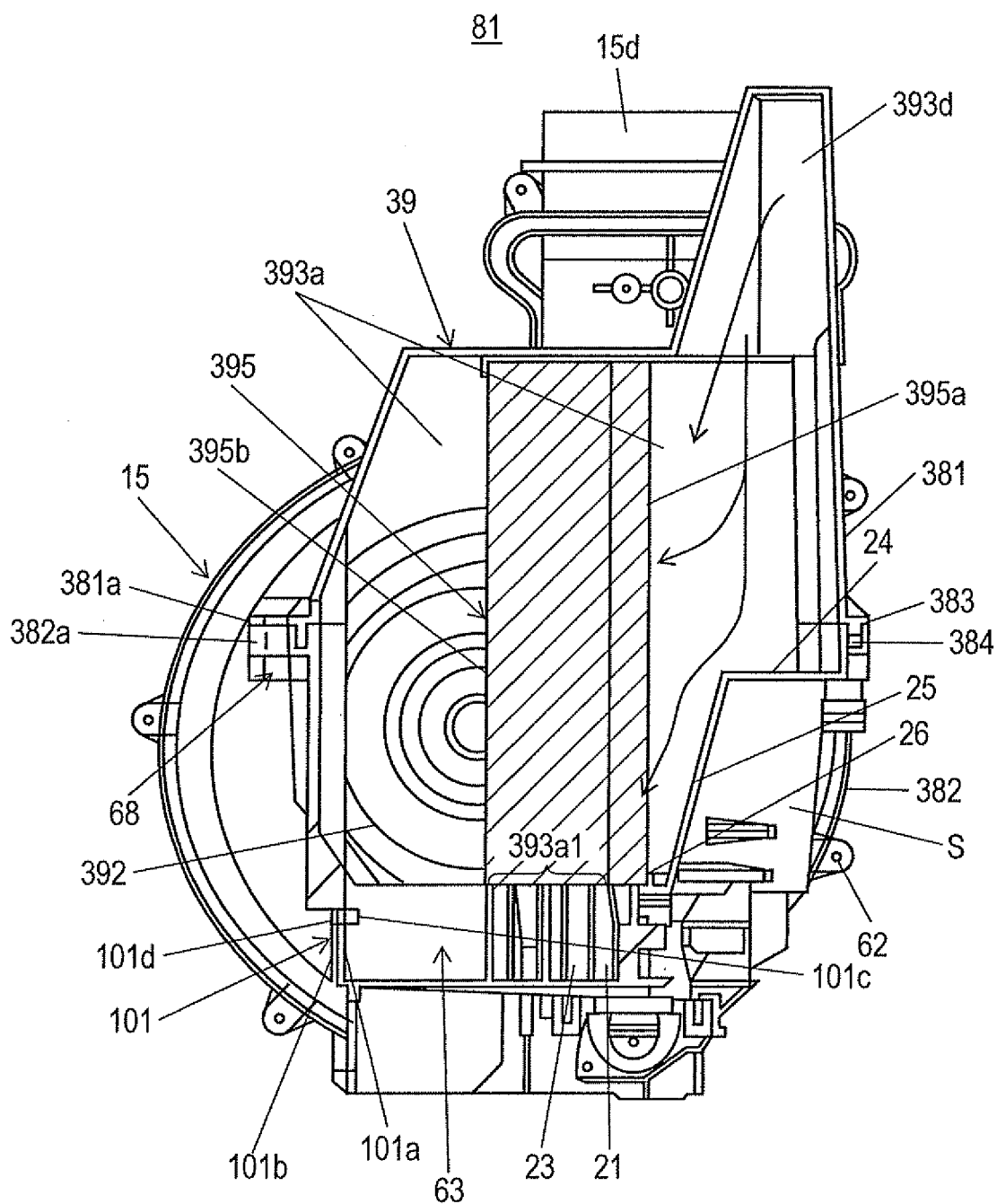


FIG. 6

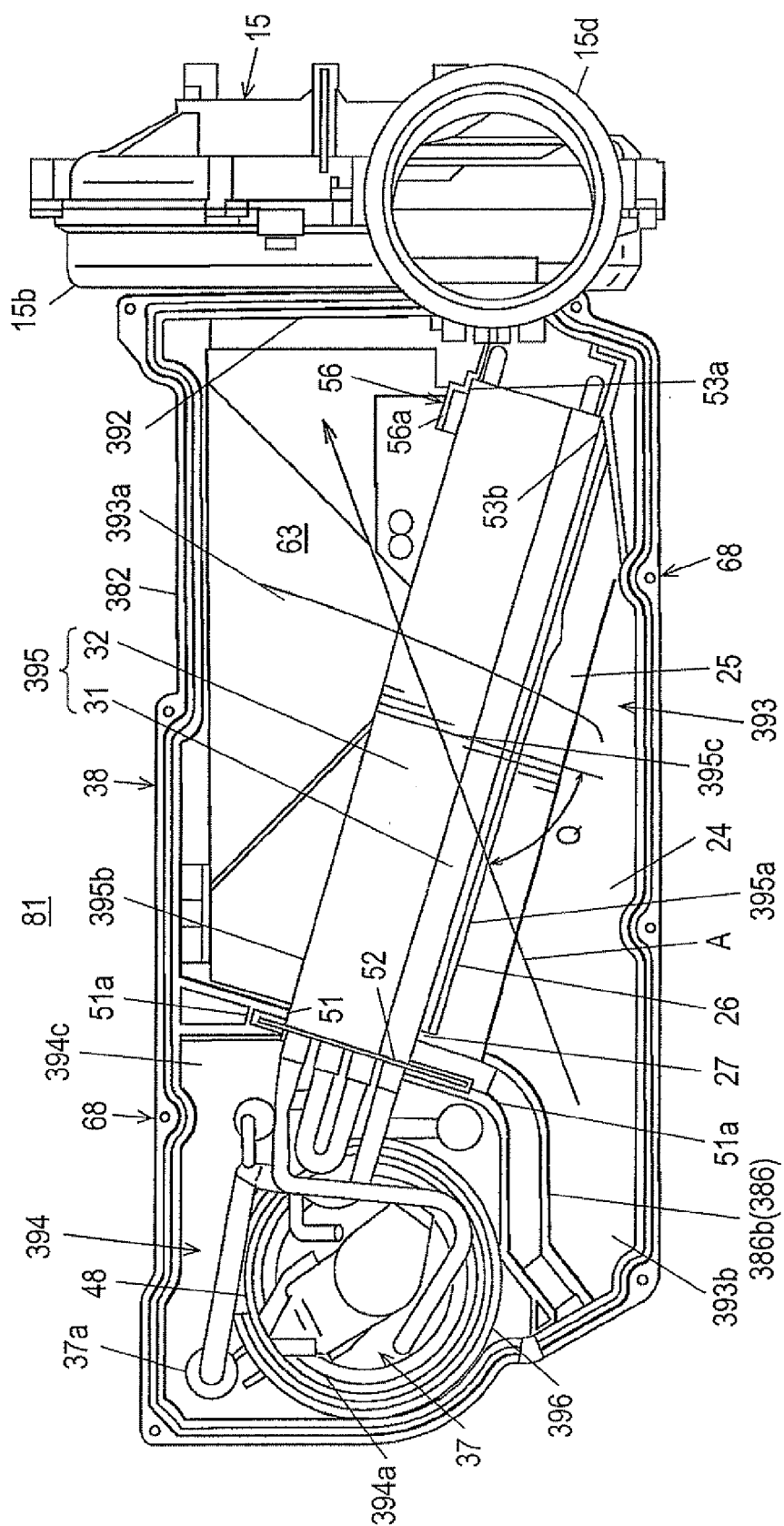


