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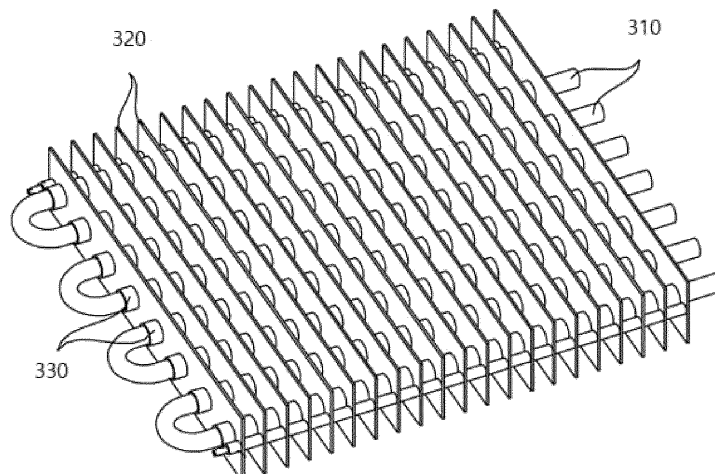
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(54) **CLOTHING PROCESSING EQUIPMENT**

(57) A clothing processing equipment of the present disclosure includes a heat pump which has an evaporator, a compressor, a condenser, and an expansion valve, and applies heat to air circulating through a drum; and an air flow path forming a movement path so that the air passes through the drum and circulates, in which the condenser includes: a plurality of condensation refrigerant tubes through which refrigerant flows; and a condensation fin which conducts heat of the condensation re-

frigerant tube, in which the evaporator includes: a plurality of evaporation refrigerant tubes through which refrigerant flows; and an evaporation fin which conducts heat of evaporation refrigerant, in which the condensation refrigerant tube includes a plurality of channels through which refrigerant flows, in which each of the channels has a cross-sectional area smaller than a cross-sectional area of the evaporation refrigerant tube.



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Description

TECHNICAL FIELD

[0001] This disclosure relates to a clothing processing equipment capable of further securing heat exchange performance, reducing air blowing resistance, and improving power consumption.

BACKGROUND

[0002] In general, a heat exchanger can be used as a condenser or evaporator in a refrigeration cycle device consisting of a compressor, a condenser, an expansion device, and an evaporator.

[0003] In addition, a heat exchanger is installed in vehicles, refrigerators, and clothing processing equipments to exchange heat between refrigerant and air.

[0004] In general, a clothing processing equipment is a device that evaporates moisture contained in laundry by blowing hot air generated by a heater into the inside of a drum to dry laundry.

[0005] Depending on a method of processing the moist air that passed through a drum after drying a laundry, a clothing processing equipment can be classified into an exhaust type clothing processing equipment and a condensation type clothing processing equipment.

[0006] The exhaust type clothing processing equipment exhausts the humid air passed through a drum to the outside of the clothing processing equipment. The condensation type clothing processing equipment does not exhaust the humid air passed through a drum to the outside of the clothing processing equipment, but circulates it, and cools the humid air to below a dew point temperature through a condenser to condense the moisture contained in the humid air.

[0007] The condensation type clothing processing equipment heats the condensed water condensed in the condenser by a heater before resupplying it to a drum, and then flows the heated air into the drum. Here, the humid air is cooled during the condensation process, so that a loss of thermal energy contained in the air occurs, and a separate heater, etc., is required to heat it to the temperature required for drying.

[0008] The exhaust-type clothing processing equipment also needs to discharge a high-temperature humid air to the outside and bring in a room temperature outside air to heat it to a required temperature level through a heater or the like. In particular, as drying progresses, the humidity of the air discharged from a drum outlet decreases, thereby losing the heat of the air that is discharged to the outside without being used to dry a drying target in a drum, so that the thermal efficiency is reduced.

[0009] Therefore, recently, a clothing processing equipment having a heat pump cycle that can increase energy efficiency by recovering the energy discharged from a drum and using it to heat the air flowing into the drum has been introduced.

[0010] The condensation type clothing processing equipment of Patent Document 1 (Korean Publication No. 2016-0069333) includes a drum 1 into which a drying target flows, a circulation duct 2 providing a path for air to circulate through the drum 1, a circulation fan 3 for flowing a circulating air along the circulation duct 2, and a heat pump cycle 4 equipped with an evaporator 5 and a condenser 6 that are installed in series in the circulation duct 2 so that the air circulating along the circulation duct 2 passes through.

[0011] The heat pump cycle 4 may be equipped with a circulation pipe forming a circulation path for refrigerant to circulate through the evaporator 5 and the condenser 6, and a compressor 7 and an expansion valve 8 that are installed in the circulation pipe between the evaporator 5 and the condenser 6.

[0012] The heat pump cycle 4, configured as described above, transmits the heat energy of the air passed through the drum 1 to the refrigerant through the evaporator 5, and then transmits the heat energy of the refrigerant to the air flowing into the drum 1 through the condenser 6.

[0013] Here, both the evaporator and the condenser use a general heat exchanger, but since the air flowing through the circulation duct contains fiber lint, if the lint gets caught in a louver of the heat exchanger, the flow resistance of the air flowing through the circulation duct increases, and the heat exchange efficiency decreases.

[0014] In addition, in the case of Patent Document 1, the distance between the evaporator and the condenser, which are arranged together in the circulation duct, is not specified, and if the distance between the evaporator and the condenser is disposed close to each other, there is a problem in that the condensed water generated in the evaporator splashes into the condenser, thereby reducing the performance of the condenser.

[0015] In addition, in the case of Patent Document 1 (Korean Publication No. 2016-0069333), the arrangement of refrigerant pipes for effectively arranging the evaporator and the condenser within a machine room is not disclosed at all. There is a problem in that such arrangement of refrigerant pipes makes it difficult to utilize a space within the machine room, and eventually, the efficiency of the clothing processing equipment is reduced.

[0016] In the case of Patent Document 2 (Korean Patent Publication No. 10-0652774), a clothing processing equipment using a far-infrared heater is disclosed, but there is a disadvantage in that the clothing processing equipment and the evaporator are arranged without considering the efficiency of the evaporator and the condenser of the clothing processing equipment and the condenser splash.

[0017] In addition, since Patent Documents 1 and 2 do not specify the type of heat exchanger used in the condenser and the evaporator, they do not disclose a structure for improving the performance of the clothing processing equipment by using a heat exchanger suitable

for the condenser and the evaporator.

[0018] In the case of Patent Document 3 (Korean Publication No. 2021-10982374), it relates to a washing machine having a drying function, and uses a microchannel condenser and a microchannel evaporator. However, if both the condenser and the evaporator use a microchannel heat exchanger, there is a disadvantage in that the manufacturing cost increases, and a heat exchanger having excessive heat capacity is used in an evaporator that does not require a large heat capacity.

SUMMARY

[0019] The disclosure has been made in view of the above problems, and may provide a clothing processing equipment that improves heat exchange performance and reduces air resistance by simultaneously using a microchannel condenser and a fin-tube evaporator inside a machine room of a clothing processing equipment.

[0020] The disclosure may further provide a clothing processing equipment that is resistant to corrosion by configuring both an evaporator and a condenser in an air path of a clothing processing equipment having a high moisture content using aluminum.

[0021] The disclosure may further provide a clothing processing equipment that adjusts a distance between an evaporator and a condenser in an air path of a machine room to an optimal distance, thereby preventing condensed water generated in the evaporator from splashing onto the evaporator, thereby lowering a heat exchange efficiency of the evaporator and lowering the efficiency of the clothing processing equipment.

[0022] The disclosure may further provide a clothing processing equipment that forms the structure of fin used in a condenser in a corrugate shape so that fiber pieces do not get caught between the fins of the condenser, thereby preventing an increase in air resistance.

[0023] The disclosure may further provide a clothing processing equipment having improved heat exchange performance by configuring a heat exchanger using microchannels as a multi-row condenser.

[0024] The problems of the present disclosure are not limited to the problems mentioned above, and other problems that are not mentioned can be clearly understood by those skilled in the art from the description below.

[0025] According to a clothing processing equipment of the present disclosure, the cross-sectional area of a channel of a refrigerant tube of a condenser is smaller than the cross-sectional area of a refrigerant tube of an evaporator.

[0026] In addition, according to a clothing processing equipment of the present disclosure, a condenser is a microchannel type heat exchanger, and an evaporator is a fin tube type heat exchanger.

[0027] In detail, the present disclosure includes a heat pump which has an evaporator, a compressor, a condenser, and an expansion valve, and applies heat to air

circulating through a drum; and an air flow path forming a movement path so that the air passes through the drum and circulates, in which the condenser includes: a plurality of condensation refrigerant tubes through which refrigerant flows; and a condensation fin which conducts heat of the condensation refrigerant tube, in which the evaporator includes: a plurality of evaporation refrigerant tubes through which refrigerant flows; and an evaporation fin which conducts heat of evaporation refrigerant, in which the condensation refrigerant tube includes a plurality of channels through which refrigerant flows, in which each of the channels has a cross-sectional area smaller than a cross-sectional area of the evaporation refrigerant tube.

[0028] The condensation refrigerant tube and the condensation fin contain aluminum.

[0029] The evaporation refrigerant tube and the evaporation fin contain aluminum.

[0030] A distance between the evaporator and the condenser is larger than a width of air flow direction of the evaporator.

[0031] The condenser further includes: a condensation inlet pipe which supplies refrigerant to the condensation refrigerant tube; and a condensation outlet pipe through which the refrigerant of the condensation refrigerant tube is discharged, in which the condensation inlet pipe and the condensation outlet pipe are located in the same direction with respect to the condensation refrigerant tube.

[0032] The evaporator further includes: an evaporation inlet pipe for supplying refrigerant to the evaporation refrigerant tube; and an evaporation outlet pipe for discharging refrigerant from the evaporation refrigerant tube, in which the evaporation inlet pipe and the evaporation outlet pipe are located in the same direction with respect to the evaporation refrigerant tube.

[0033] The condensation fin includes a plurality of inclined surfaces having an incline with respect to a direction of air flow.

[0034] The condenser includes: a first heat exchange unit comprising a plurality of condensation refrigerant tubes and a condensation fin; a second heat exchange unit comprising a plurality of condensation refrigerant tubes and a condensation fin; and a third heat exchange unit comprising a plurality of condensation refrigerant tubes and a condensation fin, in which refrigerant heat-exchanged in the third heat exchange unit is heat-exchanged in the second heat exchange unit, and then heat-exchanged in the first heat exchange unit.

