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(54) **WASHER-DRYER**

(57) The present disclosure discloses a washer-dryer. The washer-dryer includes a cabinet (10) having an air supplement port (11); an inner drum rotatably disposed in the cabinet (10), defining a containing chamber therein, and having an air outlet (52) communicating with the containing chamber; a heat pump (20, 2) disposed to the cabinet (10) and close to the air supplement port (11); a first heat exchanger (30) and a second heat exchanger (40), wherein the first heat exchanger (30) has a first end communicating with a first end of the heat pump (20, 2) and a second end communicating with a first end of the second heat exchanger (40), and a second end of the second heat exchanger (40) communicates with a second end of the heat pump (20, 2), the first heat

exchanger (30) and an internal wall face of the cabinet (10) define a condensation channel therebetween, the second heat exchanger (40) and the internal wall face of the cabinet (10) define a hot air channel therebetween, and the condensation channel communicates with the air outlet (52) and the hot air channel; and a fan (50) disposed in the cabinet (10) to blow hot air in the hot air channel and around the heat pump (20, 2) into the containing chamber. In the washer-dryer according to embodiments of the present disclosure, a temperature of air around the heat pump (20, 2) can be reduced to dissipate heat, and a temperature of supplemented air can be raised to further raise a drying efficiency of the washer-dryer.

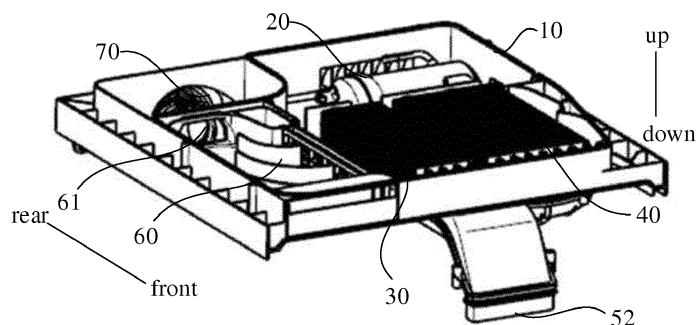


Fig. 1

Description

FIELD

[0001] The present disclosure relates to a field of a washing machine, and more particularly to a washer-dryer.

BACKGROUND

[0002] To solve a heating problem of a compressor of a heat-pump-drying product in the related art, a cooling fan is added in most cases to generate airflow around the compressor, to enhance a rate of heat exchange, thereby effectively cooling the compressor and preventing the compressor from shutting down. However, a product adopting the above manner needs an additional cooling fan and a corresponding control unit, which means a lot of components in the product, resulting in a high cost and more assembling processes.

SUMMARY

[0003] The present disclosure seeks to solve at least one of the problems existing in the related art to at least some extent. Accordingly, the present disclosure provides a washer-dryer with a simple structure, a high heat exchange efficiency and a high drying efficiency.

[0004] The washer-dryer according to an embodiment of the present disclosure includes: a cabinet having an air supplement port; an inner drum rotatably disposed in the cabinet, defining a containing chamber therein, and having an air outlet communicating with the containing chamber; a heat pump disposed to the cabinet and close to the air supplement port; a first heat exchanger and a second heat exchanger, in which the first heat exchanger has a first end communicating with a first end of the heat pump and a second end communicating with a first end of the second heat exchanger, and a second end of the second heat exchanger communicates with a second end of the heat pump, the first heat exchanger and an internal wall face of the cabinet define a condensation channel therebetween, the second heat exchanger and the internal wall face of the cabinet define a hot air channel therebetween, and the condensation channel communicates with the air outlet and the hot air channel; and a fan disposed in the cabinet to blow hot air in the hot air channel and around the heat pump into the containing chamber.