FIG. 7

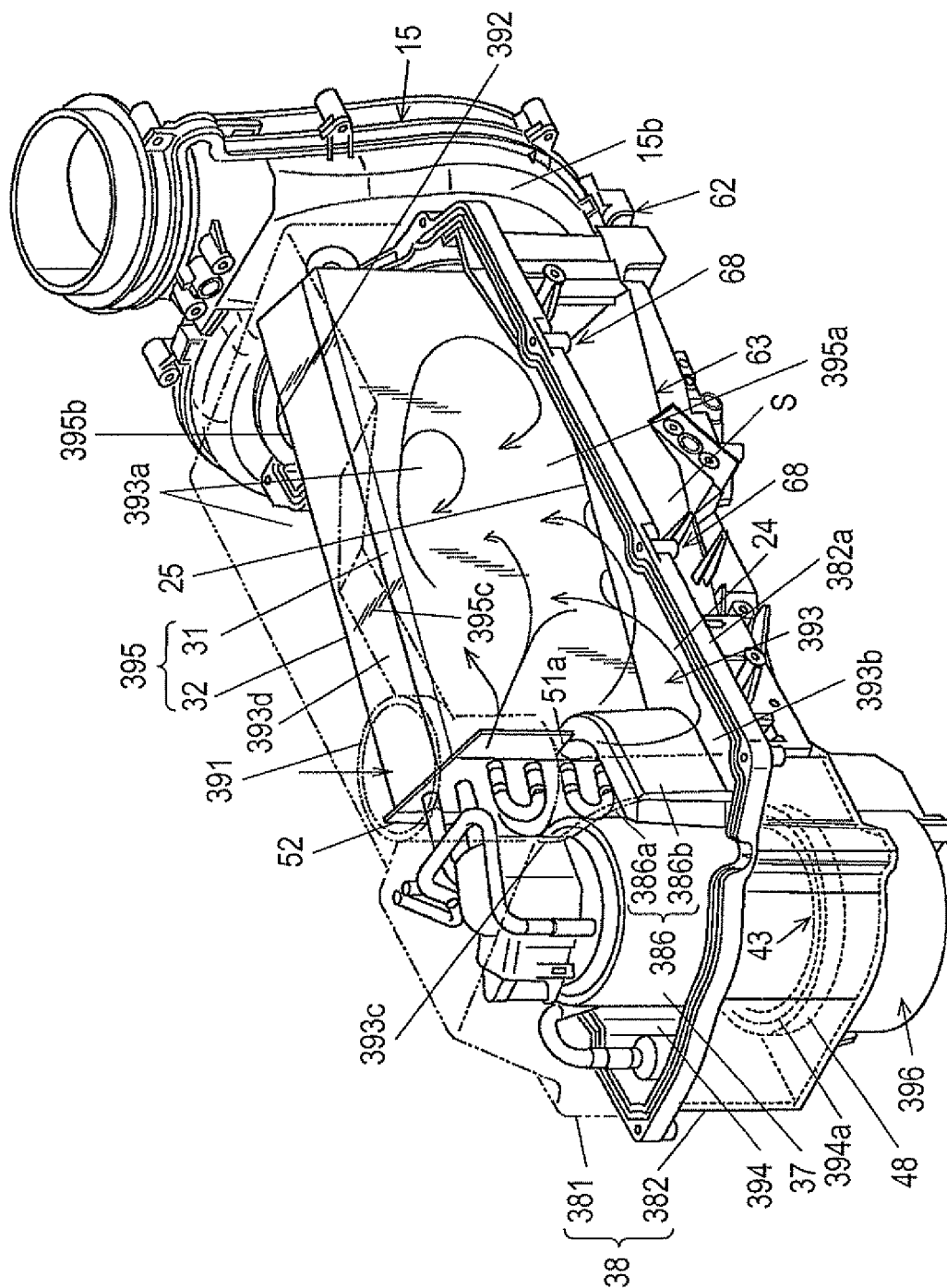


FIG. 8

