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(19) **United States**(12) **Patent Application Publication****Kim et al.**(10) **Pub. No.: US 2001/0005990 A1**(43) **Pub. Date:****Jul. 5, 2001**(54) **AIR CONDITIONER FOR INDIVIDUAL COOLING/HEATING**(76) Inventors: **Cheol Min Kim**, Kyonggi-do (KR);
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Publication Classification(51) **Int. Cl.⁷** **F25B 21/00**(52) **U.S. Cl.** **62/3.1; 165/59**(57) **ABSTRACT**

Air conditioner for individual cooling/heating including a front compartment and a rear compartment separated by a partition plate of an insulating material for forced inlet and outlet of external air therethrough respectively, at least two heat exchanger parts each in upper parts of the front and rear compartments and lower parts of front and rear compartments for making heat exchange with external air passing through the front compartment and the rear compartment respectively, first drawing means and second drawing means mounted in an upper portion or a lower portion of the front compartment or the rear compartment respectively for forced circulation of the external air through respective compartments, and driving means for driving the first and second drawing means, each of the heat exchanger parts includes thermoelectric modules each connected to a power source for absorbing a heat at a heat absorptive part and discharging the heat from a heat dissipative part provided opposite to the heat absorptive part, and heat exchangers each in contact either with the heat absorptive part or the heat dissipative part of the thermoelectric module for causing heat exchange between the air flowed into the front or rear compartment and the thermoelectric module, thereby providing individual cooling/heating to a user and constant temperature dehumidification.