[0005] In the washer-dryer according to the embodiments of the present disclosure, air entering from the air supplement port can take heat surrounding the heat pump away by disposing the air supplement port in the cabinet, thus reducing a temperature of the air around the heat pump, cooling the heat pump and raising a work efficiency of the heat pump. Moreover, the heat around the heat pump can enter the hot air channel to supplement heat for a drying system, to raise a temperature of

supplemented air, fully utilize heat generated by the heat pump during its work and greatly raise a work efficiency of the second heat exchanger, so as to further raise a drying efficiency of the washer-dryer. The washer-dryer has a simple and compact structure, a high working efficiency and a high drying efficiency.

[0006] In addition the washer-dryer according to embodiments of the present disclosure further has the following additional features:

[0007] According to an embodiment of the present disclosure, the cabinet has a heat pump mounting chamber used for mounting the heat pump, and the heat pump mounting chamber communicates with the air supplement port and the hot air channel.

[0008] According to an embodiment of the present disclosure, the fan has an air inlet and an air outlet, the air inlet communicates with the hot air channel, and the air outlet communicates with the containing chamber.

[0009] According to an embodiment of the present disclosure, the fan is disposed below the second heat exchanger, and the air inlet is located right under the second heat exchanger.

[0010] According to an embodiment of the present disclosure, the washer-dryer further includes a filter, and the filter is disposed between the air outlet and the first heat exchanger to filter air entering the condensation channel.

[0011] According to an embodiment of the present disclosure, the filter has an inlet and an outlet, the inlet communicates with the air outlet, and the outlet communicates with the condensation channel.

[0012] According to an embodiment of the present disclosure, the washer-dryer further includes a vent pipe, and the vent pipe has two ends respectively communicating with the inlet and the air outlet.

[0013] According to an embodiment of the present disclosure, the heat pump mounting chamber is disposed close to and spaced apart from the hot air channel.

[0014] Additional aspects and advantages of embodiments of present disclosure will be given in part in the following descriptions, become apparent in part from the following descriptions, or be learned from the practice of the embodiments of the present disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015]

Fig. 1 is a partially assembling view of a washer-dryer according to an embodiment of the present disclosure;

Fig. 2 is a top view of the washer-dryer shown in Fig. 1.

Reference numerals:

[0016]

cabinet 10; air supplement port 11; heat pump mounting chamber 12;
 heat pump 20;
 first heat exchanger 30;
 second heat exchanger 40;
 fan 50; air inlet 51; air outlet 52;
 filter 60; inlet 61; outlet 62;
 vent pipe 70.

DETAILED DESCRIPTION

[0017] 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 shall not be construed to limit the present invention.

[0018] In the following, a washer-dryer according to embodiments of the present invention will be described with reference to Figs. 1 and 2.

[0019] As shown in Fig. 1 and Fig. 2, the washer-dryer according to the embodiments of the present invention includes a cabinet 10, an inner drum (not shown), a heat pump 20, a first heat exchanger 30, a second heat exchanger 40 and a fan 50. Specifically, the cabinet 10 has an air supplement port 11; the inner drum is rotatably disposed in the cabinet 10, defines a containing chamber (not shown) therein, and has an air outlet (not shown) communicating with the containing chamber; the heat pump 20 is disposed to the cabinet 10 and close to the air supplement port 11; the first heat exchanger 30 has a first end communicating with a first end of the heat pump 20 and a second end communicating with a first end of the second heat exchanger 40, and a second end of the second heat exchanger 40 communicates with a second end of the heat pump 20; the first heat exchanger 30 and an internal wall face of the cabinet 10 define a condensation channel (not shown) therebetween, the second heat exchanger 40 and the internal wall face of the cabinet 10 define a hot air channel (not shown) therebetween, and the condensation channel communicates with the air outlet of the inner drum and the hot air channel; and the fan 50 is disposed in the cabinet 10 to blow hot air in the hot air channel and around the heat pump 20 into the containing chamber.

