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(54) **LAUNDRY DEVICE COMPRISING A HEAT PUMP MODULE**

(57) Laundry device (100), wherein the laundry device (100) comprises: a drying chamber (101) for drying laundry; a heat pump module (103) comprising a condenser (107), an evaporator (109), a capillary element and a compressor (111), wherein the evaporator (109), the condenser (107), the capillary element, and the compressor (111) are fluidly connected by a cooling means circle, wherein the compressor (111) is adapted to circulate a cooling means in the cooling means circle in an activated state; and an air circulation circle with a first air channel (105-1), a second air channel (105-2) and a third air channel (105-3), wherein the first air channel (105-1) is adapted to feed air from the drying chamber (101) to the evaporator (109), wherein the evaporator (109) is configured to cool down the air provided from the first air channel (105-1), wherein the second air channel (105-2) is adapted to feed the cooled air from the evaporator (109) to the condenser (107), wherein the condenser (107) is configured to heat the air provided from the second air channel (105-2), wherein the third air channel (105-3) is adapted to feed the heated air from the condenser (107) to the drying chamber (101), wherein the heat pump module (103) comprises a flexible heat pump module air inlet (103-1), which is adapted to fluidly connect the first air channel (105-1) to the evaporator (109) and to reduce a transmission of vibrations of the activated compressor (111) via the first air channel (105-1); and/or wherein the heat pump module (103) comprises a flexible heat pump module air outlet (103-2), which is adapted to fluidly connect the third air channel (105-3) to the condenser (107) and to reduce a transmission of vibrations of the activated compressor (111) via the third air channel (105-3).

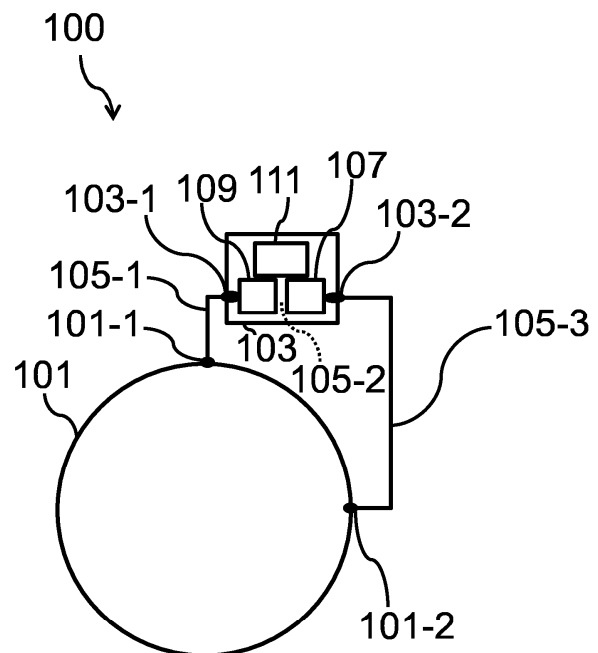


Fig. 1

Description

[0001] The present disclosure relates to a laundry device comprising a heat pump module, in particular to a dryer or washer-dryer comprising a heat pump module.

BACKGROUND

[0002] In conventional laundry devices, such as dryers or washer-dryers, heat pumps can be used, which typically comprise compressors, heat exchangers, capillary tubes or valves, and the interconnecting piping. A challenge in conventional laundry devices is addressing resonance-induced vibrations, originating from the compressor, which can lead to mechanical failures, including leaks and increased noise levels. Such resonance-induced vibrations can, for example, arise when the natural frequency of the piping aligns with excitation frequencies from the compressor.

SUMMARY

[0003] It is therefore an object of the present disclosure to provide a laundry device, in particular a dryer or washer-dryer, which allows using a compressor of a heat pump with reduced vibration generation.

[0004] This object is achieved by the features of the independent patent claim. Advantageous developments are the subject matter of the dependent claims, the description, and the appended figures.

[0005] According to an aspect, the present disclosure relates to laundry device, wherein the laundry device comprises: a drying chamber for drying laundry; a heat pump module comprising a condenser, an evaporator, a capillary element and a compressor, wherein the evaporator, the condenser, the capillary element, and the compressor are fluidly connected by a cooling means circle, wherein the compressor is adapted to circulate a cooling means in the cooling means circle in an activated state; and an air circulation circle with a first air channel, a second air channel and a third air channel, wherein the first air channel is adapted to feed air from the drying chamber to the evaporator, wherein the evaporator is configured to cool down the air provided from the first air channel, wherein the second air channel is adapted to feed the cooled air from the evaporator to the condenser, wherein the condenser is configured to heat the air provided from the second air channel, wherein the third air channel is adapted to feed the heated air from the condenser to the drying chamber, wherein the heat pump module comprises a flexible heat pump module air inlet, which is adapted to fluidly connect the first air channel to the evaporator and to reduce a transmission of vibrations of the activated compressor via the first air channel; and/or wherein the heat pump module comprises a flexible heat pump module air outlet, which is adapted to fluidly connect

the third air channel to the condenser and to reduce a transmission of vibrations of the activated compressor via the third air channel.

[0006] As a result, the first air channel and/or the third air channel may be prevented from transmitting vibrations of the activated compressor to other components, such as, for example, vibration-sensitive components like control units or sensors, of the laundry device, thereby achieving a reduction of noise, minimizing measurement inaccuracies, and increasing the lifespan of the components. Additionally, the reduced vibration transmission contributes to an improved overall system stability of the laundry device and a comfort of a user of the laundry device by lowering operational noise levels of the laundry device. Moreover, the compressor can be operated at frequencies, which induce resonance vibrations in conventional laundry devices, thereby allowing a more efficient control of the compressor.

[0007] The capillary element may comprise a capillary valve and/or a valve and/or a capillary pipe. The cooling means circle may further comprise a desiccant filter, which is adapted to absorb moisture and filter out contaminants of the cooling means.

[0008] The first air channel may comprise a pipe. The third air channel may comprise a pipe.

[0009] The laundry device according to the present disclosure in particular refers to a laundry device which is adapted to dry laundry, in particular by thereby removing or at least significantly reducing the amount of water attached to the laundry. In particular, the laundry device according to the present disclosure is a dryer, which is adapted to dry laundry. More particular, the laundry device according to the present disclosure is a heatpump tumble dryer.

[0010] According to an embodiment, the flexible heat pump module air inlet and/or the flexible heat pump module air outlet is made of an elastomer, in particular rubber.

[0011] As a result, a high flexibility, a high durability, and an effective vibration damping can be achieved.

[0012] According to an embodiment, the flexible heat pump module air inlet and/or the flexible heat pump module air outlet is formed as a tube with a rectangular cross section.

[0013] As a result, an optimized airflow and an effective dampening of vibrations by the four walls of the tube with the cross section can be achieved.

[0014] The flexible heat pump module air inlet and/or the flexible heat pump module air outlet could be also formed as a tube with circular, elliptical, or regular polygon of n sides where n is greater than or equal to three cross section.