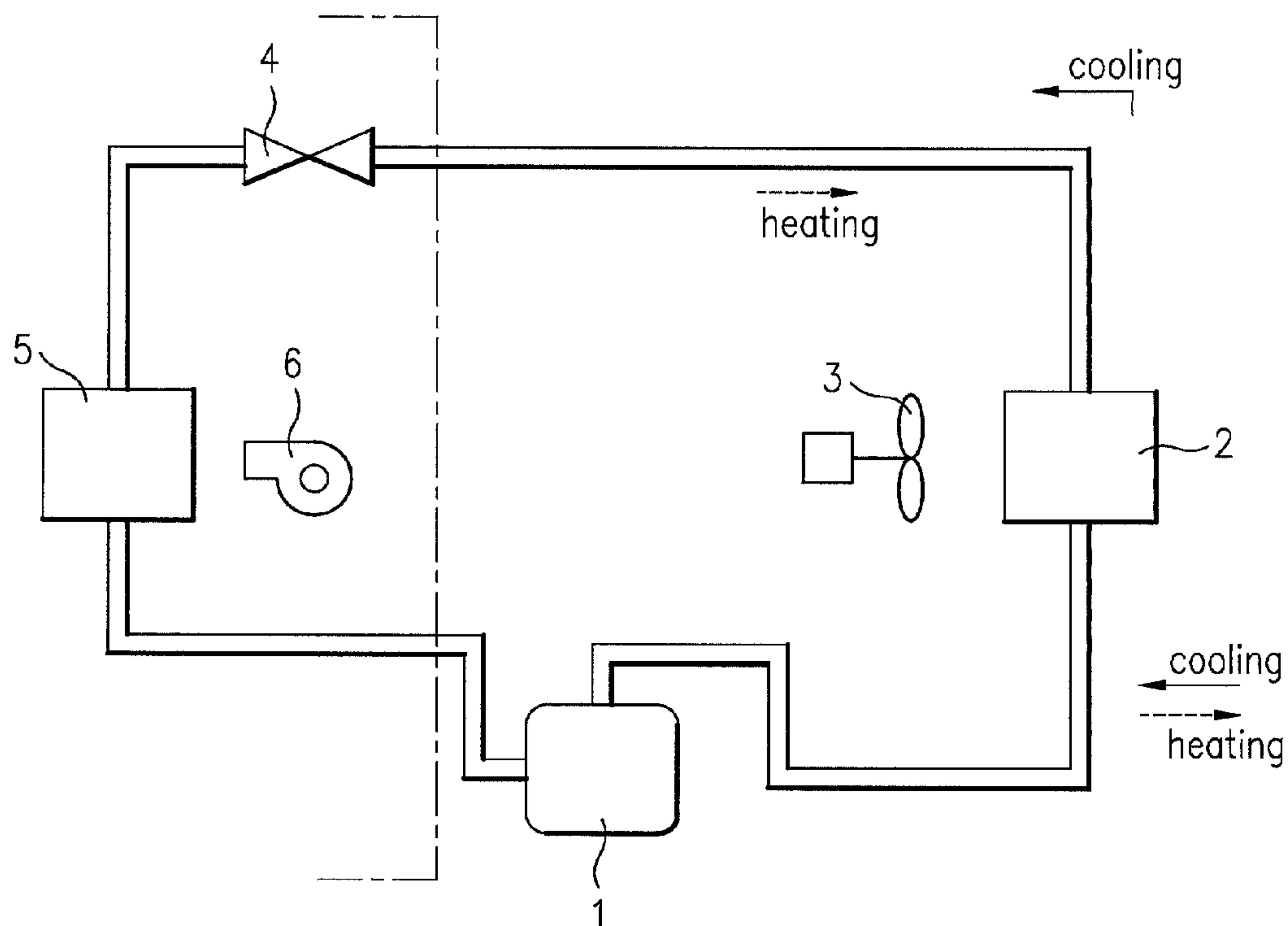


FIG. 1
Related Art

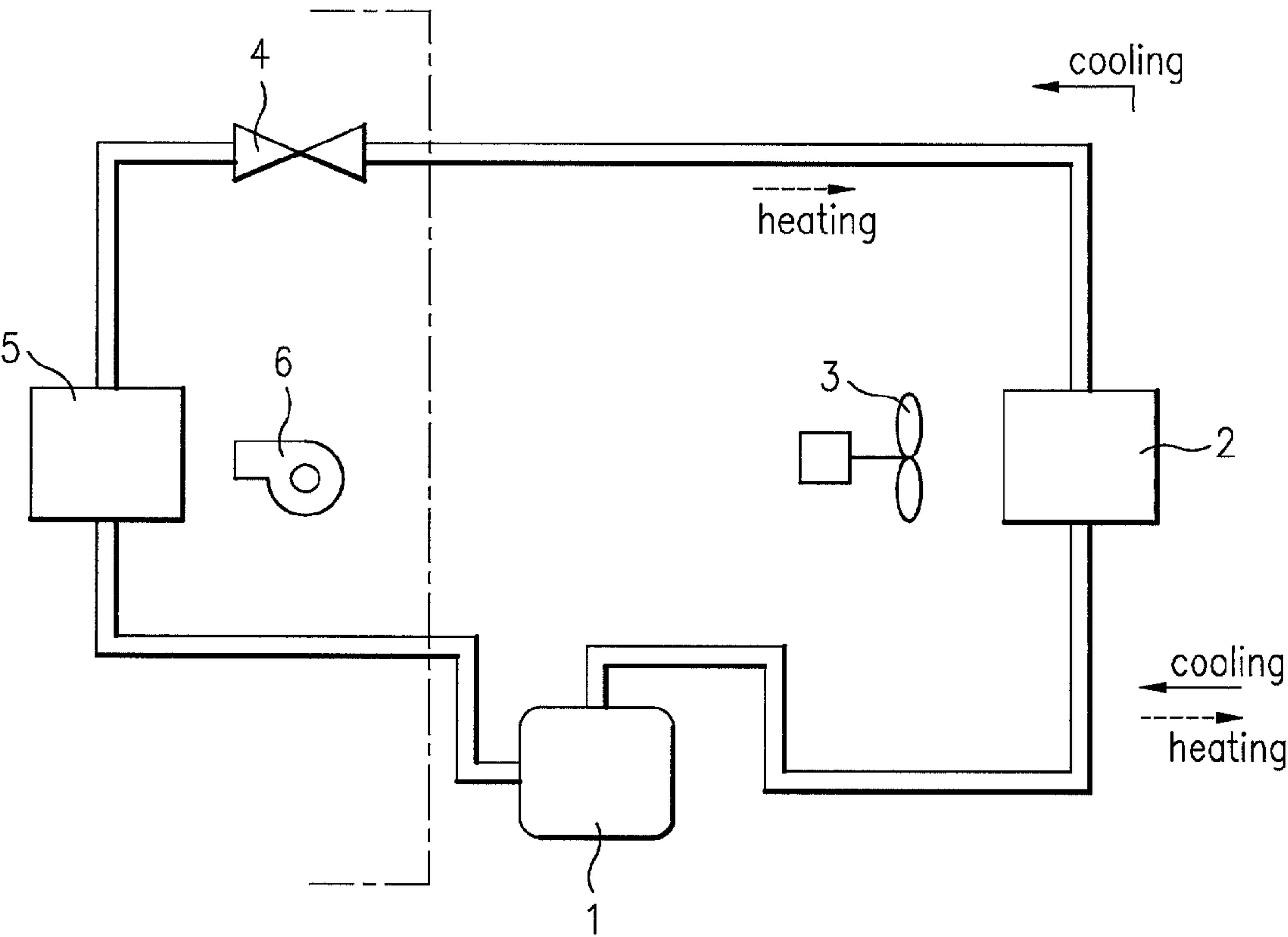


FIG. 2

