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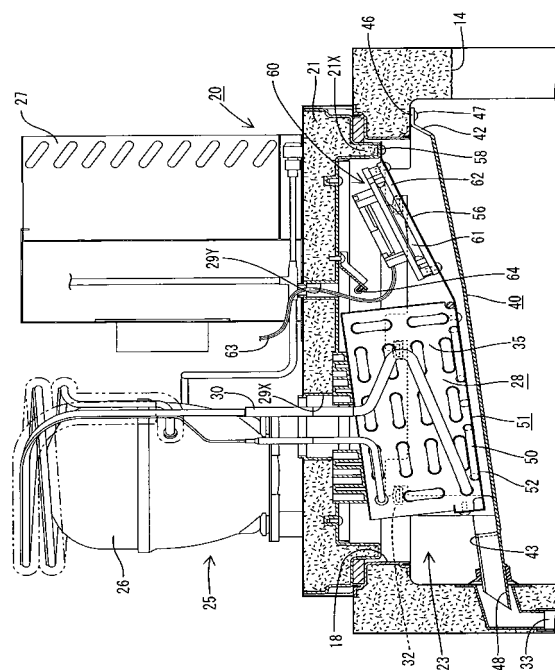
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(54) **COOLING STORAGE**

(57) A cooler chamber 23 is defined by laying a wall 40 which also serves as a drain pan in a ceiling part of a storage chamber 12, and a cooler 28 is housed in its back side. A heater 50 for defrosting is arranged on a body part 52 of a heating plate 51 in a staggered state, and the body part 52 is mounted to an undersurface of the cooler 28. A fan fitting part 56 is formed to extend from a front edge of the body part 52 in a diagonal posture raised at the front, and a mounting part 58 at its tip end is fixed to a unit base 21. A fan device 60 for cooling is fitted to the fan fitting part 56. There is the possibility of frost forming on the fan device 60, but when the heater 50 is heated in the defrosting operation, the heat is transferred to the fan device 60 through the heating plate 51, and defrosting of the fan device 60 is efficiently performed by receiving the heat. The defrost water is received by a cooling duct 40, and is drained from a drain port 48.

FIG.2



Description

[0001] The present invention relates to a cooling storage cabinet, and particularly relates to improvement of a structure suitable for defrosting of a fan device for cooling.

[0002] Conventionally, one example of a commercial cooling storage cabinet, for example, is disclosed in Japanese Patent Laid-open No. 2003-214755. In this storage cabinet, a cooler chamber is defined by laying a duct, which is also used as a drain pan, on a ceiling part of a storage cabinet body, and a cooler which is connected to a freezer outside the cabinet is housed in the cooler chamber. Further, an inlet port equipped with a cooling fan device is provided at a front side of the duct while a blow port is provided at a back side. A defrosting heater is mounted to the cooler.

[0003] Cooling operation is performed by driving the freezer and the cooling fan device. Air inside the cabinet is taken in from the inlet port and exchanges heat with the cooler while flowing in the cooler chamber, and thereby, the cold air is generated. The cold air is circulated and supplied to be blown out into the cabinet from the blowport, and thereby, the inside of the cabinet is cooled. Meanwhile, defrosting operation of the cooler is performed by energizing the heater and causing the heater to generate heat after stopping the freezer and the cooling fan device. The cooler is heated, and the frost adhering to the cooler is melted. The defrost water is received by the *duct (drainpan), and thereafter, is drained outside the cabinet.

[0004] In the cooling storage cabinet as described above, it is mainly on the cooler that frost forms, but in the cooling fan device, for example, the case and the fan guard are cooled to about the same temperature as the temperature of the inside of the cabinet, and they are located at the place where they easily contact the external air which enters the cabinet when the door is opened. Therefore, if the temperature in the cabinet is low (as in the freezer), the external air is at a high temperature with high humidity, resulting in the possibility that frost also forms on the case, the fan guard and the like. Thus, as the conventional defrosting measures, radiation heat from the heater is only applied to the cooling fan device, and it cannot be said that sufficient defrosting can be performed.

[0005] The present invention is completed based on the circumstances as described above, and an object of the present invention is to make it possible to perform defrosting of a cooling fan device effectively.

[0006] As the means for achieving the above described object, the present invention has the characteristic in that a heat transfer member which transfers heat of the heating device equipped in a cooler to a cooling fan device is provided.

[0007] In the case where a heating plate to which a heating device is fitted is mounted on the cooler, if the cooling fan device is fitted to a fan fitting part extended

from the heating plate, the heating plate can be used as the heat transfer member.

[0008] In the case where the heating device is fitted to the cooler, and the cooling fan device is fitted to the wall of the cooler chamber via the plate for defrosting, if the heating device or a contact part which is brought into contact with the cooler is provided at the plate for defrosting, it can be used as the heat transfer member.

Figure 1 is a vertical sectional view of a cooling storage cabinet according to the first embodiment of the present invention;

Figure 2 is a sectional view of a cooler chamber and its periphery;

Figure 3 is an exploded sectional view of the cooler chamber and its periphery;

Figure 4 is an exploded perspective view of the cooler chamber and its periphery;

Figure 5 is a sectional view of a cooler chamber and its periphery according to the second embodiment;

Figure 6 is a perspective view of a heating plate of the second embodiment;

Figure 7 is a sectional view of a cooler chamber and its periphery according to the third embodiment;

Figure 8 is a perspective view of a heating plate and a cooling duct according to the third embodiment;

Figure 9 is a sectional view of a cooler chamber and its periphery according to the fourth embodiment;

Figure 10 is an exploded perspective view of a drain port of a cooling duct and its periphery according to the fourth embodiment;

Figure 11 is a side view of a heat transfer member according to the fourth embodiment;

Figure 12 is a sectional view showing a mounting operation of a pipe part of the heat transfer member to the drain port according to the fourth embodiment;

Figure 13 is a perspective view and a partially enlarged sectional view showing a mounting structure of an inlet port side of a cooling duct according to the fourth embodiment;

Figure 14 is a sectional view of a cooler chamber and its periphery according to the fifth embodiment;

Figure 15 is an exploded perspective view of a heating plate and its periphery according to the fifth embodiment;

Figure 16 is a sectional view of a cooler chamber and its periphery according to the sixth embodiment; and

Figure 17 is a sectional view of a cooler chamber and its periphery according to the seventh embodiment.

<Embodiment 1>

[0009] The first embodiment of the present invention will be described based on Figures 1 to 4.

[0010] In Figure 1, reference numeral 10 denotes a storage cabinet body constituted of an heat insulating

casing body with a front face opened, and the storage cabinet main body is supported with four legs 11 and has a storage chamber 12. At a front face of the storage chamber 12, two upper and lower entrance/exit doors 14 are separated by a partition frame 13, and a heat insulating door 15 is fitted to each of the entrance/exit doors 14 to openable and closable by oscillation.

[0011] On a top surface of the storage cabinet body 10, a machine chamber 16 is constructed by raising a panel 17 around it. A square opening 18 is formed on a ceiling wall of the storage cabinet body 10 which is a bottom surface of the machine chamber 16, and a unit base 21 of an refrigerating unit 20 is placed to close a top surface of the opening 18. Meanwhile, from the position of an opening edge of a lower surface in a front side (right side in Figure 1) of the opening 18, a wall 40 which is also used as a drain pan is extensively provided with a descending slope toward the back wall, and thereby, a cooler chamber 23 is formed between the wall 40 and the unit base 21.

[0012] The unit base 21 has an insulation property, and as is shown in detail in Figure 2, a freezer 25 constituted of a compressor 26, an air-cooling type condenser 27 and the like is mounted on its top surface, while a cooler 28 (evaporator) is attached to a back side of its lower surface in the posture inclined to the rear to be unitized. The cooler 28 and the freezer 25 are connected by circulation with a coolant pipe 30 which is inserted into an insertion hole 29X provided in the unit base 21, and a known refrigeration cycle is constructed.

[0013] The structure of the cooler chamber 23 will be further described. The wall 40 is made of a synthetic resin such as an ABS resin, and is formed into a plate-shape which is square in plane view as shown in Figures 3 and 4, but the depth of it is made gradually larger from the front side (right side in Figure 3) to the back side. A front wall 41X has an upper portion side cut with both left and right end portions left and a lower part left by predetermined height, so that an inlet portion 42 is formed by the cut portion. A back wall 41Y has an upper portion side cut except for a lower portion of predetermined height, so that a blow port 43 is formed by the cut portion.

[0014] Mounting plates 44 are formed upright at positions near to both left and right side edges in the inner bottom surface of the wall 40 with predetermined spaces provided between the mounting plates 44 and left and right side walls 41Z, and hooks 45 are formed at respective upper edges. At the side of the front wall 41X, a pair of mounting plates 46 are formed at both left and right sides of the inlet port 42 in a horizontal posture.

[0015] The wall 40 is mounted close to the lower surface side of the opening 18 as shown in Figure 2 by hooking the hooks 45 at both the vertically-oriented mounting plates 44 in hooking parts 32 (see Figure 2) provided at left and right side surface sides of the above described opening 18, and by applying both the mounting plates 46 at the front side to the front edge at the lower surface side in the opening part 18 and fastening them with

screws 47. The bottom surface of the wall 40 takes a posture having a descending slope toward the back edge (left side in Figure 2), and the cooler 28 is housed in the posture slightly lifted from the bottom surface of the wall 40. The inlet port 42 is formed at the front surface side of the wall 40 and the blow port 43 is formed at the back surface side.

[0016] The wall 40, which also serves as the drain pan receiving defrost water as described above, has the deepest portion at the back side, and has a drain port 48 formed in the position near the left side (as seen from the front) from the center in a width direction in the remaining back wall 41. The drain port 48 forms a groove shape with a top surface opened, and is formed to have the posture downward at a tip toward the back side. The drain port 48 is fitted in and connected to an upper end portion of a drain passage 33 formed in a back wall of the storage cabinet body 10. The drain passage 33 is partially turned to the side wall and is opened to the front side of the bottom surface.

[0017] A heater 50 for de-frosting is fitted to the lower surface side of the cooler 28. With this, a heating plate 51 corresponding to a heat transfer member is included. The heating plate 51 can be made of stainless steel, and has a body part 52 in such a size as to be able to cover the entire surface of the lower surface of the cooler 28 as shown in Figure 4. The cord type heater 50 is arranged on the top surface of the body part 52 in a staggered form. Water draining holes 53, characterized as a plurality of long holes, are arranged and opened at a front edge and a back edge of the body part 52. Insertion holes 54X for screws 47 are formed at both left and right end portions of the front edge of the body part 52, a mounting plate 55 is raised from the back edge of the body part 52 and insertion holes 54Y of the screws 47 are similarly formed at both left and right end portions of the mounting plate 55.

[0018] The body part 52 of the heating plate 51 is applied to the lower surface of the cooler 28 by inserting the heater 50 into the mounting groove 36 which is notched and formed at the lower edge of the end plate 35 in the cooler 28. The mounting plate 55 is applied to the lower part of the rear surface of the cooler 28 and the screw 47 is screwed therein, and the front edge of the body part 52 is fastened and fixed to the front edge side of the lower surface of the cooler 28 with the screw 47. A lead wire (not shown) of the heater 50 is drawn into the machine chamber 16 through another insertion hole 29Y penetrated through the unit base 21, and is led to an electric equipment casing 37 (see Figure 1) equipped therein.

[0019] Fan devices 60 for cooling are fitted to the above described heating plate 51. The fan device 60 has the structure in which a fan motor 61 is housed in a case 62 including a shroud. Meanwhile, from the front edge of the body part 52 of the heating plate 51, a fan fitting part 56 which is extended with an ascending slope toward the front side is formed. Two left and right circular holes 57 are formed in the fan fitting part 56. The fan device 60 is

placed on a top surface side of the circular hole 57 to cover the circular hole 57, and is fixed by fastening the four corners of the case 62 with the screws 47.

[0020] A short mounting part 58 is formed by bending to form a horizontal posture from the front edge of the fan fitting part 56 of the heating plate 51. The mounting part 58 is applied to the lower surface of a front leg 21X fitted in the opening 18 in the unit base 21, and is fixed by fastening both the left and right end portions with the screws 47. Lead wires 63 which are drawn out from both the fan devices 60 are drawn out into the machine chamber 16 through the insertion hole 29Y of the unit base 21, and similarly led to the electric equipment casing 37.

[0021] A cabinet thermistor 64, which is located between the cooler 28 and the fan device 60, detects the temperature in the cabinet and is mounted to the lower surface of the unit base 21.

[0022] This embodiment has the structure as described above, and the cooler chamber 23 and its periphery are assembled, for example, as follows.