[0015] According to an embodiment, the flexible heat pump module air inlet is formed as a compressible flexible heat pump module air inlet, in particular along an extension direction of the flexible heat pump module air inlet, wherein in particular the compressible flexible heat pump module air inlet is formed as a corrugated

flexible heat pump module air inlet; and/or the flexible heat pump module air outlet is formed as a compressible flexible heat pump module air outlet, in particular along an extension direction of the flexible heat pump module air outlet, wherein in particular the compressible flexible heat pump module air outlet is formed as a corrugated flexible heat pump module air outlet.

[0016] As a result, an advantageous vibration absorption, a reduction of material tension and improved mounting tolerance ranges of the first and third air channel can be achieved.

[0017] According to an embodiment, the flexible heat pump module air inlet and the evaporator have the same width and/or the same height; and/or the flexible heat pump module air outlet and the condenser have the same width and/or the same height.

[0018] As a result, an optimized air flow from the flexible heat pump module air inlet to the evaporator and/or from the condenser to the flexible heat pump module air outlet can be achieved. When the dimensions of the flexible heat pump module air inlet match those of the evaporator and/or when the dimensions of the flexible heat pump module air outlet match those of the condenser, abrupt changes in airflow patterns can be prevented, thereby preventing localized vibration hotspots. This also reduces the risk of amplifying vibrations of the compressor at specific frequencies, i.e. reduces the risk of resonance vibrations.

[0019] According to an embodiment, the evaporator comprises a first mounting recess formed in a cover plate of the evaporator, wherein the evaporator comprises a second mounting recess formed in a base plate of the evaporator, wherein the first and second mounting recesses are adapted to fix the flexible heat pump module air inlet to the evaporator in a form-fitting manner, wherein in particular side walls of the evaporator are free of mounting recesses; and/or the condenser comprises a third mounting recess formed in a cover plate of the condenser, wherein the condenser comprises a fourth mounting recess formed in a base plate of the condenser, wherein the third and fourth mounting recesses are adapted to fix the flexible heat pump module air outlet to the condenser in a form-fitting manner, wherein in particular side walls of the condenser are free of mounting recesses.

[0020] As a result, the flexible heat pump module air inlet can be advantageously connected to the evaporator and/or the flexible heat pump module air outlet can be advantageously connected to the condenser, such that a vibration reduction transmission by the respective connection can be reduced.

[0021] According to an embodiment, the heat pump module comprises a base plate, on which the compressor, the evaporator and the condenser are arranged, wherein the condenser and the evaporator are arranged of the base plate and wherein the compressor is arranged on an additional section of the base plate, wherein in particular the additional section of the base

plate is delimited by at least one recess of the base plate.

[0022] As a result, at least a part of the vibration of the compressor can be limited to the additional section of the base plate.

[0023] According to an embodiment, the heat pump module comprises a base plate, and wherein the compressor has a cylindrical form with a lateral surface and a base surface, wherein the base surface of the compressor is connected to the base plate, in particular an additional section of the base plate, and wherein the lateral surface of the compressor extends along a height direction of the heat pump module.

[0024] As a result, the compressor can be connected to the base plate at a surface, namely the base surface, of the compressor, which transmits fewer vibrations than other surfaces of the compressor, such as the lateral surface of the compressor.

[0025] As a result, the heat pump assembly also behaves like a rigid solid, reducing the stresses between the different parts caused by vibrations.

[0026] According to an embodiment, the heat pump module comprises a base plate, which comprises a water collection recess, in particular formed as one piece with the base plate or attached to the base plate, in particular at a rectangular section of the base plate, and wherein the evaporator is arranged above the water collection recess on the base plate.

[0027] As a result, water condensed at the evaporator during the operation of the heat pump module can be advantageously collected in the water collection recess.

[0028] According to an embodiment, the flexible heat pump module air inlet is arranged on a first side of the evaporator, wherein the evaporator comprises a second side opposite to the first side of the evaporator, wherein the flexible heat pump module air outlet is arranged on a first side of the condenser, wherein the condenser comprises a second side opposite to the first side of the condenser, wherein the second air channel is formed between the second sides of the evaporator and the condenser, wherein in particular the areas of the second sides of the evaporator and the condenser are congruent and aligned with each other.

[0029] As a result, the second air channel can be direct and relatively short compared to traditional implementations, which reduces the risk of vibration resonance at the second air channel.

[0030] According to an embodiment, the evaporator comprises an end face facing the compressor, wherein the end face of the evaporator comprises a cooling means connection terminal, wherein the cooling means connection terminal of the evaporator is adapted to connect the evaporator with the compressor via a pipe of the cooling means circle, wherein the condenser comprises a further end face facing the compressor, wherein the further end face of the condenser com-

prises a further cooling means connection terminal, wherein the further cooling means connection terminal of the condenser is adapted to connect the condenser with the compressor via a further pipe of the cooling means circle, wherein in particular the end face of the evaporator and the further end face of the condenser are arranged in one plane.

[0031] As a result, the pipe and the further pipe can be relatively short compared to traditional implementations, which reduces the risk of vibration resonance at the pipe and the further pipe and saves material. The pipe and/or the further pipe can be made out of copper, aluminum or steel. The cooling means connection terminal and/or the further cooling means connection terminal can be made out of copper, aluminum or steel, preferably copper.

[0032] According to an embodiment, the heat pump module comprises a base plate and a lower housing, wherein the base plate comprises a plurality of dampening elements made of an elastomer, in particular rubber, which is adapted to connect the base plate of the heat pump module to a bottom plate of the lower housing, wherein in particular a distance between two dampening elements of the plurality of dampening elements is smaller at a side of the base plate, in particular an additional section of the base plate, at which the compressor is arranged than a further distance between two further dampening elements of the plurality of dampening elements at an opposite side of the base plate, in particular a rectangular section of the base plate at which the evaporator and the condenser is arranged.

[0033] As a result, a vibration transmission between the compressor of the heat pump module and the lower housing of the heat pump module can be reduced.

[0034] The plurality of dampening elements are in particular a plurality of grommets.

[0035] According to an embodiment, the heat pump module comprises a lower housing and an upper housing, wherein the lower housing completely houses the condenser and the evaporator and a lower section of the compressor, wherein the upper housing houses an upper section of the compressor and covers the condenser and the evaporator, wherein the lower housing is removably connected to the upper housing.

[0036] As a result, the components of the heat pump module, in particular the condenser, the evaporator, and the compressor, can be easily accessed, for example in order to repair them.

[0037] According to an embodiment, the lower housing and the upper housing each comprise a recess which together form a cable opening, which is adapted to accommodate an electric cable for supplying the compressor with power, wherein in particular a dampening element is arranged in the cable opening, which is adapted to reduce a transmission of vibrations of the activated compressor via the electric cable.

[0038] As a result, the compressor can be provided

with power via the electric cable. Although electric cables are less prone to transmitting vibrations, the cable opening can be optionally further adapted to further reduce minor vibrations transmitted via the electric cable.

[0039] According to an embodiment, the compressor is arranged at a distance from the lower housing and the upper housing such that pipes of the cooling means circle, in particular a pipe of the cooling means circle connecting the evaporator with the compressor and/or a further pipe of the cooling means circle connecting the condenser with the compressor, are arrangeable inside the lower housing and the upper housing without contacting the lower housing and the upper housing.

[0040] As a result, vibrations of the pipe and the further pipe are prevented from being transmitted to the lower housing and the upper housing of the heat pump module.