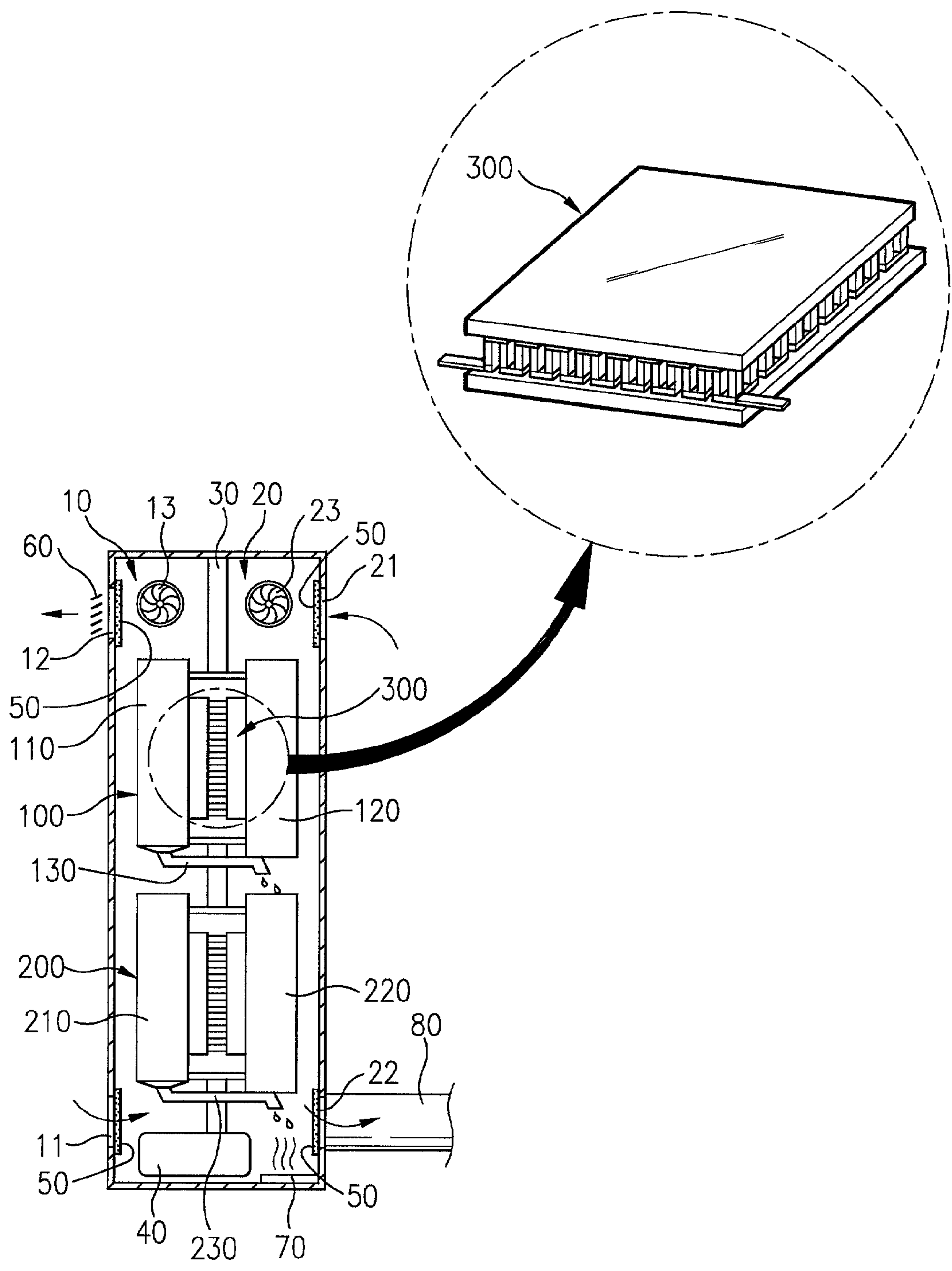


FIG. 3

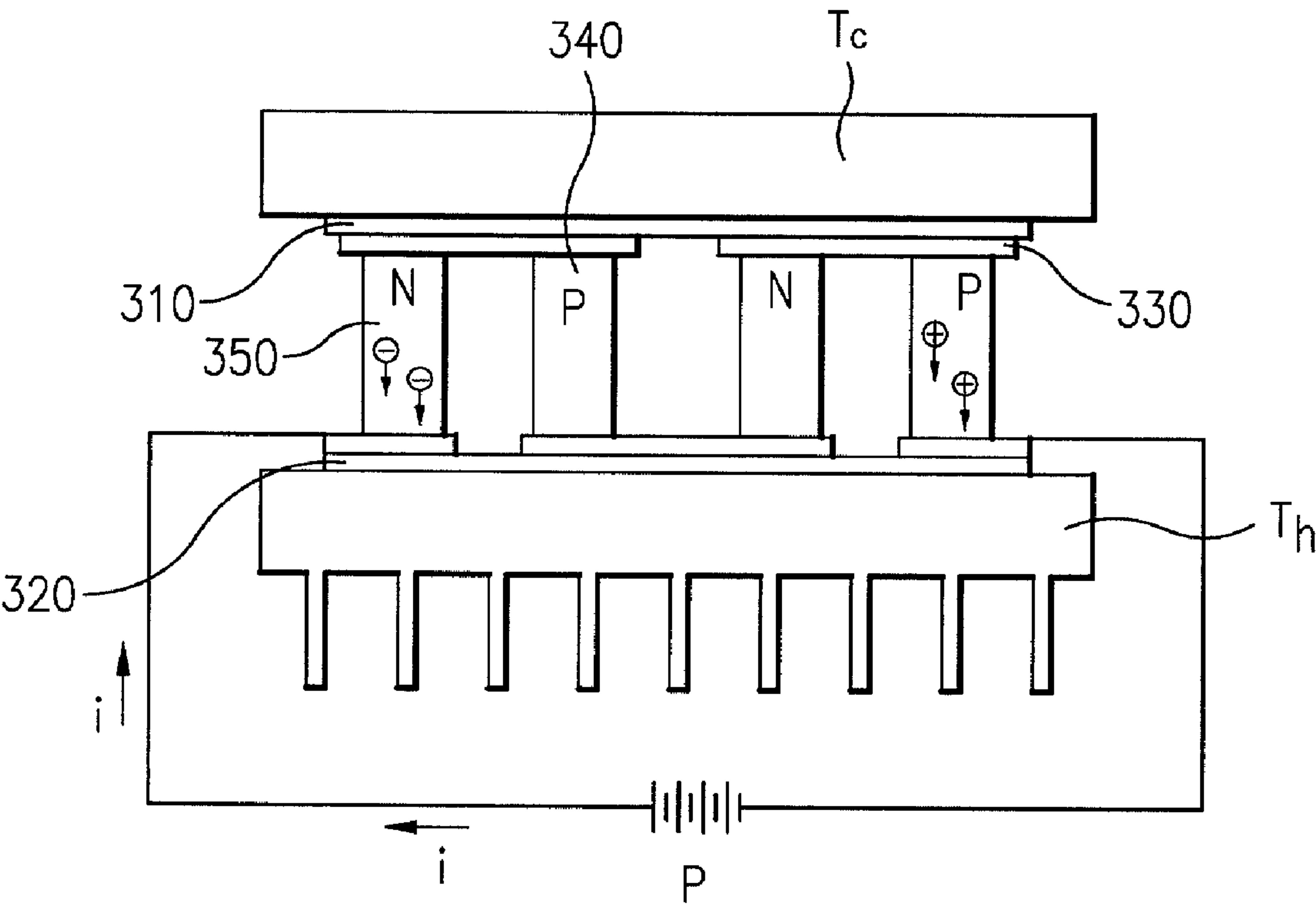
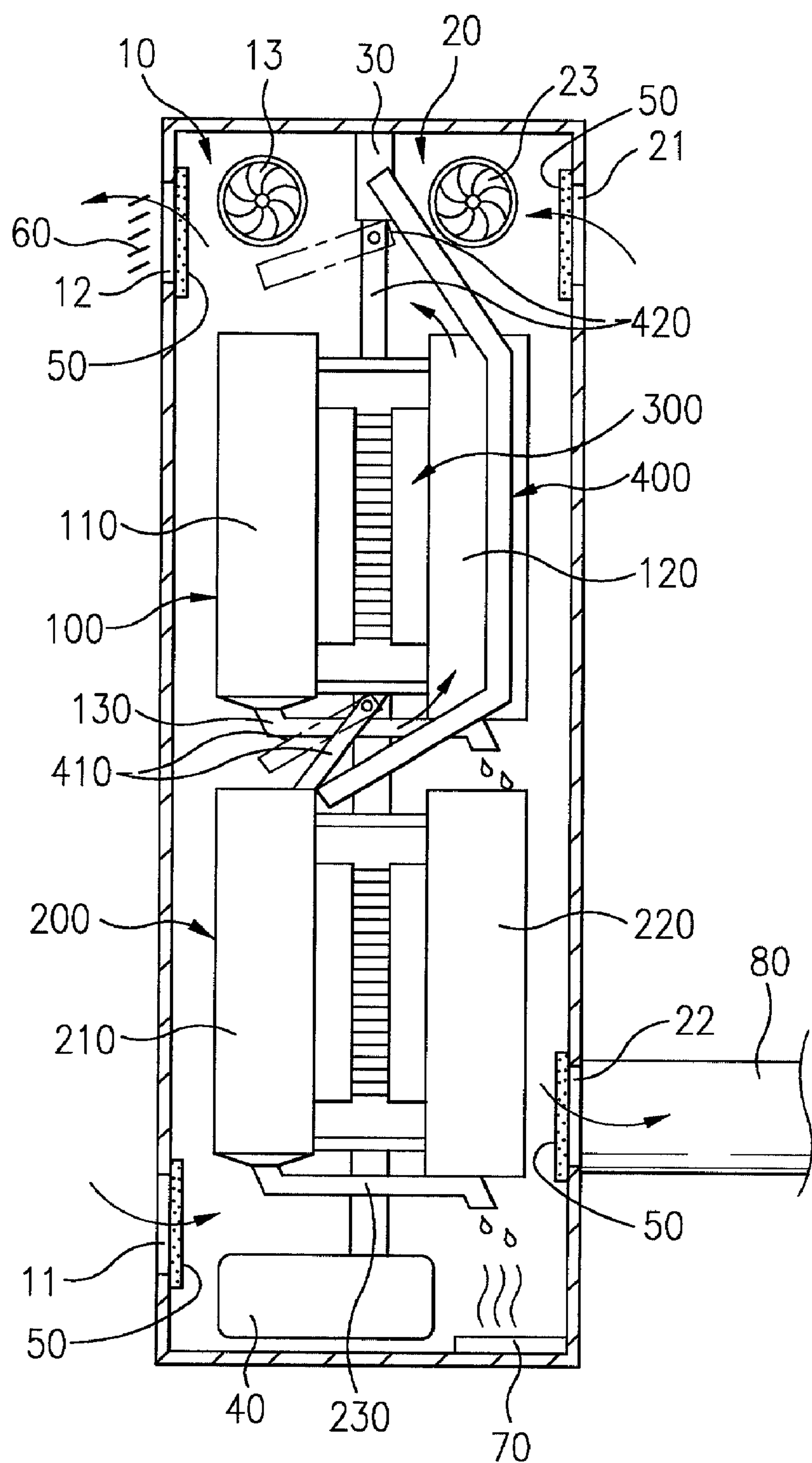