[0023] On the unit base 21, the freezer 25 is placed on its top surface, and the cooler 28 and the cabinet thermistor 64 are mounted to its lower surface. Meanwhile, as shown in Figure 3, the heater 50 is arranged on the top surface of the body part 52 of the heating plate 51, and a pair of fan devices 60 are mounted to the top surface of the fan fitting part 56. The body part 52 of the heating plate 51 is applied to the lower surface of the cooler 28 mounted to the lower surface of the unit base 21, and is fixed by being fastened with the screws 47. With this, the mounting part 58 at the front edge of the fan fitting part 56 is fixed to the front leg 21X of the unit base 21 by being fastened to it with screw 47. The lead wires 63 of the fan devices 60 and the lead wire of the cabinet thermistor 64 are drawn out to the top surface side through the insertion hole 29Y.

[0024] Meanwhile, in the cabinet, the wall 40 is extensively provided by hooking the hooks 45 of the vertically oriented mounting plates 44 to the hooking parts 32 at the opening part 18 side, and by fastening the mounting plates 46 at the front side with the screws 47. At this time, the drain port 48 is fitted in the upper end of the drain passage 33.

[0025] Subsequently, the unit base 21 is placed to close the opening 18, and thereby, the cooler chamber 23 is formed. As shown in Figure 2, at the back side in the cooler chamber 23, the cooler 28 is housed in the state in which the heater 50 is fitted to the lower surface, and at the front side, the two fan devices 60 are equipped by being mounted to the fan fitting part 56 extended from the heating plate 51.

[0026] The cooling operation is performed by driving the freezer 25 (compressor 26) and the fan devices 60. As shown by the arrows in Figure 1, by circulating the air in the storage chamber 12 in such a way that after the air in the storage chamber 12 is sucked into the cooler chamber 23 from the inlet port 42 and passes through the fan devices 60, heat exchange is performed and cold

air is generated while the air passes through the cooler 28 from the front to the rear. The cold air is blown into the storage chamber 12 from the blow port 43, and the inside of the storage chamber 12 is cooled. During this time, the temperature in the cabinet is detected by the cabinet thermistor 64, and depending on whether the detected temperature is higher or lower than the set temperature, drive and stoppage of the freezer 25 and the fan devices 60 are controlled, whereby the temperature in the cabinet is kept at a substantially set temperature.

[0027] When the cooling operation is continued, frost gradually forms on the cooler 28. With respect to the fan devices 60, for example, the case 62 is cooled to about the same temperature as the temperature in the cabinet, and it is in the positioned such that when the heat insulating door 15 is opened the entering external air easily contacts it through the inlet port 42. Therefore, if the cabinet temperature is low, and the external air is at a high temperature with high humidity and the like, there is the possibility that frost forms on the case 62.

[0028] Thus, de-frosting operation is properly performed during the cooling operation. The de-frosting operation is performed by energizing the heater 50 in the state in which the freezer 25 and the fan devices 60 are stopped. Thereby, frost formed on the cooler 28 melts, and the defrost water passes through the water draining holes 53 provided at the body part 52 of the heating plate 51 and drops on the wall 40.

[0029] Meanwhile, heat of the heater 50 is transferred to the fan devices 60 through the heating plate 51, and the frost formed on the fan devices 60 is melted, and the defrost water drops on the wall 40 directly or after passing the heating plate 51. The defrost water flows down to the deepest part at the back edge along the slope of the bottom surface of the wall 40, and thereafter, flows into the drain passage 33 of the back surface wall from the drain port 48, and is drained outside the cabinet.

[0030] During this operation, the de-frosting thermistor (not shown) detects the temperature of the cooler 28, and when the temperature of the cooler 28 reaches a predetermined temperature, it is determined that de-frosting is completed, energization to the heater 50 is shut off, and after a predetermined water draining time passes, the cooling operation is restarted.

[0031] As described above, according to this embodiment, the de-frosting heater 50 is arranged such that the fan fitting part 56 is extensively provided at the heating plate 51 mounted on the lower surface of the cooler 28, and the fan device 60 is equipped there. Therefore, at the time of de-frosting operation, heat of the heater 50 is transferred to the fan devices 60 through the fan fitting part 56 of the heating plate 51, and de-frosting of the fan devices 60 can be performed efficiently.

[0032] During the cooling operation, there is a fear that cold of the cooler 28 is transferred to the fan devices 60 through the heating plate 51. However, since, during the cooling operation, the fan devices 60 are driven, the fans (vanes) themselves rotate, and air is also applied to the

case 62, thus reducing the possibility of frost forming. In other words, the fan devices 60 do not help frost forming by being cooled more than necessary by the influence of the cold of the cooler 28. However, since the fan devices 60 as well as the freezer 25 is repeatedly operated and stopped depending on whether the temperature in the cabinet is higher or lower than the set temperature, it can be said that frost easily forms during stoppage of the operation of the fan devices 60 because the fan stops. But, since the temperature of the cooler 28 also rises with the stoppage of the freezer 25, frost forming on the fans or the like can be suppressed to the minimum.

[0033] On the other hand, during de-frosting operation, the fan devices 60 are stopped and there is no influence of the fans or air. Therefore, heat of the heater 50 can be favorably transferred to the fan devices 60, and defrosting is efficiently performed as described above.

[0034] As the result of fitting the fan devices 60 to the heating plate 51, the following advantages can be obtained.

[0035] A plurality of fan devices 60 are included, and the fan devices 60 are relatively large in weight. Therefore, when the fan devices 60 are fitted to the synthetic resin wall 40 as in the conventional art, there is the fear that the fan devices 60, and the wall 40 itself are removed when receiving vibrations during transportation or the like of the cooling storage cabinet. In this respect, in this embodiment, the fan devices 60 are attached to the heating plate 51 made of a stainless steel plate with high rigidity, and the heating plate 51 is firmly fixed to the unit base 21 and the cooler 28 with the screws 47 at both the front and rear sides. Therefore, when receiving vibration as described above, the fan devices 60 are prevented from being detached, or the wall 40 which becomes light with removal of the fan devices 60 is prevented from being detached.

[0036] When frost forms on the cooler 28, impurities in the cabinet also adhere thereto at the same time, and since the impurities cannot be easily removed with normal de-frosting operation, the cooler 28 is desired to be cleaned regularly. In this embodiment, the wall 40 is not equipped with the fan devices 60, and therefore, the wall 40 can be easily removed as a single piece by loosening the screws 47 and removing the hooks 45 from the hooking parts 32. As a result, the side below the cooler 28 is opened, and the cooler 28 can be easily cleaned.

[0037] When the commercial cooling storage cabinet of this kind is installed, the cooling storage cabinet sometimes has to be transported by being inclined due to, for example, the insufficient dimension of the frontage of the entrance of the room or the like, and in such an occasion, the refrigerating unit 20 is removed in many cases. When the fan devices 60 are fitted to the wall 40 as in the conventional art, the lead wires 63 need to be temporarily cut since the lead wires 63 are drawn out through the unit base 21. In this respect, in this embodiment, the fan devices 60 are fitted to the heating plate 51 which constitutes the freezer unit 20, and with this, the lead wires

63 are also included in the refrigerating unit 20, and therefore, it is not necessary to cut the lead wires 63 on removal of the refrigerating unit 20.

[0038] When the refrigerating unit 20 is removed and placed on a floor or the like, it is the heating plate 51 that contacts the floor, and therefore, there is no fear of damaging the heater 50.

<Embodiment 2>

[0039] Figure 5 and Figure 6 show the second embodiment of the present invention. In the second embodiment, a modification is added to the shape of a heating plate 51A.

[0040] In this heating plate 51A, with respect to the heating plate 51 shown in the above described in the first embodiment, a guard part 65 in which a number of punch holes 66 are opened is formed into a suspended shape by bending from the front edge of the mounting part 58 as shown in Figure 6. When the mounting part 58 of the heating plate 51A is mounted to the front leg 21X of the unit base 21 as shown in Figure 5, the guard part 65 is arranged to be suspended directly inside the inlet port 42 of the wall 40.

[0041] As above, in this embodiment, interference of foreign matters with the fan motors 61 of the fan devices 60 through the inlet port 42 is inhibited by being shielded with the guard part 65.

[0042] Meanwhile, there is the possibility of frost forming on the guard part 65, but since the guard part 65 and the heating plate 51A are integrally formed, heat of the heater 50 is transferred to the guard part 65 through the heating plate 51A at the time of defrosting operation, and defrosting is performed efficiently. Since the guard part 65 is disposed inside the wall 40, all the defrost water is received by the wall 40, and does not drop in the cabinet.

<Embodiment 3>

[0043] Figures 7 to 8 show the third embodiment of the present invention.

[0044] In the third embodiment, with respect to a wall 40B, in addition to the inlet port 42 notched and formed at the front wall 41X side, inlet ports 42B are also opened in the front end portions of left and right side walls 41Z. The lower edges of both the inlet ports 42B are located at a slightly higher position than the bottom surface of the wall 40B. Window holes 68 are opened in the left and right mounting plates 44, which are provided with the hooks 45, at the positions corresponding to the inner sides of the left and right inlet ports 42B.

[0045] In the heating plate 51B, in addition to the guard part 65 located directly inside the inlet port 42 at the front wall 41X side, guard parts 65B, which are located directly inside the window holes 68 in the left and right mounting plates 44, are formed. The guard parts 65B have the structure in which a number of punch holes 66 are opened.

[0046] In the third embodiment, the inlet ports 42 and 42B for air in the cabinet are formed on the three surfaces that are left and right side walls 41Z with the front wall 41X therebetween in addition to the front wall 41X of the wall 40B, and therefore, when a predetermined inlet area is ensured, the inlet port 42 facing the entrance/exit port 14 at the front surface of the storage cabinet body 10 can be narrowed. Therefore, the inlet amount of the external air entering with opening and closing of the insulating door 15 can be decreased, and frost formation on the guard parts 65 and 65B, and further onto the fan devices 60 can be suppressed.

[0047] Since the guard parts 65 and 65B are formed on the three surfaces and have a large area, external air diffuses when contacting them, which reduces or prevents the formation of frost.

[0048] If frost forms on the guard parts 65 and 65B, they are formed integrally with the heating plate 51B. Therefore, at the time of defrosting operation, heat of the heater 50 is transferred to the guard parts 65 and 65B, and defrosting of them as well as the fan devices 60 is efficiently performed. Likewise, since the guard parts 65 and 65B are disposed in the wall 40B, all the defrost water is received by the wall 40B, and does not drop in the cabinet.

<Embodiment 4>

[0049] The fourth embodiment of the present invention will be described based on Figures 9 to 13.

[0050] In this embodiment, means for heating a drain port 48C of a wall 40C is included. Therefore, as shown in Figure 10, a heat transfer member 70 is provided. The heat transfer member 70 is formed by press-forming a metal plate. A groove 72 is formed in a central portion in a width direction in a base board 71, and a pipe part 73 with a top surface opened is formed to extend from a rear edge to communicate with the groove 72. The pipe part 73 is closely fittable in the drain port 48C of the wall 40C with their tip ends aligned with each other. Locking claws 74 are formed by being cut and raised at left and right side surfaces of the pipe part 73. Also, locking holes 75, to which the locking claws 74 are locked, are formed in the left and right side surfaces of the drain port 48C. In the bottom portion sides of the left and right side surfaces at the base end side of the pipe part 73, introduction ports 76 are opened. A water draining part 77 in a tongue piece shape is formed by bending from the tip end of the pipe part 73.

[0051] The base board 71 of the heat transfer member 70 is positioned on the bottom surface at the rear portion side in the body part 52 of the heating plate 51, and joined thereto by spot welding or the like.

[0052] A pair of left and right inlet ports 42C are opened in the front wall of the wall 40C with a space therebetween as shown in Figure 13. Further, a flanged mounting plate 46C is formed at an upper edge of the front wall over a substantially entire width thereof, and insertion holes 78

are opened at both of its left and right ends. Decorative screws 47C capable of being rotationally operated by a coin C are inserted through both the insertion holes 78, and are fixed by being screwed in and fastened to thread holes 79 threaded at the front edge side of the opening 18 in the ceiling surface of the storage cabinet body 10.

[0053] While a magnet 81 is fitted to a central portion in the width direction of the mounting plate 46C, a lead switch 82 sensitive to the above described magnet 81 is buried at a position corresponding to the ceiling surface of the storage cabinet body 10, and thereby, detecting means 80 which detects presence and absence of mounting of the wall 40C is constructed.