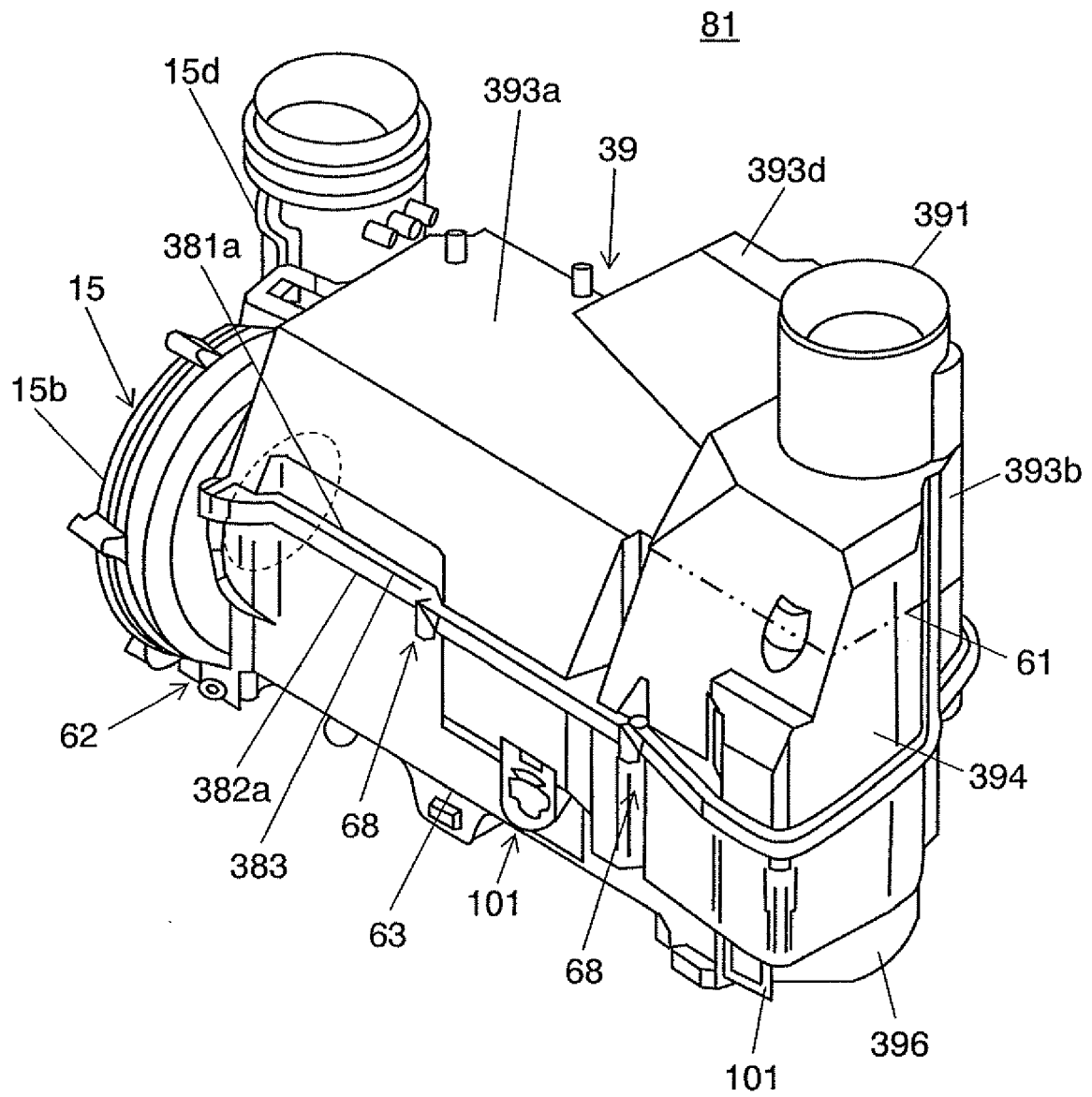


FIG. 9

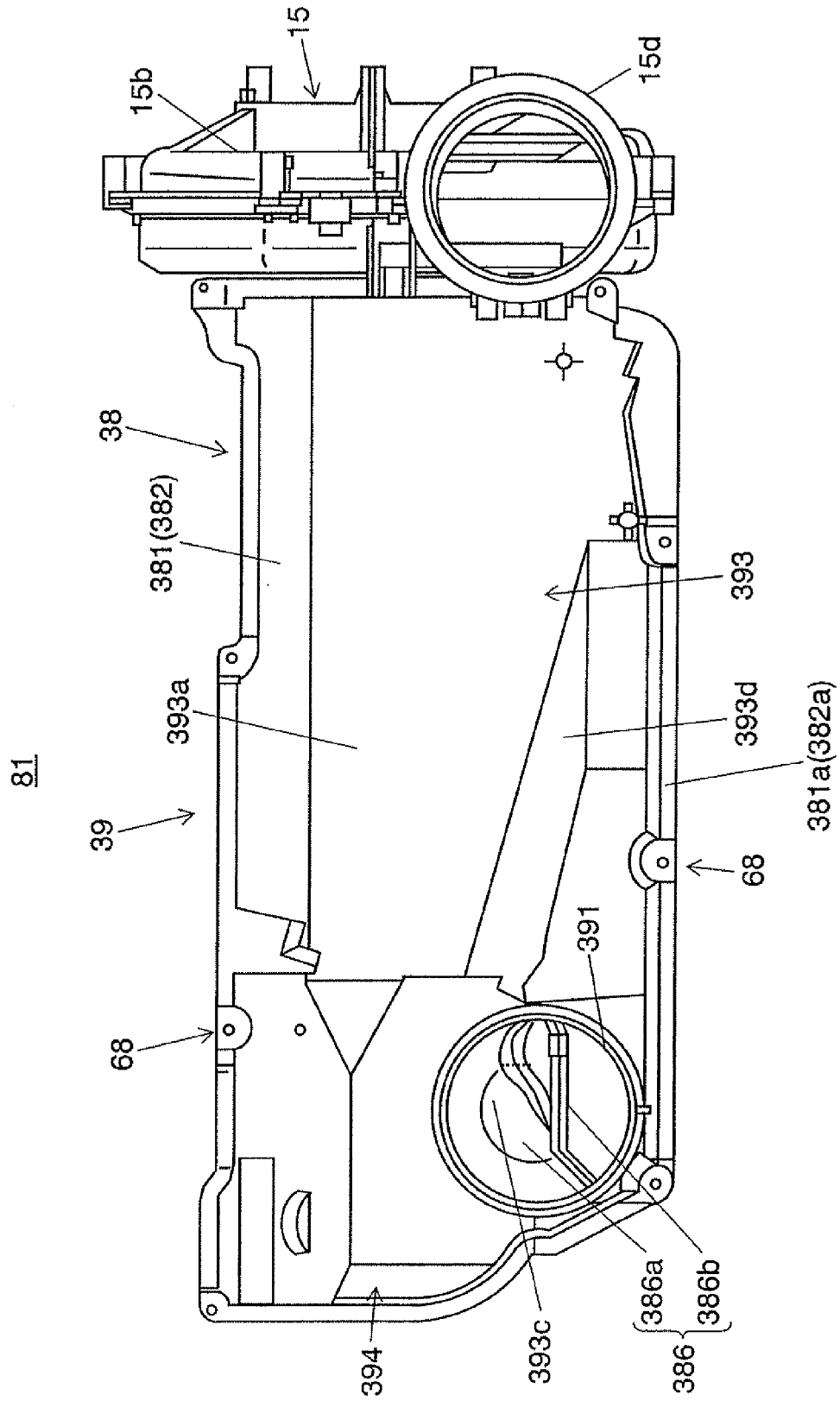