[0020] In other words, the washer-dryer is mainly composed of the cabinet 10, an outer drum (not shown), the inner drum, the heat pump 20, the first heat exchanger 30, the second heat exchanger 40 and the fan 50. The cabinet 10 extends along a vertical direction (an up-down direction shown in Fig. 1), and the outer drum is fixed in the cabinet 10. The inner drum is rotatably disposed in the outer drum, and an external circumferential wall of the inner drum is spaced apart from an internal circumferential wall of the outer drum. The inner drum defines the containing chamber for containing clothes. The inner drum has an air inlet (not shown) and the air outlet, both of which communicate with the containing chamber. Op-

tionally, axes of the outer drum and the inner drum respectively extend along a front-back direction, that is, the inner drum has an opening towards a front side.

[0021] Further, the heat pump 20, the first heat exchanger 30 and the second heat exchanger 40 are fixedly disposed in the cabinet 10, the first end and the second end of the heat pump 20 communicate with the first end of the first heat exchanger 30 and the second end of the second heat exchanger 40 respectively, and the second end of the first heat exchanger 30 communicates with the first end of the second heat exchanger 40. Therefore, the heat pump 20, the first heat exchanger 30 and the second heat exchanger 40 form a circulation path for a refrigerant. The cabinet 10 is provided with the air supplement port 11, and the air supplement port 11 communicates with air around the heat pump 20. The first heat exchanger 30 and the cabinet 10 define the condensation channel therebetween, and the condensation channel communicates with the air outlet of the inner drum. The second heat exchanger 40 and the cabinet 10 define the hot air channel, and the hot air channel communicates with the condensation channel. Therefore, an air circulation path is formed.

[0022] The fan 50 is disposed in the cabinet 10. Optionally, the fan 50 is disposed close to the hot air channel. When the washer-dryer operates a drying procedure, wet air in the inner drum enters the condensation channel, dry air is generated after condensation and then enters the hot air channel, and high-temperature dry air is obtained after being heated by the second heat exchanger. The heat pump 20 generates a lot of heat during its work, air entering from the air supplement port takes away the heat around the heat pump 20 and enters the hot air channel. High-temperature air in two parts enters the fan 50 under a suction effect of the fan 50, and enters the inner drum to dry the clothes in the inner drum, resulting in a gradually increased humidity of the air, and the air is discharged from the air outlet, and so on.

[0023] Accordingly, in the washer-dryer according to the embodiments of the present disclosure, the air entering from the air supplement port can take the heat around the heat pump away by disposing the air supplement port 11 in the cabinet 10, thus reducing a temperature of the air around the heat pump 20, cooling the heat pump 20 and raising a work efficiency of the heat pump 20. Moreover, the heat around the heat pump 20 can enter the hot air channel to supplement heat for a drying system, to raise a temperature of supplemented air, fully utilize the heat generated by the heat pump during its work, and greatly raise a work efficiency of the second heat exchanger 40, so as to further raise a drying efficiency of the washer-dryer. The washer-dryer has a simple and compact structure, a high working efficiency and a high drying efficiency.

[0024] According to an embodiment of the present disclosure, the cabinet 10 has a heat pump mounting chamber 12 used for mounting the heat pump 20, and the heat pump mounting chamber 12 communicates with the air

supplement port 11 and the hot air channel.

[0025] Specifically, as shown in Fig. 2, a side wall of the cabinet 10 and a separating board (not shown) in the cabinet 10 define the heat pump mounting chamber 12 therebetween used for mounting the heat pump 20. The side wall of the cabinet 10 is provided with the air supplement port 11 communicating with the heat pump mounting chamber 12. The heat pump 20 can generate a great amount of heat during its work, and the air entering from the air supplement port 11 takes the heat around the heat pump 20 away under the suction effect of the fan 50 and then enters the hot air channel to supplement drying hot air needed by the clothes in the inner drum and to cool the heat pump 20 at the same time, which raises the efficiency of the heat pump 20 and effectively utilize the heat around the heat pump 2.