[0035] The third heat exchange unit is located upstream of an air flow direction than the second heat exchange unit, and the second heat exchange unit is located upstream of an air flow direction than the first heat exchange unit.

[0036] The first heat exchange unit, the second heat exchange unit, and the third heat exchange unit are located to overlap in an air flow direction.

[0037] The plurality of condensation refrigerant tubes

are arranged in a direction intersecting with an air flow direction.

[0038] The first heat exchange unit includes a first left header and a first right header which are connected to both ends of the plurality of condensation refrigerant tubes and through which refrigerant flows, the second heat exchange unit includes a second left header and a second right header which are connected to both ends of the plurality of condensation refrigerant tubes and through which refrigerant flows, and the third heat exchange unit includes a third left header and a third right header which are connected to both ends of the plurality of condensation refrigerant tubes and through which refrigerant flows.

[0039] The condenser includes: a first connection pipe which connects the first right header and the second right header, and through which refrigerant flows; and a second connection pipe which connects the second left header and the third left header, and through which refrigerant flows.

[0040] The condenser further includes: a condensation inlet pipe supplying refrigerant to the condensation refrigerant tube; and a condensation outlet pipe through which refrigerant of the condensation refrigerant tube is discharged, in which the condensation inlet pipe is connected to the first left header, and the condensation outlet pipe is connected to the third left header.

[0041] The second connection pipe located higher than the condensation outlet pipe.

[0042] In addition, a clothing processing equipment according to an embodiment of the present disclosure includes a heat pump which has an evaporator, a compressor, a condenser, and an expansion valve, and applies heat to air circulating through a drum; and an air flow path forming a movement path so that the air passes through the drum and circulates, in which the condenser includes a condensation refrigerant tube including a plurality of microchannels through which refrigerant flows, and the evaporator includes a plurality of evaporation refrigerant tubes through which refrigerant flows.

[0043] The condensation refrigerant tube contains aluminum.

[0044] The evaporation refrigerant tube contains aluminum.

[0045] A distance between the evaporator and the condenser is larger than a width of air flow direction of the evaporator.

[0046] The condenser further includes: a condensation inlet pipe which supplies refrigerant to the condensation refrigerant tube; and a condensation outlet pipe through which the refrigerant of the condensation refrigerant tube is discharged, in which the condensation inlet pipe and the condensation outlet pipe are located in the same direction with respect to the condensation refrigerant tube.

[0047] In addition, a clothing processing equipment according to an embodiment of the present disclosure includes a heat pump which has an evaporator, a com-

pressor, a condenser, and an expansion valve, and applies heat to air circulating through a drum; and an air flow path forming a movement path so that the air passes through the drum and circulates, in which the condenser includes: a plurality of condensation refrigerant tubes through which refrigerant flows; and a condensation fin which conducts heat of the condensation refrigerant tube, in which the evaporator includes: a plurality of evaporation refrigerant tubes through which refrigerant flows; and an evaporation fin which conducts heat of evaporation refrigerant, in which the condensation refrigerant tube includes a plurality of channels through which refrigerant flows, and in which the evaporator is located upstream of air flow than the condenser.

BRIEF DESCRIPTION OF THE DRAWINGS

[0048] The above and other objects, features and advantages of the present invention will be more apparent from the following detailed description in conjunction with the accompanying drawings, in which:

FIG. 1 is a schematic diagram showing the flow of air and refrigerant in a clothing processing equipment according to an embodiment of the present disclosure;

FIG. 2 is a schematic diagram showing a configuration of a clothing processing equipment according to an embodiment of the present disclosure;

FIG. 3 is a diagram showing a machine room and an air flow path section of a clothing processing equipment according to an embodiment of the present disclosure;

FIG. 4 is a diagram showing an evaporator and a condenser shown in FIG. 3;

FIG. 5 is a perspective view showing the condenser shown in FIG. 3;

FIG. 6 is a plan view showing the condenser shown in FIG. 3;

FIG. 7 is a diagram explaining a pass of the condenser shown in FIG. 3;

FIG. 8 is a longitudinal cross-sectional view of a first heat exchange unit of the condenser shown in FIG. 4;

FIG. 9 is a cross-sectional view of the first heat exchange unit shown in FIG. 8; and

FIG. 10 is a perspective view showing the evaporator shown in FIG. 3.

DETAILED DESCRIPTION

[0049] Advantages and features of the present invention and methods for achieving those of the present invention will become apparent upon referring to embodiments described later in detail with reference to the attached drawings. However, embodiments are not limited to the embodiments disclosed hereinafter and may be embodied in different ways. The embodiments are provided for perfection of disclosure and for informing

persons skilled in this field of art of the scope of the present invention. The same reference numerals may refer to the same elements throughout the specification.

[0050] Spatially-relative terms such as "below", "beneath", "lower", "above", or "upper" may be used herein to describe one element's relationship to another element as illustrated in the Figures. It will be understood that spatially-relative terms are intended to encompass different orientations of the device in addition to the orientation depicted in the Figures. For example, if the device in one of the figures is turned over, elements described as "below" or "beneath" other elements would then be oriented "above" the other elements. The exemplary terms "below" or "beneath" can, therefore, encompass both an orientation of above and below. Since the device may be oriented in another direction, the spatially-relative terms may be interpreted in accordance with the orientation of the device.

[0051] The terminology used in the present disclosure is for the purpose of describing particular embodiments only and is not intended to limit the disclosure. As used in the disclosure and the appended claims, the singular forms "a", "an" and "the" are intended to include the plural forms as well, unless context clearly indicates otherwise. It will be further understood that the terms "comprises" and/or "comprising," when used in this specification, specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof.

[0052] Unless otherwise defined, all terms including technical and scientific terms used herein have the same meaning as commonly understood by one of ordinary skill in the art. It will be further understood that terms, such as those defined in commonly used dictionaries, should be interpreted as having a meaning that is consistent with their meaning in the context of the relevant art and the present disclosure, and will not be interpreted in an idealized or overly formal sense unless expressly so defined herein.

[0053] In the drawings, the thickness or size of each layer is exaggerated, omitted, or schematically illustrated for convenience of description and clarity. Also, the size or area of each constituent element does not entirely reflect the actual size thereof.

[0054] Hereinafter, exemplary embodiments of the present invention will be described with reference to the accompanying drawings.

[0055] FIG. 1 is a schematic diagram showing the flow of air and refrigerant in a clothing processing equipment according to an embodiment of the present disclosure, and FIG. 2 is a schematic diagram showing a configuration of a clothing processing equipment according to an embodiment of the present disclosure.

[0056] Referring to FIG. 1 and FIG. 2, a clothing processing equipment 100 according to the present disclosure is an example of a drum-type dryer, and may be

configured to include a cabinet 110, a drum 130, a driving unit (not shown), a blower fan 170, and a heat pump 160, and the air of the drum 130 is connected to the heat pump 160 by an air path 150.

[0057] Here, the cabinet 110 may include a door 112 provided on a front side to insert clothing while forming an outer shape of a product, and a base 114 on which an internal configuration of the clothing processing equipment 100 is installed.

[0058] Meanwhile, the drum 130 may rotate around a rotation axis that is arranged horizontally or inclined at a certain angle inside the cabinet. Meanwhile, the drum 130 has a hollow cylindrical shape, and provides an accommodation space for drying clothing, which are drying target, by putting the clothing into the space.

[0059] The drum 130 is formed in a cylindrical shape having front and rear sides that are open. The drum 130 has a front support portion 132 that rotatably supports the drum 130 at a front side. In addition, the drum 130 has a rear support portion 133 that rotatably supports the drum 130 at a rear side.

[0060] In addition, a front roller 142 and a rear roller 143 in the form of roller that rotatably support the drum 130 may be additionally provided at the front and rear lower portions of the drum 130. That is, the front support portion 132 and the rear support portion 133 block the front and rear surfaces of the drum 130 to form a drying space for drying target, and at the same time, serve to support the front and rear ends of the drum 130.

[0061] Meanwhile, an inlet 132b for inserting the drying target into the drum 130 is formed in the front support portion 132, and the inlet is selectively opened and closed by the door 112. In addition, an air discharge port 132a to which an air path 150 described later is connected is located at the lower portion of the front support portion 132. A suction path 151 of air path 150 described later is provided in the air discharge port 132a to communicate.

[0062] In addition, an air inlet 133a formed with a plurality of holes is formed in the rear support portion 133 so that air is supplied to the drum 130. The air inlet 133a is provided so that an exhaust path 152 of the air path 150 described later is communicated.

[0063] Here, in order to efficiently dry the clothing, which are the objects to be dried, a lifter 131a for tumbling the clothing that is put in may be further provided on the inner surface of the drum 130.

[0064] In addition, a driving unit provides rotational power by using a motor (not shown), and the output shaft of the motor and the drum 130 are connected by a power transmission means such as a belt, and the rotational power of the motor is transmitted to the drum 130, thereby rotating the drum 130.

[0065] In addition, the air path 150 may be connected to the drum 130 to form a closed loop for air circulation. For example, the air path 150 may be formed in the form of duct. The suction path 151 for air discharge is formed at the lower portion of the front support portion 132 of the drum 130, and the exhaust path 152 for air supply is

formed at the rear support portion 133 of the drum 130.

[0066] Meanwhile, the blower fan 170 may be installed inside the air path 150 extending from the suction path 151 to an evaporator 300 of the heat pump 160, or installed inside the air path 150 extending from the condenser 400 of the heat pump 160 to the exhaust path 152.

[0067] Here, the blower fan 170 may be driven by a separate fan motor, and may apply power to the air to pass it through the inside of the drum 130, and may circulate the air discharged from the drum 130 back into the drum 130.

[0068] In addition, a lint filter 162 (see FIG. 3) for filtering a lint in the circulating air is installed in the suction path 151. The lint filter 162 may capture the lint contained in the air as the air sucked from the drum 130 passes through the suction path 151.

[0069] Therefore, the clothing (also called 'cloth') evaporates moisture by a hot air supplied into the drum 130, and the air passing through the drum 130 is discharged from the drum 130 while containing the moisture evaporated from the clothing. The high-temperature and humid air discharged from the drum 130 moves along the air path 150, receives heat from the heat pump 160 to be heated, and then is circulated to the drum 130.