FIG. 10

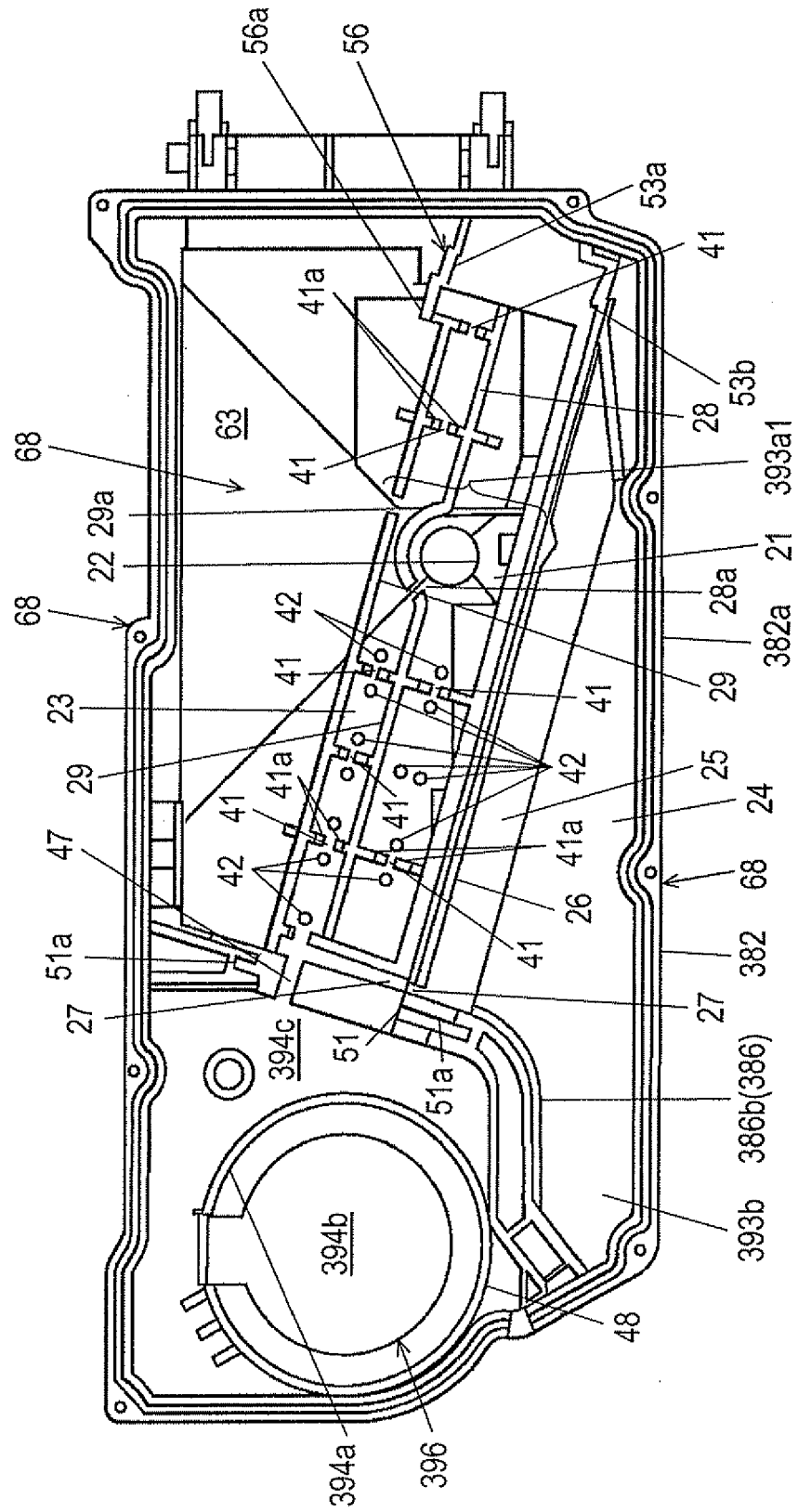


FIG. 11

