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(54) **HEAT PUMP MODULE FOR LAUNDRY TREATMENT DEVICE AND LAUNDRY TREATMENT DEVICE**

(57) A heat pump module for a laundry treatment device and the laundry treatment device are provided. The heat pump module includes a compressor (1), a condenser (2), an evaporator (3), a casing (4) and a cooling air passage (5). The casing (4) has an accommodating chamber provided with a partition plate (43) to divide the accommodating chamber into a first mounting chamber (41) and a second mounting chamber (42), the compressor (1) is disposed within the first mounting chamber (41), and the evaporator (3) and the condenser (2) are disposed within the second mounting chamber (42). The compressor (1) has an air exhaust port and an air suction port; the condenser (2) has a first end in communication with the air exhaust port; and the evaporator (3) has a first end in communication with a second end of the condenser (2), and a second end in communication with the air suction port. The cooling air passage (5) has an air outlet end in communication with the first mounting chamber (41), and an air inlet end in communication with the outside. For the heat pump module according to the present invention, the first mounting chamber (41) is in communication with the outside by providing the cooling air passage (5), such that the compressor (1) may exchange heat with the outside, thereby improving performance of the compressor (1), optimizing layout of various components in the heat pump module and saving installation space.

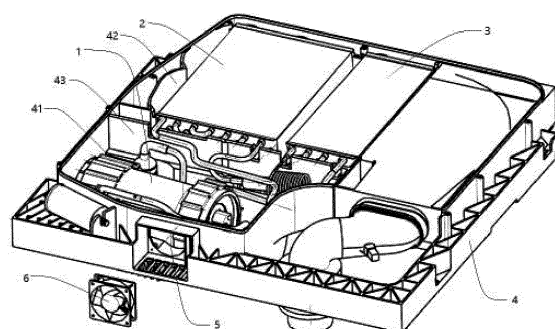


Fig. 1

Description

FIELD

[0001] The present invention relates to a technical field of household appliances, and more particularly to a heat pump module for a laundry treatment device and the laundry treatment device.

BACKGROUND

[0002] A washer-dryer is an intelligent novel washing machine, provided with an additional drying function based on an automatic washing machine, and thus combining many functions, such as washing, spinning and drying, into a single machine in one. The washer-dryer may have two types, namely, an air-vented washer-dryer and a condensation-based washer-dryer. The air-vented washer-dryer works in such a principle that air is heated by a heater to heat clothes and then becomes wet hot air to be exhausted, thereby carrying away moisture in the clothes in such a circulation and achieving a purpose of drying the clothes. The condensation-based washer-dryer works in such a principle that air enters a drum to heat clothes after heated by a heater, the drum is filled with wet hot air which is condensed into water by a condensation system and then collected in a water storage box, and hence moisture in the clothes is taken away in such a circulation, so as to achieve a purpose of drying the clothes.

[0003] A heat pump washer-dryer belongs to the condensation-based washer-dryer, in which installation space for a cooling fan of a compressor is very limited due to a space problem.

SUMMARY

[0004] The present invention aims to solve at least one of the problems existing in the related art. Thus, embodiments of the present invention provide a heat pump module for a laundry treatment device that has advantages of simple structure and excellent performance.

[0005] Embodiments of the present invention further provide a laundry treatment device having the heat pump module.

[0006] According to the embodiments of the present invention, the heat pump module includes a compressor having an air exhaust port and an air suction port; a condenser having a first end in communication with the air exhaust port; an evaporator having a first end in communication with a second end of the condenser, and a second end in communication with the air suction port; a casing having an accommodating chamber provided with a partition plate to divide the accommodating chamber into a first mounting chamber and a second mounting chamber, wherein the compressor is disposed within the first mounting chamber, and the evaporator and the condenser are disposed within the second mounting cham-

ber; and a cooling air passage having an air outlet end in communication with the first mounting chamber, and an air inlet end in communication with the outside.

[0007] For the heat pump module according to the embodiments of the present invention, the first mounting chamber is in communication with the outside by providing the cooling air passage, such that the compressor may exchange heat with the outside, thereby improving performance of the compressor, optimizing layout of various components in the heat pump module and saving installation space.

[0008] According to an embodiment of the present invention, a cooling fan is provided in the cooling air passage.

[0009] According to an embodiment of the present invention, the cooling fan is embedded in a side wall of the casing configured for the first mounting chamber.

[0010] According to an embodiment of the present invention, the cooling fan is embedded in the side wall of the casing opposite the partition plate.