FIG. 4



AIR CONDITIONER FOR INDIVIDUAL COOLING/HEATING

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates to an air conditioner, and more particularly, to an air conditioner for individual cooling/heating, which can provide fresh cooling or heating air to users, individually.

[0003] 2. Background of the Related Art

[0004] In general, a cooling/heating device is used for cooling/heating a room space, such as living rooms, restaurants, offices, or the like, of which operation will be explained with reference to **FIG. 1**.

[0005] A refrigerant gas compressed to a high pressure and a high temperature at a compressor **1** is provided to a first heat exchanger **2**, and condensed into liquid as the refrigerant gas discharges a heat to external air blown by a blower **3** on one side of the first heat exchanger **2**. The external air heated as it passes through the first heat exchanger **2** is discharged to outside of the room. The refrigerant condensed thus at the first heat exchanger **2** is throttled and decompressed into a pressure easy to vaporize as the refrigerant passes through an expansion valve **4**, provided to a second heat exchanger **5**, and absorbs an external heat as the refrigerant is vaporized by external air blown by a blower **6** on one side of the second heat exchanger **5**. The external air cooled as the external air passes through the second heat exchanger **5** is discharged into a room, to cool down the room, and the liquid refrigerant vaporized into a low pressure refrigerant gas at the second heat exchanger **5** is provided to the compressor **1** again to repeat the foregoing process, until entire room is cooled down. In the meantime, if it is desired that the cooling/heating device is used for heating the room, the refrigerant is circulated reversely, when the second heat exchanger **5** works as a condenser, to make warm air to flow into the room, and, opposite to this, the first heat exchanger works as an evaporator to discharge cooled air out of the room.

[0006] However, the related art cooling/heating device has problems in that, as the related art cooling/heating device has a system to cool/heat entire room space, neither the air provided by the related art cooling/heating device can satisfy all individual tastes of persons in the room, nor an amount of the air required for the air conditioning is efficient. That is, it is known that though a rate of air required for respiration per one person is 0.133 l/s in view of physiology, a standard rate of conditioning air per one person is 10 l/s in a case of general air conditioning, that is, the rate of air required for respiration per one person is merely approx. 1% of the total conditioning air.

[0007] And, since the related art cooling/heating device is of a bulky and heavy stationary type, which is difficult to carry, transmission of a cooling/heating effect to a region far from the cooling/heating device is poor, and the cooling/heating can not be expected in a case when a person should work after the person comes out of the room where the cooling/heating is available and moves to a place where the cooling/heating is not available.