[0070] Meanwhile, the heat pump 160 is configured to include an evaporator 300, a compressor 163, a condenser 400, and an expansion valve 164. The heat pump 160 may use a refrigerant as a working fluid. The refrigerant moves along a refrigerant pipe 165, and the refrigerant pipe 165 forms a closed loop for the circulation of the refrigerant. The evaporator 300, the compressor 163, the condenser 400, and the expansion valve 164 are connected by the refrigerant pipe 165, so that the refrigerant passes through the evaporator 300, the compressor 163, the condenser 400, and the expansion valve 164 in sequence.

[0071] Here, the evaporator 300 is installed in the air path 150 so as to be connected to a drum outlet, and heat-exchanges the air discharged from the drum outlet with the refrigerant, thereby recovering the heat of the air discharged from the drum 130 without discharging it to the outside of a dryer.

[0072] In addition, the condenser 400 is installed in the air path 150 so as to be connected to a drum inlet, and heat-exchanges the air passing through the evaporator 300 with the refrigerant, thereby dissipating the heat of the refrigerant absorbed in the evaporator 300 to the air to be flowed into the drum 130.

[0073] The compressor 163 compresses the refrigerant evaporated in the evaporator 300 to create a high-temperature, high-pressure refrigerant, and moves the high-temperature, high-pressure refrigerant to the condenser 400 along the refrigerant pipe 165. The compressor 163 may be an inverter-type compressor 163 capable of varying a frequency to control the discharge amount of the refrigerant.

[0074] The expansion valve 164 is installed in the refrigerant pipe 165 extending from the condenser 400

to the evaporator 300, and expands the refrigerant condensed in the condenser 400 to make a low-temperature, low-pressure refrigerant and transmits it to the evaporator 300.

[0075] Looking at the movement path of the refrigerant according to a configuration, the refrigerant is flowed into the compressor 163 in a gaseous state and becomes high-temperature, high-pressure by compression of the compressor 163, and the high-temperature, high-pressure refrigerant is flowed into the condenser 400 and changed from a gaseous state to a liquid state as the condenser 400 dissipates heat to the air.

[0076] Next, the liquid refrigerant flows into the expansion valve 164 and is changed into low-temperature, low-pressure by a wire drawing effect of the expansion valve 164 (or including a capillary tube, etc.), and the low-temperature, low-pressure liquid refrigerant flows into the evaporator 300 and absorbs heat from the air in the evaporator 300, thereby evaporating the refrigerant from the liquid state into the gas state.

[0077] As described above, the heat pump 160 repeatedly circulates the refrigerant in the order of the compressor 163, the condenser 400, the expansion valve 164, and the evaporator 300, and provides a heat source to the air circulated to the drum 130.

[0078] Meanwhile, the clothing processing equipment 100 according to the present disclosure can supply pressurized air into the inside of the drum 130 separately from the circulation supply of heated air by the heat pump 160, thereby shocking the drying target inside the drum 130 and changing the movement path of the heated air inside the drum 130 simultaneously.

[0079] That is, in the case of the drying target loaded into the drum 130, various types of moisture may be contained according to the material of the drying target, and by supplying pressurized air, relatively large moisture contained in the drying target may be removed from the drying target, or broken down into relatively small-sized moisture, thereby allowing faster drying of the moisture by the heated air.

[0080] In addition, in the case of the heated air supplied to the drum 130, while moving from the air inlet 133a at the rear of the drum 130 to the air outlet 132a at the front of the drum 130, it dries the drying target inside the drum 130, passes through the air path 150 and circulates the drum 130 and the heat pump 160. In the case of the movement path of such heated air, the drying degree of the drying target may be improved as the heated air is in contact with the drying target over a large area and for a long time. Here, in the case of pressurized air supplied separately from the heated air, it is supplied at a higher pressure than the heated air through a different location and different path from the heated air, thereby impacting the drying target and changing the path along which the heated air moves inside the drum 130, so that the heated air can dry moisture faster.

[0081] Meanwhile, in order to supply pressurized air into the inside of the drum 130, there may be provided a

pressurized air generator 200 that generates pressurized air and a pressurized air nozzle 300 that sprays the pressurized air generated from the pressurized air generator 200 into the inside of the drum 130.

[0082] Hereinafter, the arrangement of the evaporator 300 and the condenser 400 will be described in detail.

[0083] FIG. 3 is a diagram showing a machine room and an air flow path section of a clothing processing equipment according to an embodiment of the present disclosure, and FIG. 4 is a diagram showing the evaporator 300 and the condenser 400 shown in FIG. 3.

[0084] Referring to FIGS. 3 and 4, the evaporator 300 and the condenser 400 may be installed inside the air flow path 150. The evaporator 300 may be connected to the drum outlet, and the condenser 400 may be connected to the drum inlet.

[0085] Meanwhile, the present disclosure may include a machine room 161 in which a compressor 163, an expansion valve, and a refrigerant pipe 165 are located. The machine room 161 may be arranged next to the air flow path 150. Since the high temperature and humidity air discharged from the drum 130 has a higher temperature than the refrigerant of the evaporator 300, as it passes through the evaporator 300, the heat of the air is absorbed by the refrigerant of the evaporator 300, thereby being condensed and generating condensed water. Accordingly, the moisture of the high temperature-humidity air is removed by the evaporator 300, and the condensed water can be collected into a separate condensed water tank (not shown) and drained.

[0086] Meanwhile, the heat source of the air absorbed in the evaporator 300 is moved to the condenser 400 via the refrigerant, and the compressor 163 may be located between the evaporator 300 and the condenser 400 to move the heat source from the evaporator 300 (low heat source portion) to the condenser 400 (high heat source portion). Meanwhile, the evaporator 300 may be a fin & tube type heat exchanger. The fin & tube type is a type in which a plurality of flat fins are attached to a hollow tube, and the refrigerant flows along the inside of the tube, and the air can exchange heat with the refrigerant as it passes between the plurality of fins attached to the tube. Here, the fin is used to expand the heat exchange area between the air and the refrigerant.

[0087] For example, the evaporator 300 may include a plurality of evaporation refrigerant tubes 310 through which refrigerant flows, and an evaporation fin 320 that conducts heat of the evaporation refrigerant. The evaporator 300 may include an evaporation inlet pipe 391 that supplies refrigerant to the evaporation refrigerant tube 310, and an evaporation outlet pipe 392 through which refrigerant is discharged from the evaporation refrigerant tube 310. The evaporation inlet pipe 391 is connected to the expansion valve 164 and the evaporation refrigerant tube 310, and the evaporation outlet pipe 392 is connected to the compressor 163 and the evaporation refrigerant tube 310. The detailed structure of the evaporator 300 is described later in FIG. 10.

[0088] The condenser 400 may include a microchannel type heat exchanger. The condenser 400 includes a condensation refrigerant tube 410 including a plurality of channels 410a through which refrigerant flows, and a condensation fin 420 for conducting heat of the condensation refrigerant tube 410.

[0089] The condenser 400 may include a condensation inlet pipe 491 for supplying refrigerant to the condensation refrigerant tube 410, and a condensation outlet pipe 492 for discharging refrigerant from the condensation refrigerant tube 410. The condensation inlet pipe 491 is connected to the compressor 163 and the condensation refrigerant tube 410, and the condensation outlet pipe 492 is connected to the expansion valve 164 and the condensation refrigerant tube 410. The detailed structure of the condenser 400 is described later in FIGS. 5 to 9.

[0090] If a micro-channel type heat exchanger is used for the condenser 400, the temperature of the air passing through the condenser 400 can be increased more than when a fin tube heat exchanger is used, and the air can be heated to a target temperature in a much shorter heat exchange time. Therefore, if a micro-channel type heat exchanger is used for the condenser 400, the drying efficiency of the clothing processing equipment can be improved.

[0091] Here, the cross-sectional area of each channel 410a of the refrigerant tube of the condenser 400 is smaller than the cross-sectional area of the refrigerant tube of the evaporator 300. In the case of the evaporator 300, a fin tube heat exchanger is used rather than a micro-channel heat exchanger because a large amount of heat exchange is not required.

[0092] The air flowing in the air flow path 150 exchanges heat with the evaporator 300 and then flows into the condenser 400. At this time, if the evaporator 300 and the condenser 400 are disposed too close together, the condensed water generated in the evaporator 300 flows into the condenser 400, thereby reducing the heat exchange efficiency of the condenser 400.

[0093] In order to prevent the condensed water generated in the evaporator 300 from flowing into the condenser 400, the separation distance D1 between the evaporator 300 and the condenser 400 may be larger than the width W1 of the air flow direction of the evaporator 300.

[0094] The width W1 of the airflow direction of the evaporator 300 may be larger than the width W2 of the airflow direction of the condenser 400. The height H1 of the evaporator 300 may be smaller than the height H2 of the condenser 400.

[0095] Preferably, the separation distance D1 of the condenser 400 may be larger than the sum of the width W1 of the airflow direction of the evaporator 300 and the width W2 of the airflow direction of the condenser 400. More preferably, the separation distance D1 of the condenser 400 may be 100 mm to 250 mm.

[0096] If the separation distance D1 of the condenser 400 is larger than the sum of the width W1 of the air flow

direction of the evaporator 300 and the width W2 of the air flow direction of the condenser 400, the condensed water generated in the evaporator 300 by the air flow falls into a space between the condenser 400 and the evaporator 300.

[0097] The condensation inlet pipe 491 and the condensation outlet pipe 492 may be located in the same direction with respect to the condensation refrigerant tube 410. Specifically, the condensation inlet pipe 491 and the condensation outlet pipe 492 may extend from the condensation refrigerant tube 410 toward the machine room.

[0098] More specifically, if the air flow direction is defined as a front-rear direction FR, the condensation inlet pipe 491 and the condensation outlet pipe 492 extend to the right from the condensation refrigerant tube 410.

[0099] If the condensation inlet pipe 491 and the condensation outlet pipe 492 are located in the same direction with respect to the condensation refrigerant tube 410, a space for arranging the refrigerant pipe can be reduced, the length of the refrigerant pipe can be reduced, and a sufficient space for the air flow path 150 can be secured.

[0100] An evaporation inlet pipe 391 and an evaporation outlet pipe 392 can be located in the same direction with respect to an evaporation refrigerant tube 310. Specifically, the evaporation inlet pipe 391 and the evaporation outlet pipe 392 can be extended from the evaporation refrigerant tube 310 toward the machine room.

[0101] More specifically, the evaporation inlet pipe 391 and the evaporation outlet pipe 392 are extended to the right from the evaporation refrigerant tube 310.