[0011] According to an embodiment of the present invention, the air inlet end is disposed in a bottom wall of the cooling air passage.

[0012] According to an embodiment of the present invention, the air inlet end is configured as an air inlet grille.

[0013] According to an embodiment of the present invention, the air outlet end is opposite the compressor.

[0014] According to an embodiment of the present invention, the partition plate is provided with a clearance notch running through the first mounting chamber and the second mounting chamber.

[0015] According to an embodiment of the present invention, the casing includes: a top cover; and a base defining the accommodating chamber together with the top cover, and connected with the top cover by way of snapping.

[0016] The laundry treatment device according to the embodiments of the present invention includes: a housing provided with an opening; a drum assembly disposed in the housing and having an open end opposite the opening; and the heat pump module for the laundry treatment device, in which the casing of the heat pump module is disposed on the housing and the air inlet end of the cooling air passage is in communication with an exterior of the housing.

[0017] For the laundry treatment device according to the embodiments of the present invention, the first mounting chamber is in communication with the outside by providing the cooling air passage, such that the compressor may exchange heat with the outside, thereby improving performance of the compressor, optimizing layout of various components in the heat pump module and saving installation space.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] These and/or additional aspects and advantages of embodiments of the present invention will become

apparent and more readily appreciated from the following descriptions made with reference to the drawings, in which:

Fig. 1 is a schematic view of a heat pump module for a laundry treatment device according to an embodiment of the present invention;

Fig. 2 is a top view of the heat pump module according to the embodiment of the present invention;

Fig. 3 is a front view of the heat pump module according to the embodiment of the present invention.

[0019] Reference numerals:

compressor 1,
condenser 2, evaporator 3,
casing 4, first mounting chamber 41, second mounting chamber 42, partition plate 43, cooling air passage 5, cooling fan 6.

DETAILED DESCRIPTION

[0020] Embodiments of the present invention will be described in detail and examples of the embodiments will be illustrated in the drawings. The embodiments described herein with reference to drawings are explanatory, which are used to illustrate the present invention, but should not be construed to limit the present invention.

[0021] In the following, a heat pump module for a laundry treatment device according to embodiments of the present invention will be described with reference to Figs. 1 to 3.

[0022] As shown in Figs. 1 to 3, the heat pump module according to the embodiments of the present invention includes a compressor 1, a condenser 2, an evaporator 3, a casing 4 and a cooling air passage 5.

[0023] Specifically, the casing 4 has an accommodating chamber provided with a partition plate to divide the accommodating chamber into a first mounting chamber 41 and a second mounting chamber 42, the compressor 1 is disposed within the first mounting chamber 41, and the condenser 2 and the evaporator 3 are disposed within the second mounting chamber 42. The compressor 1 has an air exhaust port and an air suction port; the condenser 2 has a first end in communication with the air exhaust port; the evaporator 3 has a first end in communication with a second end of the condenser 2, and a second end in communication with the air suction port. The cooling air passage 5 has an air outlet end in communication with the first mounting chamber 41, and an air inlet end in communication with the outside. Accordingly, the cooling air passage 5 is utilized to cool down the compressor 1. It should be noted that the term "the outside" may be interpreted broadly - referring to a cabinet space for accommodating the heat pump module or an indoor environment.

[0024] For the heat pump module according to the present invention, the first mounting chamber 41 is in

communication with the outside by providing the cooling air passage 5, such that the compressor 1 may exchange heat with the outside, thereby improving performance of the compressor, optimizing layout of various components in the heat pump module and saving installation space.

[0025] According to some embodiments of the present invention, as shown in Figs. 1 and 3, a cooling fan 6 is provided in the cooling air passage 5 to accelerate an air flow speed in the cooling air passage 5, so as to improve heat exchange efficiency between the compressor 1 and an air flow in the first mounting chamber 41. In some examples of the present invention, the cooling fan 6 is embedded in a side wall of the first mounting chamber 41 of the casing 4 opposite the partition plate, so as to optimize the layout of various components in the heat pump module and save the installation space of the cooling fan 6.

[0026] According to some embodiments of the present invention, as shown in Figs. 1 and 2, the air outlet end is opposite the compressor 1, so as to enhance a cooling effect on the compressor 1 to improve a compression performance of the compressor, and save the installation space.