[0008] In the meantime, the dehumidified air, provided when the cooling/heating device is in a dehumidifying

mode, may make people feel unpleasant as an air temperature in the dehumidifying mode is too low if an external temperature is relatively low in a summer season owing to rain, and the like because the air is cooled lower than an external air temperature for dehumidification.

SUMMARY OF THE INVENTION

[0009] Accordingly, the present invention is directed to an air conditioner for individual cooling/heating that substantially obviates one or more of the problems due to limitations and disadvantages of the related art.

[0010] An object of the present invention is to provide an air conditioner for individual cooling/heating, which is portable and capable of providing cooling/heating air at a comfortable temperature and humidity to users in a room, individually.

[0011] Another object of the present invention is to provide an air conditioner for individual cooling/heating, which has a constant temperature dehumidifying function in which air can be dehumidified without dropping an air temperature too much so that air with comfortable temperature and humidity can be provided to the users.

[0012] Additional features and advantages of the invention will be set forth in the description which follows, and in part will be apparent from the description, or may be learned by practice of the invention. The objectives and other advantages of the invention will be realized and attained by the structure particularly pointed out in the written description and claims hereof as well as the appended drawings.

[0013] To achieve these and other advantages and in accordance with the purpose of the present invention, as embodied and broadly described, the air conditioner for individual cooling/heating includes a front compartment and a rear compartment separated by a partition plate of an insulating material for forced inlet and outlet of external air therethrough respectively, at least two heat exchanger parts each in upper parts of the front and rear compartments and lower parts of front and rear compartments for making heat exchange with external air passing through the front compartment and the rear compartment respectively, first drawing means and second drawing means mounted in an upper portion or a lower portion of the front compartment or the rear compartment respectively for forced circulation of the external air through respective compartments, and driving means for driving the first and second drawing means, each of the heat exchanger parts includes thermoelectric modules each connected to a power source for absorbing a heat at a heat absorptive part and discharging the heat from a heat dissipative part provided opposite to the heat absorptive part, and heat exchangers each in contact either with the heat absorptive part or the heat dissipative part of the thermoelectric module for causing heat exchange between the air flowed into the front or rear compartment and the thermoelectric module, thereby providing individual cooling/heating to a user and constant temperature dehumidification.

[0014] It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory and are intended to provide further explanation of the invention as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this specification, illustrate embodiments of the invention and together with the description serve to explain the principles of the invention:

[0016] In the drawings:

[0017] **FIG. 1** illustrates a system of a related art cooling/heating device, schematically;

[0018] **FIG. 2** illustrates a side section of an air conditioner for individual cooling/heating in accordance with a first preferred embodiment of the present invention, schematically;

[0019] **FIG. 3** illustrates an operation principle of a thermoelectric module employed in an air conditioner for individual cooling/heating of the present invention; and,

[0020] **FIG. 4** illustrates a side section of an air conditioner for individual cooling/heating in accordance with a second preferred embodiment of the present invention, schematically.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0021] Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings. For reference, in the following explanation, a left side of the device in the drawing is a front side of the device, and a right side of the device in the drawing is a rear side of the device, and names of components explained below are given with reference to a cooling operation in which air discharged toward a user is a cooled air, which may be opposite in a case of heating or constant temperature dehumidification, and not absolute definition of functions of the components. For example, an absorptive heat exchanger explained below absorbs a heat during cooling operation, the absorptive heat exchanger discharges a heat, opposite to the heat absorption, during heating operation. **FIG. 2** illustrates a side section of an air conditioner for individual cooling/heating in accordance with a first preferred embodiment of the present invention, schematically.

[0022] Referring to **FIG. 2**, the air conditioner for individual cooling/heating in accordance with a first preferred embodiment of the present invention includes a front compartment **10**, a rear compartment **20**, a partition plate **30** of an insulating material for isolating the front compartment **10** and the rear compartment **20**, a first heat exchanger part **100** in upper parts of the front compartment **10** and the rear compartment **20**, and a second heat exchanger part **200** in lower parts of the front compartment **10** and the rear compartment **20**. The first and second heat exchanger parts **100** and **200** have the same system, each inclusive of a thermoelectric module **300** connected to a power source **40** mounted on a bottom of the air conditioner for absorbing a heat through a heat absorptive part and discharging the heat through a heat dissipative part by using an electric power, an absorptive heat exchanger **110** or **210** in the front compartment **10** in contact with the heat absorptive part **10** in the thermoelectric module **300** for absorbing a heat from, and

cooling down air flowing into the front compartment **10**, and dissipative heat exchanger **120** or **220** in the rear compartment **20** in contact with the heat dissipative part in the thermoelectric module **300** for discharging a heat to air flowing into the rear compartment **20**, to heat the air. That is, the two absorptive heat exchangers **110** and **210** are arranged in the front compartment **10** in upper and lower parts thereof, and the two dissipative heat exchangers **120** and **220** are arranged in the rear compartment **20** in upper and lower parts thereof, for cooling/heating the air flowed into the front or rear compartment **10** or **20** twice by the two heat exchangers, respectively. It is preferable that the heat exchangers **110**, **210**, **120**, and **220** are plates formed of a material which is light with a good heat transfer coefficient, such as aluminum. And, the thermoelectric modules **300** are connected to the power source **40** on a bottom of the front or rear compartment **10** or **20** through a change-over switch (not shown) for selective change-over to an electrode of either thermoelectric modules **300** in the first heat exchanger part **100** or the second heat exchanger part **200**. Accordingly, the air conditioner of the present invention makes, not only at will selection of cooling/heating available, but also a constant temperature dehumidifying function available. Moreover, there is a crossflow fan **13** or **23** in an upper part of each of the front compartment **10** and the rear compartment **20** for forced drawing and discharge of external air. Directions of air flows in the front compartment **10** and the rear compartment **20** are opposite to each other. For this, while there is a front air inlet **11** in a lower portion of front side of the front compartment **10** for drawing air, and a front air outlet **12** in an upper portion of front side of the front compartment **10** for discharging the air, there is a rear air inlet **21** in an upper portion of rear side of the rear compartment **20** for drawing air, and a rear air outlet **22** in a lower portion of rear side of the rear compartment **20** for discharging the air. There is a filter **50** fitted to an inside of each of the front air inlet **11** and the front air outlet **12** of the front compartment **10**, and the rear air inlet **21** and the rear air outlet **22** of the rear compartment **20**. The filters **50** may be fitted to the front and rear air inlets **11** and **21** or the front and rear air outlets **12** and **22**, selectively. There is an air guide **60** detachably fitted to the front air outlet **12** of the front compartment **10** a direction of which can be adjusted in an up, down, left, or right direction for discharging the air cooled/heated as the air passes through the front compartment **10** to a desired direction.