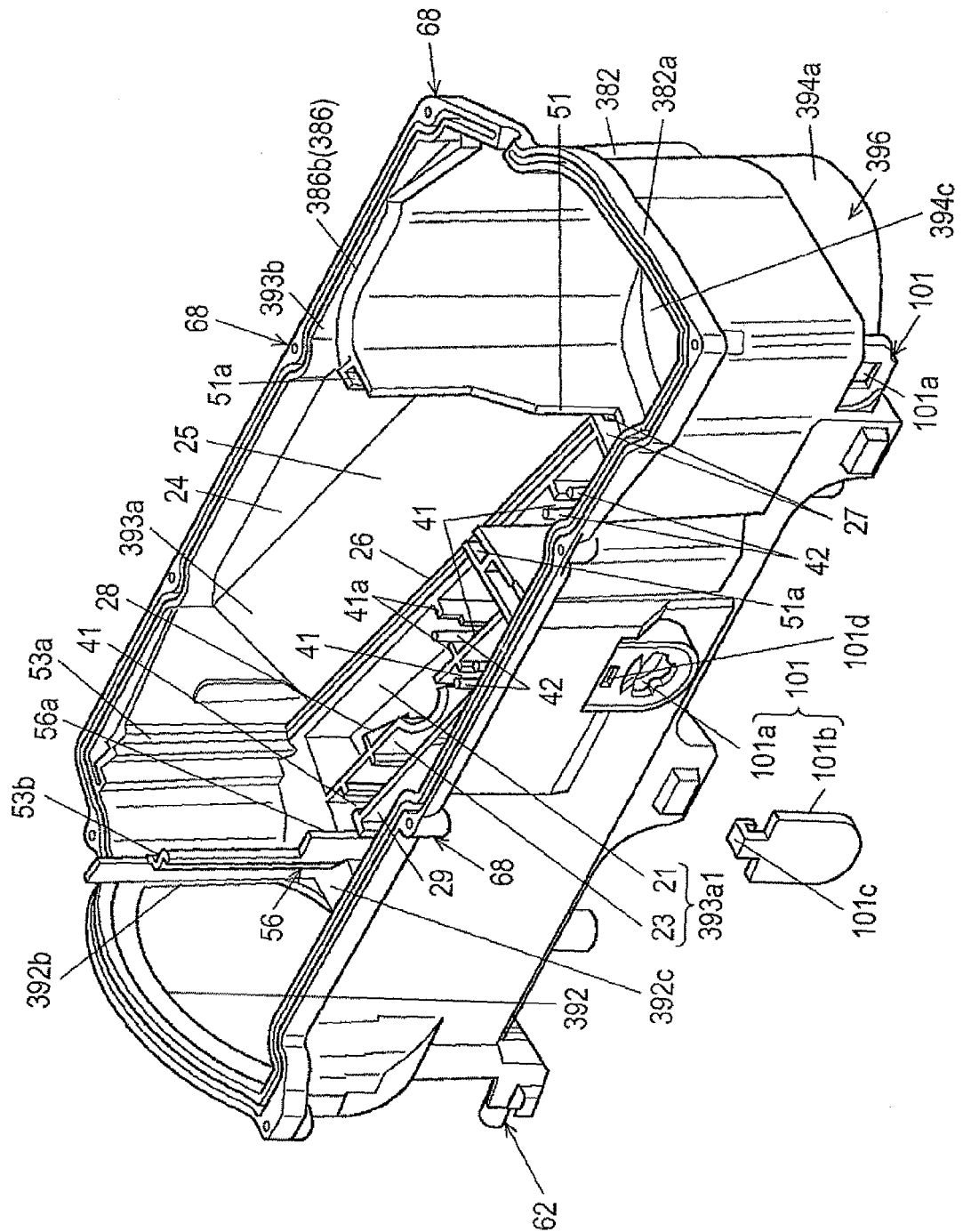


FIG. 12

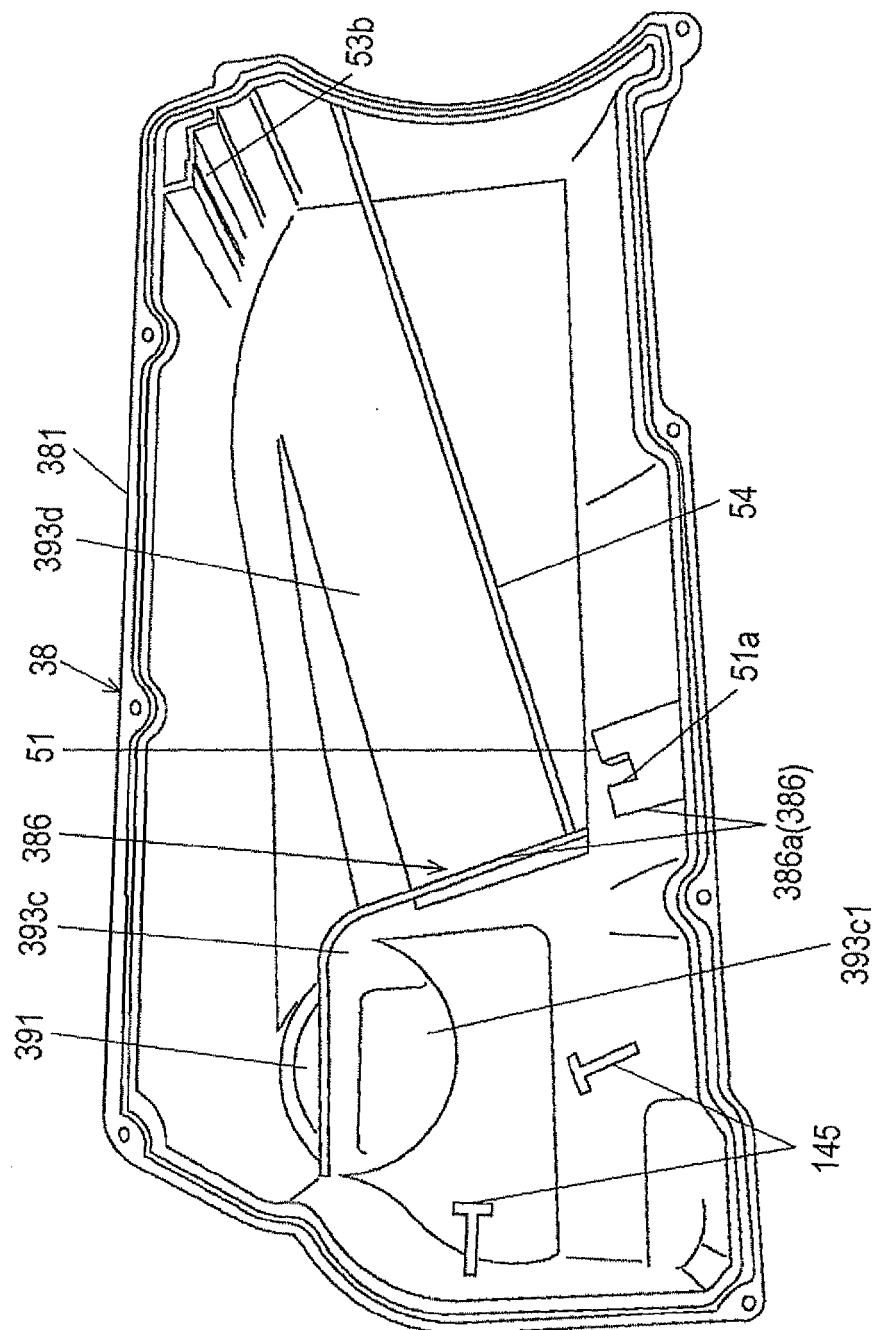