[0027] According to an embodiment of the present invention, the air inlet end of the cooling passage 5 is disposed in a bottom wall of the cooling air passage 5 to facilitate the flow of outside air into the cooling air passage 5 through the air inlet end. It should be noted that the air inlet end of the cooling air passage 5 may be located outside a housing of the laundry treatment device when mounted onto the housing, in order to improve smoothness of the air flow in the cooling air passage 5. Further, the air inlet end is configured as an air inlet grille to prevent foreign matters from entering the heat pump module.

[0028] According to an embodiment of the present invention, as shown in Figs. 1 and 2, the partition plate 43 is provided with a clearance notch running through the first mounting chamber 41 and the second mounting chamber 42. Thus, the air flow that enters the first mounting chamber 41 from the cooling air passage 5 may enter the second mounting chamber 42 via the clearance notch, so as to improve the cooling effect on the compressor 1.

[0029] According to an embodiment of the present invention, the casing 4 includes: a top cover and a base. The base and the top cover together define the accommodating chamber, and are connected with each other by way of snapping, so as to simplify an assembling process of the base and the top cover, shorten an assembling period and improve an assembling efficiency.

[0030] The heat pump module according to a specific embodiment of the present invention will be described in detail with reference to Figs. 1 to 3. It should be appreciated that the following description is only explanatory and should not be construed to limit the present invention.

[0031] As shown in Fig. 1, the heat pump module includes the compressor 1, the condenser 2, the evapora-

tor 3, the casing 4 and the cooling air passage 5.

[0032] Specifically, the casing 4 includes the top cover and the base. The base and the top cover together define the accommodating chamber, and are connected with each other by way of snapping, which is simple in structure and convenient to assemble. The casing 4 has the accommodating chamber provided with the partition plate 43 to divide the accommodating chamber into the first mounting chamber 41 and the second mounting chamber 42, the compressor 1 is disposed within the first mounting chamber 41, and the condenser 2 and the evaporator 3 are disposed within the second mounting chamber 42. The compressor 1 has the air exhaust port and the air suction port; the condenser 2 has the first end in communication with the air exhaust port; the evaporator 3 has the first end in communication with the second end of the condenser 2, and the second end in communication with the air suction port. In such a way, a circulation system of the heat pump module is constructed.

[0033] The cooling air passage 5 has the air outlet end in communication with the first mounting chamber 41, and the air inlet end in communication with the outside. The cooling air passage is provided with the cooling fan 6 that is embedded in a side wall of the casing 4 configured for the first mounting chamber 41 and opposite the partition plate 43. The air inlet end is disposed in the bottom wall of the cooling air passage, and further configured as the air inlet grille (as shown in Figs. 1 and 2) to prevent foreign matters from entering the heat pump module; the air outlet end is opposite the compressor 1. The outside air enters the heat pump module through the cooling fan 6 to cool down the compressor 1.

[0034] Further, the partition plate is provided with the clearance notch running through the first mounting chamber 41 and the second mounting chamber 42. Thus, it is possible to realize heat circulation in the whole heat pump module when the cooling fan 6 is working, so as to improve the cooling effect.

[0035] A laundry treatment device according to embodiments of the present invention includes: a housing, a drum assembly and the heat pump module according to the above embodiments.

[0036] Specifically, the housing is provided with an opening; the drum assembly is disposed in the housing and has an open end opposite the opening; the heat pump module is used for the laundry treatment device; and the casing of the heat pump module is disposed on the housing.

[0037] For the laundry treatment device according to the embodiments of the present invention, the first mounting chamber 41 is in communication with the outside by providing the cooling air passage, such that the compressor 1 may exchange heat with the outside, thereby improving performance of the compressor, optimizing layout of various components in the heat pump module and saving installation space.

[0038] In an embodiment of the present invention, the opening is provided in a front side of the housing; the

drum assembly is disposed in the housing and has a front end configured as the open end; the open end of the drum assembly is opposite the opening; and the heat pump module is disposed in the housing and located at the top of the housing. Preferably, the heat pump module is configured as a top wall of the housing.

[0039] In the specification, it is to be understood that terms such as "upper," "top," "bottom," "inner," and "outer" should be construed to refer to the orientation as then described or as shown in the drawings under discussion. These relative terms are for convenience of description and do not require that the present invention be constructed or operated in a particular orientation.

[0040] In addition, terms such as "first" and "second" are used herein for purposes of description and are not intended to indicate or imply relative importance or significance or to imply the number of indicated technical features. Thus, the feature defined with "first" and "second" may comprise one or more of this feature. In the description of the present invention, "a plurality of" means two or more than two, unless specified otherwise.