[0023] In the meantime, there are condensed water pipes **130** and **230** fitted to bottoms of the absorptive heat exchangers **110** and **210** of the first heat exchanger part **100** and the second heat exchanger part **200**, both in the front compartment **10**, and led to the rear compartment **20** through the partition plate **30** for collecting, and guiding water drops condensed by cooling at the absorptive heat exchangers **110** and **210** during the cooling operation to a water receiving heater **70** on the bottom of the rear compartment **20**, wherein a first water pipe **130** fitted to the bottom of the absorptive heat exchanger **110** of the first heat exchanger part **100** ends right over the dissipative heat exchanger **220** of the second heat exchanger part **200** in the rear compartment **20** so that the water drops guided through the first condensed water pipe **130** can be utilized as a cooling water for cooling the dissipative heat exchanger **220** of the second heat exchanger part **200**, and a second condensed water pipe **230** fitted to the bottom of the absorptive heat exchanger **210** of the second

heat exchanger part **200** ends right over the water receiving heater **70** so that the water drops guided through the second condensed water pipe **230** is guided to the water receiving heater **70** directly for vaporizing the water drop. The water receiving heater **70** is connected to the power source for operation, and may be detachably fitted to the bottom of the rear compartment **20** or on an outside surface of the front air outlet **12** for receiving warmer air from the front air outlet **12** in heating.

[0024] The use of thermoelectric module as cooling/heating means, which can make an accurate temperature control, in the air conditioner of the present invention permits an accurate temperature control in a range of 20° C.~23° C. which provides the most comfortable feeling to a human body. And, the air conditioner of the present invention can change a cooling mode into a heating mode simply by changing over the electrodes connected to the thermoelectric module **300**, which converts the heat absorptive part into a heat dissipative part and vice versa.

[0025] For reference, system and operation principle of the thermoelectric module **300** will be explained. Being an electric element based on a semiconductor which acts as a solid state heat pump, the thermoelectric module employs the Peltier Effect in which a current applied to an interface of two different materials connected in series causes heat absorption/dissipation in proportion to the current. As shown in FIG. 3, the thermoelectric module **300** employed in the air conditioner of the present invention includes an upper ceramic plate **310** to be brought into contact with a substance Tc to be cooled by absorbing a heat therefrom, a lower ceramic plate **320** to be brought into contact with a substance Th for discharging the heat thereto, 'p' type semiconductors **340** and 'n' type semiconductors **350** connected between the upper ceramic plate **310** and the lower ceramic plate **320** alternately, and electric alternative connection layers **330** of copper or the like each electrically connected to the 'p' type semiconductor **340** and the 'n' type semiconductor **350** alternately and connecting one ends of the 'p' type semiconductor **340** and the 'n' type semiconductor **350** to the upper ceramic plate **310** or the lower ceramic plate **320**. The alternative connection layer **330** is connected to a DC power source 'P' for having a current flowing through the 'p' type semiconductor **340** and the 'n' type semiconductor **350**. Accordingly, if a DC power is applied for cooling/heating the substance Tc by using the thermoelectric module **300**, a current 'i' flows through the 'p' type semiconductor **340** and the 'n' type semiconductor **350** connected to the alternative connection layers **330** alternately, to cause electron (-) migration opposite to a flow direction of the current 'i' in the 'n' type semiconductor **350** and hole (+) migration in a direction the same with the flow direction of the current 'i' in the 'p' type semiconductor **340**. That is, electrons (-) and holes (+) migrate from the upper ceramic plate **310** to the lower ceramic plate **320** through the 'n' type semiconductor **350** and the 'p' type semiconductor **340**, causing the upper ceramic plate **310** to absorb a heat and discharge the heat to the lower ceramic plate **320** such that the upper ceramic plate **310** acts as the heat absorptive part to cool down the substance Tc in contact with the upper ceramic plate **310**, and the lower ceramic plate **320** acts as the heat dissipative part to heat the substance Th in contact with the lower ceramic plate **320**. And, if polarities of the electricity connected to the thermoelectric module **300** are changed over, to change the flow direction of the current, i.e., if connec-

tions of a positive pole (+) and a negative pole (-) of the power source 'P' is changed over, opposite to the foregoing explanation, the heat is transmitted from the lower ceramic plate **320** toward the upper ceramic plate **310**, converting the heat absorptive part into the heat dissipative part, and vice versa.

[0026] In summary, the thermoelectric module has the following features.

[0027] First, an accurate temperature control is possible as the absorbed/dissipated thermal energy is proportional to an intensity of a provided current.

[0028] Second, there is no noise or vibration from the air conditioner as there is no mechanical moving parts in the air conditioner.

[0029] Third, the air conditioner has a small size and light.

[0030] Fourth, local cooling/heating is possible.

[0031] Fifth, the air conditioner is friendly to the environment as CFC gas or any other refrigerant gas is used.

[0032] Sixth, a flow direction of the current determines heating or cooling mode.

[0033] The operation of the first embodiment air conditioner of the present invention will be explained.