BRIEF DESCRIPTION OF THE DRAWINGS

[0041] Further examples of the principles and techniques of that disclosure are explained in greater detail with reference to the appended drawings, in which:

Fig. 1 shows a schematic representation of a laundry device according to an embodiment;

Fig. 2 shows a perspective view of a heat pump module according to an embodiment of a laundry device according to Fig. 1 in a perspective view;

Fig. 3 shows a further perspective view of a heat pump module according to an embodiment of a laundry device according to Fig. 1 in a perspective view;

Figs. 4a and 4b show further perspective views of a heat pump module according to an embodiment of a laundry device according to Fig. 1 in a perspective view; and

Figs. 5a and 5b show further perspective views of a heat pump module according to an embodiment of a laundry device according to Fig. 1 in a perspective view.

DETAILED DESCRIPTION OF THE DRAWINGS

[0042] Fig. 1 shows a schematic representation of a laundry device 100 according to an embodiment.

[0043] The laundry device 100, which is only schematically shown in Fig. 1, comprises a schematically shown drying chamber 101 for drying laundry, which may be arranged in an interior space of the laundry device 100. During a drying program of the laundry device 100 for performing a laundry treatment process, wet laundry, which may be received in the drying cham-

ber 101, may be treated and afterwards the treated laundry may be taken out by the user from the drying chamber 101. During the drying program, the laundry may give off moisture to the air in the drying chamber 101.

[0044] As schematically shown in Fig. 1, the laundry device 100 comprises a heat pump module 103 comprising a condenser 107, an evaporator 109 and a compressor 111. Although not shown in Fig. 1, the heat pump module 103 further comprises a capillary element, such as a capillary valve and/or a capillary pipe.

[0045] The evaporator 109, the condenser 107, the capillary element, and the compressor 111 are fluidly connected by a cooling means circle. The compressor 111 is adapted to circulate a cooling means in the cooling means circle in an activated state.

[0046] As schematically shown in Fig. 1, the laundry device 100 comprises an air circulation circle with a first air channel 105-1, a second air channel 105-2 and a third air channel 105-3. The first air channel 105-1 is adapted to feed air from the drying chamber 101 to the evaporator 109. The first air channel 105-1 may be connected to the drying chamber 101 by a drying chamber air outlet 101-1.

[0047] The evaporator 109 is configured to cool down the air provided from the first air channel 105-1. The second air channel 105-2 is adapted to feed the cooled air from the evaporator 109 to the condenser 107. The condenser 107 is configured to heat the air provided from the second air channel 105-2. The third air channel 105-3 is adapted to feed the heated air from the condenser 107 to the drying chamber 101. The third air channel 105-3 may be connected to the drying chamber 101 by a drying chamber air inlet 101-2.

[0048] As schematically shown in Fig. 1, the heat pump module 103 comprises a flexible heat pump module air inlet 103-1, which is adapted to fluidly connect the first air channel 105-1 to the evaporator 109 and to reduce a transmission of vibrations of the activated compressor 111 via the first air channel 105-1. Additionally or alternatively, the heat pump module 103 comprises a flexible heat pump module air outlet 103-2, which is adapted to fluidly connect the third air channel 105-3 to the condenser 107 and to reduce a transmission of vibrations of the activated compressor 111 via the third air channel 105-3.

[0049] The flexible heat pump module air inlet 103-1 and/or the flexible heat pump module air outlet 103-2 may be made of an elastomer, in particular rubber.

[0050] Fig. 2 shows a perspective view of a heat pump module 103 according to an embodiment of a laundry device 100 according to Fig. 1 in a perspective view. The heat pump module 103 may be the heat pump module 103 of Fig. 1. As already described for Fig. 1, the heat pump module 103 comprises a condenser 107, an evaporator 109 and a compressor 111 as well as a flexible heat pump module air inlet 103-1 and/or a flexible heat pump module air outlet 103-2.

[0051] As schematically shown in Fig. 2, the flexible heat pump module air inlet 103-1 and/or the flexible heat pump module air outlet 103-2 may be formed as a tube with a rectangular cross section.

[0052] As schematically shown in Fig. 2, the flexible heat pump module air inlet 103-1 may be formed as a compressible flexible heat pump module air inlet 103-1, in particular along an extension direction 104-2 of the flexible heat pump module air inlet 103-1. In particular, the compressible flexible heat pump module air inlet 103-1 may be formed as a corrugated flexible heat pump module air inlet 103-1. Additionally or alternatively, the flexible heat pump module air outlet 103-2 may be formed as a compressible flexible heat pump module air outlet 103-2, in particular along an extension direction 104-3 of the flexible heat pump module air outlet 103-2. In particular, the compressible flexible heat pump module air outlet 103-2 may be formed as a corrugated flexible heat pump module air outlet 103-2.

[0053] As schematically shown in Fig. 2, the heat pump module 103 may comprise a base plate 117, on which the compressor 111, the evaporator 109 and the condenser 107 may be arranged. Although only partly shown in Fig. 2, the condenser 107 and the evaporator 109 may be arranged on a rectangular section 117-1 of the base plate. The compressor 111 may be arranged on an additional section 117-2 of the base plate. In particular, the additional section 117-2 of the base plate may be delimited by at least one recess 117-3, 117-4 of the base plate 117.

[0054] The compressor 111 may have a cylindrical form with a lateral surface 111-1 and a base surface 111-2 (not shown in Fig. 2, see Fig. 5a). The base surface 111-2 of the compressor 111 may be connected to the base plate 117, in particular the additional section 117-2 of the base plate 117. The lateral surface of the compressor 111 may extend along a height direction 104-1 of the heat pump module 103.

[0055] As schematically shown in Fig. 2, the evaporator 109 may comprise an end face 109-6 facing the compressor 111. The end face 109-6 of the evaporator 109 may comprise a cooling means connection terminal 109-7, which may be adapted to connect the evaporator 109 with the compressor 111 via a pipe (not shown in Fig. 2) of the cooling means circle. The condenser 107 may comprise a further end face 107-6 facing the compressor 111. The further end face 107-6 of the condenser 107 may comprise a further cooling means connection terminal 107-7, which may be adapted to connect the condenser 107 with the compressor 111 via a further pipe (not shown in Fig. 2) of the cooling means circle. In particular, the end face 109-6 of the evaporator 109 and the further end face 107-6 of the condenser 107 are arranged in one plane, as shown in Fig. 2.

[0056] Fig. 3 shows a further perspective view of a heat pump module 103 according to an embodiment of a laundry device 100 according to Fig. 1 in a perspec-

tive view. The heat pump module 103 may be the heat pump module 103 of Fig. 1 or Fig. 2. As already described for Fig. 1, the heat pump module 103 comprises a condenser 107, an evaporator 109 and a compressor 111 as well as a flexible heat pump module air inlet 103-1 (not shown in Fig. 3) and/or a flexible heat pump module air outlet 103-2 (not shown in Fig. 3).

[0057] As schematically shown in Fig. 3, the evaporator 109 may comprise a first mounting recess 113-1 formed in a cover plate 109-3 of the evaporator 109. The evaporator 109 may comprise a second mounting recess 113-2 formed in a base plate 109-4 of the evaporator 109. The first and second mounting recesses 113-1, 113-2 may be adapted to fix the flexible heat pump module air inlet 103-1 to the evaporator 109 in a form-fitting manner. In particular, side walls 109-5 of the evaporator 109 are free of mounting recesses.