[0054] Assembly is performed as follows. The heat transfer member 70 is joined to the heating plate 51 as described above, and as the heating plate 51 with the fan devices 60 mounted thereon is mounted on the undersurface of the cooler 28, the heat transfer member 70 is assembled as a part of the refrigerating unit 20. Meanwhile, in the cabinet, the wall 40C is provided to be laid in advance, and the drain port 48C is fitted in the drain passage 33.

[0055] When the unit base 21 of the refrigerating unit 20 is placed close to the opening 18, while the cooler 28 and the like are positioned from the opening 18, the pipe part 73 of the heat transfer member 70 is fitted into the drain port 48C of the wall 40C from above the front side as shown in Figure 12(A). The pipe part 73 is pushed in while deforming the locking claws 74 by bending, and when it is fitted into a predetermined position, the locking claw 74 is restored and locked to the locking hole 75 as shown in Figure 12(B), the pipe part 73 is fixed in the state in which it closely contacts with the inside of the drain port 48C. At this time, the introduction ports 76 of the pipe part 73 are located inside the back wall 41Y of the wall 40C.

[0056] The defrosting operation is performed by energizing the heater 50, and defrost water from the cooler 28 passes through the water draining holes 53 provided in the body part 52 of the heating plate 51, drops into the groove 72 of the heat transfer member 70 and flows into the pipe part 73, or drops onto the wall 40C through the water draining holes 53 and flows down to the deepest part, thereafter, flows into the pipe part 73 from the introduction ports 76 and is drained toward the draining passage 33.

[0057] When frost forms on the fan devices 60, defrosting is performed efficiently by the heat of the heater 50 being transferred to the fan devices 60 through the heating plate 51, and the defrost water is similarly drained through the pipe part 73 after being received by the wall 40C.

[0058] At the time of defrosting operation as described above, if water drops and a small lump of frost remain in the drain port 48C, namely, in the pipe part 73, they are frozen and clogged in the pipe part 73 when the cooling operation is restarted, especially when the temperature in the cabinet is kept at about minus 20°C as in the re-

frigerating cabinet. Thus, there is the fear that defrost water cannot be drained at the time of the next defrosting operation.

[0059] In this respect, in this embodiment, at the time of defrosting operation, heat of the heater 50 is transferred to the pipe part 73 of the heat transfer member 70 integrally joined to this and heats this, and therefore, when freezing occurs, clogging is eliminated by melting the ice, as a result of which, defrost water is drained smoothly. Thus, it is unnecessary to provide special heating means to prevent clogging in the drain port 48C of the wall 40C.

[0060] Meanwhile, when the wall 40C is removed on the occasion of cleaning, the decorative screw 47C is first removed, which is convenient because it can be removed with the coin C without using a tool as described above. When both the locking claws 74 are deformed inward by bending from the state in Figure 12(B), locking of the draining port 48C and the pipe part 73 is released, and therefore, the wall 40C can be removed as a single piece while the hooks 45 are removed from the locking part 32. A large factor in the capability of removing the wall 40C as a single piece is a result of it being unnecessary to provide the heater for heating the drain port 48C at the wall 40C side, and thus not needing to wire the lead wire between the wall 40C and the refrigerating unit 20.

[0061] Because the wall 40C can be removed as the single piece, cleaning of the wall 40C itself can be easily performed, and the lower side of the cooler 28 is opened, the cleaning of the cooler 28 can be easily performed, thus reducing bad odor and the propagation of germs.

[0062] In this embodiment, the detecting means 80 which detects presence and absence of mounting of the wall 40C is equipped. For example, when cleaning is performed as described above, the power supply is basically turned off, but if it is forgotten, if the detecting means 80 issues warning of a buzzer or the like and stops the fan devices 60 when it detects removal of the wall 40C, cleaning with the fan devices 60 rotating can be prevented.

<Embodiment 5>

[0063] The fifth embodiment of the present invention will be described based on Figures 14 and 15.

[0064] In the fifth embodiment, the fan device 60 is arranged in the posture parallel with the front end surface of the cooler 28 in the front surface side of the cooler 28. Therefore, from the front edge of the body part 52 of a heating plate 51D, a fan fitting part 56D, which is perpendicularly raised after extended forward by a predetermined dimension, is formed. In the fan fitting part 56D, two of left and right circular holes 57 are similarly formed, and the fan devices 60 are applied thereto from the back surface side so as to cover the circular holes 57, and are fixed by fastening four corners of the cases 62 with the screws 47.

[0065] In the fan fitting part 56D, mounting parts 58D,

which are perpendicularly bent forward, are formed at its upper edge and left and right edges. The mounting part 58D of the top surface is fastened to the undersurface of the unit base 21 with the screws 47. Meanwhile, side panels 85 are passed and laid in gaps between the left and right mounting parts 58D and side surfaces of the cooler 28. Thereby, the air in the cabinet attracted by the fan devices 60 is reliably guided to the cooler 28.

[0066] A fan guard 86 is provided so as to cover the front side of the fan fitting part 56D. The fan guard 86 is formed into a box shape by a metal plate with its top surface and rear surface opened, and a number of punch holes 87 are opened in each surface. Left and right side plates of the fan guard 86 are fitted to the outside of the left and right mounting parts 58D, and are fixed by being screwed together. The cabinet thermistor 64 is mounted to the front surface of the fan guard 86.

[0067] An inlet port 42D for air in the cabinet is provided in the undersurface at the front end side in a wall 40D. A raised part 88 is formed in the area forward of the placement position of the fan guard 86, and a number of slits 89 are formed in its top surface by being cut side by side.

[0068] The other structure is the same as the above described first embodiment.

[0069] Since in this embodiment 5, the fan devices 60 are equipped at the fan fitting part 56D which is formed integrally with the heating plate 51D, heat of the heater 50 is similarly transferred to the fan devices 60 through the fan fitting part 56D of the heating plate 51D at the time of defrosting operation, and defrosting of the fan devices 60 is efficiently performed.

[0070] The fan guard 86 is placed to cover the front side of the fan devices 60, and therefore, when maintenance or the like is performed by removing, for example, the wall 40D, interference of a foreign matter with the fan motors 61 of the rotating fan devices 60 and the like are inhibited. Since the fan guard 86 is formed to have four surfaces and have a large area, external air diffuses when the external air contacts the fan guard 86 and thus makes it difficult for frost to form, and thereby, clogging can be suppressed.

[0071] Even if frost forms on the fan guard 86, heat of the heater 50 is transferred to the fan guard 86 through the heating plate 51D at the time of defrosting operation since the fan guard 86 is integrally connected to the heating plate 51D, and therefore, defrosting is efficiently performed. Since the fan guard 86 is arranged backward of the inlet port 42D inside the wall 40D, all the defrost water is received by the wall 40D, and does not drop in the cabinet.

<Embodiment 6>

[0072] The sixth embodiment of the present invention will be described based on Figure 16.

[0073] The sixth embodiment shows the mode in which the fan devices 60 are equipped in a wall 40E. The basic structure is that an inlet port 42E is opened at a front end

side of an undersurface of a wall 40E, and the fan devices 60 are fitted to an inner surface side of the inlet port 42E while a fan guard 90 is mounted to an outer surface side. Meanwhile, for defrosting, the heater 50 is fitted to the undersurface of the cooler 28 by being arranged in the staggered state, and on the wall 40E, a metal heat transfer plate 91 corresponding to a heat transfer member is laid from the side under the cooler 28 to the placement position of the fan device 60.

[0074] The defrosting operation is performed similarly by energizing the heater 50, and defrost water from the cooler 28 is received by the wall 40E and drained. When it is detected that the cooler 28 rises to a predetermined temperature by a defrosting thermistor 93, and it is determined that defrosting is completed, the defrosting operation is finished.

[0075] Incidentally, frost sometimes forms on the fan devices 60, especially on the fan guard 90. Conventionally, on the occasion of defrosting operation, the heat transfer plate 91 is heated by receiving radiation heat from the heater 50 and the cooler 28, and frost formed on the fan devices 60 together with a lump of frost which drops on the heat transfer plate 91 is melted. However, since heating of the heat transfer plate 91 depends on the radiation heat from the heater 50 and the cooler 28 as described above, rise in temperature cannot be expected so much, and frost is sometimes not melted sufficiently.

[0076] Thus, this embodiment adopts the structure in which an endportion 50X of the heater 50 is lowered to be in contact with the heat transfer plate 91.

[0077] Accordingly, at the time of defrosting operation, the heat transfer plate 91 is directly heated by the heater 50, namely, heat transfer. Therefore, the heat transfer plate 91 is raised to a sufficiently high temperature, and defrosting on the fan device 60 side such as the fan guard 90 can be reliably performed.

<Embodiment 7>

[0078] Figure 17 shows the seventh embodiment of the present invention.

[0079] In the seventh embodiment, the basic structure is the same as the above described in the sixth embodiment, except that a modification is added to the heating structure of the heat transfer plate 91.

[0080] A contact plate 95 of a metal plate, which is provided with a folded part 96 at one edge side, is included. The contact plate 95 is fixed to the back side of the fan device 60 on the heat transfer plate 91 by spot welding or the like, and the tip end of the folded part 96 is in contact with the undersurface of the cooler 28.

[0081] At the time of defrosting operation, the cooler 28 is heated by the heater 50, and the heat of the cooler 28 is transferred to the heat transfer plate 91 through the contact plate 95. Therefore, the heat transfer plate 91 is raised to a sufficiently high temperature, and defrosting at the side of the fan devices 60 such as the fan guard

90 can be also reliably performed.

<Other embodiments>

[0082] The present invention is not limited to the embodiments which are described based on the above description and drawings, but, for example, the following embodiments are also included in the technical range of the present invention.

(1) In the third embodiment, the front end side of the mounting plate 44 may be cut out instead of opening the window holes 68 in the left and right mounting plates 44 of the wall 40B.

(2) In the third embodiment, the inlet port may be provided only in either one side surface of the left or right side surface in addition to the front surface.

(3) In the fourth embodiment, the heat transfer member 70 may be mounted to the undersurface of the cooler 28.

(4) In the fourth embodiment, the heat transfer member does not always have to include the pipe part which is fitted into the drain port, but may be the one only provided with the contact part which is in contact with the drain port.

(5) In the seventh embodiment, the contact plate maybe integrally formed by cutting and raising the wall plate.

(6) In the seventh embodiment, the contact plate may be brought into contact with the heater.

(7) The heating means for defrosting is not limited to the heater, but may be a hot gas pipe in which a hot gas flows.

(8) The present invention is not limited to the one provided with the cooler chamber in the ceiling portion of the storage chamber, but may be applicable to the one of the type provided with the cooling chamber in the other portions such as side surface of the storage chamber and the like.

Claims

1. A cooling storage cabinet comprising the following construction:

a storage cabinet body in which an inside is partitioned by a wall and a cooler chamber is formed;

a cooler that is provided in said cooler chamber; a cooling fan device that circulates and supplies cold air which is generated by heat exchange with said cooler into said storage cabinet body; a heating device that is equipped in said cooler to perform defrosting of said cooler; and a heat transfer member that transfers heat of said heating device to said cooling fan device.

2. The cooling storage cabinet according to claim 1,
wherein the wall which partitions said cooler chamber is located under said cooler to also serve as a drain pan, a heating plate with said heating device fitted therein is mounted to said cooler, and said cooling fan device is fitted to a fan fitting part which is extended from the heating plate. 5

3. The cooling storage cabinet according to claim 2,
wherein said wall is laid with a descending slope toward a back side from an opening side at a front surface of said storage cabinet body to define said cooler chamber, said cooler is housed at a back side in the cooler chamber, said cooling fan device is fitted to a fan fitting part of said heating plate which is provided to extend to a front side from an undersurface of the cooler, an inlet port for air in a cabinet is provided in an end portion at a front side of said wall while an outlet port for cold air is provided at a back side, and said inlet ports are provided separately in a front surface in said wall and side surfaces adjacently to it. 10
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4. The cooling storage cabinet according to claim 2 or claim 3, 25
wherein said heating plate is provided with a guard part which covers a front side of said cooling fan device.

5. The cooling storage cabinet according to any one of claims 2 to 4, 30
wherein a drain port is projectingly provided at a back end side of said drain pan, and is connected to a drain passage provided in a wall surface of said storage cabinet body, and said heating plate is provided with a contact part which is in contact with said drain port. 35

6. The cooling storage cabinet according to claim 1, 40
wherein said cooling fan device is fitted to said wall with a heat transfer plate therebetween, and a part of said heating device is in contact with said heat transfer plate.

7. Said heat transfer plate is provided with a contact 45
part which is in contact with said heating device or said cooler.