[0102] If the evaporation inlet pipe 391 and the evaporation outlet pipe 392 are located in the same direction with respect to the evaporation refrigerant tube 310, a space for arranging the refrigerant pipe can be reduced, the length of the refrigerant pipe can be reduced, and sufficient space for the air path 150 can be secured.

[0103] Preferably, the evaporation inlet pipe 391, the evaporation outlet pipe 392, the condensation inlet pipe 491, and the condensation outlet pipe 492 can extend in the same direction from the air path 150. The evaporation inlet pipe 391, the evaporation outlet pipe 392, the condensation inlet pipe 491, and the condensation outlet pipe 492 extend in the right direction from the air path 150.

[0104] Hereinafter, the structure of the condenser 400 will be described in detail.

[0105] FIG. 5 is a perspective view showing the condenser 400 shown in FIG. 3, FIG. 6 is a plan view showing the condenser 400 shown in FIG. 3, and FIG. 7 is a diagram explaining a pass of the condenser 400 shown in FIG. 3.

[0106] Referring to FIGS. 5 to 7, the condenser 400 is a microchannel type heat exchanger. The condenser 400 is made of aluminum material.

[0107] The condenser 400 may include a first heat exchange unit P1, a second heat exchange unit P2, and a third heat exchange unit P3. Unlike the present

embodiment, the condenser 400 may have three or more heat exchange units that are stacked.

[0108] The first heat exchange unit P1, the second heat exchange unit P2, and the third heat exchange unit P3 may be arranged to overlap with each other in the front-rear direction which is the air flow direction. The first heat exchange unit P1, the second heat exchange unit P2, and the third heat exchange unit P3 may be arranged to completely overlap in the front-rear direction or may be arranged to overlap in some area. The first heat exchange unit P1, the second heat exchange unit P2, and the third heat exchange unit P3 may be arranged along the front-rear direction which is the air flow direction.

[0109] The condenser 400 includes a first heat exchange unit P1, a second heat exchange unit P2 located to overlap with the first heat exchange unit P1 in the front-rear direction, a third heat exchange unit P3 located to overlap the second heat exchange unit P2 in the front-rear direction, a condensation inlet pipe 491 connected to the first heat exchange unit P1 to supply refrigerant, a condensation outlet pipe 492 connected to the third heat exchange unit P3 to discharge refrigerant, a first connection pipe 493 that connects the first heat exchange unit P1 and the second heat exchange unit P2, and allows the refrigerant to flow from the first heat exchange unit P1 to the second heat exchange unit P2, and a second connection pipe 494 that connects the second heat exchange unit P2 and the third heat exchange unit P3, and allows the refrigerant to flow from the second heat exchange unit P2 to the third heat exchange unit P3.

[0110] The first heat exchange unit P1 is arranged to exchange heat with air that has been heat-exchanged with the second heat exchange unit P2, and the second heat exchange unit P2 is arranged to exchange heat with air that has been heat-exchanged with the third heat exchange unit P3. That is, air that has been heat-exchanged in the third heat exchange unit P3 is heat-exchanged in the second heat exchange unit P2, and then heat-exchanged in the first heat exchange unit P1.

[0111] Specifically, the first heat exchange unit P1, the second heat exchange unit P2, and the third heat exchange unit P3 are arranged on a path through which external air flows, and the external air is firstly heat-exchanged with the third heat exchange unit P3, secondly heat-exchanged with the second heat exchange unit P2, and thirdly heat-exchanged with the first heat exchange unit P1.

[0112] The third heat exchange unit P3 may be located upstream of the air flow direction than the second heat exchange unit P2, and the second heat exchange unit P2 may be located upstream of the air flow direction than the first heat exchange unit P1.

[0113] Specifically, the third heat exchange unit P3 may be located closer to the suction path 151 through which air is flowed in than the second heat exchange unit P2, and the first heat exchange unit P1 may be located closer to the exhaust path 152 through which air is dis-

charged than the second heat exchange unit P2.

[0114] Since the heat exchange efficiency decreases when the temperature difference between the refrigerant and the air is too large, the heat exchange efficiency is improved by maintaining the temperature difference between the refrigerant and the air appropriately. The first heat exchange unit P1 through which the high-temperature refrigerant flows is disposed in an area where the temperature of the outside air is high, and the third heat exchange unit P3 through which the low-temperature refrigerant flows is disposed in an area where the temperature of the outside air is low, so that the temperature of the refrigerant in each heat exchange unit and the temperature of the outside air are appropriately different, thereby improving the heat exchange efficiency of the condenser 400.

[0115] The first heat exchange unit P1, the second heat exchange unit P2, and the third heat exchange unit P3 may include a plurality of condensation refrigerant tubes 410 and a condensation fin 420 located between the condensation refrigerant tubes 410 that are adjacent to each other to conduct heat.

[0116] The first heat exchange unit P1, the second heat exchange unit P2, and the third heat exchange unit P3 are manufactured by stacking a plurality of condensation refrigerant tubes 410. Each condensation refrigerant tube 410 extends in a horizontal direction (left-right direction LeRi) so that the refrigerant moves horizontally.

[0117] Specifically, the condensation refrigerant tubes 410 of the first heat exchange unit P1, the second heat exchange unit P2, and the third heat exchange unit P3 are arranged long in a horizontal direction (transverse direction) when the air flow direction is front-rear direction, and a plurality of condensation refrigerant tubes 410 can be stacked vertically. As air passes through a space between the plurality of condensation refrigerant tubes 410 stacked in a vertical direction (longitudinal direction), heat is exchanged with the refrigerant in the condensation refrigerant tubes 410. The plurality of condensation refrigerant tubes 410 stacked vertically define a heat exchange surface together with the condensation fin 420 described below.

[0118] The first heat exchange unit P1 may include a first condensation refrigerant tube 411, a first left header 431, a first right header 441, and a first condensation fin 421. Specifically, the first heat exchange unit P1 includes a plurality of first condensation refrigerant tubes 411 having a plurality of flow paths formed therein, a first condensation fin 421 that connects the first condensation refrigerant tubes 411 to conduct heat, a first left header 431 that is coupled to one side of the plurality of first condensation refrigerant tubes 411 and communicates with one side of the plurality of first condensation refrigerant tubes 411 so that refrigerant flows, and a first right header 441 that is coupled to the other side of the plurality of first condensation refrigerant tubes 411 and communicates with the other side of the plurality of first condensation refrigerant tubes 411 so that refrigerant flows.

[0119] The first condensation refrigerant tube 411 is arranged horizontally, and a plurality of first condensation refrigerant tubes 411 are stacked in the vertical direction. A plurality of channels 410a may be formed inside the first condensation refrigerant tube 411.

[0120] The first condensation fin 421 is formed by being bent in the up-down direction, and conducts heat by connecting two first condensation refrigerant tubes 411 stacked in the up-down direction.

[0121] The first left header 431 is connected to one side of the plurality of first condensation refrigerant tubes 411. The first left header 431 is arranged to be extended in the up-down direction, and is connected to the condensation inlet pipe 491. The inside of the first left header 431 is formed as a single space, and the refrigerant flowed in through the condensation inlet pipe 491 is distributed and supplied to the plurality of first condensation refrigerant tubes 411.

[0122] The first right header 441 is connected to the other side of the plurality of first condensation refrigerant tubes 411. The first right header 441 is arranged to extend in the up-down direction and is connected to the first connection pipe 493. The inside of the first right header 441 is formed as a single space, so that the refrigerant discharged to the other side of the plurality of first condensation refrigerant tubes 411 is guided to the first connection pipe 493.

[0123] Preferably, the first connection pipe 493 may be connected to the lower end of the first right header 441, and the condensation inlet pipe 491 may be connected to the upper end of the first left header 431.

[0124] One side of the first connection pipe 493 is connected to the first right header 441 of the first heat exchange unit P1, and the other side of the first connection pipe 493 is connected to the second right header 442 of the second heat exchange unit P2.

[0125] The refrigerant flowed in through the condensation inlet pipe 491 is supplied to each of the first condensation refrigerant tubes 411 through the first left header 431, and the refrigerant passing through the first condensation refrigerant tube 411 is heat-exchanged with air, and supplied to the first connection pipe 493 through the first right header 441. The condensation inlet pipe 491 is connected to the compressor 163(10) and supplies high-temperature and high-pressure refrigerant to the first heat exchange unit P1.

[0126] The second heat exchange unit P2 may include a second condensation refrigerant tube 412, a second left header 432, a second right header 442, and a second condensation fin 422. Specifically, the second heat exchange unit P2 includes a plurality of second condensation refrigerant tubes 412 having a plurality of flow paths formed therein, a second condensation fin 422 that connects the second condensation refrigerant tube 412 to conduct heat, a second left header 432 that is coupled to one side of the plurality of second condensation refrigerant tubes 412 and communicates with one side of the plurality of second condensation refrigerant tubes 412 so

that refrigerant flows, and a second right header 442 that is coupled to the other side of the plurality of second condensation refrigerant tubes 412 and communicates with the other side of the plurality of second condensation refrigerant tubes 412 so that refrigerant flows.

[0127] The second condensation refrigerant tube 412 is arranged horizontally, and a plurality of second condensation refrigerant tubes 412 are stacked in an up-down direction. A plurality of channels 410a may be formed inside the second condensation refrigerant tube 412.

[0128] The second condensation fin 422 is formed by being bent in the up-down direction and conducts heat by connecting two second condensation refrigerant tubes 412 that are stacked in the up-down direction.

[0129] The second right header 442 is connected to the other side of the plurality of second condensation refrigerant tubes 412. The second right header 442 is arranged to be extended in the up-down direction and is connected to the first connection pipe 493. The inside of the second right header 442 is formed as a single space so that the refrigerant flowed in through the condensation inlet pipe 491 can be distributed and supplied to the plurality of second condensation refrigerant tubes 412.

[0130] Preferably, the inside of the second right header 442 is formed as two spaces so that the refrigerant flowed in through the first connection pipe 493 can change direction several times while flowing through the plurality of second condensation refrigerant tubes 412.

[0131] Specifically, the inside of the second right header 442 may include a first baffle 442a that divides the internal space of the second right header 442 into two areas in the up-down direction. The first baffle 442a may be located to be offset from the center of the second right header 442 toward the bottom. The first connection pipe 493 is connected to the lower space of the second right header 442 located below the first baffle 442a.

[0132] The second left header 432 is connected to one side of a plurality of second condensation refrigerant tubes 412. The second left header 432 is arranged to be extended in the up-down direction and is connected to the second connection pipe 494. The inside of the second left header 432 is formed as a single space, so that the refrigerant discharged to one side of the plurality of second condensation refrigerant tubes 412 can be guided to the second connection pipe 494.