[0058] Alternatively or additionally, the condenser 107 may comprise a third mounting recess 115 formed in a cover plate 107-3 of the condenser 107. The condenser 107 may comprise a fourth mounting recess (not shown in Fig. 3) formed in a base plate 107-4 (not shown in Fig. 3) of the condenser 107. The third and fourth mounting recesses 115 may be adapted to fix the flexible heat pump module air outlet 103-2 to the condenser 107 in a form-fitting manner. In particular, side walls 107-5 of the condenser 107 are free of mounting recesses.

[0059] As schematically shown in Fig. 3, the flexible heat pump module air inlet 103-1 may be arranged on a first side 109-1 of the evaporator 109 and the evaporator 109 may comprise a second side 109-2 (not shown in Fig. 3) opposite to the first side of the evaporator 109. The flexible heat pump module air outlet 103-2 may be arranged on a first side 107-1 (not shown in Fig. 3) of the condenser 107 and the condenser 107 may comprise a second side 107-2 opposite to the first side 107-1 of the condenser 107. The second air channel 105-2 may be formed between the second sides 107-2, 109-2 of the evaporator 109 and the condenser 107. In particular, the areas of the second sides 107-2, 109-2 of the evaporator 109 and the condenser 107 may be congruent and aligned with each other.

[0060] Figs. 4a and 4b show further perspective views of a heat pump module 103 according to an embodiment of a laundry device 100 according to Fig. 1 in a perspective view. The heat pump module 103 may be the heat pump module 103 of any one of Figs. 1 to 3. As already described for Fig. 1, the heat pump module 103 comprises a condenser 107 (shown in Fig. 4b), an evaporator 109 (not shown in Figs. 4a and 4b) and a compressor 111 as well as a flexible heat pump module air inlet 103-1 (not shown in Figs. 4a and 4b) and/or a flexible heat pump module air outlet 103-2 (not shown in Figs. 4a and 4b).

[0061] As schematically shown in Figs. 4a and 4b, and already described for Fig. 2, the heat pump module 103 may comprise a base plate 117, on which the com-

pressor 111, the evaporator 109 and the condenser 107 are arranged. The condenser 107 and the evaporator 109 may be arranged on a rectangular section 117-1 of the base plate 117 and the compressor 111 may be arranged on an additional section 117-2 of the base plate. In particular, the additional section 117-2 of the base plate may be delimited by at least one recess 117-3, 117-4 of the base plate 117 (the recess 117-4 is shown in Fig. 4b).

[0062] As schematically shown in Figs. 4a and 4b, the base plate 117 may comprise a water collection recess 118, in particular formed as one piece with the base plate 117 or attached to the base plate 117, in particular at the rectangular section 117-1 of the base plate. The evaporator 109 may be arranged above the water collection recess 118 on the base plate 117. The water collection recess 118 may comprise an opening 118-1 for connecting a drain pipe, and in particular a drain pump, in order to drain collected water in the water collection recess 118.

[0063] Although not shown in Figs. 4a and 4b, the heat pump module 103 may comprise a lower housing 119 (shown in Fig. 5b). As shown in Figs. 4a and 4b, the base plate 117 comprises a plurality of dampening elements 121-1, 121-2, 121-3, 121-4, in particular grommets, made of an elastomer, in particular rubber. The plurality of dampening elements 121-1, 121-2, 121-3, 121-4 is adapted to connect the base plate 117 of the heat pump module 103 to a bottom plate 119-1 (not shown in Figs. 4a and 4b, see Fig. 5b) of the lower housing 119. In particular, a distance 121-5 between two dampening elements 121-1, 121-2 of the plurality of dampening elements 121-1, 121-2, 121-3, 121-4 is smaller at a side of the base plate 117, in particular the additional section 117-2 of the base plate 117, at which the compressor 111 is arranged than a further distance 121-6 between two further dampening elements 121-3, 121-4 of the plurality of dampening elements 121-1, 121-2, 121-3, 121-4 at an opposite side of the base plate 117, in particular a rectangular section 117-1 of the base plate, at which the evaporator 109 and the condenser 107 is arranged.

[0064] Figs. 5a and 5b show further perspective views of a heat pump module 103 according to an embodiment of a laundry device 100 according to Fig. 1 in a perspective view. The heat pump module 103 may be the heat pump module 103 of any one of Figs. 1 to 3, 4a and 4b. As already described for Fig. 1, the heat pump module 103 comprises a condenser 107, an evaporator 109 (shown in Fig. 5b) and a compressor 111 as well as a flexible heat pump module air inlet 103-1 and/or a flexible heat pump module air outlet 103-2.

[0065] As shown in Figs. 5a and 5b, the flexible heat pump module air inlet 103-1 and the evaporator 109 may have the same width 110-1 and/or the same height 110-2.

[0066] Additionally or alternatively, the flexible heat pump module air outlet 103-2 and the condenser 107

may have the same width 108-1 and/or the same height 108-2.

[0067] As shown in Figure 5b, the heat pump module 103 may comprise a lower housing 119 and an upper housing 123. Although not shown in Figure 5b, the lower housing 119 may comprise openings for the first air channel 105-1 and the third air channel 105-3.

[0068] The lower housing 119 may completely house the condenser 107 and the evaporator 109 and a lower section of the compressor 111. The upper housing 123 may house an upper section of the compressor 111 and may cover the condenser 107 and the evaporator 109. The lower housing 119 may be removably connected to the upper housing 123.

[0069] As shown in Figure 5b, the lower housing 119 and the upper housing 123 may each comprise a recess 125-1, 125-2 which together form a cable opening 125-3, which is adapted to accommodate an electric cable (not shown in Figure 5b) for supplying the compressor 111 with power, wherein in particular a dampening element (not shown in Figure 5b) is arranged in the cable opening 125-3, which is adapted to reduce a transmission of vibrations of the activated compressor 111 via the electric cable.

[0070] As shown in Figure 5b, the compressor 111 is arranged at a distance from the lower housing 119 and the upper housing 123 such that pipes (not shown in Figure 5b) of the cooling means circle, in particular a pipe of the cooling means circle connecting the evaporator 109 with the compressor 111 and/or a further pipe of the cooling means circle connecting the condenser 107 with the compressor 111, are arrangeable inside the lower housing 119 and the upper housing 123 without contacting the lower housing 119 and the upper housing 123.