[0041] In the present invention, unless specified or limited otherwise, the terms "mounted," "connected," "coupled," "fixed" and the like are used broadly, and may be, for example, fixed connections, detachable connections, or integral connections; may also be mechanical or electrical connections; may also be direct connections or indirect connections via intervening structures; may also be inner communications of two elements, which can be understood by those skilled in the art according to specific situations.

[0042] Reference throughout this specification to "an embodiment," "some embodiments," "an example," "specific examples," or "some examples" means that a particular feature, structure, material, or characteristic described in connection with the embodiment or example is included in at least one embodiment or example of the present invention. Thus, the appearances of the above phrases throughout this specification are not necessarily referring to the same embodiment or example of the present invention. Furthermore, the particular features, structures, materials, or characteristics may be combined in any suitable manner in one or more embodiments or examples. Those skilled in the art can integrate and combine different embodiments or examples and the features in different embodiments or examples in the specification.

[0043] Although embodiments of the present invention have been shown and illustrated, it should be understood by those skilled in the art that various changes, modifications, alternatives and variants without departing from the principle and spirit of the present invention are acceptable. The scope of the present invention is defined by the claims or the like.

Claims

1. A heat pump module for a laundry treatment device, comprising:

a compressor (1) having an air exhaust port and an air suction port; 5
 a condenser (2) having a first end in communication with the air exhaust port; 10
 an evaporator (3) having a first end in communication with a second end of the condenser (2), and a second end in communication with the air suction port; 15
 a casing (4) having an accommodating chamber provided with a partition plate (43) to divide the accommodating chamber into a first mounting chamber (41) and a second mounting chamber (42), wherein the compressor (1) is disposed within the first mounting chamber (41), and the evaporator (3) and the condenser (2) are disposed within the second mounting chamber (42); and 20
 a cooling air passage (5) having an air outlet end in communication with the first mounting chamber (41), and an air inlet end in communication with the outside. 25

2. The heat pump module according to claim 1, wherein a cooling fan (6) is provided in the cooling air passage (5). 30
3. The heat pump module according to claim 2, wherein the cooling fan (6) is embedded in a side wall of the casing (4) configured for the first mounting chamber (41). 35
4. The heat pump module according to claim 3, wherein the cooling fan (6) is embedded in the side wall of the casing (4) opposite the partition plate (43). 40
5. The heat pump module according to claim 1, wherein the air inlet end is disposed in a bottom wall of the cooling air passage (5).
6. The heat pump module according to claim 5, wherein the air inlet end is configured as an air inlet grille. 45
7. The heat pump module according to claim 1, wherein the air outlet end is opposite the compressor (1). 50
8. The heat pump module according to claim 1, wherein the partition plate (43) is provided with a clearance notch running through the first mounting chamber (41) and the second mounting chamber (42). 55
9. The heat pump module according to claim 1, wherein the casing (4) comprises:

a top cover; and
 a base defining the accommodating chamber together with the top cover, and connected with the top cover by way of snapping.

10. A laundry treatment device, comprising:

a housing provided with an opening;
 a drum assembly disposed in the housing and having an open end opposite the opening; and
 a heat pump module according to any one of claims 1 to 9, wherein the casing (4) of the heat pump module is disposed on the housing and the air inlet end of the cooling air passage (5) is in communication with an exterior of the housing.