[0133] Preferably, the inside of the second left header 432 is formed into two spaces, so that the refrigerant flowed in through the second condensation refrigerant tube 412 can change a direction several times while flowing through the plurality of second condensation refrigerant tubes 412.

[0134] Specifically, the inside of the second left header 432 may include a second baffle 442a that divides the internal space of the second left header 432 into two areas in the up-down direction. The second baffle 432a may be located at the center of the second left header 432. The second connection pipe 494 is connected to the

upper space of the second left header 432 located above the second baffle 432a.

[0135] The second baffle 432a may be located higher than the first baffle 442a. Therefore, through two baffles, the second heat exchange unit P2 may allow the refrigerant flowing in the left-to-right direction to flow again in the right-to-left direction, and may allow it to flow again in the left-to-right direction.

[0136] The third heat exchange unit P3 may include a third condensation refrigerant tube 413, a third left header 433, a third right header 443, and a third condensation fin 423.

[0137] Specifically, the third heat exchange unit P3 includes a plurality of third condensation refrigerant tubes 413 having a plurality of flow paths formed therein, a third condensation fin 423 that connects the third condensation refrigerant tube 413 to conduct heat, a third left header 433 that is coupled to one side of the plurality of third condensation refrigerant tubes 413 and communicates with one side of the plurality of third condensation refrigerant tubes 413 so that refrigerant flows, and a third right header 443 that is coupled to the other side of the plurality of third condensation refrigerant tubes 413 and communicates with the other side of the plurality of third condensation refrigerant tubes 413 so that refrigerant flows.

[0138] The third condensation refrigerant tube 413 is arranged horizontally, and a plurality of third condensation refrigerant tubes 413 are stacked in the up-down direction. A plurality of channels 410a may be formed inside the third condensation refrigerant tube 413.

[0139] The third condensation fin 423 is formed by being bent in the up-down direction, and conducts heat by connecting two third condensation refrigerant tubes 413 stacked in the up-down direction.

[0140] The third left header 433 is communicated with one side of the plurality of third condensation refrigerant tubes 413. The third left header 433 is arranged to be extended in the up-down direction, and is connected to the second connection pipe 494 and the condensation outlet pipe 492.

[0141] The inside of the third left header 433 is formed as three spaces, so that the refrigerant flowed in through the second connection pipe 494 can change a direction several times while flowing through the plurality of third condensation refrigerant tubes 413.

[0142] Specifically, the inside of the third left header 433 may include a third baffle 433a and a fourth baffle 433b that divide the internal space of the third left header 433 into three areas in the up-down direction. The third baffle 433a may be located higher than the fourth baffle 433b.

[0143] The second connection pipe 494 is connected to the upper space of the third left header 433 located above the third baffle 433a, and the condensation outlet pipe 492 is connected to the lower space of the third left header 433 located below the fourth baffle 433b. The second connection pipe 494 is located higher than the

condensation outlet pipe 492.

[0144] The second connection pipe 494 is located higher than the first connection pipe 493. When the second connection pipe 494 is located higher than the first connection pipe 493, the refrigerant discharged from the first heat exchange unit P1 is supplied to the lower portion of the first heat exchange unit P2, thereby pushing the droplets that are driven downward by gravity upward, and the droplets and the refrigerant are discharged together through the second connection pipe 494.

[0145] Between the third baffle 433a and the fourth baffle 433b, a central space of the third left header 433 may be located.

[0146] The third right header 443 is connected to the other side of the plurality of third condensation refrigerant tubes 413. The third right header 443 is arranged to extend in the up-down direction. The inside of the third right header 443 is formed as a single space, so that the refrigerant discharged from the other side of the plurality of third condensation refrigerant tubes 413 can be guided to the third connecting pipe 494.

[0147] Preferably, the inside of the third right header 443 is formed as two spaces, so that the refrigerant flowed in through the third condensation refrigerant tubes 413 can change a direction several times while flowing through the plurality of third condensation refrigerant tubes 413.

[0148] Specifically, the inside of the third right header 443 may include a fifth baffle 443a that divides the internal space of the third right header 443 into two areas in the up-down direction. The fifth baffle 443a may be located at the center of the third right header 443.

[0149] The fifth baffle 443a may be located higher than the fourth baffle 433b and lower than the third baffle 433a. Therefore, through the three baffles, the third heat exchange unit P3 may allow the refrigerant flowing in the right-to-left direction to flow again in the left-to-right direction, and allow it to flow again in the right-to-left direction.

[0150] Specifically, when the refrigerant is flowed into the center of the second heat exchange unit P2 and the refrigerant is discharged to the center or upper portion of the second heat exchange unit P2, oil is collected at the lower portion by gravity, due to the difference in specific gravity between the oil discharged from the compressor and the refrigerant, and the oil collected at the lower portion of the second heat exchange unit P2 prevents the refrigerant from being flowed in. Therefore, the refrigerant does not flow through the entire second heat exchange unit P2, but only flows through a part of it, thereby reducing the heat exchange efficiency. The efficiency of the third heat exchange unit P3 is also reduced for the same reason as the second heat exchange unit P2.

[0151] Accordingly, when the second heat exchange unit P2 and the third heat exchange unit P3 are configured as in the present disclosure, the oil is prevented from being collected at the lower portion of each heat exchange unit, and the refrigerant flows through the entire

heat exchange unit, thereby increasing the heat exchange efficiency.

[0152] Hereinafter, the structure of the condensation refrigerant tube 410 and the condensation fin 420 of each heat exchanger will be described in detail.

[0153] FIG. 8 is a cross-sectional view of the first heat exchange unit P1 of the condenser 400 illustrated in FIG. 4, and FIG. 9 is a cross-sectional view of the first heat exchange unit P1 illustrated in FIG. 8.

[0154] FIGS. 8 and 9 illustrate the first heat exchange unit P1, but the structures of the condensation refrigerant tube 410 and the condensation fin 420 of the second heat exchange unit P2 and the third heat exchange unit P3 are the same as that of the first heat exchange unit P1.

[0155] Referring to FIGS. 8 and 9, the condensation refrigerant tube 410 may include a plurality of channels 410a therein. The plurality of channels 410a provide a space through which the refrigerant passes. A plurality of channels 410a may extend in a direction parallel to the condensation refrigerant tube 410.

[0156] Specifically, the cross-sectional shape of the condensation refrigerant tube 410 is a rectangular shape that has left and right sides longer than upper and lower sides, and the cross-sectional shape of the channel 410a may be a quadrangle shape.

[0157] The channels 410a are usually stacked in a single row in a direction (front-rear direction) FR intersecting with the longitudinal direction of the condensation refrigerant tube 410. The cross-sectional area of the channel 410a may be smaller than the cross-sectional area of the evaporation refrigerant tube 310.

[0158] The condensation fin 420 transmits heat from the condensation refrigerant tube 410. The condensation fin 420 increases the contact area with air to improve heat dissipation performance.

[0159] The condensation fin 420 is arranged between adjacent condensation refrigerant tubes 410. The condensation fin 420 may have various shapes, but may be formed by bending a plate having the same width as the condensation refrigerant tube 410. The condensation fin 420 may be coated with a clad (not shown).

[0160] The condensation fin 420 may connect two condensation refrigerant tubes 410 that are stacked in the up-down direction to conduct heat. The condensation fin 420 may be in direct contact with the condensation refrigerant tube 410, or may be connected to the condensation refrigerant tube 410 by a sacrificial sheet (not shown).

[0161] The condensation fin 420 may include a plurality of inclined surfaces having an inclination with respect to the air flow direction (front-rear direction). If the condensation fin 420 has an inclination, the contact area between the air and the condensation fin 420 may be improved, thereby improving the heat exchange efficiency.

[0162] If the condensation fin 420 has a louver, the louver protrudes from the condensation fin 420 and has a space between it and the condensation fin 420, so that lint

may get stuck, thereby reducing the heat exchange efficiency. Therefore, if the condensation fin 420 has an inclined surface, the lint may be prevented from getting stuck.

[0163] The structure of the evaporator 300 will be described below.

[0164] FIG. 10 is a perspective view showing the evaporator 300 shown in FIG. 3.

[0165] Referring to FIG. 10, the evaporator 300 includes a plurality of evaporation refrigerant tubes 310 through which refrigerant flows, and an evaporation fin 320 that is connected to each evaporation refrigerant tube 310 and dissipate the heat transmitted from the evaporation refrigerant tube 310.

[0166] Obviously, the evaporator 300 further includes a plurality of collars 42 that surround at least a portion of the outer surface of each evaporation refrigerant tube 310, and at this time, the evaporation fin 320 may be connected to the plurality of collars 42.

[0167] The evaporation refrigerant tube 310 provides a space through which the refrigerant flows. The evaporation refrigerant tube 310 may be formed as a single pipe or as a plurality of pipes, but is not limited thereto.

[0168] The evaporation refrigerant tube 310 and the evaporation fin 320 may include aluminum or an aluminum alloy.

[0169] The clothing processing equipment of the present disclosure has one or more of the following effects.

[0170] First, the present disclosure uses a microchannel heat exchanger as a condenser, and uses a fin-tube heat exchanger as an evaporator in the machine room of the clothing processing equipment, so that a fin-tube heat exchanger having a low manufacturing cost is used as the evaporator requires a relatively small energy, and the condenser, which requires a large amount of heat to reheat the air in the air path and supply it into a tub, uses a microchannel heat exchanger. Accordingly, there is an advantage of improving heat exchange performance, reducing airflow resistance, and lowering the manufacturing cost.

[0171] Second, since the present disclosure has the evaporator and the condenser that are made of aluminum, it has the advantage of improving corrosion resistance in the air flow path of the clothing processing equipment having a high moisture content, improving the reliability of the clothing processing equipment, and preventing galvanic corrosion that occurs when copper and aluminum are mixed.

[0172] Third, since the present disclosure adjusts the distance between the evaporator and the condenser to an optimal distance in the air flow path of the machine room, it has the advantage of preventing the lowering of the heat exchange efficiency of the evaporator and the lowering of the efficiency of the clothing processing equipment as the condensed water generated in the evaporator is splashed to the evaporator.

[0173] Fourth, the present disclosure forms the structure of fin used in a condenser in a corrugate shape so

that fiber pieces do not get caught between the fins of the condenser, thereby preventing an increase in air resistance. The present disclosure provides a clothing processing equipment that improves heat exchange performance and reduces airflow resistance by simultaneously using a microchannel condenser and a fin-tube evaporator in the machine room of the clothing processing equipment.