[0026] Accordingly, through a flow guidance structure, the washer-dryer makes ambient air pass through a surface of the heat pump 20 and then enter the hot air channel, thus accomplishing air movement around the heat pump 20 without a cooling fan, enhancing a heat exchange efficiency at the surface of the heat pump 20 and facilitating cooling the heat pump 20. An additional cooling fan is needless, which reduces a part count, simplifies an assembling process, saves a cost and simplifies a control panel. At the same time, the air entering from the air supplement port 11 absorbs the heat from the heat pump 20, thereby raising its temperature. Compared with a conventional heat pump system in which supplemented air has an ambient temperature, the washer-dryer has an air supplement structure which is capable of adding dry supplemented air of a higher temperature to an outer circulation of the heat pump system, thus further facilitating a drying efficiency of a product.

[0027] Further, the fan 50 has the air inlet 51 and the air outlet 52, the air inlet 51 communicates with the hot air channel, and the air outlet 52 communicates with the containing chamber. In other words, the hot air in the hot air channel enters the fan 50 from the air inlet 51 of the fan 50 under the suction effect of the fan 50, and then is exhausted into the inner drum from the air outlet 52 of the fan 50. Accordingly, the fan 50 disposed in the cabinet 10 can drive air to flow and change a direction of airflow.

[0028] Specifically, as shown in Fig. 2, the fan 50 is disposed below the second heat exchanger 40, and the air inlet 51 is located right under the second heat exchanger 40. Accordingly, the fan 50 is disposed below the second heat exchanger 40, and the air inlet 51 of the fan 50 right corresponds to the second heat exchanger 40, thereby reducing a travel path of the hot air, and effectively transporting the hot air in the hot air channel into the inner drum by the fan 50.

[0029] Advantageously, the washer-dryer further includes a filter 60, and the filter 60 is disposed between the air outlet of the inner drum and the first heat exchanger 30 to filter air entering the condensation channel.

[0030] That is the washer-dryer is mainly composed of the cabinet 10, the outer drum, the inner drum, the heat

pump 20, the first heat exchanger 30, the second heat exchanger 40, the fan 50 and the filter 60. The filter 60 is located between the air outlet of the inner drum and the condensation channel, i.e. between the air outlet of the inner drum and the condensation channel in an air intake direction, to filter out and prevent flocks of the clothes from entering the condensation channel and the hot air channel, and to avoid influence on the heat exchange efficiencies of the first heat exchanger 30 and the second heat exchanger 40.

[0031] According to an embodiment of the present disclosure, the filter 60 has an inlet 61 and an outlet 62, the inlet 61 communicates with the air outlet of the inner drum, and the outlet communicates with the condensation channel.

[0032] Specifically, the filter 60 has the inlet 61 and the outlet 62, the inlet 61 communicates with the air outlet of the inner drum, and the outlet 62 communicates with the condensation channel. The filter 60 is further provided with a filtering member therein to filter air before the air enters the condensation channel, so as to filter out the flocks of the clothes.

[0033] In addition, according to an embodiment of the present disclosure, the washer-dryer further comprises a vent pipe 70, and the vent pipe 70 has two ends respectively communicating with the inlet 61 and the air outlet of the inner drum.

[0034] In other words, the washer-dryer is mainly composed of the cabinet 10, the outer drum, the inner drum, the heat pump 20, the first heat exchanger 30, the second heat exchanger 40, the fan 50, the filter 60, and the vent pipe 70. As shown in Fig. 2, the vent pipe 70 has a first end communicating with the air outlet of the inner drum and a second end communicating with the inlet 61 of the filter 60, so as to transmit air. Optionally, the vent pipe 70 may be configured as a thermoplastic pipe which has high reliability and long service life.