[0034] In cooling, the air conditioner is operated, setting the air conditioner such that the ceramic plates **310** in the thermoelectric modules **300** of the first and second heat exchanger parts **100** and **200** in the front compartment **10** act as the heat absorptive parts, and the ceramic plates **320** in the rear compartment **20** act as the heat dissipative parts. Upon putting the crossflow fan **13** in the upper portion of the front compartment **10** into operation, external air flows into the front compartment **10** through the front air inlet **11** in the lower portion of the front compartment **10**. Then, the air flowing through the front compartment **10** is cooled down at the first time as the absorptive heat exchanger **210** in the second heat exchanger part **200** absorbs a heat from the air, rises upward, and cooled down at the second time as the absorptive heat exchanger **110** in the first heat exchanger part **100** absorbs a heat from the air, to cool down the air to a temperature suitable for the user, and discharged to the user through the front air outlet **12** in the upper portion of the front face of the air conditioner. On the same time with this, an air flow is occurred in the rear compartment **20** in a direction opposite to a direction in the front compartment **10** by the crossflow fan **23** fitted in the upper portion of the rear compartment **20**, i.e., external air flows into the rear compartment **20** through the rear air inlet **21** in the upper portion of the rear compartment **20**, flows down to be heated at the first time as the dissipative heat exchanger **120** in the first heat exchanger part **100** dissipate a heat thereto, and to be heated at the second time as the dissipative heat exchanger **220** in the second heat exchanger part **200** dissipate a heat thereto, and discharged through the rear air outlet **22** in a lower portion of the rear compartment **20**, and to outside of the room through a discharge duct **80** provided right after the rear air outlet **22**. In the meantime, the water drops formed as the air passes through the absorptive heat exchangers **110** and **210** in the front compartment **10** are led to the rear compartment **20** through the first and second condensed water pipes **130** and **230**, wherein the water drops led through the first condensed water pipe **130** are dropped onto

the dissipative heat exchanger **220** of the second heat exchanger part **200**, and evaporated while cooling down the dissipative heat exchanger **220**, or, a portion of the water drops left after the evaporation, dropped onto the water receiving heater **70** on the bottom of the rear compartment **20** and evaporated, and the water drops led through the second condensed water pipe **230** is dropped onto the water receiving heater **70** directly, and evaporated therefrom.

[0035] Next, the heating operation of the first embodiment air conditioner of the present invention will be explained.

[0036] In the heating, the change-over switch(not shown) is operated to change the electrodes of the thermoelectric modules **300** in the first and second heat exchanger parts **100** and **200**, for altering the heat dissipative part and the heat absorptive part. In this instance, the air conditioner can heat the room as the absorptive heat exchangers **110** and **210** in the front compartment **10** are made to be operative as dissipative heat exchangers which discharge a heat to the flowing air, and the dissipative heat exchangers **120** and **220** in the rear compartment **20** are made to be operative as absorptive heat exchangers which absorb a heat from the flowing air, thereby discharging warm air through the front air outlet **12** in the front compartment **10**.

[0037] In the meantime, the air conditioner of the present invention also has a constant temperature dehumidifying function in which a dehumidification can be carried out without dropping an air temperature much, wherein, in a state the second heat exchanger part **200** is set to be operative the same as the cooling mode, the change-over switch (not shown) connected to the thermoelectric module **300** in the first heat exchanger part **100** is operated to alter the heat absorptive part and the heat dissipative part in the first heat exchanger part **100**, for operating the absorptive heat exchanger **110** in the first heat exchanger part **100** as a dissipative heat exchanger, and the dissipative heat exchanger as an absorptive heat exchanger. That is, the air flowed into the front compartment **10** through the front air inlet **11** in the lower portion of the front compartment **10** is involved in dehumidification as the air is cooled by the absorptive heat exchanger **210** in the second heat exchanger part **200**, rises upward, heated again by the absorptive heat exchanger **110**, which acts as a dissipative heat exchanger at the present time, to an appropriate temperature, and discharged through the front air outlet **12**, thereby having the constant temperature dehumidification done. Therefore, if a dehumidification is required in a cool rainy day, this constant temperature dehumidifying function is selected, to carry out dehumidification with an external temperature kept the same.

[0038] FIG. 4 illustrates a side section of an air conditioner for individual cooling/heating in accordance with a second preferred embodiment of the present invention schematically, of which system is almost same with the first embodiment air conditioner except that the second embodiment air conditioner has an air flow path which is changeable for the constant temperature dehumidification function.

[0039] Referring to FIG. 4, there is an air flow passage **400** from a top of the absorptive heat exchanger **210** in the second heat exchanger part **200** to the partition plate **30** above the dissipative heat exchanger **120** through a portion of the dissipative heat exchanger **120**. And, there is an inlet open/shut device **410** between an inner bottom side of the

dissipative heat exchanger **120** in the first heat exchanger part **100** and an inner top side of the absorptive heat exchanger **210** in the second heat exchanger part **200** for opening/shutting an inlet to the air flow passage **400**, and an outlet open/shut device **420** in the partition plate **30** above the first heat exchanger part **100** for opening/shutting an outlet from the air flow passage **400**. It is preferable that both of the inlet and outlet open/shut devices **410** and **420** are operable by means of an electric-mechanical system which may be known. Accordingly, in room heating/cooling by using the air conditioner of the present invention, both of the inlet and outlet open/shut devices **410** and **420** are closed, and the room heating/cooling is conducted in a process the same with the first embodiment. However, in a case of the constant temperature dehumidification, both of the inlet and outlet open/shut devices **410** and **420** are opened, for the constant temperature dehumidification. Upon opening the air flow passage **400** by opening the inlet and outlet open/shut devices **410** and **420** for the constant temperature dehumidification, air flows into the air flow passage **400** through the front air inlet **11** in the lower portion of the front compartment **10**, and is dehumidified as the air is cooled at the absorptive heat exchanger **210** in the second heat exchanger part **200**, one portion of which air rises upward above the second heat exchanger part **200** directly, and is cooled at the first heat exchanger part **100** as the air keeps rising passing through the first heat exchanger part **100**, and the other portion of which air rises through the air flow passage **400**, is heated as the air keeps rising through the dissipative heat exchanger **120** in the first heat exchanger part **100**, and discharged through the outlet open/shut device **420** above the second heat exchanger part **200**. Eventually, the air cooled at the first heat exchanger part **100** is involved in a temperature rise to a level almost similar to an external temperature as the cooled air is mixed with the heated air discharged through the outlet open/shut device **420** on the air flow passage **400**, and discharged through the front air outlet **12**, thereby having the constant temperature dehumidification done. As explained, the temperature of air discharged through the front air outlet **12** can be controlled by controlling a voltage provided to the respective thermoelectric modules **300** of the first and second heat exchanger parts **100** and **200**.