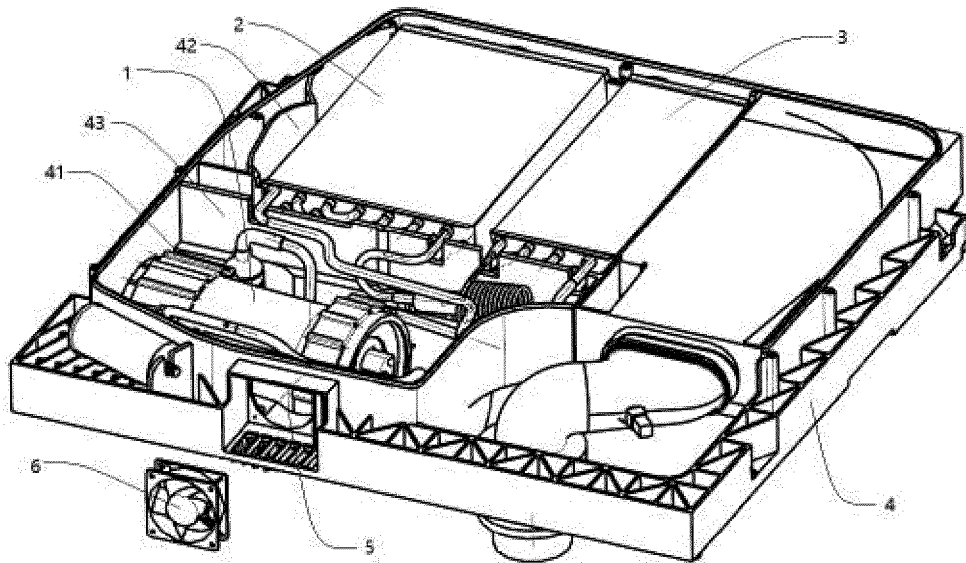


Fig. 1

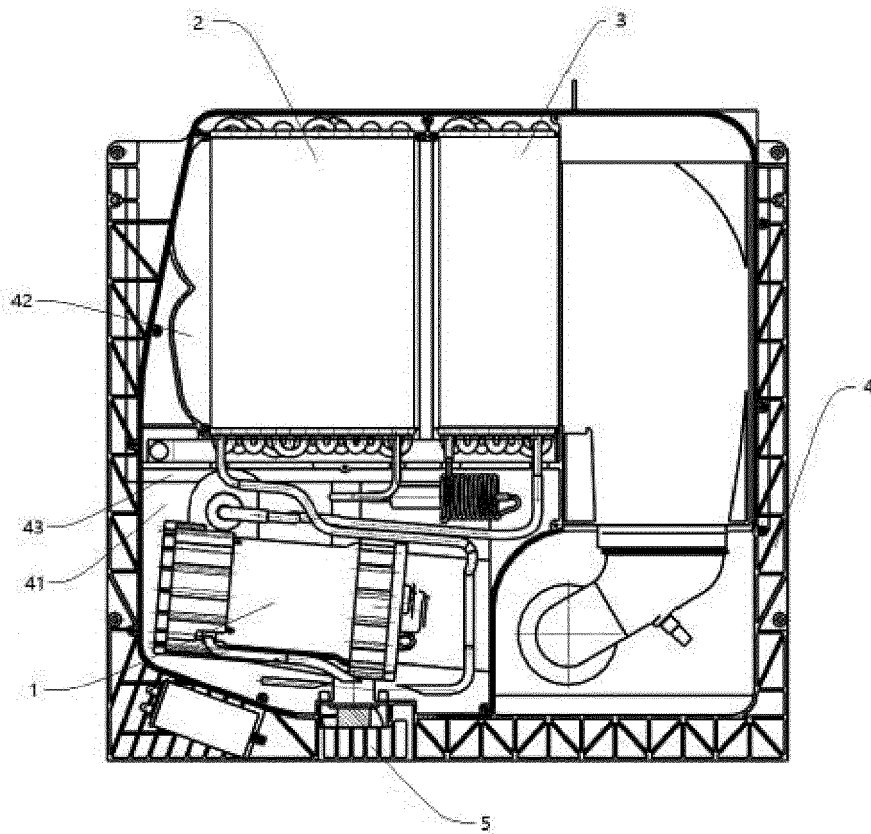


Fig. 2

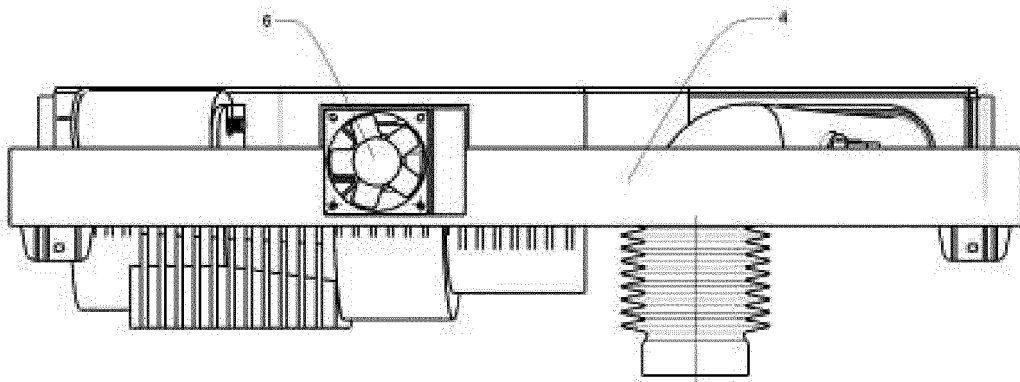


Fig. 3



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Application Number
EP 17 15 0089

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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