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FIG.1

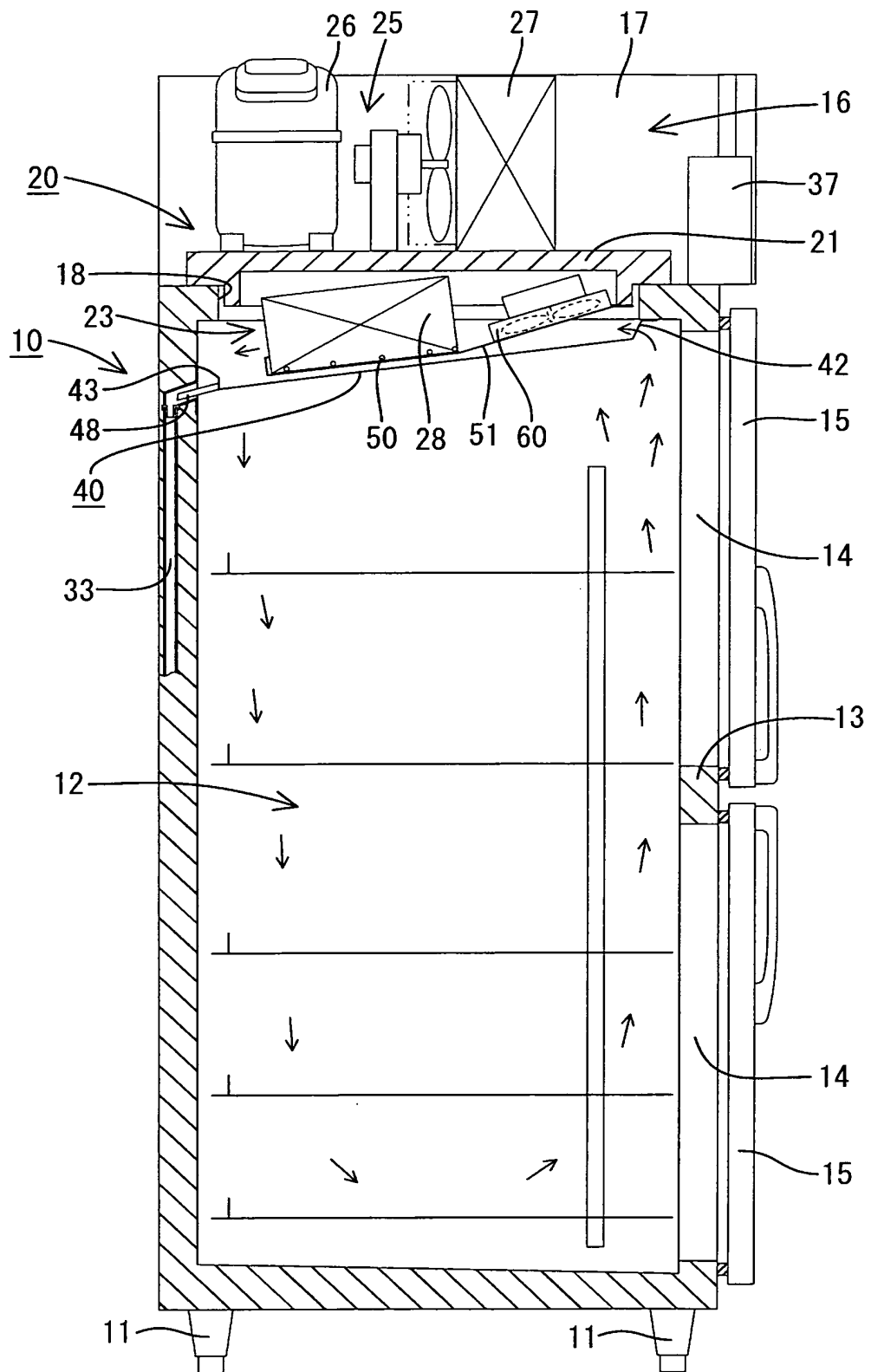


FIG.2

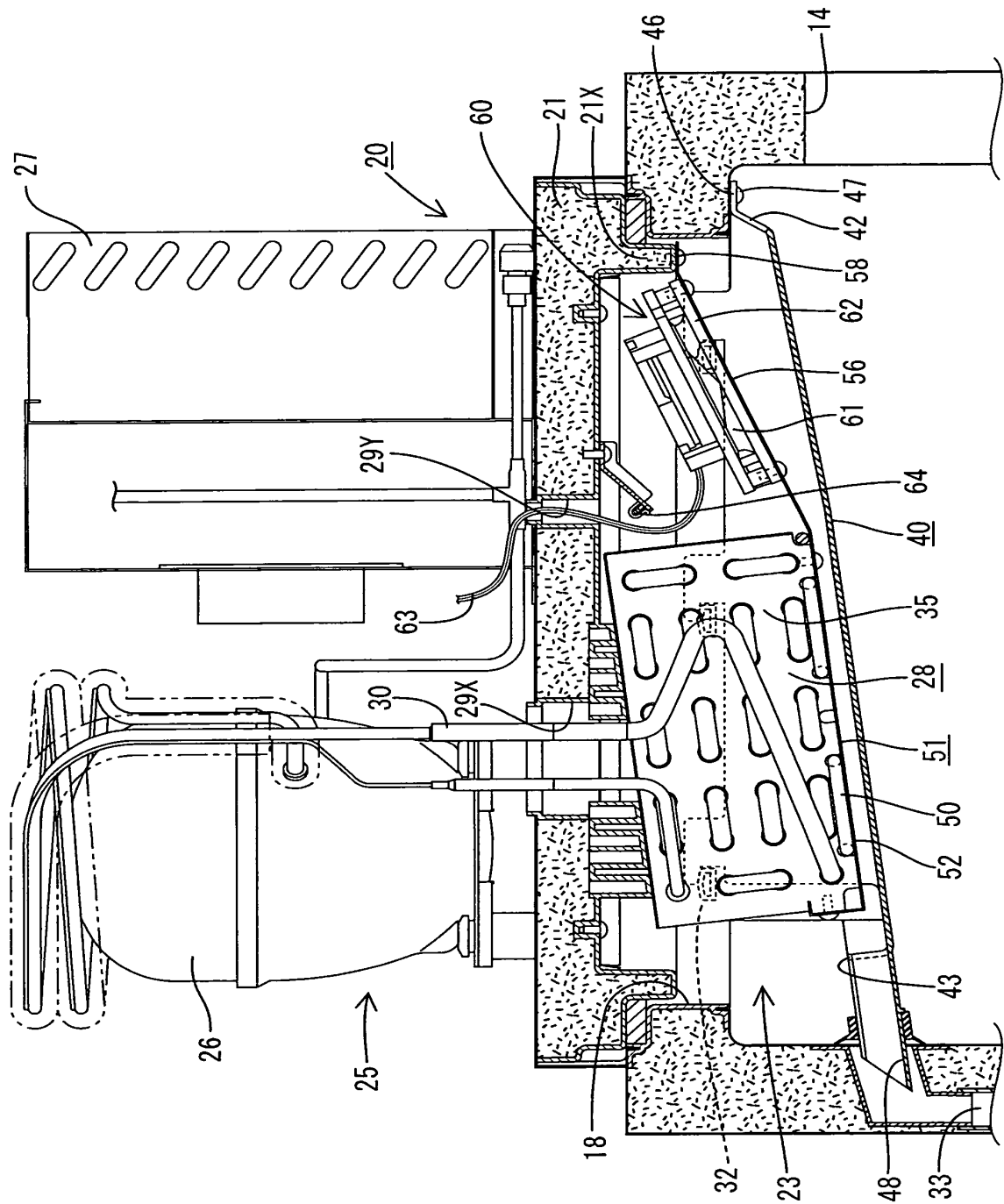


FIG.3

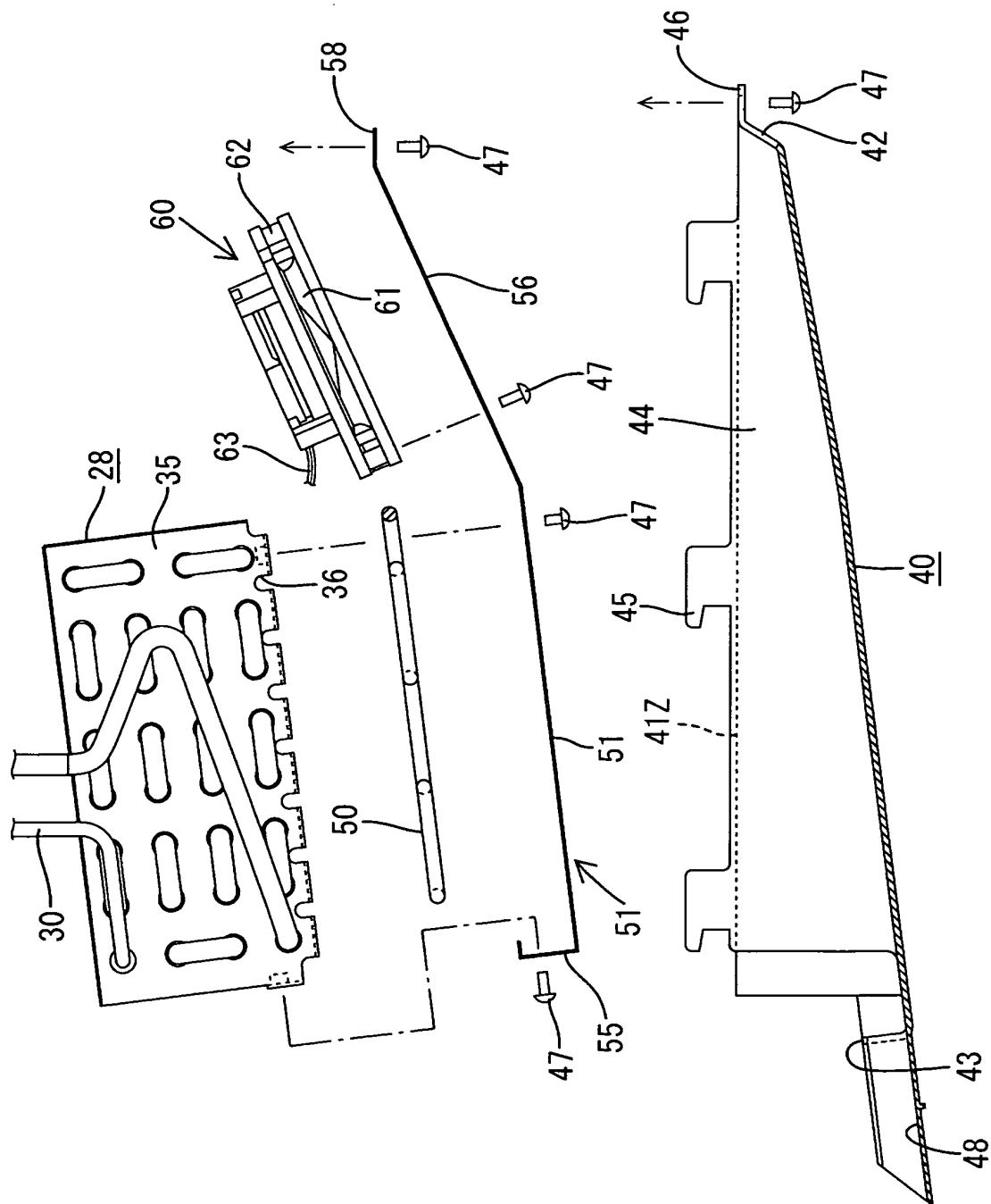


FIG.4