REFERENCE NUMBERS

[0071]

100 laundry device
101 drying chamber
101-1 drying chamber air inlet
101-2 drying chamber air outlet
103 heat pump module
103-1 flexible heat pump module air inlet
103-2 flexible heat pump module air outlet
104-1 height direction of the heat pump module
104-2 extension direction of the flexible heat pump module air inlet
104-3 extension direction of the flexible heat pump module air outlet
105-1 first air channel
105-2 second air channel
105-3 third air channel
107 condenser
107-1 first side of the condenser
107-2 second side of the condenser

107-3 cover plate of the condenser
107-4 base plate of the condenser
107-5 side wall of the condenser
107-6 further end face of the condenser
5 107-7 further cooling means connection terminal of the condenser
108-1 width of the flexible heat pump module air outlet and the condenser
108-2 height of the flexible heat pump module air outlet and the condenser
10 109 evaporator
109-1 first side of the evaporator
109-2 second side of the evaporator
109-3 cover plate of the evaporator
15 109-4 base plate of the evaporator
109-5 side wall of the evaporator
109-6 end face of the evaporator
109-7 cooling means connection terminal of the evaporator
20 110-1 width of the flexible heat pump module air inlet and the evaporator
110-2 height of the flexible heat pump module air inlet and the evaporator
111 compressor
25 111-1 lateral surface of the compressor
111-2 base surface of the compressor
113-1 first mounting recess
113-2 second mounting recess
115 third mounting recess
30 117 base plate
117-1 rectangular section of the base plate
117-2 additional section of the base plate
117-3 recess of the base plate
117-4 further recess of the base plate
35 118 water collection recess
118-1 opening of the water collection recess
119 lower housing
119-1 bottom plate of the lower housing
121-1 first dampening element
40 121-2 second dampening element
121-3 third dampening element
121-4 fourth dampening element
121-5 distance between two dampening elements
121-6 further distance between two further dampening elements
45 123 upper housing
125-1 recess of the lower housing
125-1 recess of the upper housing
125-3 cable opening
50

Claims

1. Laundry device (100), wherein the laundry device (100) comprises:

a drying chamber (101) for drying laundry;
a heat pump module (103) comprising a condenser (107), an evaporator (109), a capillary

element and a compressor (111), wherein the evaporator (109), the condenser (107), the capillary element, and the compressor (111) are fluidly connected by a cooling means circle, wherein the compressor (111) is adapted to circulate a cooling means in the cooling means circle in an activated state; and

an air circulation circle with a first air channel (105-1), a second air channel (105-2) and a third air channel (105-3), wherein the first air channel (105-1) is adapted to feed air from the drying chamber (101) to the evaporator (109), wherein the evaporator (109) is configured to cool down the air provided from the first air channel (105-1), wherein the second air channel (105-2) is adapted to feed the cooled air from the evaporator (109) to the condenser (107), wherein the condenser (107) is configured to heat the air provided from the second air channel (105-2), wherein the third air channel (105-3) is adapted to feed the heated air from the condenser (107) to the drying chamber (101),

characterized in,

that the heat pump module (103) comprises a flexible heat pump module air inlet (103-1), which is adapted to fluidly connect the first air channel (105-1) to the evaporator (109) and to reduce a transmission of vibrations of the activated compressor (111) via the first air channel (105-1); and/or

that the heat pump module (103) comprises a flexible heat pump module air outlet (103-2), which is adapted to fluidly connect the third air channel (105-3) to the condenser (107) and to reduce a transmission of vibrations of the activated compressor (111) via the third air channel (105-3).

2. Laundry device (100) according to claim 1, wherein the flexible heat pump module air inlet (103-1) and/or the flexible heat pump module air outlet (103-2) is made of an elastomer, in particular rubber.
3. Laundry device (100) according to claim 1 or 2, wherein the flexible heat pump module air inlet (103-1) and/or the flexible heat pump module air outlet (103-2) is formed as a tube with a rectangular cross section.
4. Laundry device (100) according to one of the preceding claims, wherein the flexible heat pump module air inlet (103-1) is formed as a compressible flexible heat pump module air inlet (103-1), in particular along an extension direction (104-2) of the flexible heat pump module air inlet (103-1), wherein in particular the compressible flexible heat

pump module air inlet (103-1) is formed as a corrugated flexible heat pump module air inlet (103-1); and/or

wherein the flexible heat pump module air outlet (103-2) is formed as a compressible flexible heat pump module air outlet (103-2), in particular along an extension direction (104-3) of the flexible heat pump module air outlet (103-2), wherein in particular the compressible flexible heat pump module air outlet (103-2) is formed as a corrugated flexible heat pump module air outlet (103-2).

5. Laundry device (100) according to one of the preceding claims, wherein the flexible heat pump module air inlet (103-1) and the evaporator (109) have the same width (110-1) and/or the same height (110-2); and/or wherein the flexible heat pump module air outlet (103-2) and the condenser (107) have the same width (108-1) and/or the same height (108-2).
6. Laundry device (100) according to one of the preceding claims, wherein the evaporator (109) comprises a first mounting recess (113-1) formed in a cover plate (109-3) of the evaporator (109), wherein the evaporator (109) comprises a second mounting recess (113-2) formed in a base plate (109-4) of the evaporator (109), wherein the first and second mounting recesses (113-1, 113-2) are adapted to fix the flexible heat pump module air inlet (103-1) to the evaporator (109) in a form-fitting manner, wherein in particular side walls (109-5) of the evaporator (109) are free of mounting recesses; and/or wherein the condenser (107) comprises a third mounting recess (115) formed in a cover plate (107-3) of the condenser (107), wherein the condenser (107) comprises a fourth mounting recess formed in a base plate (107-4) of the condenser (107), wherein the third and fourth mounting recesses (115) are adapted to fix the flexible heat pump module air outlet (103-2) to the condenser (107) in a form-fitting manner, wherein in particular side walls (107-5) of the condenser (107) are free of mounting recesses.
7. Laundry device (100) according to one of the preceding claims, wherein the heat pump module (103) comprises a base plate (117), on which the compressor (111), the evaporator (109) and the condenser (107) are arranged, wherein the condenser (107) and the evaporator (109) are arranged on a rectangular section (117-1) of the base plate and wherein the compressor (111) is arranged on an additional section (117-2) of the base plate, wherein in particular the additional section (117-2) of the base plate is delimited by at least one recess (117-3, 117-4) of the base plate (117).