[0174] Fifth, in order to reheat the air in the air flow path and supply it into the tub, the present disclosure uses microchannels for a condenser that requires a large amount of heat and is configured in multiple rows to easily control the temperature of air supplied into the tub, and there is an advantage in that heat exchange performance is improved as it is easy to control the temperature of the air supplied into the tub, and the counterflow (detailed explanation) configuration is easy.

[0175] Sixth, the present disclosure arranges the refrigerant pipe of condenser and the refrigerant pipe of evaporator in the same direction, in a machine room having a small space, so that it has the advantage of minimizing the length of the refrigerant pipe connecting the condenser and evaporator to the compressor and expansion valve, and reducing the increase in flow resistance due to the refrigerant pipe.

[0176] The above described features, configurations, effects, and the like are included in at least one of the embodiments of the present invention, and should not be limited to only one embodiment. In addition, the features, configurations, effects, and the like as illustrated in each embodiment may be implemented with regard to other embodiments as they are combined with one another or modified by those skilled in the art. Thus, content related to these combinations and modifications should be construed as including in the scope of the invention as disclosed in the accompanying claims.

Claims

1. A clothing processing equipment (100) comprising:

a heat pump (160), which has an evaporator (5, 300), a compressor (7, 163), a condenser (6, 400), and an expansion valve (8, 164), and is configured to apply heat to air circulating through a drum (1, 130); and

an air flow path (150) forming a movement path so that the air passes through the drum (1, 130) and circulates,

wherein the condenser (6, 400) comprises:

a plurality of condensation refrigerant tubes (410, 411, 412, 413) through which refrigerant flows; and

a condensation fin (420, 421, 422, 423), which conducts heat of the condensation refrigerant tube (410, 411, 412, 413),

characterized in that the evaporator (5, 300) comprises:

a plurality of evaporation refrigerant tubes (310) through which refrigerant flows; and an evaporation fin (320), which conducts heat of evaporation refrigerant,

wherein the condensation refrigerant tube (410, 411, 412, 413) comprises a plurality of channels (410a) through which refrigerant flows, wherein each of the channels (410a) has a cross-sectional area smaller than a cross-sectional area of the evaporation refrigerant tube (310).

2. The clothing processing equipment (100) of claim 1, wherein the condensation refrigerant tube (410, 411, 412, 413) and/or the condensation fin (420, 421, 422, 423) contain aluminum.

3. The clothing processing equipment (100) of claim 1 or 2, wherein the evaporation refrigerant tube (310) and/or the evaporation fin (320) contain aluminum.

4. The clothing processing equipment (100) according to any one of the claims 1 to 3, wherein a distance between the evaporator (5, 300) and the condenser (6, 400) is larger than a width (W1) of air flow direction of the evaporator (5, 300).

5. The clothing processing equipment (100) according to any one of the claims 1 to 4, wherein the condenser (6, 400) further comprises:

a condensation inlet pipe (491), which supplies refrigerant to the condensation refrigerant tube (410, 411, 412, 413); and a condensation outlet pipe (492) through which the refrigerant of the condensation refrigerant tube (410, 411, 412, 413) is discharged, wherein the condensation inlet pipe (491) and the condensation outlet pipe (492) are located in the same direction with respect to the condensation refrigerant tube (492).

6. The clothing processing equipment (100) according to any one of the claims 1 to 5, wherein the evaporator (5, 300) further comprises:

an evaporation inlet pipe (391) for supplying refrigerant to the evaporation refrigerant tube (310); and an evaporation outlet pipe (392) for discharging refrigerant from the evaporation refrigerant tube (310), wherein the evaporation inlet pipe (391) and the evaporation outlet pipe (392) are located in the

same direction with respect to the evaporation refrigerant tube (310).

7. The clothing processing equipment (100) according to any one of the claims 1 to 6, wherein the condensation fin (420, 421, 422, 423) comprises a plurality of inclined surfaces having an incline with respect to a direction of air flow.

8. The clothing processing equipment (100) according to any one of the claims 1 to 7, wherein the condenser (6, 400) comprises:

a first heat exchange unit (P1) comprising a plurality of condensation refrigerant tubes (410) and a condensation fin (420, 421, 421, 423); a second heat exchange unit (P2) comprising a plurality of condensation refrigerant tubes (410) and a condensation fin (420, 421, 421, 423); and a third heat exchange unit (P3) comprising a plurality of condensation refrigerant tubes (410) and a condensation fin (420, 421, 421, 423), wherein refrigerant heat-exchanged in the third heat exchange unit (P3) is heat-exchanged in the second heat exchange unit (P2), and then heat-exchanged in the first heat exchange unit (P1).

9. The clothing processing equipment (100) of claim 8, wherein the third heat exchange unit (P3) is located upstream of an air flow direction than the second heat exchange unit (P2),

the second heat exchange unit (P2) is located upstream of an air flow direction than the first heat exchange unit (P1), and wherein the first heat exchange unit (P1), the second heat exchange unit (P2), and the third heat exchange unit (P3) are located to overlap in an air flow direction.

10. The clothing processing equipment (100) of claims 8 or 9, wherein the plurality of condensation refrigerant tubes (410) are arranged in a direction intersecting with an air flow direction.

11. The clothing processing equipment (100) according to any one of the claims 8 to 10, wherein the first heat exchange unit (P1) comprises a first left header (431) and a first right header (441), which are connected to both ends of the plurality of condensation refrigerant tubes (411) and through which refrigerant flows,

wherein the second heat exchange unit (P2) comprises a second left header (432) and a second right header (442), which are connected

to both ends of the plurality of condensation refrigerant tubes (412) and through which refrigerant flows, and

wherein the third heat exchange unit (P3) comprises a third left header (433) and a third right header (443), which are connected to both ends of the plurality of condensation refrigerant tubes (413) and through which refrigerant flows. 5

12. The clothing processing equipment (100) of claim 11, wherein the condenser (6, 400) comprises: 10

a first connection pipe (493), which connects the first right header (441) and the second right header (442), and through which refrigerant flows; and 15

a second connection pipe (494), which connects the second left header (432) and the third left header (433), and through which refrigerant flows. 20

13. The clothing processing equipment (100) of claims 11 or 12, wherein the condenser (6, 400) further comprises: 25

a condensation inlet pipe (491) supplying refrigerant to the condensation refrigerant tube (410, 411, 412, 413); and

a condensation outlet pipe (492) through which refrigerant of the condensation refrigerant tube (410, 411, 412, 413) is discharged. 30

14. The clothing processing equipment (100) of claim 13, wherein the condensation inlet pipe (491) is connected to the first left header (431), and wherein the condensation outlet pipe (492) is connected to the third left header (433). 35

15. The clothing processing equipment (100) of claim 14, wherein the second connection pipe (494) located higher than the condensation outlet pipe (492). 40