[0035] Preferably, according to an embodiment of the present disclosure, the heat pump mounting chamber 12 is close to and spaced apart from the hot air channel. Specifically, as shown in Fig. 1 and Fig. 2, in the embodiment, the heat pump 20, the first heat exchanger 30, the second heat exchanger 40, the fan 50, the filter 60, and the vent pipe 70 all are arranged above the inner drum and the outer drum. Optionally, the cabinet 10 has a rectangular section and provided with a horizontally disposed mounting board (not shown) therein, and all of the heat pump 20, the first heat exchanger 30, the second heat exchanger 40, the fan 50 and the filter 60 are disposed on the mounting board.

[0036] A rear side wall and a right side wall of the cabinet 10, the mounting board and the separating board define the heat pump mounting chamber 12, and the right side wall and a front side wall of the cabinet 10, the mounting board and the separating board define the condensation channel and the hot air channel which are spaced apart. That is, the heat pump 20 is disposed on the mounting board and located at a right rear position of the mount-

ing board, the first heat exchanger 30 and the second heat exchanger 40 are disposed on the mounting board and located at a right front position of the mounting board, the filter 60 is disposed on the mounting board and located at a left front position of the mounting board, at least a portion of the vent pipe 70 is disposed on the mounting board and located at a left rear position of the mounting board, and the fan 50 is disposed under the first heat exchanger 30 and the second heat exchanger 40.

[0037] Accordingly, the washer-dryer is simple and compact in structure, convenient to mount and dismount. Through the flow guidance structure, the washer-dryer makes ambient air enter the heat pump mounting chamber 12 from the air supplement 11 in the cabinet 10, and makes heat at the surface of and around the heat pump 20 taken into the hot air channel, thus accomplishing air movement around the heat pump 20 without a cooling fan, enhancing the heat exchange efficiency around the heat pump 20 and facilitating cooling the heat pump 20. At the same time, supplemented air having a high temperature enters the hot air channel with no need to be heated by the second heat exchanger 40, thus raising the work efficiency of the second heat exchanger 40 and raising the drying efficiency of the washer-dryer.

[0038] Other configurations and operation of the washer-dryer according to embodiments of the present disclosure are known for those skilled in the art, which will not be described in detail herein.

[0039] In the specification, it is to be understood that terms such as "central," "longitudinal," "transverse," "length," "width," "thickness," "upper," "lower," "front," "rear," "left," "right," "vertical," "horizontal," "top," "bottom," "inner," "outer," "clockwise," "counterclockwise," "axial," "radial," and "circumferential" 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 disclosure 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 include one or more of this feature. In the description of the present disclosure, "a plurality of" means at least two, e.g. two or three and etc., unless specified otherwise.

[0041] In the present disclosure, 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, or communicate with each other; may also be direct connections or indirect connections via intervening structures; may also be inner communications or interaction of two elements, which can be un-

derstood by those skilled in the art according to specific situations.

[0042] In the present disclosure, unless specified or limited otherwise, a structure in which a first feature is "on" or "below" a second feature may include an embodiment in which the first feature is in direct contact with the second feature, and may also include an embodiment in which the first feature and the second feature are not in direct contact with each other, but are contacted via an additional feature formed therebetween. Furthermore, a first feature "on," "above," or "on top of" a second feature may include an embodiment in which the first feature is right or obliquely "on," "above," or "on top of" the second feature, or just means that the first feature is at a height higher than that of the second feature; while a first feature "below," "under," or "on bottom of" a second feature may include an embodiment in which the first feature is right or obliquely "below," "under," or "on bottom of" the second feature, or just means that the first feature is at a height lower than that of the second feature.

[0043] Reference throughout this specification to "an embodiment," "some embodiments," "an example," "a specific example," 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 disclosure. Thus, the appearances of the phrases in various places throughout this specification are not necessarily referring to the same embodiment or example of the present disclosure. 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, in the condition without mutual contradiction.

[0044] Although explanatory embodiments have been shown and described, it would be appreciated by those skilled in the art that the above embodiments cannot be construed to limit the present disclosure, and changes, alternatives, and modifications can be made in the embodiments without departing from spirit, principles and scope of the present disclosure.