FIG. 13

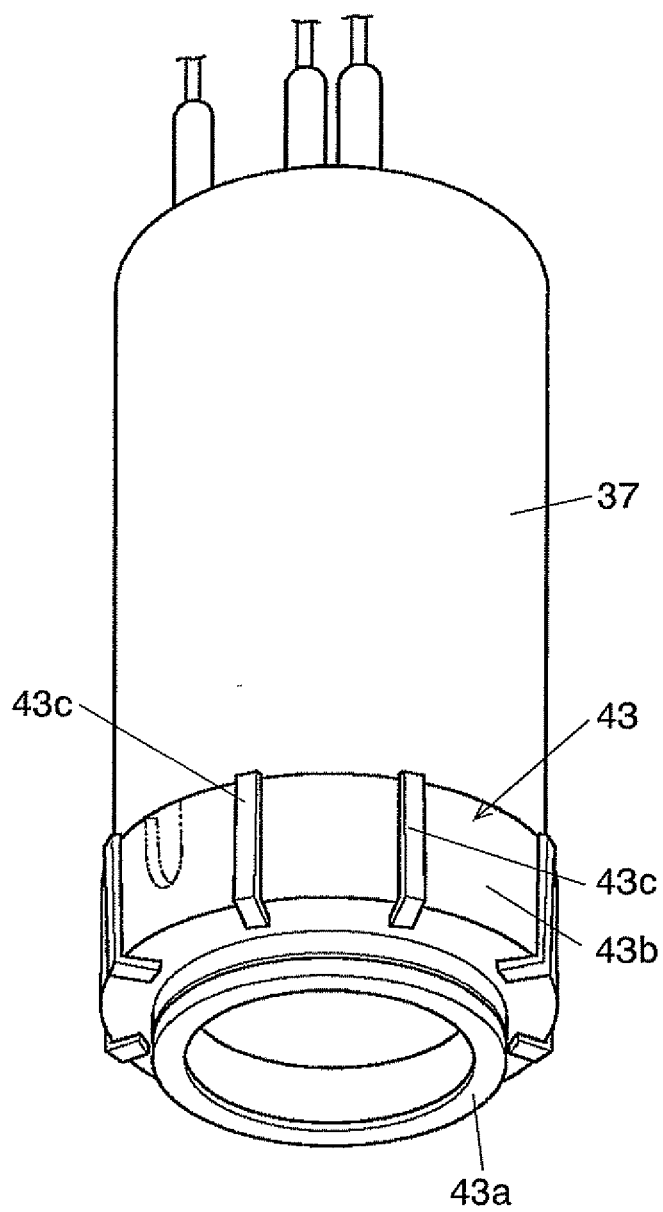


FIG. 14

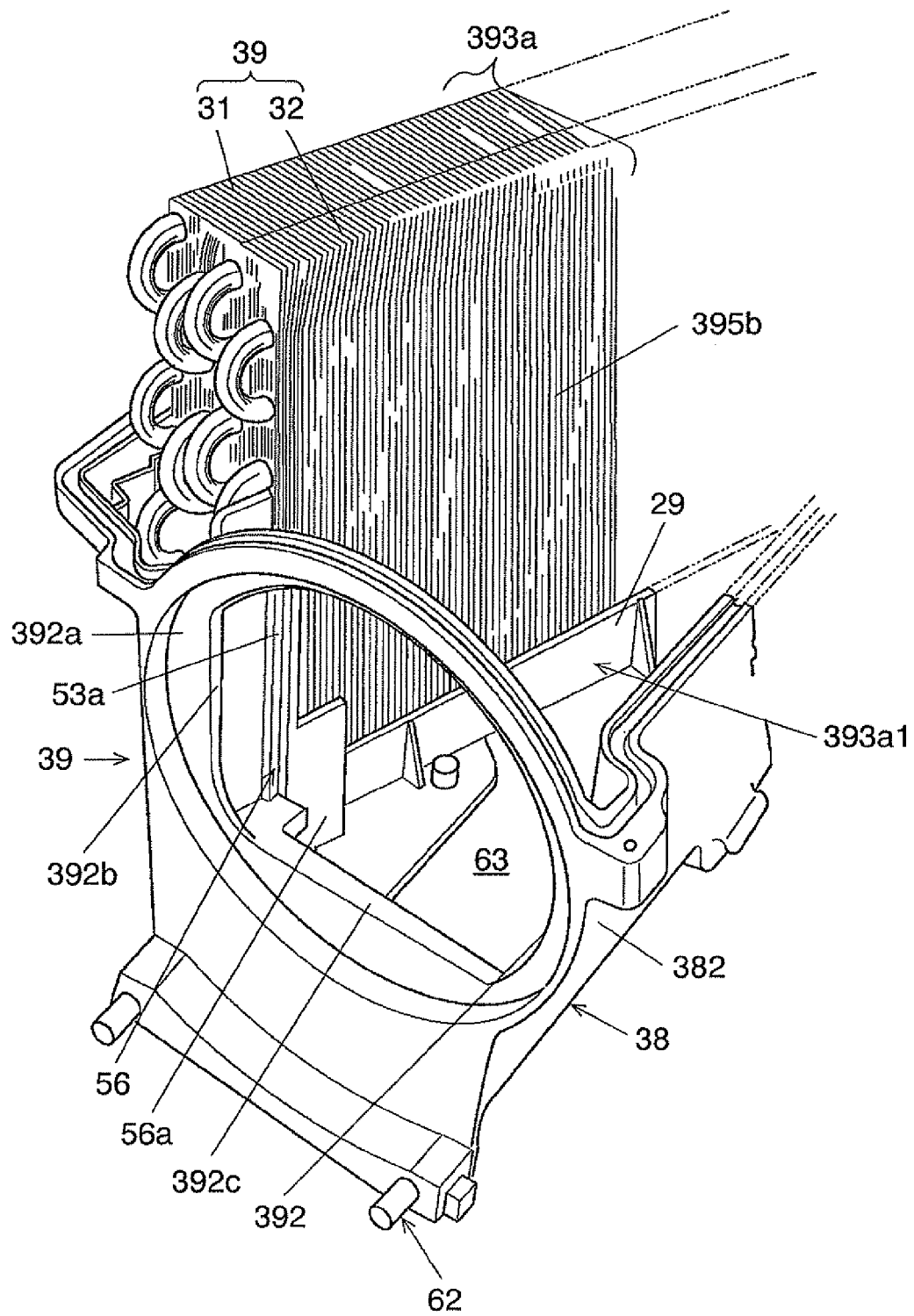