[0040] As has been explained, the air conditioner for individual cooling/heating of the present invention has the following advantages.

[0041] Since the employment of small thermoelectric modules as air conditioning means permits to fabricate air conditioners in a variety of sizes taking carriage and air conditioning capability into account, the air conditioner serves better to the users because only a space around the user can be cooled/heated intensively as the air conditioner can be placed with easy anywhere the user like.

[0042] The availability of accurate temperature control by the thermoelectric module permits the air conditioner of the present invention to control an air temperature, accurately.

[0043] The air conditioner of the present invention has no noise or vibration, and is easy to change from a cooling mode to a heating mode and vice versa as the mode conversion can be done by change-over of electrodes connected to the motors for driving the crossflow fans or the thermoelectric modules.

[0044] The constant temperature dehumidifying function can serve better to the users as the dehumidification can be done at a temperature similar to an external temperature in an environment the air temperature is low while the humidity is high, such as in a rainy day.

[0045] It will be apparent to those skilled in the art that various modifications and variations can be made in an air conditioner for individual cooling/heating of the present invention without departing from the spirit or scope of the invention. Thus, it is intended that the present invention cover the modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents.

What is claimed is:

1. An air conditioner for individual cooling/heating comprising:

a front compartment and a rear compartment separated by a partition plate of an insulating material for forced inlet and outlet of external air therethrough, respectively;

at least two heat exchanger parts each in upper parts of the front and rear compartments and lower parts of front and rear compartments for making heat exchange with external air passing through the front compartment and the rear compartment, respectively;

first drawing means and second drawing means mounted in an upper portion or a lower portion of the front compartment or the rear compartment respectively for forced circulation of the external air through respective compartments; and,

driving means for driving the first and second drawing means.

2. An air conditioner as claimed in claim 1, wherein each of the heat exchanger parts includes;

thermoelectric modules each connected to a power source for absorbing a heat at a heat absorptive part and discharging the heat from a heat dissipative part provided opposite to the heat absorptive part, and

heat exchangers each in contact either with the heat absorptive part or the heat dissipative part of the thermoelectric module for causing heat exchange between the air flowed into the front or rear compartment and the thermoelectric module.

3. An air conditioner as claimed in claim 1, wherein the air in the front compartment and the air in the rear compartment circulate in directions opposite to each other.

4. An air conditioner as claimed in claim 1, wherein the front compartment has an air inlet in a lower portion and an air outlet in an upper portion of a front surface thereof, and the rear compartment has an air inlet in an upper portion and an air outlet in a lower portion of a rear surface thereof.

5. An air conditioner as claimed in claim 4, further comprising filters for filtering contaminant from the air flowed into respective inlets and outlets of the front compartment and the rear compartment.

6. An air conditioner as claimed in claim 4, further comprising a blow direction guide detachably fitted to the air

outlet of the front compartment for deflecting a discharge direction of the air discharged through the air outlet, freely.

7. An air conditioner as claimed in claim 4, further comprising a discharge duct detachably mounted to the air outlet of the rear compartment for discharging air from the air outlet to outside of room.

8. An air conditioner as claimed in claim 1, wherein the first and second drawing means are crossflow fans.

9. An air conditioner as claimed in claim 1, further comprising a condensed water pipe fitted to a bottom of each of the heat exchangers of respective heat exchanger parts in the front compartment and ended in the rear compartment through the partition plate between the front compartment and the rear compartment for collecting, and leading water condensed at the heat exchangers to the rear compartment.

10. An air conditioner as claimed in claim 9, further comprising collecting means on a bottom of the rear compartment for collecting water drops dropped through the condensed water pipe.

11. An air conditioner as claimed in claim 10, wherein the collecting means includes a heater for vaporizing the collected water drops.

12. An air conditioner as claimed in claim 11, wherein the heater is detachably fitted to the bottom of the rear compartment or to the air outlet of the front compartment.

13. An air conditioner as claimed in claim 2, wherein the heat absorptive part and the heat dissipative part of the thermoelectric module can be altered by change-over of the electrodes of the thermoelectric module connected to the power source.

14. An air conditioner as claimed in claim 2, wherein the thermoelectric module in each of the heat exchanger parts is connected to the power source through a change-over switch for selective change-over of the electrodes connected thereto.

15. An air conditioner as claimed in claim 2, wherein the heat exchangers in the heat exchanger parts are formed of aluminum plate.

16. An air conditioner as claimed in claim 2, wherein constant temperature dehumidification by the air conditioner is made possible by changing-over the electrodes connected to the thermoelectric module in the heat exchanger part disposed in the upper portion during cooling.

17. An air conditioner as claimed in claim 1, further comprising an air flow passage formed starting from a top of the heat exchanger in the lower heat exchanger part in the lower portion of the front compartment to the upper heat exchanger part in the front compartment through the partition plate between the heat exchanger parts, the heat exchanger in the upper heat exchanger part in the upper portion of the rear compartment, and the partition plate above the upper heat exchanger part.

18. An air conditioner as claimed in claim 17, wherein the air flow passage further includes an open/shut means at an inlet and outlet of the air flow passage for opening/shutting the air flow passage.

19. An air conditioner as claimed in claim 18, wherein the open/shut means is operable from outside of the air conditioner by an electrical device.

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