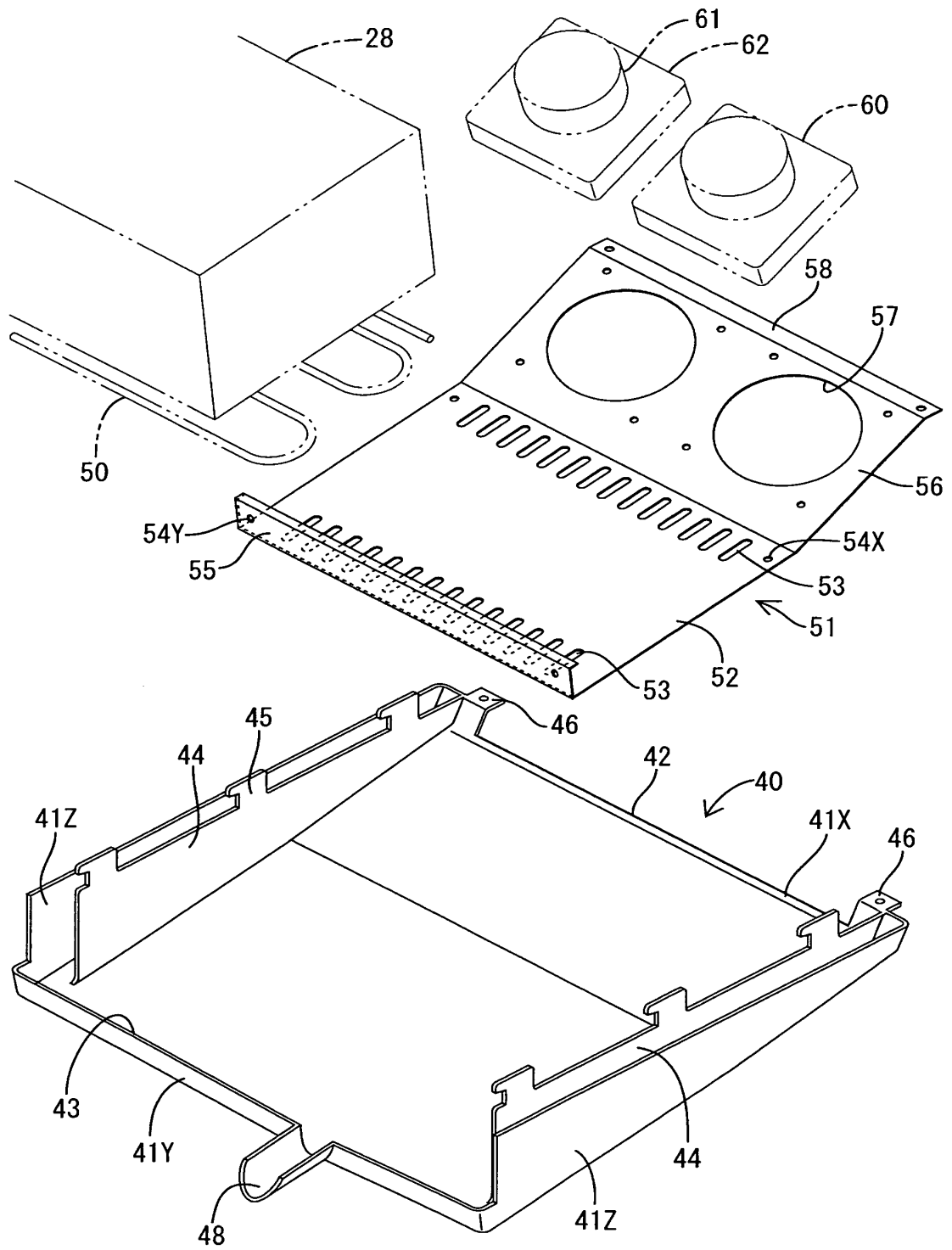


FIG.5

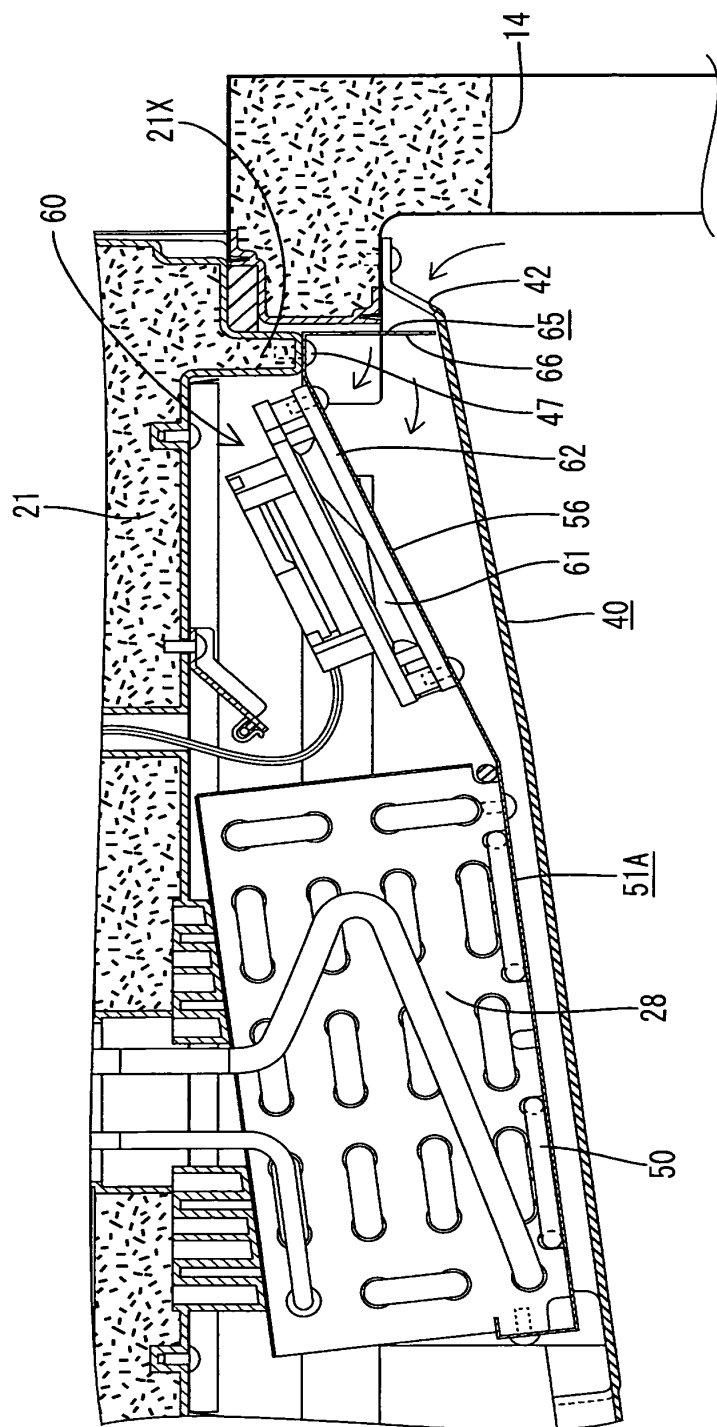


FIG.6

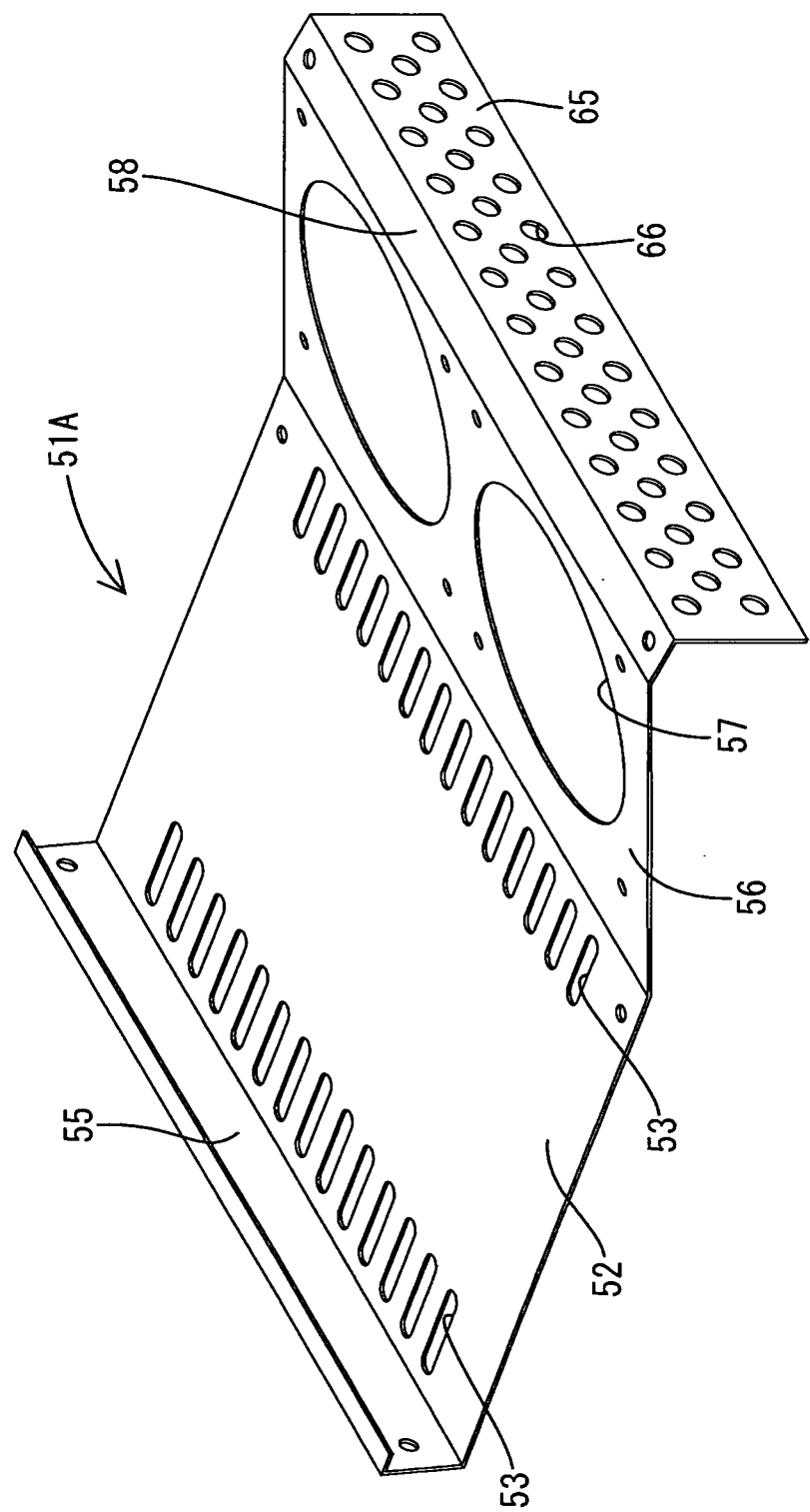


FIG.7

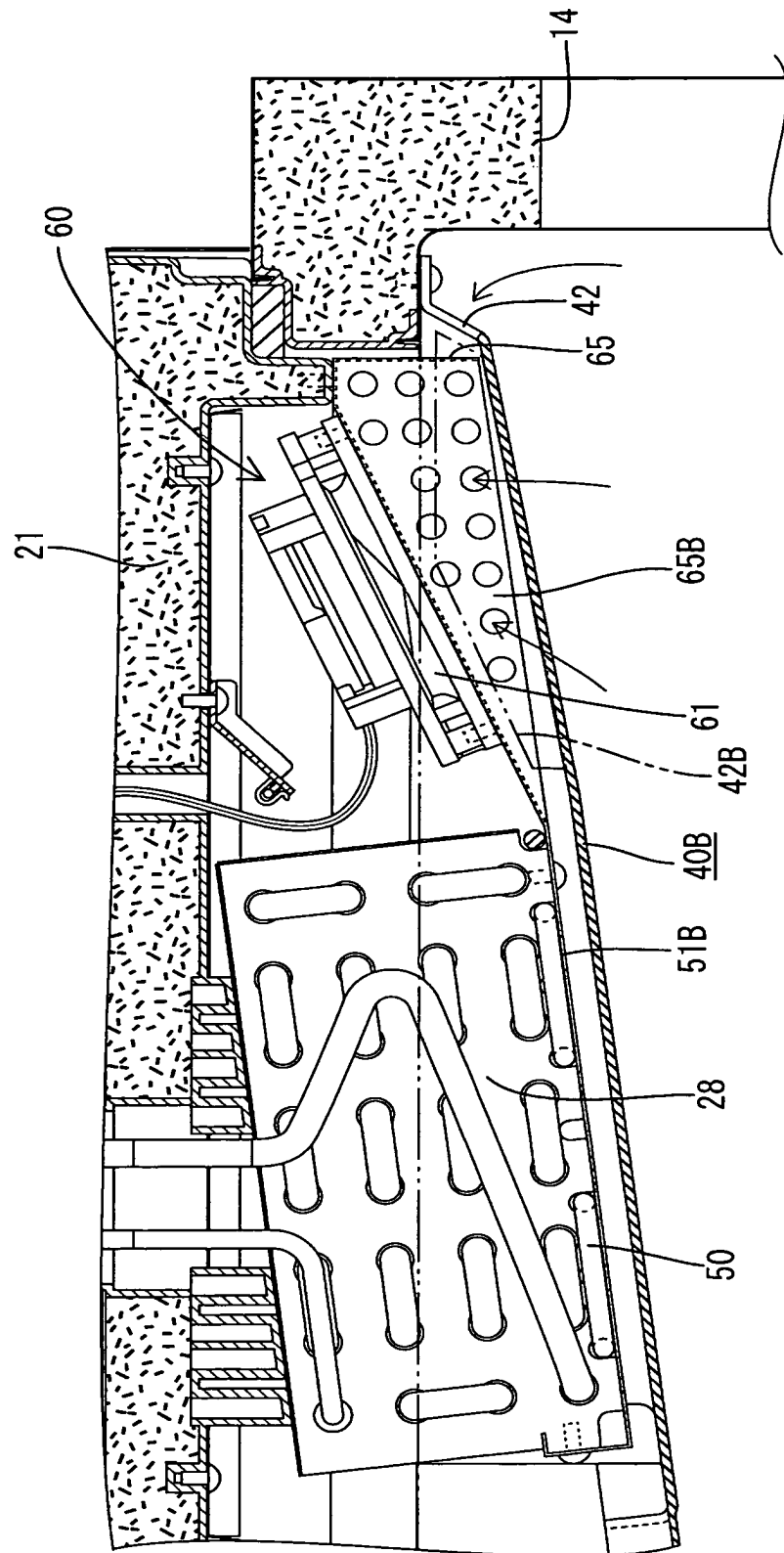


FIG.8

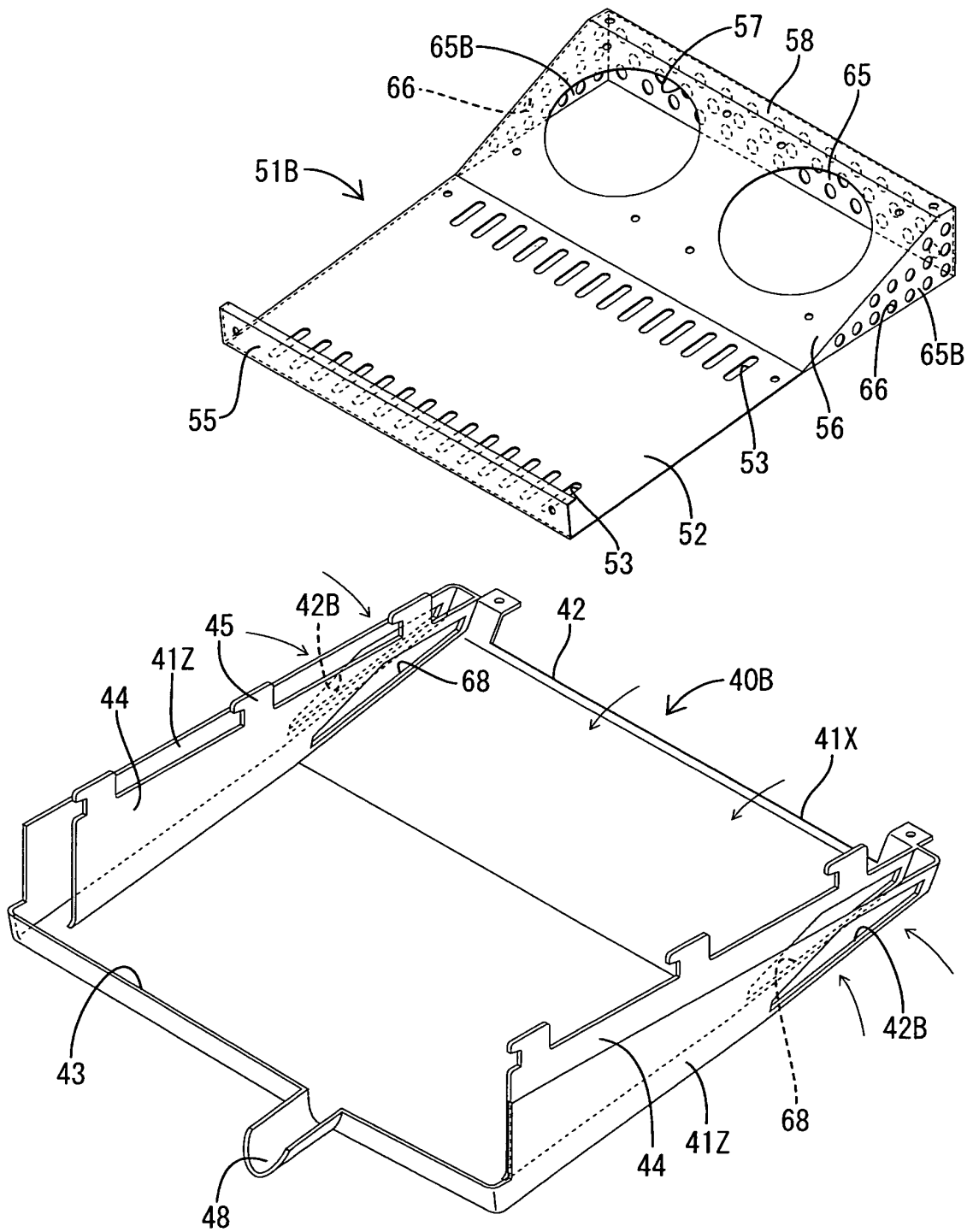