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Fig. 1

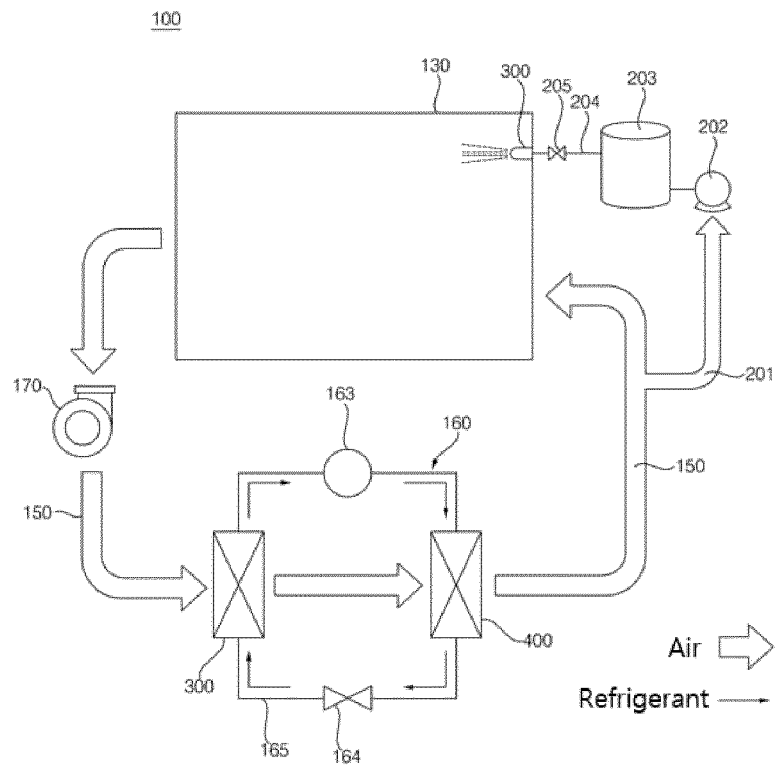


Fig. 2

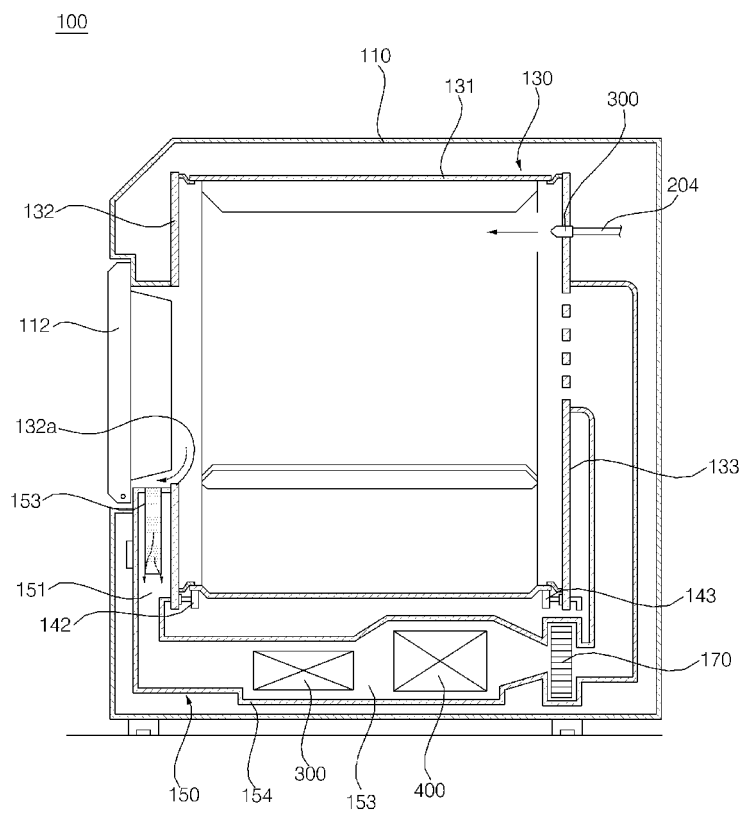


Fig. 3

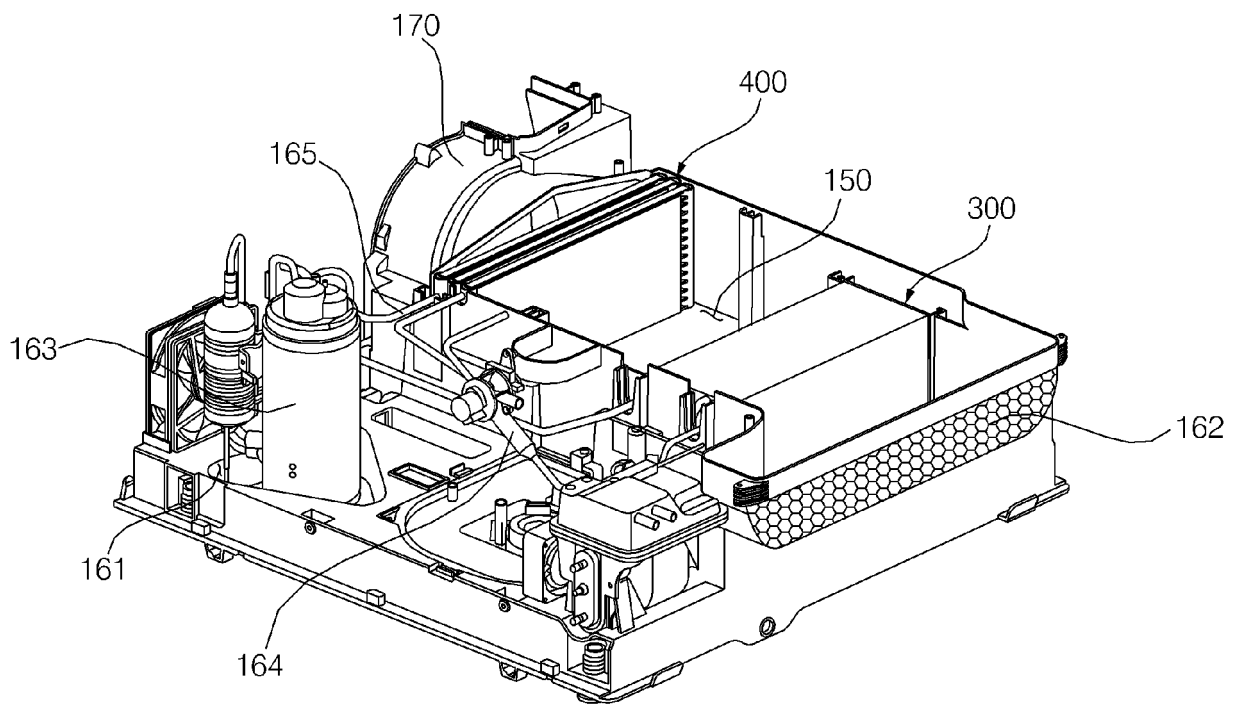


Fig. 4

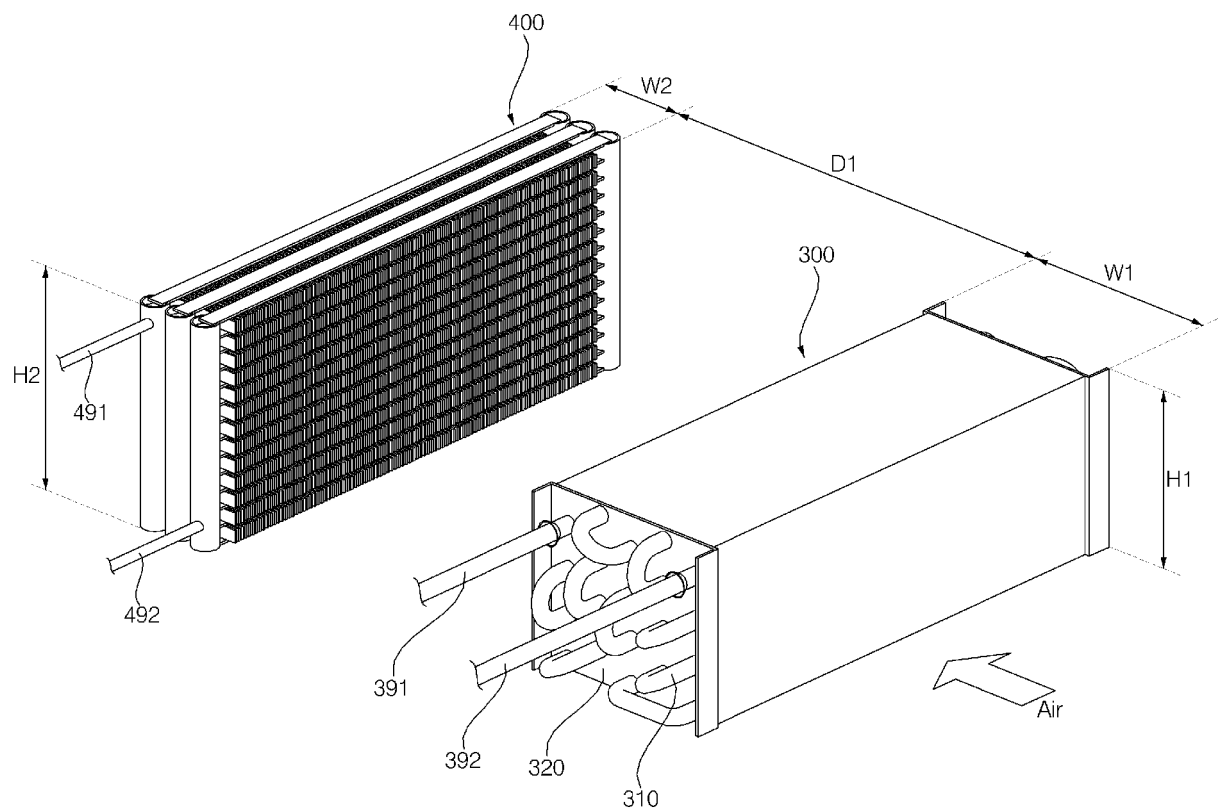


Fig. 5

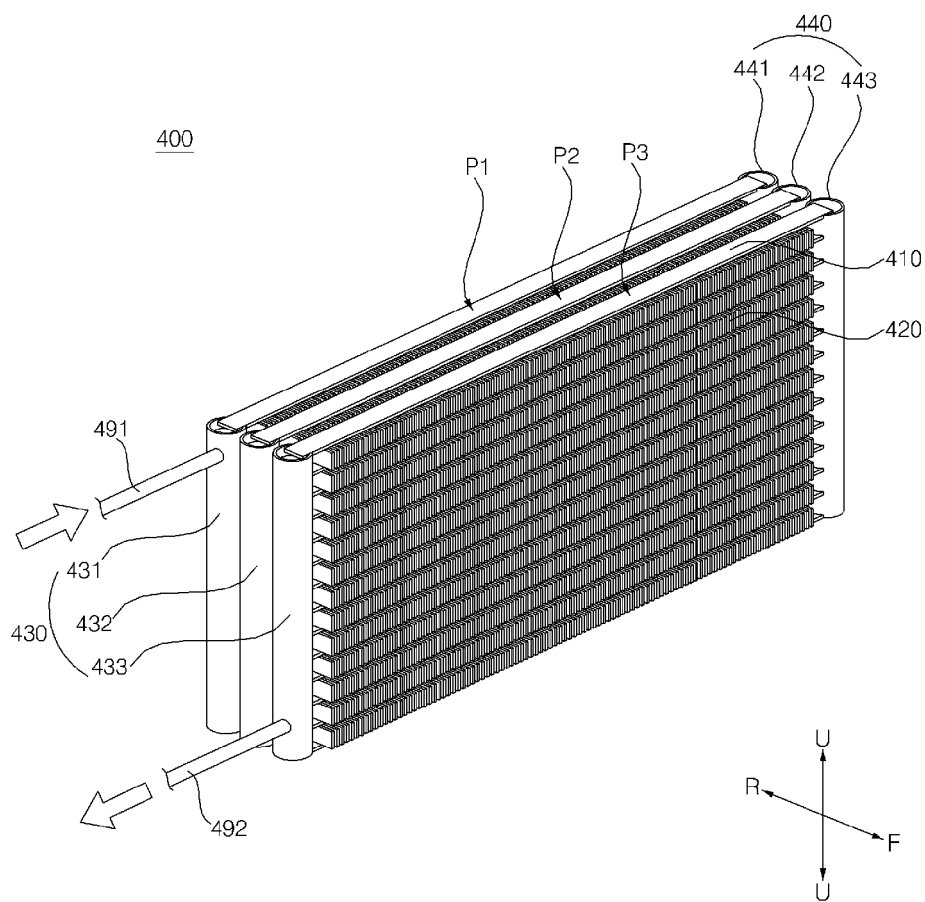


Fig. 6

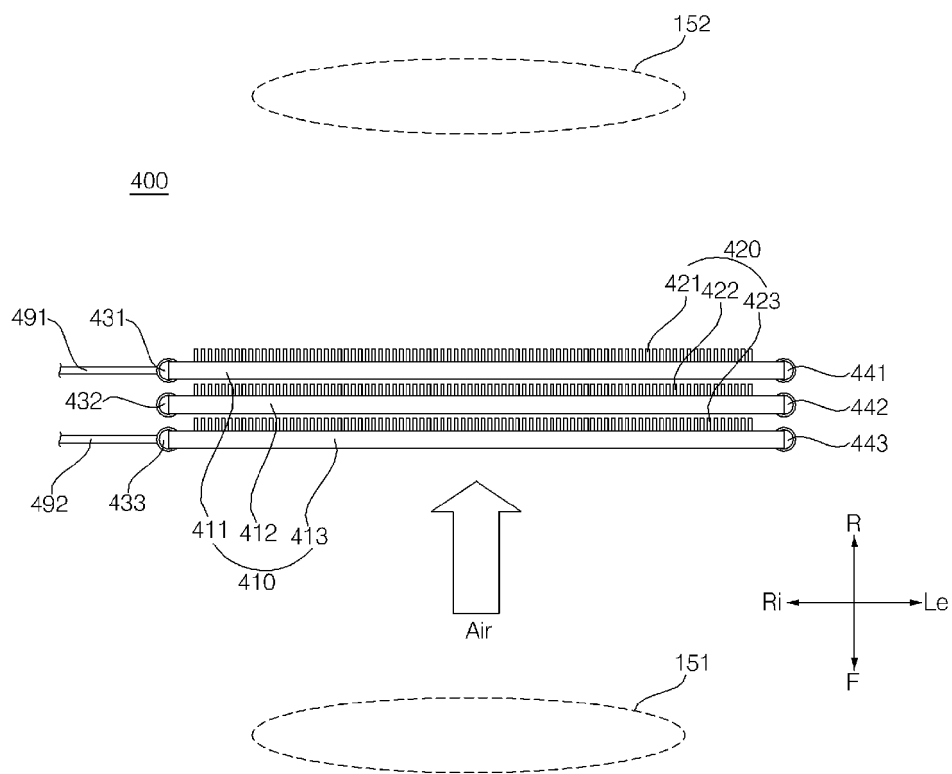


Fig. 7

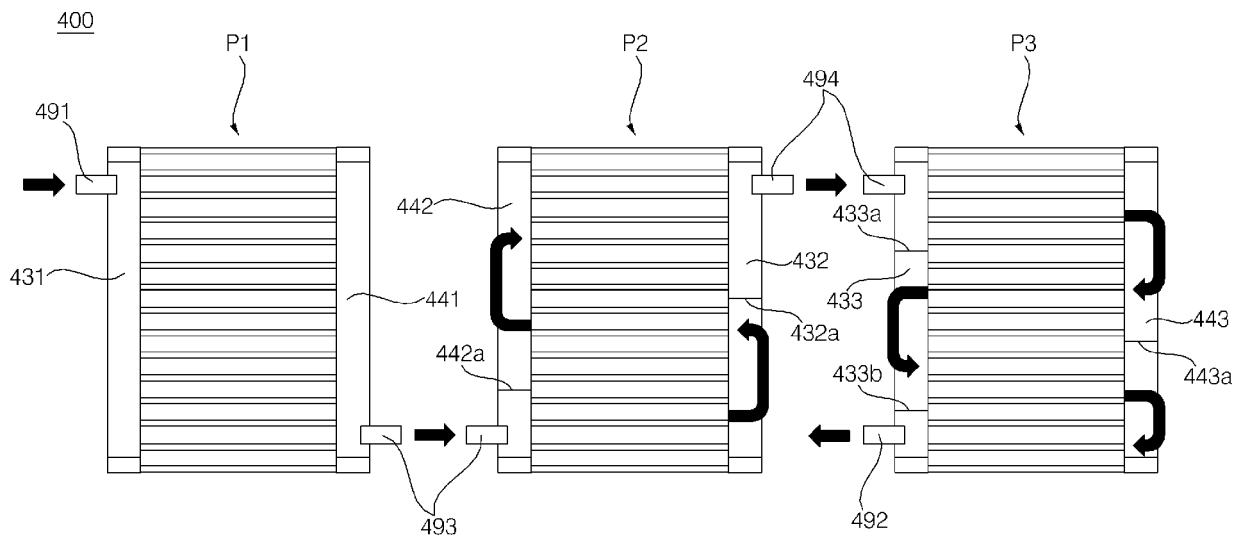


Fig. 8

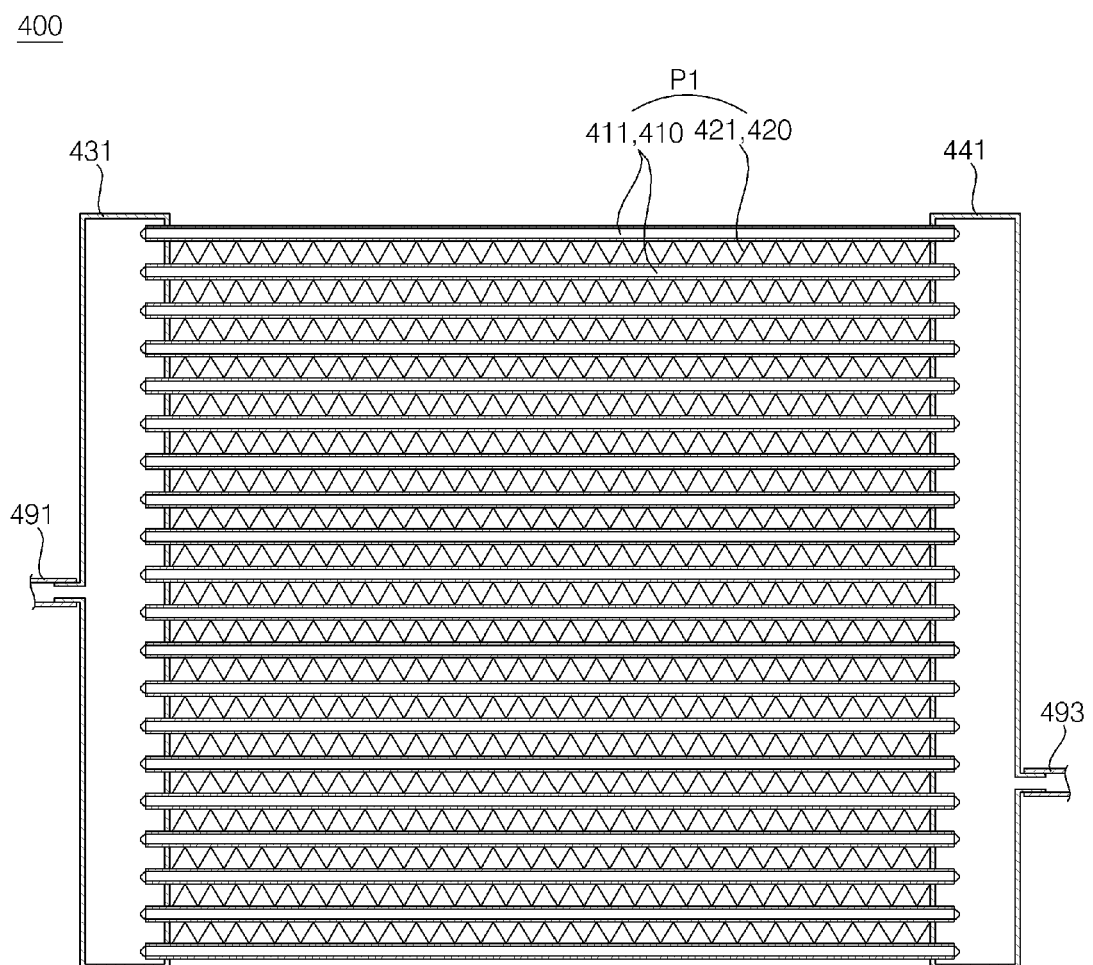


Fig. 9

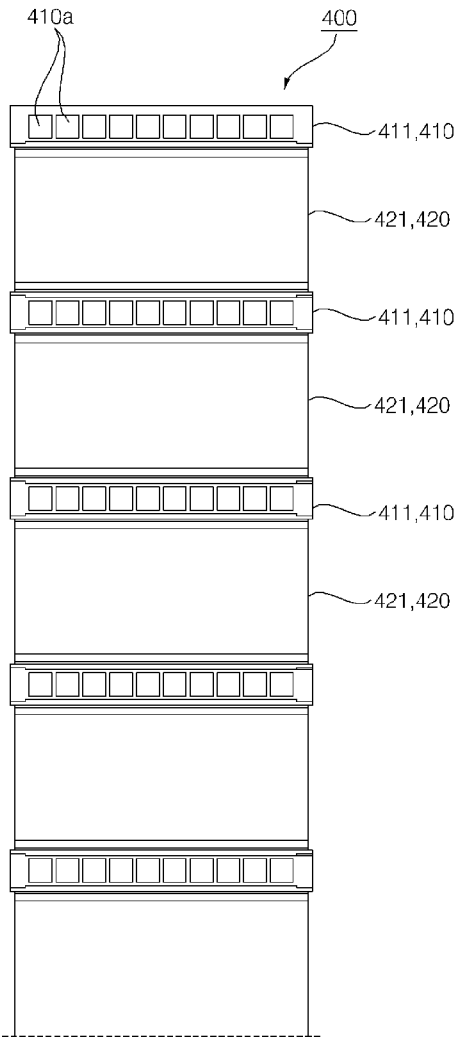