Claims

1. A washer-dryer comprising:

- a cabinet (10) having an air supplement port (11);
- an inner drum rotatably disposed in the cabinet (10), defining a containing chamber therein, and having an air outlet (52) communicating with the containing chamber;
- a heat pump (20) disposed to the cabinet (10) and close to the air supplement port (11);

- a first heat exchanger (30) and a second heat exchanger (40), wherein the first heat exchanger (30) has a first end communicating with a first end of the heat pump (20) and a second end communicating with a first end of the second heat exchanger (40), and a second end of the second heat exchanger (40) communicates with a second end of the heat pump (20), the first heat exchanger (30) and an internal wall face of the cabinet (10) define a condensation channel therebetween, the second heat exchanger (40) and the internal wall face of the cabinet (10) define a hot air channel therebetween, and the condensation channel communicates with the air outlet (52) and the hot air channel; and a fan (50) disposed in the cabinet (10) to blow hot air in the hot air channel and around the heat pump (20) into the containing chamber. 5 10 15
2. The washer-dryer according to claim 1, wherein the cabinet (10) has a heat pump mounting chamber (12) used for mounting the heat pump (20), and the heat pump mounting chamber (12) communicates with the air supplement port (11) and the hot air channel. 20 25
 3. The washer-dryer according to claim 2, wherein the fan (50) has an air inlet (51) and an air outlet (52), the air inlet (51) communicates with the hot air channel, and the air outlet (52) communicates with the containing chamber. 30
 4. The washer-dryer according to claim 3, wherein the fan (50) is disposed below the second heat exchanger (40), and the air inlet (51) is located right under the second heat exchanger (40). 35
 5. The washer-dryer according to claim 1, further comprising a filter (60) disposed between the air outlet (52) and the first heat exchanger (30) to filter (60) air entering the condensation channel. 40
 6. The washer-dryer according to claim 5, wherein the filter (60) has an inlet (61) and an outlet (62), the inlet (61) communicates with the air outlet (52), and the outlet (62) communicates with the condensation channel. 45
 7. The washer-dryer according to claim 6, further comprising a vent pipe (70), wherein the vent pipe (70) has two ends communicating with the inlet (61) and the air outlet (52) respectively. 50
 8. The washer-dryer according to claim 2, wherein the heat pump mounting chamber (12) is disposed close to and spaced apart from the hot air channel. 55