FIG.9

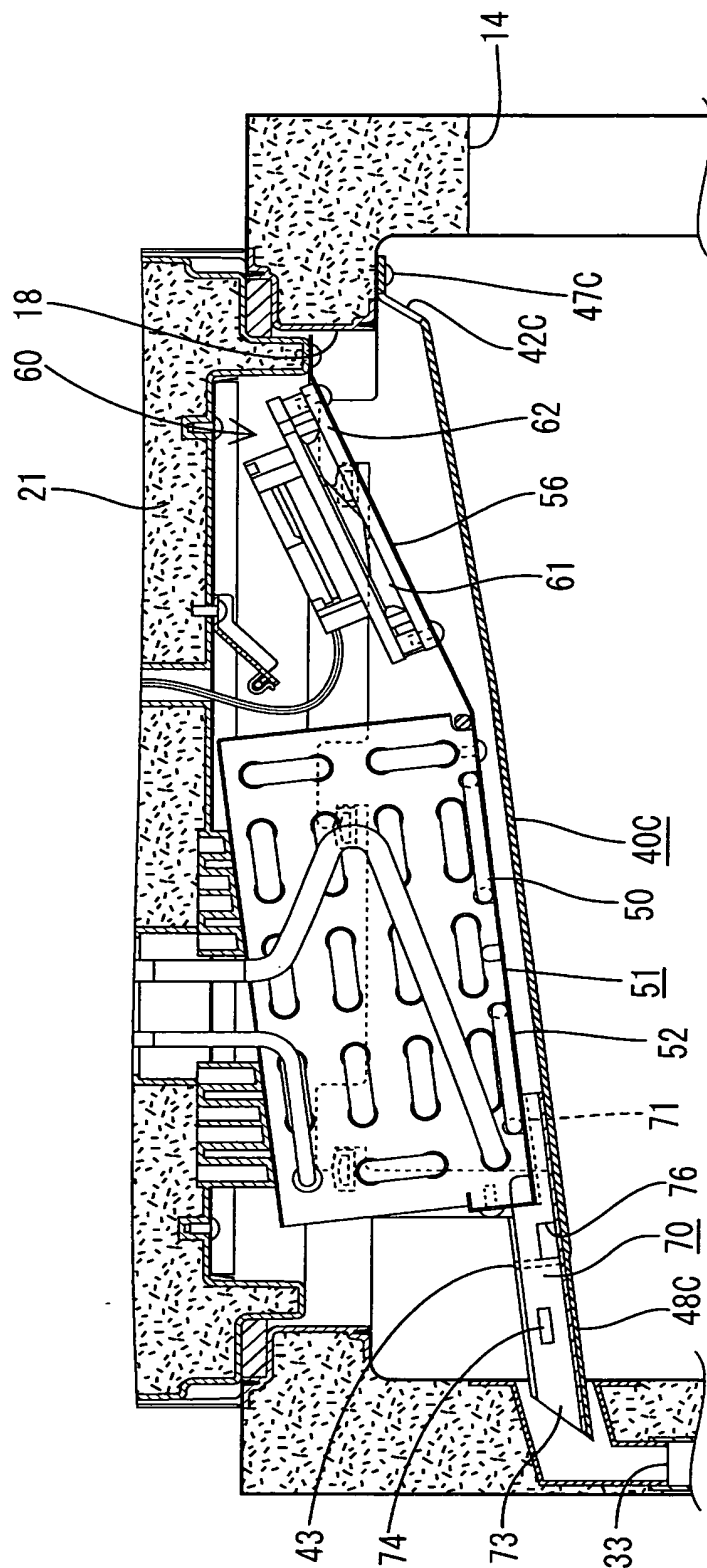


FIG.10

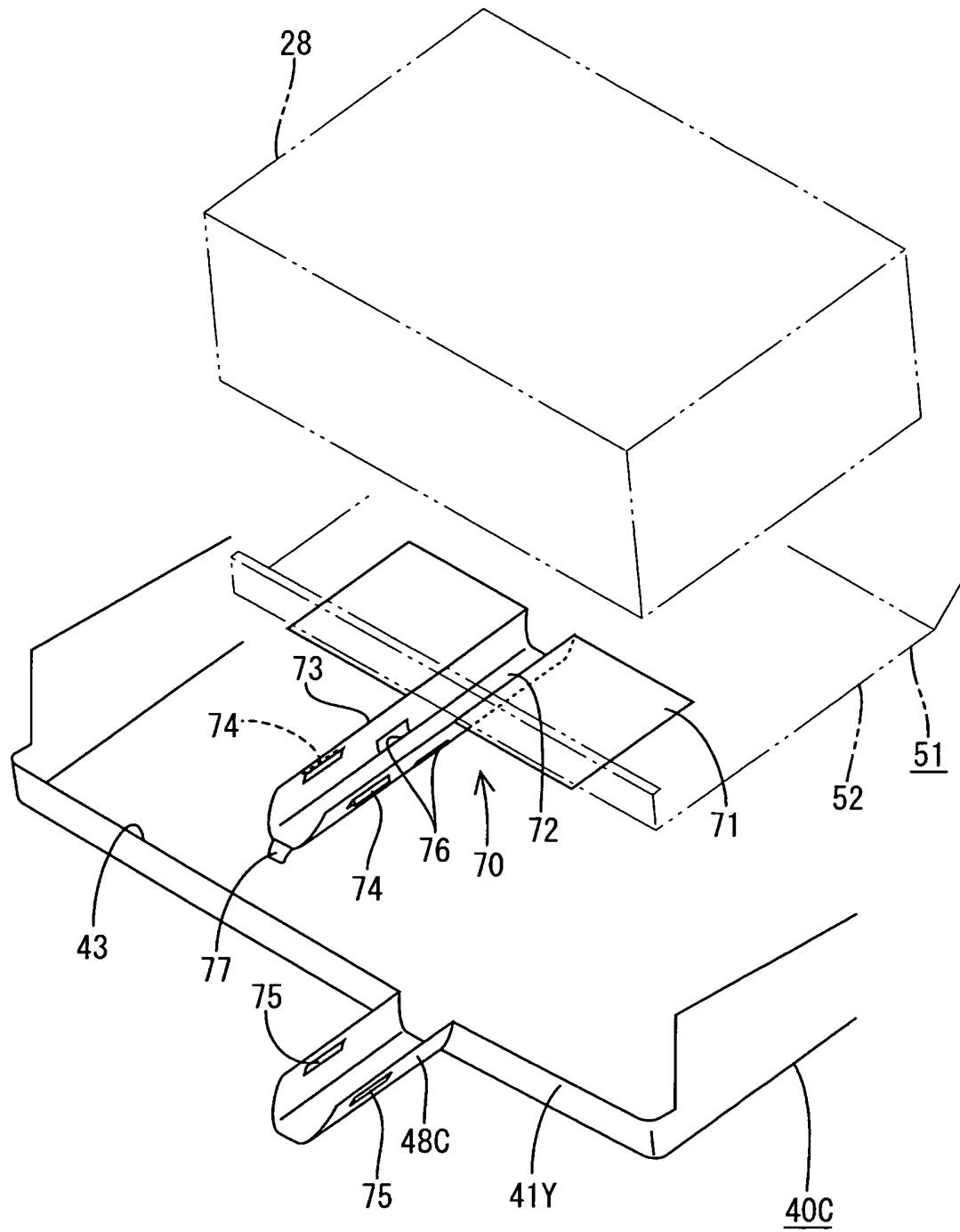


FIG.11

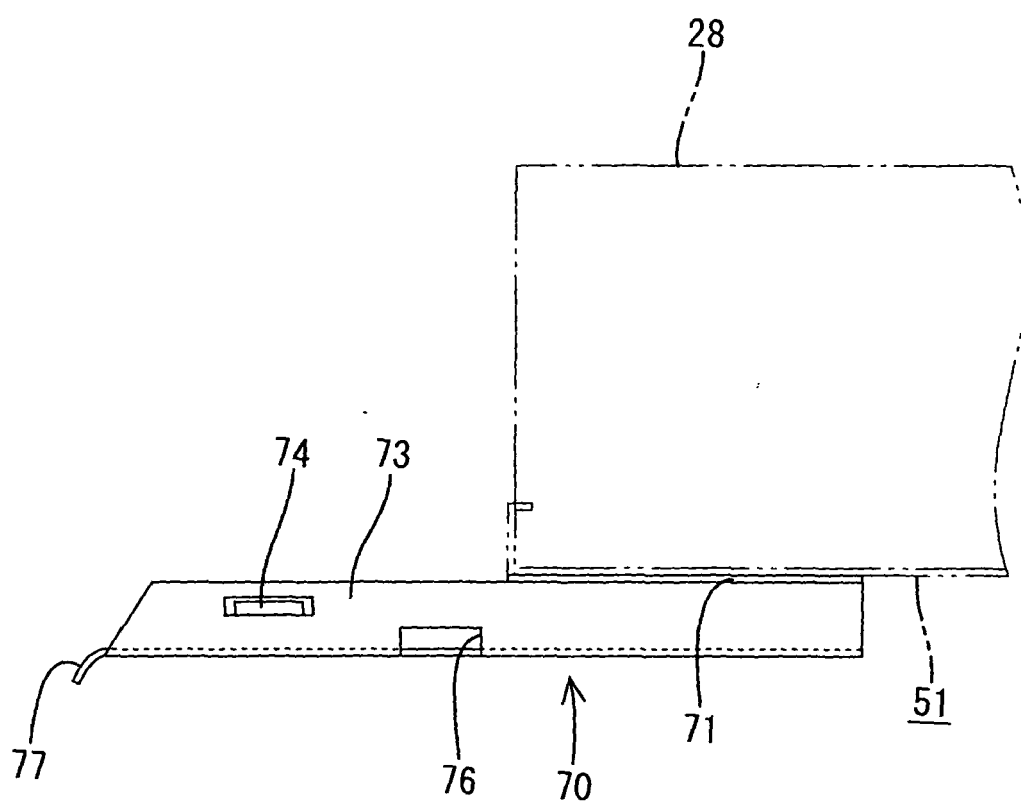
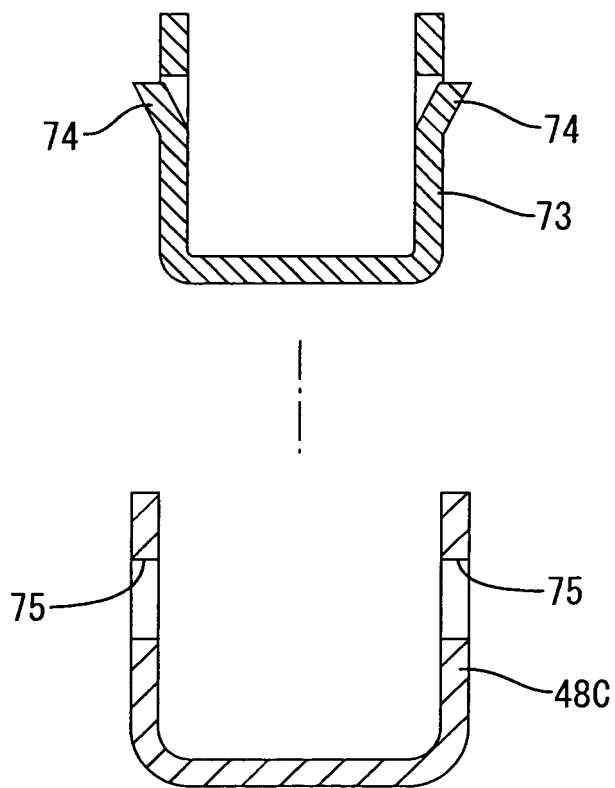


FIG.12

(A)



(B)