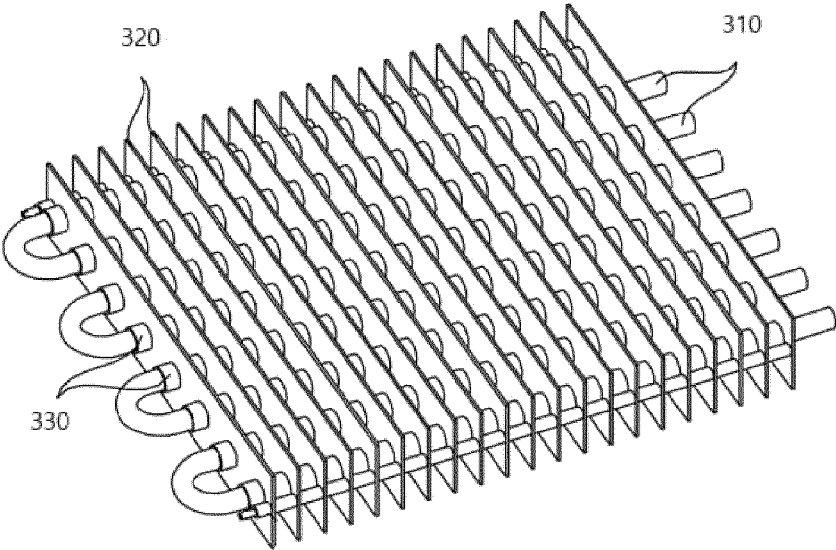


Fig. 10





EUROPEAN SEARCH REPORT

Application Number

EP 24 21 2422

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	DE 10 2016 102690 A1 (MIELE & CIE [DE]) 17 August 2017 (2017-08-17) * figures 1-9 * -----	1 - 15	INV. F25B39/02 D06F58/24 F25B39/04
			TECHNICAL FIELDS SEARCHED (IPC)
			F25B D06F
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
Munich		20 March 2025	Gaspar, Ralf
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