8. Laundry device (100) according to one of the preceding claims, wherein the heat pump module (103) comprises a base plate (117), and wherein the compressor (111) has a cylindrical form with a lateral surface (111-1) and a base surface (111-2), wherein the base surface (112-2) of the compressor (111) is connected to the base plate (117), in particular an additional section (117-2) of the base plate (117), and wherein the lateral surface of the compressor (111) extends along a height direction (104-1) of the heat pump module (103).
9. Laundry device (100) according to one of the preceding claims, wherein the heat pump module (103) comprises a base plate (117), which comprises a water collection recess (118), in particular formed as one piece with the base plate (117) or attached to the base plate (117), in particular at a rectangular section (117-1) of the base plate, and wherein the evaporator (109) is arranged above the water collection recess (118) on the base plate (117).
10. Laundry device (100) according to one of the preceding claims, wherein the flexible heat pump module air inlet (103-1) is arranged on a first side (109-1) of the evaporator (109), wherein the evaporator (109) comprises a second side (109-2) opposite to the first side of the evaporator (109), wherein the flexible heat pump module air outlet (103-2) is arranged on a first side (107-1) of the condenser (107), wherein the condenser (107) comprises a second side (107-2) opposite to the first side (107-1) of the condenser (107), wherein the second air channel (105-2) is formed between the second sides (107-2, 109-2) of the evaporator (109) and the condenser (107), wherein in particular the areas of the second sides (107-2, 109-2) of the evaporator (109) and the condenser (107) are congruent and aligned with each other.
11. Laundry device (100) according to one of the preceding claims, wherein the evaporator (109) comprises an end face (109-6) facing the compressor (111), wherein the end face (109-6) of the evaporator (109) comprises a cooling means connection terminal (109-7), wherein the cooling means connection terminal (109-7) of the evaporator (109) is adapted to connect the evaporator (109) with the compressor (111) via a pipe of the cooling means circle,
 wherein the condenser (107) comprises a further end face (107-6) facing the compressor (111), wherein the further end face (107-6) of the condenser (107) comprises a further cooling means connection terminal (107-7), wherein the further cooling means connection terminal (107-7) of the condenser (107) is adapted to connect the condenser (107) with the compressor (111) via a further pipe of the cooling means circle,
 wherein in particular the end face (109-6) of the evaporator (109) and the further end face (107-6) of the condenser (107) are arranged in one plane.
12. Laundry device (100) according to one of the preceding claims, wherein the heat pump module (103) comprises a base plate (117) and a lower housing (119), wherein the base plate (117) comprises a plurality of dampening elements (121-1, 121-2, 121-3, 121-4) made of an elastomer, in particular rubber, which is adapted to connect the base plate (117) of the heat pump module (103) to a bottom plate (119-1) of the lower housing (119), wherein in particular a distance (121-5) between two dampening elements (121-1, 121-2) of the plurality of dampening elements (121-1, 121-2, 121-3, 121-4) is smaller at a side of the base plate (117), in particular an additional section (117-2) of the base plate (117), at which the compressor (111) is arranged than a further distance (121-6) between two further dampening elements (121-3, 121-4) of the plurality of dampening elements (121-1, 121-2, 121-3, 121-4) at an opposite side of the base plate (117), in particular a rectangular section (117-1) of the base plate at which the evaporator (109) and the condenser (107) is arranged.
13. Laundry device (100) according to one of the preceding claims, wherein the heat pump module (103) comprises a lower housing (119) and an upper housing (123), wherein the lower housing (119) completely houses the condenser (107) and the evaporator (109) and a lower section of the compressor (111), wherein the upper housing (123) houses an upper section of the compressor (111) and covers the condenser (107) and the evaporator (109), wherein the lower housing (119) is removably connected to the upper housing (123).
14. Laundry device (100) according to claim 13, wherein the lower housing (119) and the upper housing (123) each comprise a recess (125-1, 125-2) which together form a cable opening (125-3), which is adapted to accommodate an electric cable for supplying the compressor (111) with power, wherein in particular a dampening element is arranged in the cable opening (125-3), which is adapted to reduce a transmission of vibrations of the activated compressor (111) via the electric cable.
15. Laundry device (100) according to claim 13 or 14, wherein the compressor (111) is arranged at a dis-

tance from the lower housing (119) and the upper housing (123) such that pipes of the cooling means circle, in particular a pipe of the cooling means circle connecting the evaporator (109) with the compressor (111) and/or a further pipe of the cooling means circle connecting the condenser (107) with the compressor (111), are arrangeable inside the lower housing (119) and the upper housing (123) without contacting the lower housing (119) and the upper housing (123).

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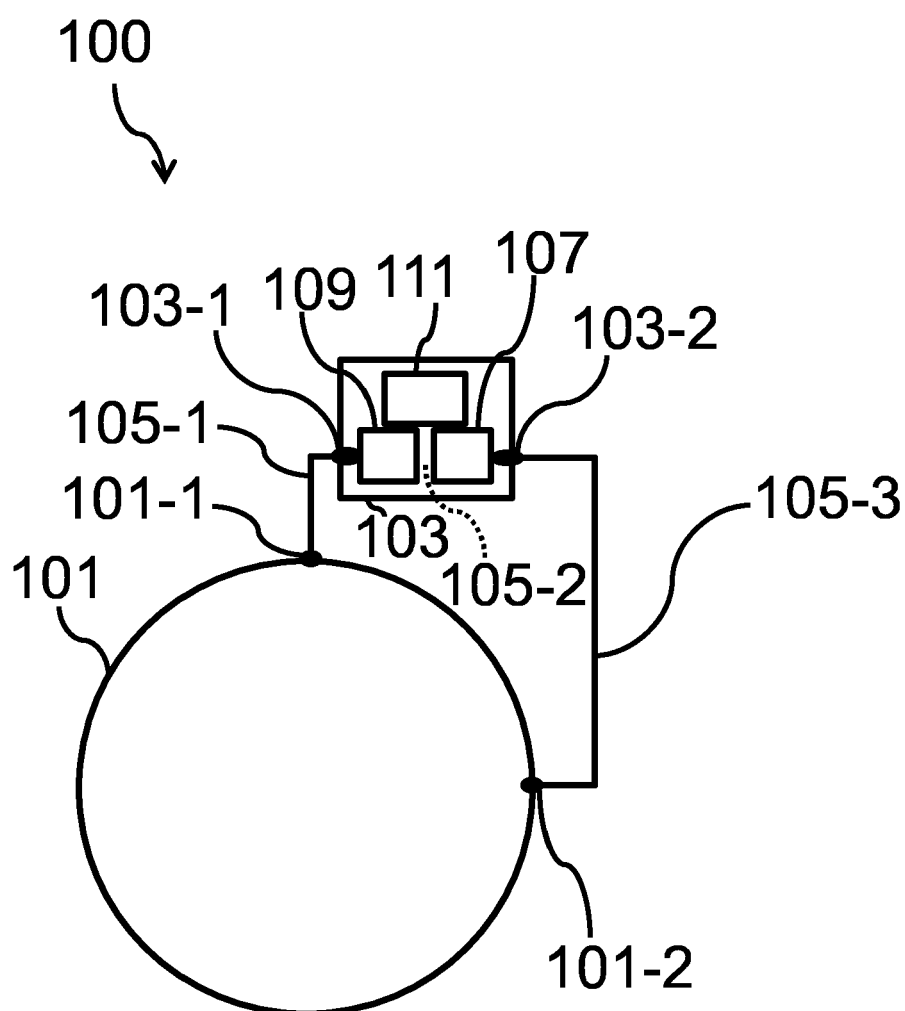