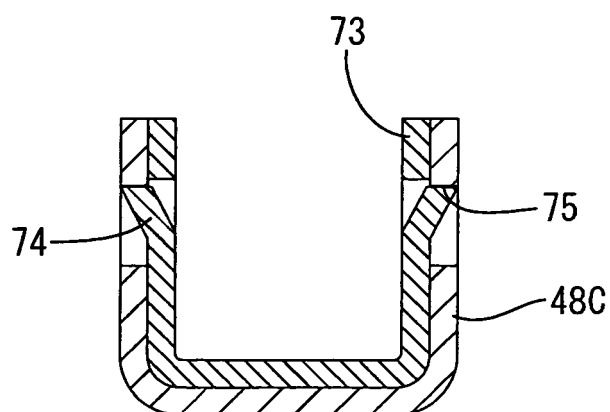


FIG.13

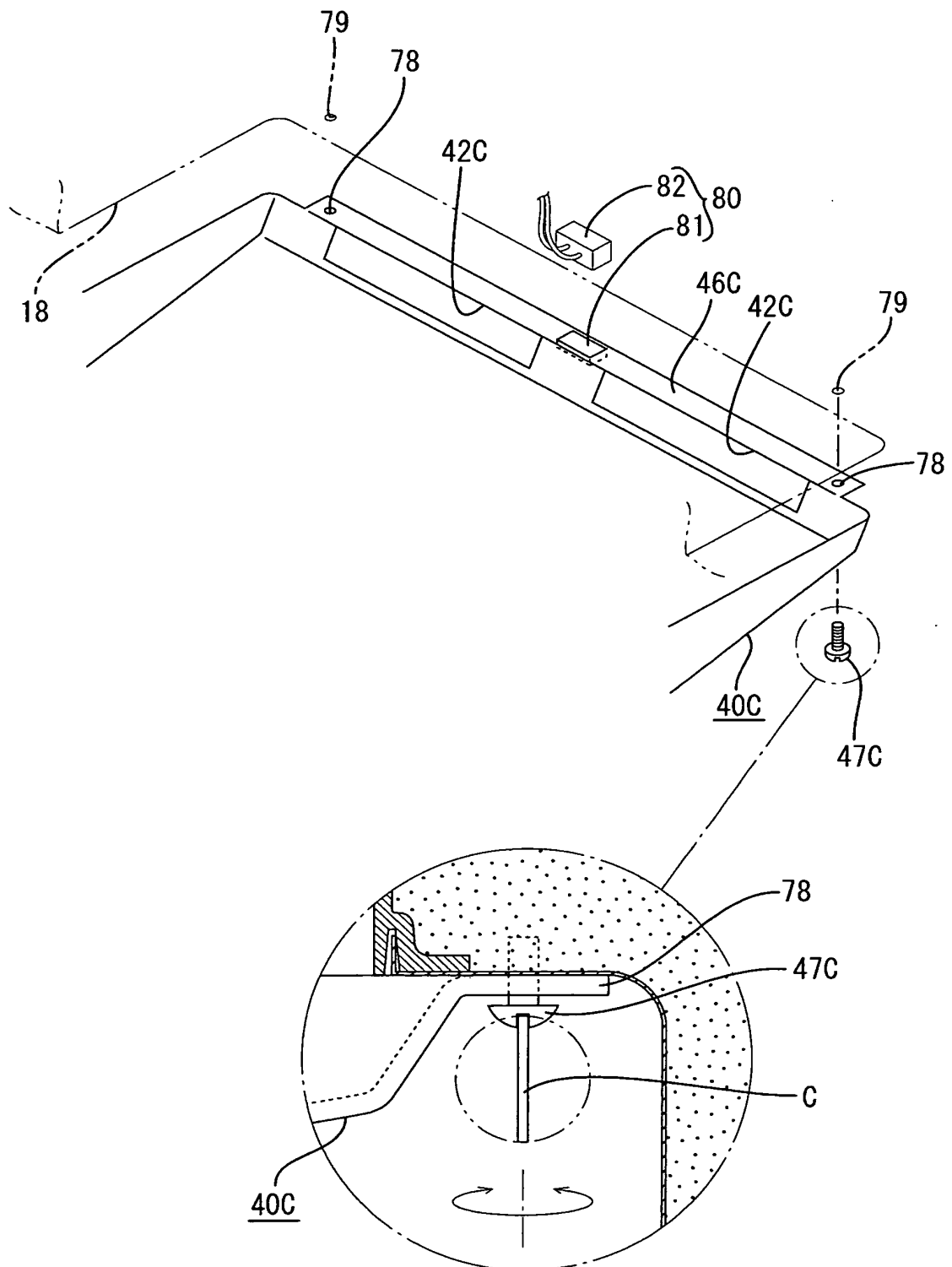


FIG.14

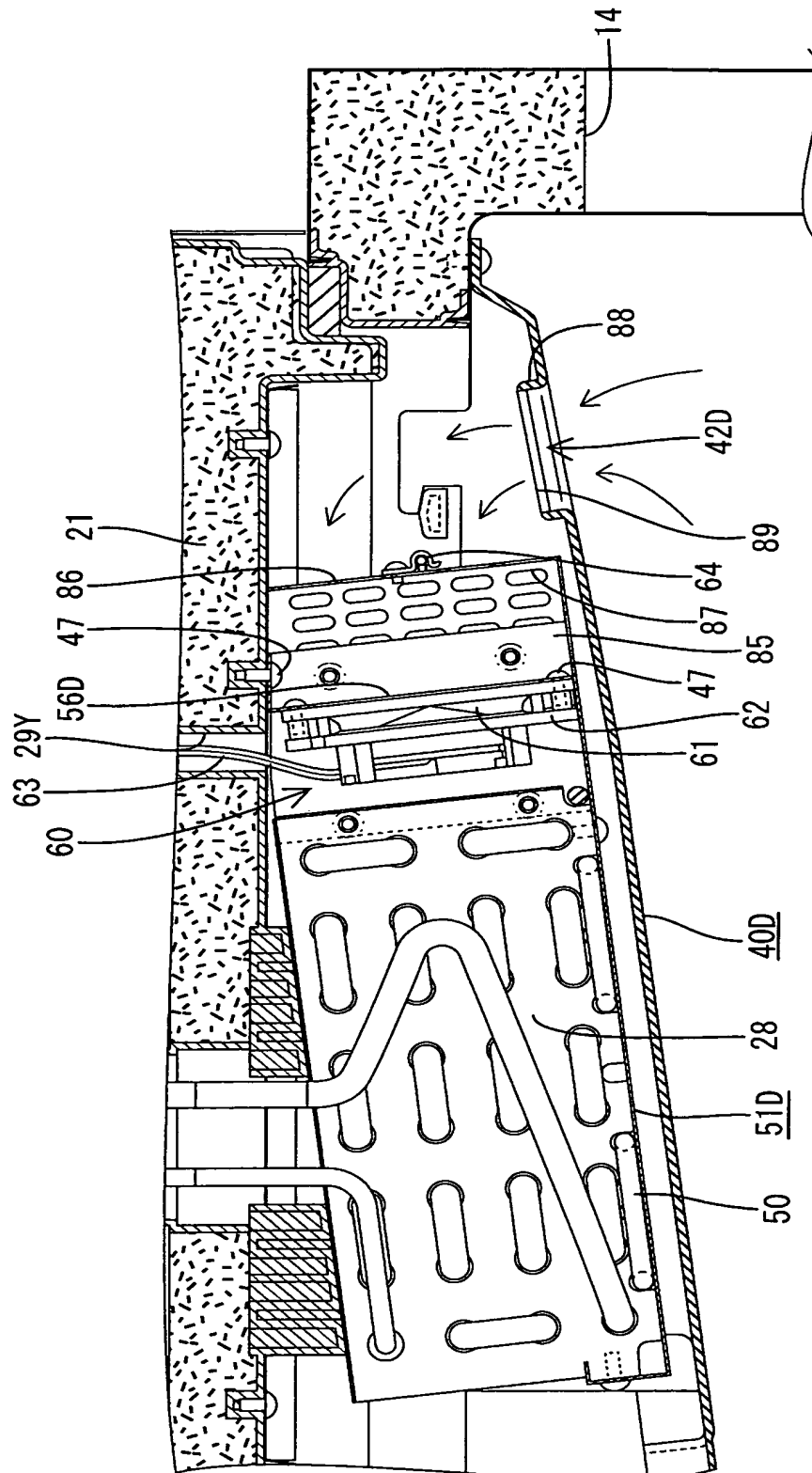


FIG.15

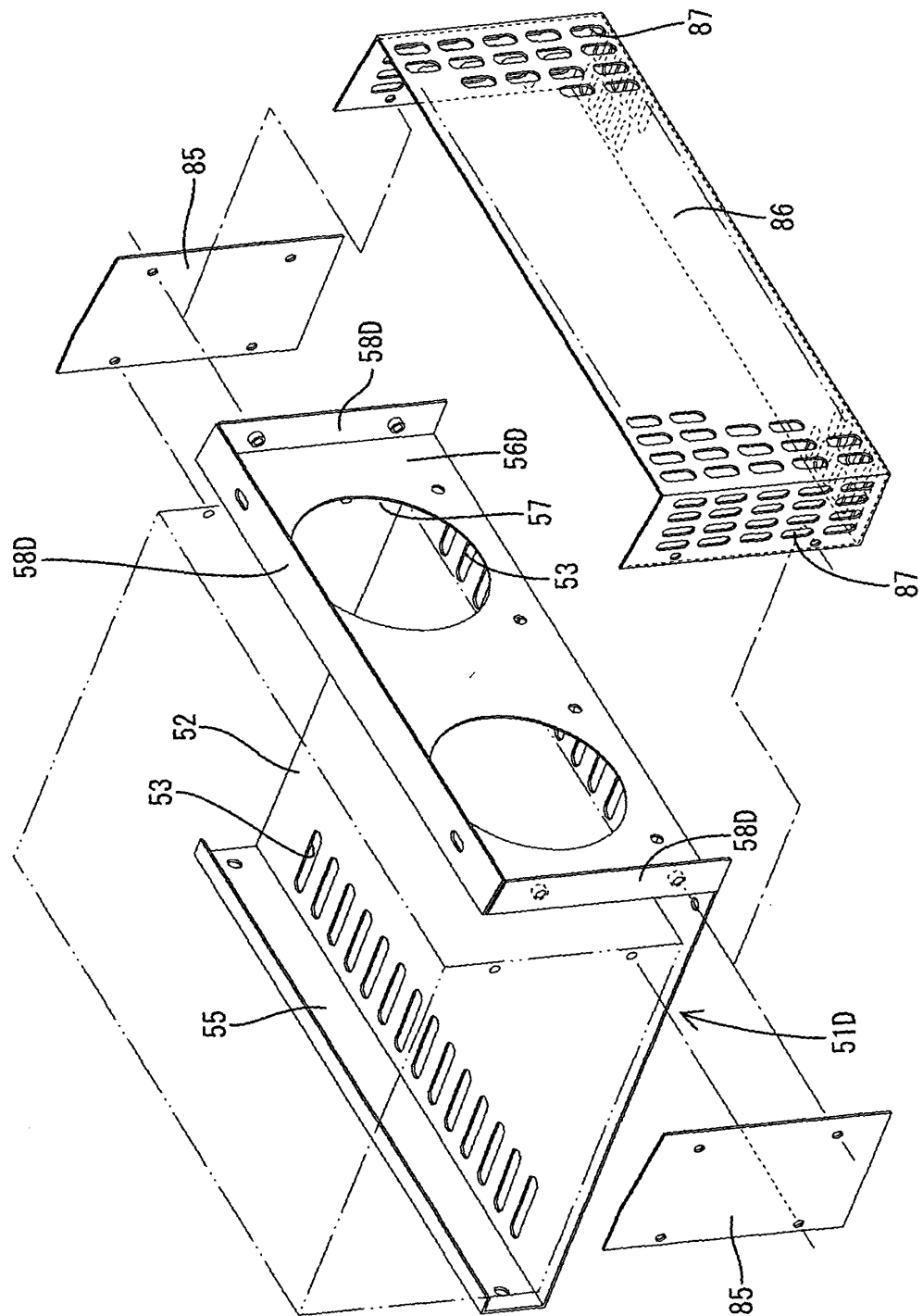


FIG.16

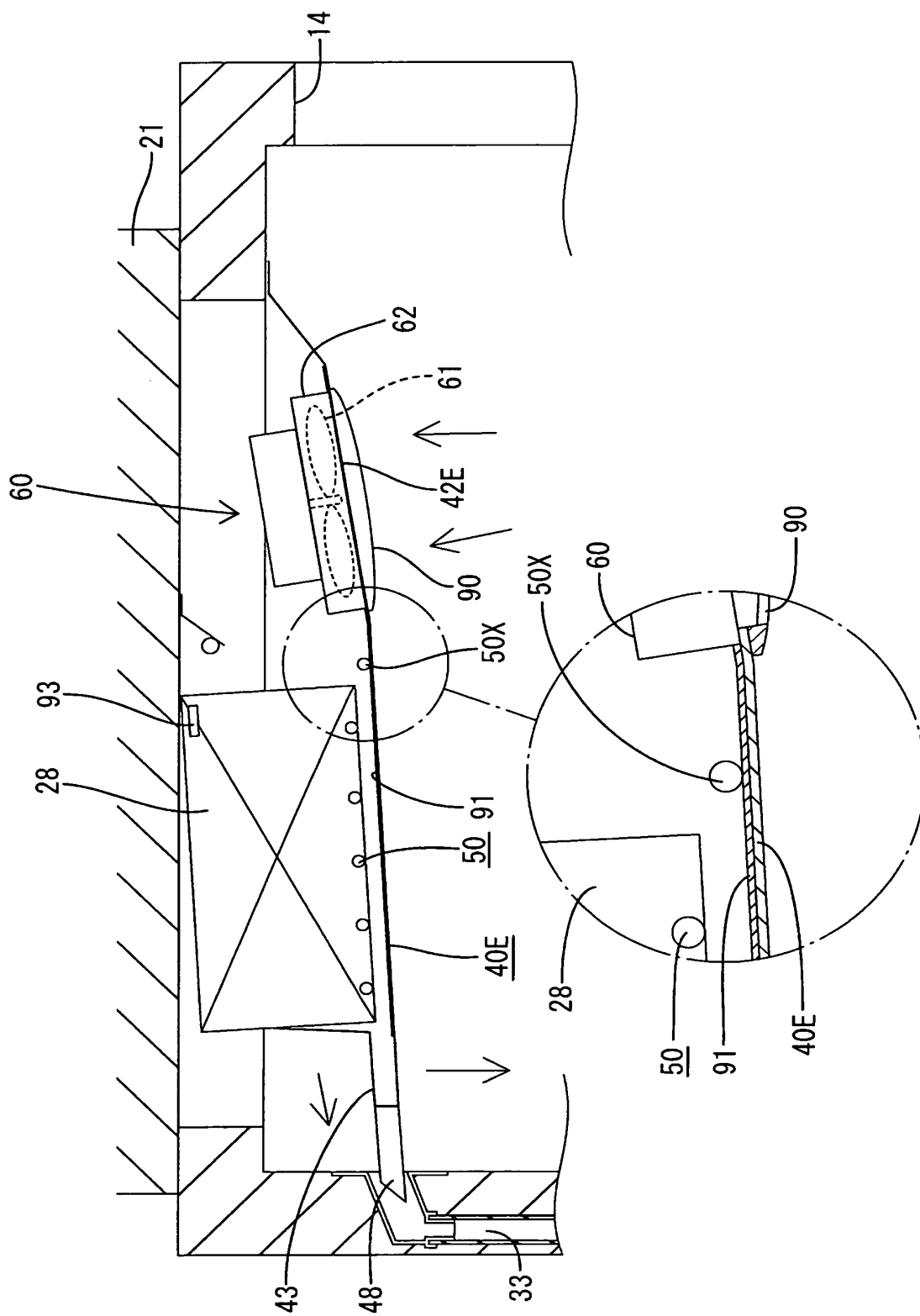
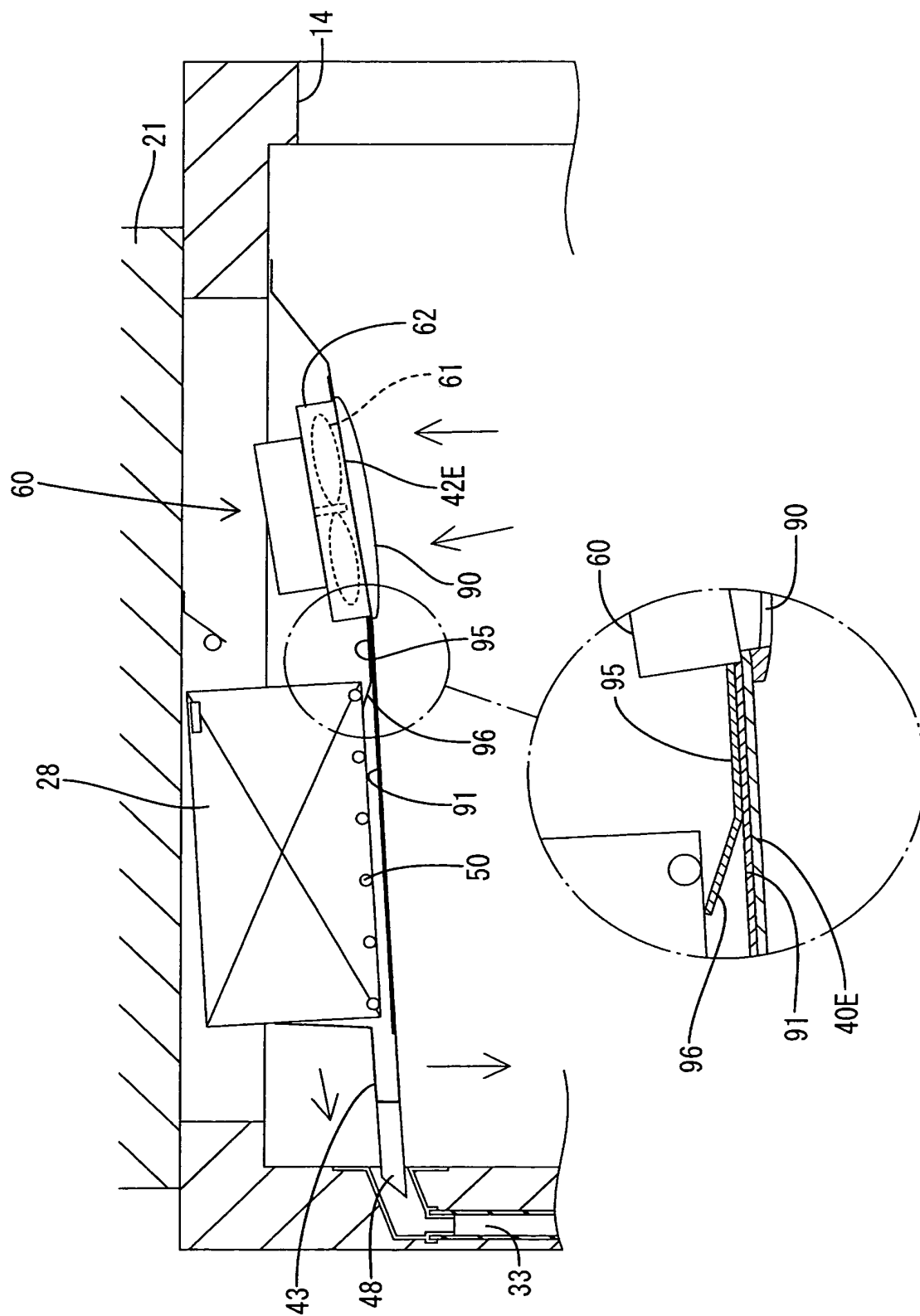


FIG.17



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2005/013739

A. CLASSIFICATION OF SUBJECT MATTER F25D21/04 (2006.01)		
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) F25D21/04 (2006.01)		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2005 Kokai Jitsuyo Shinan Koho 1971-2005 Toroku Jitsuyo Shinan Koho 1994-2005		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 2001-304746 A (Hoshizaki Electric Co., Ltd.), 31 October, 2001 (31.10.01), Par. Nos. [0024], [0025]; Figs. 5, 6 (Family: none)	1, 7 2-6
Y	JP 11-248328 A (Matsushita Refrigeration Co.), 14 September, 1999 (14.09.99), Par. No. [0006]; Fig. 12 (Family: none)	2-6
☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 15 November, 2005 (15.11.05)		Date of mailing of the international search report 22 November, 2005 (22.11.05)
Name and mailing address of the ISA/ Japanese Patent Office		Authorized officer
Facsimile No.		Telephone No.

Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2005/013739

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	CD-ROM of the specification and drawings annexed to the request of Japanese Utility Model Application No. 21131/1992 (Laid-open No. 83682/1993) (Mitsubishi Electric Corp.), 12 November, 1993 (12.11.93), Par. Nos. [0010], [0011]; Fig. 2 (Family: none)	4

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2003214755 A [0002]