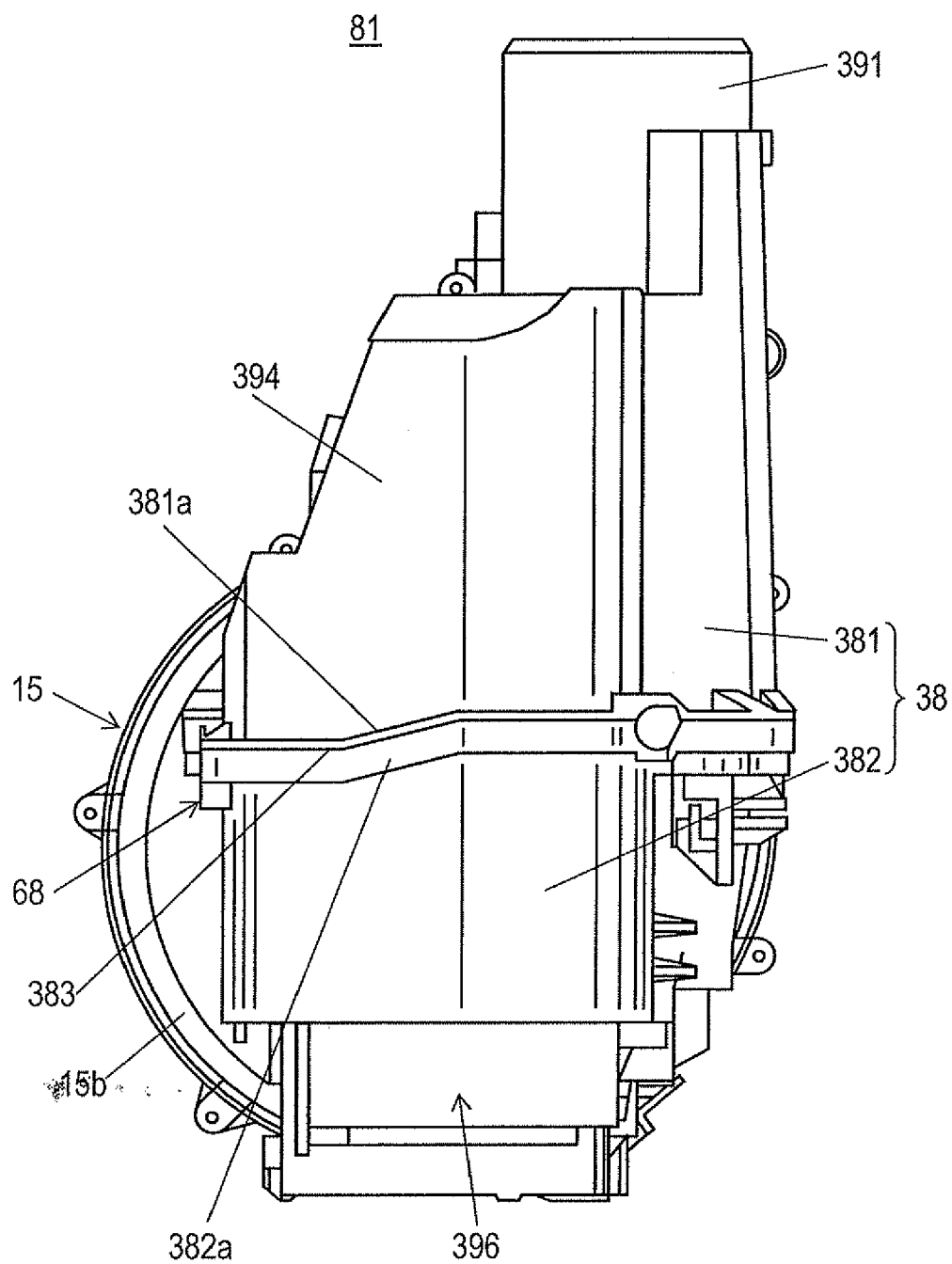


FIG. 15



REFERENCES CITED IN THE DESCRIPTION

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