Fig. 1

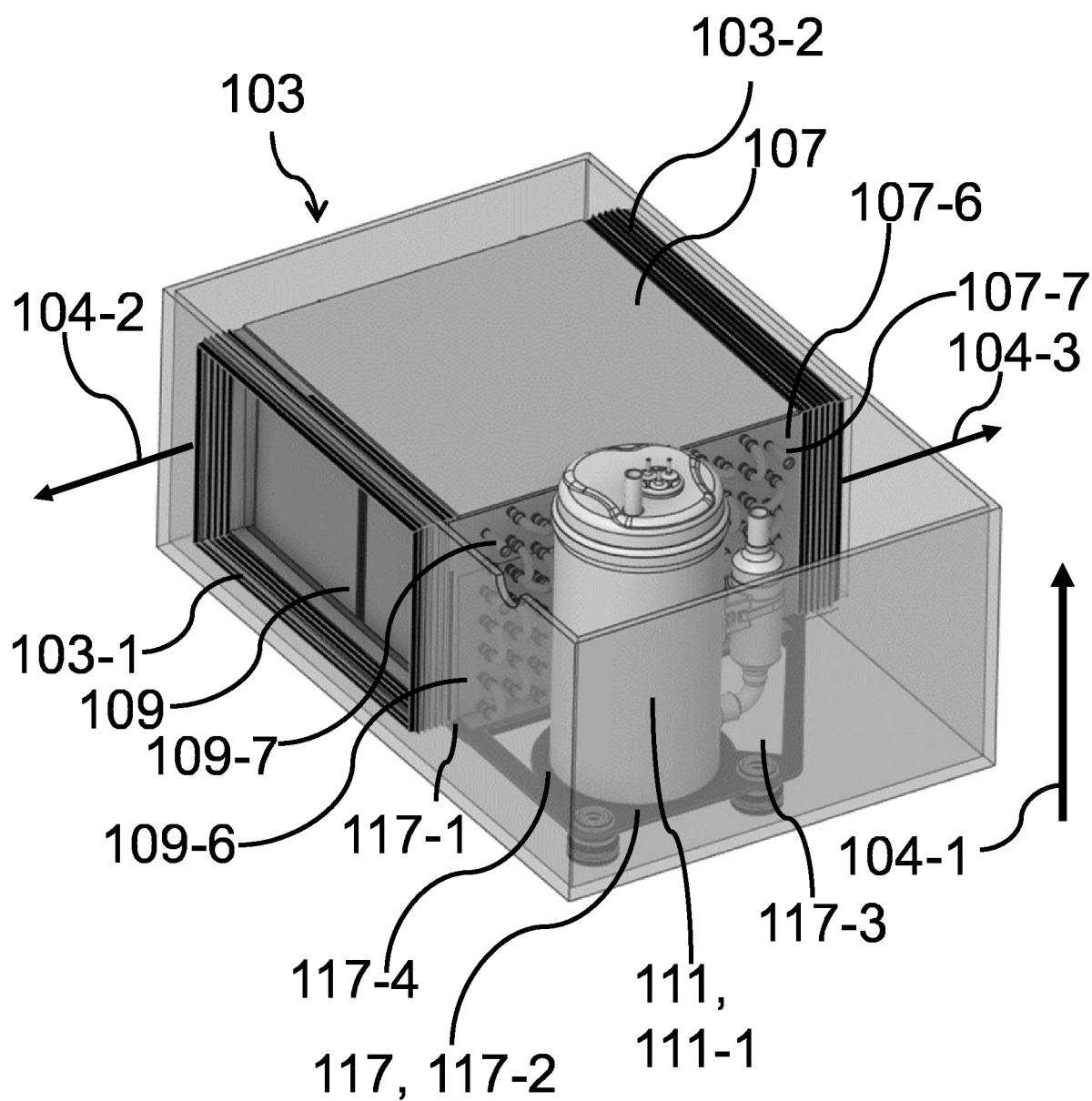


Fig. 2

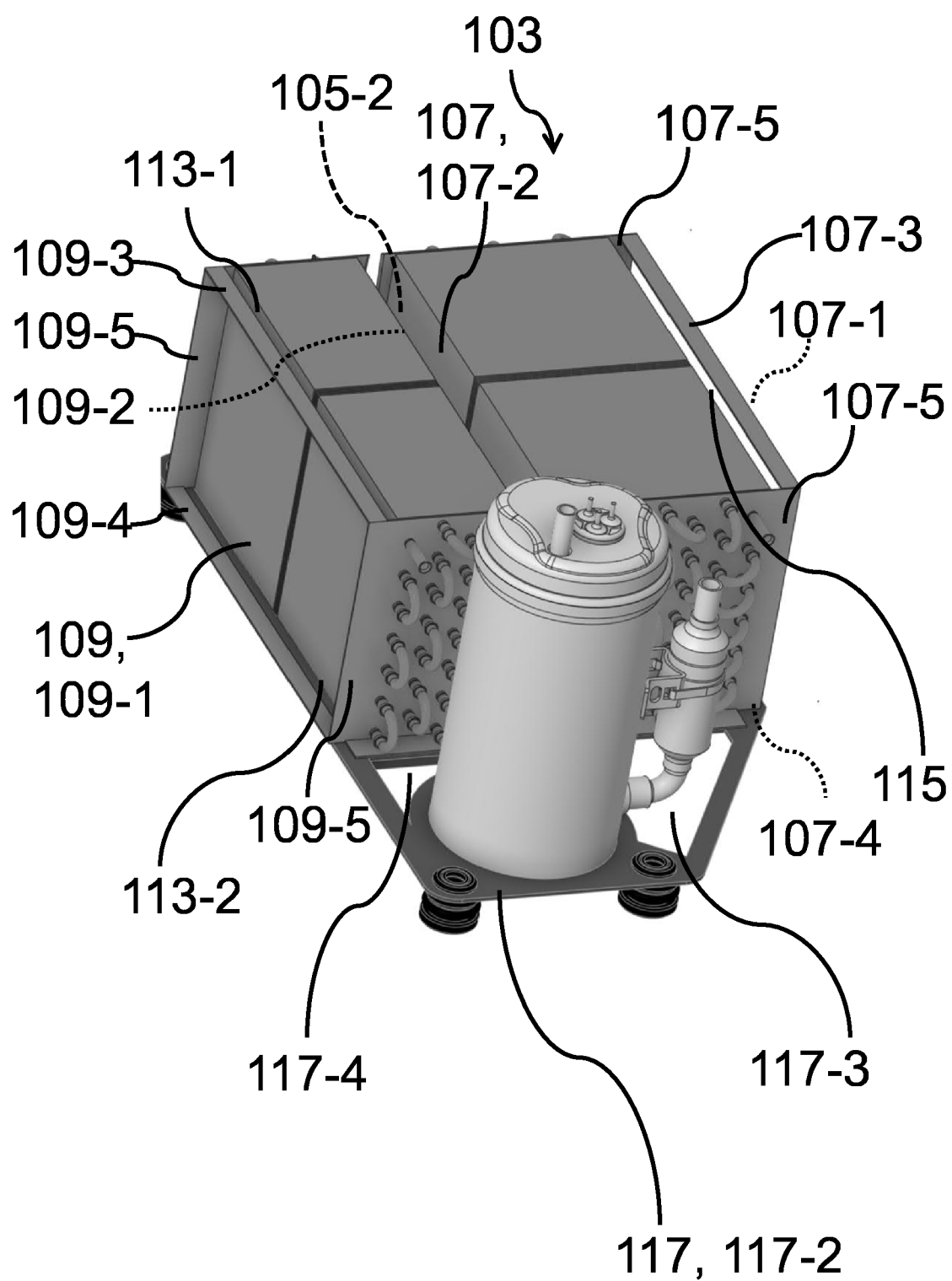


Fig. 3