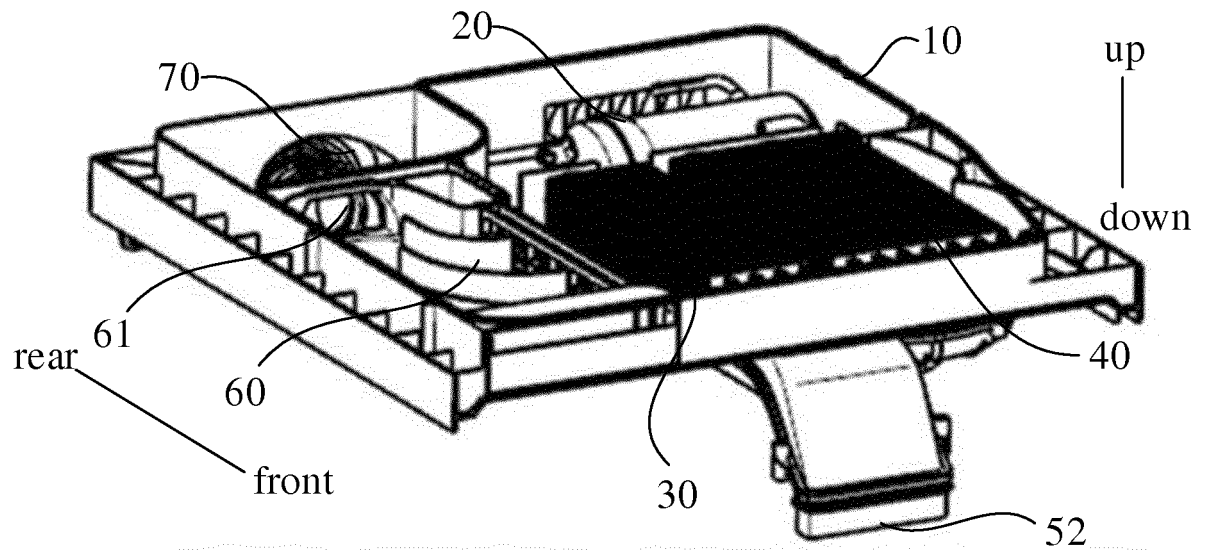


Fig. 1

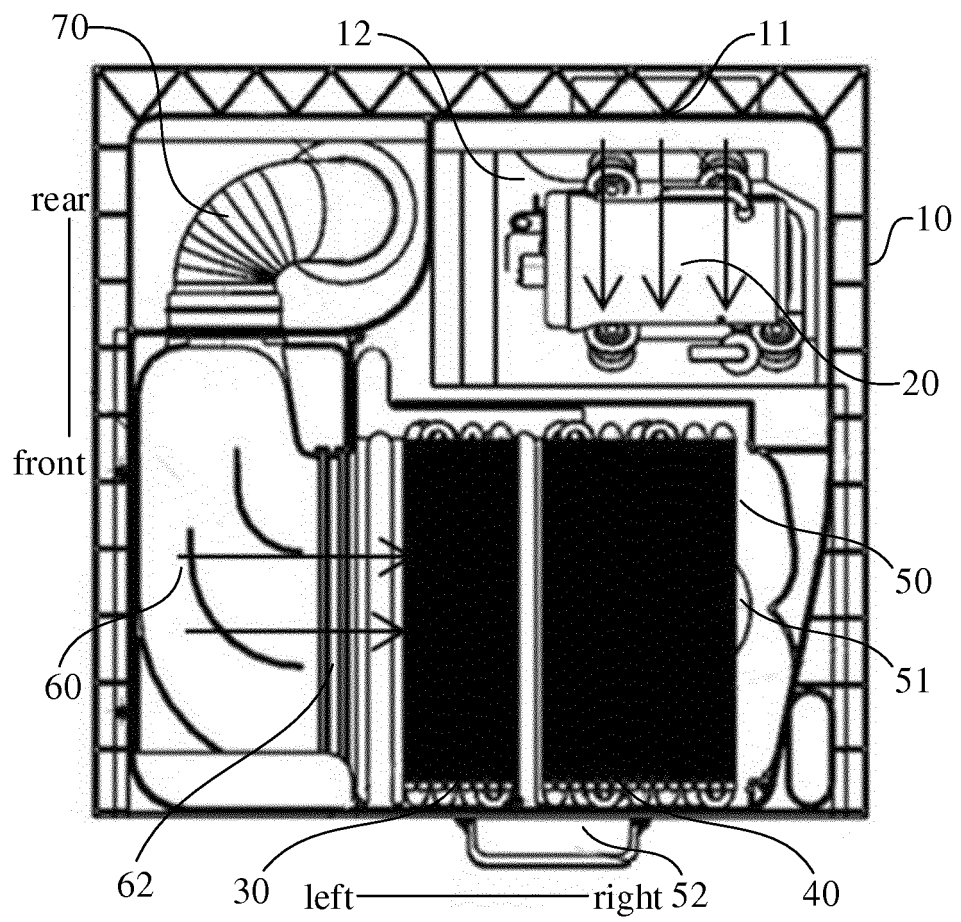


Fig. 2



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Application Number
EP 16 19 7011

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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 21 February 2017	Examiner Beckman, Anja
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 16 19 7011

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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