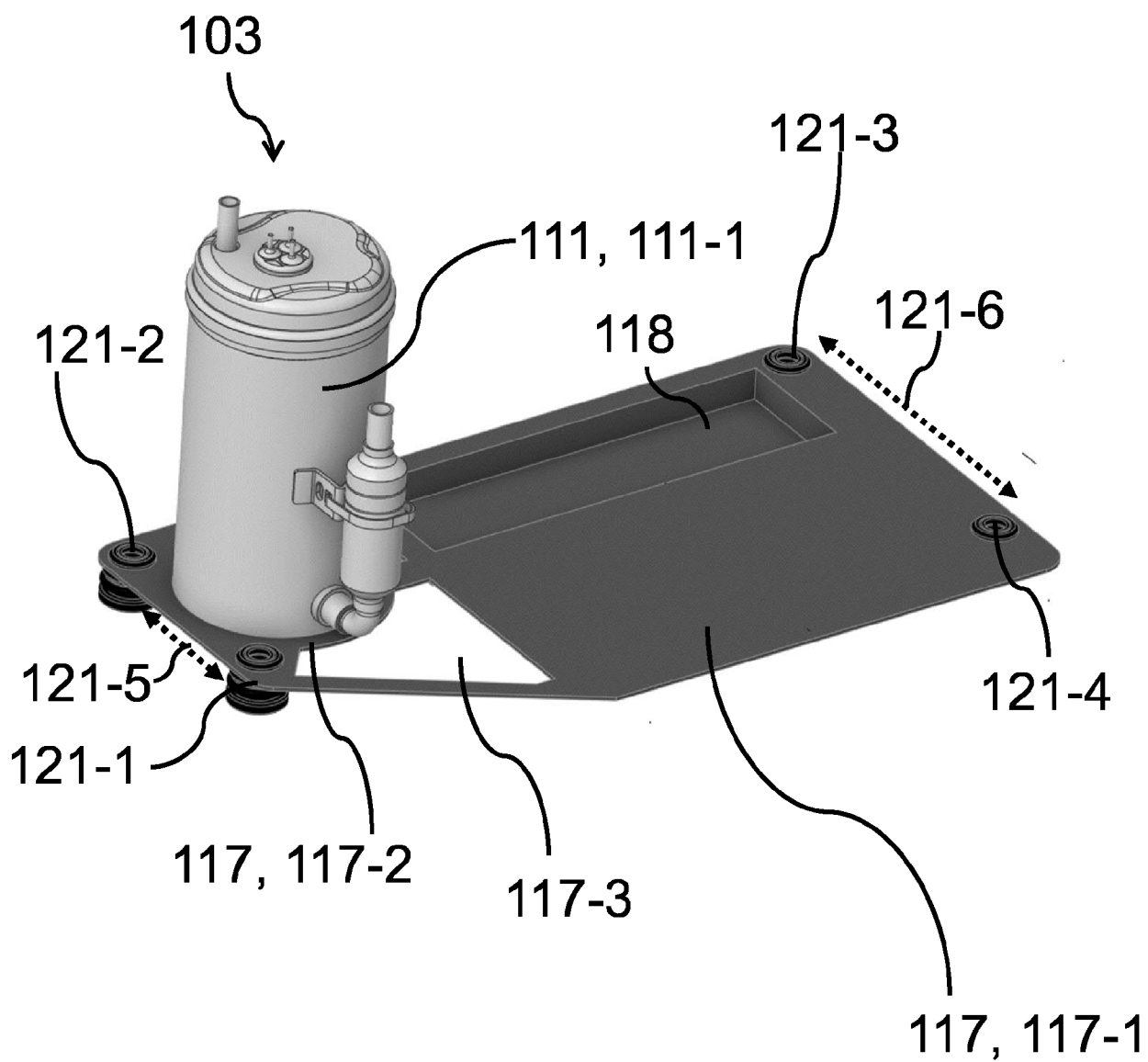


Fig. 4a

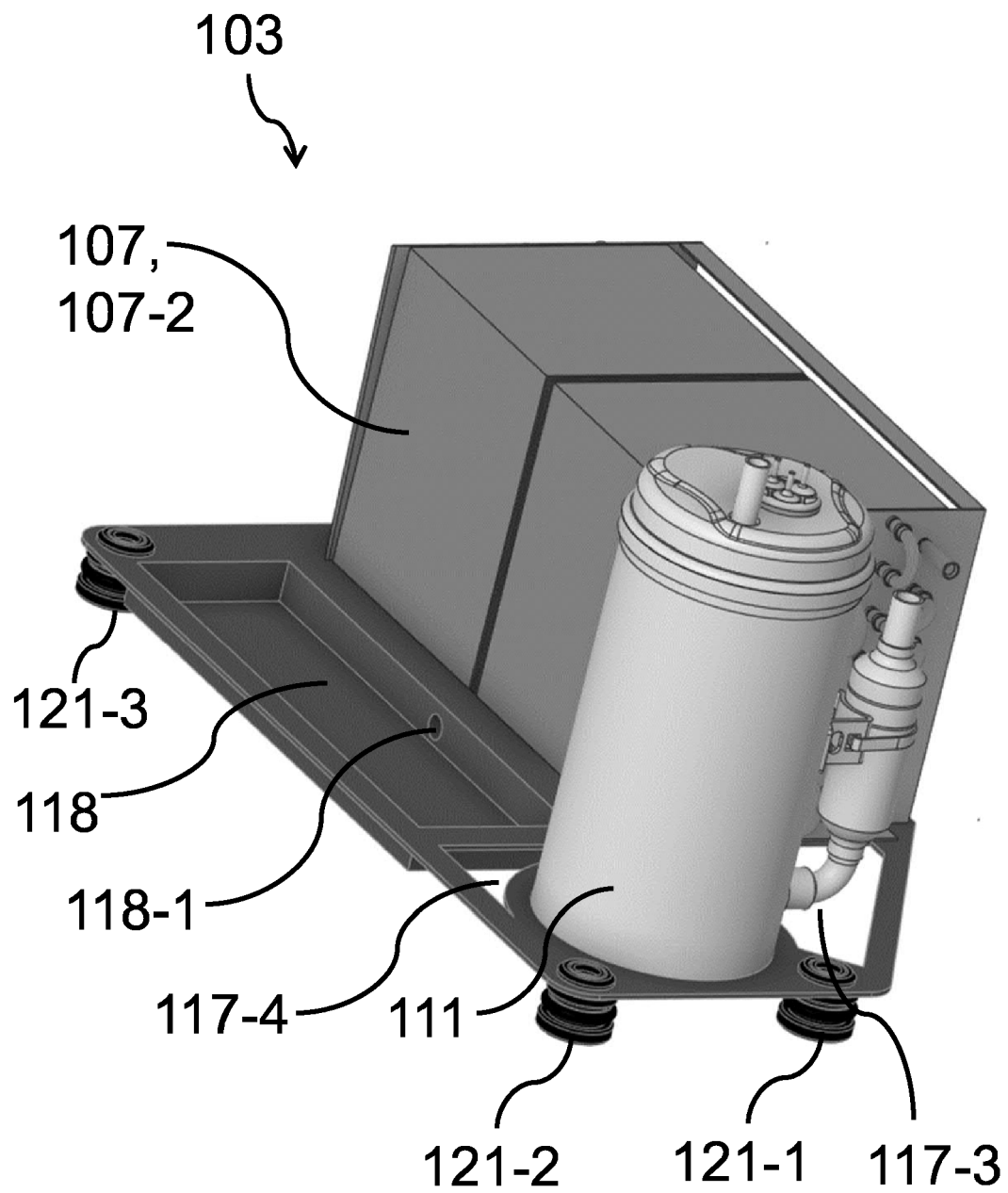


Fig. 4b

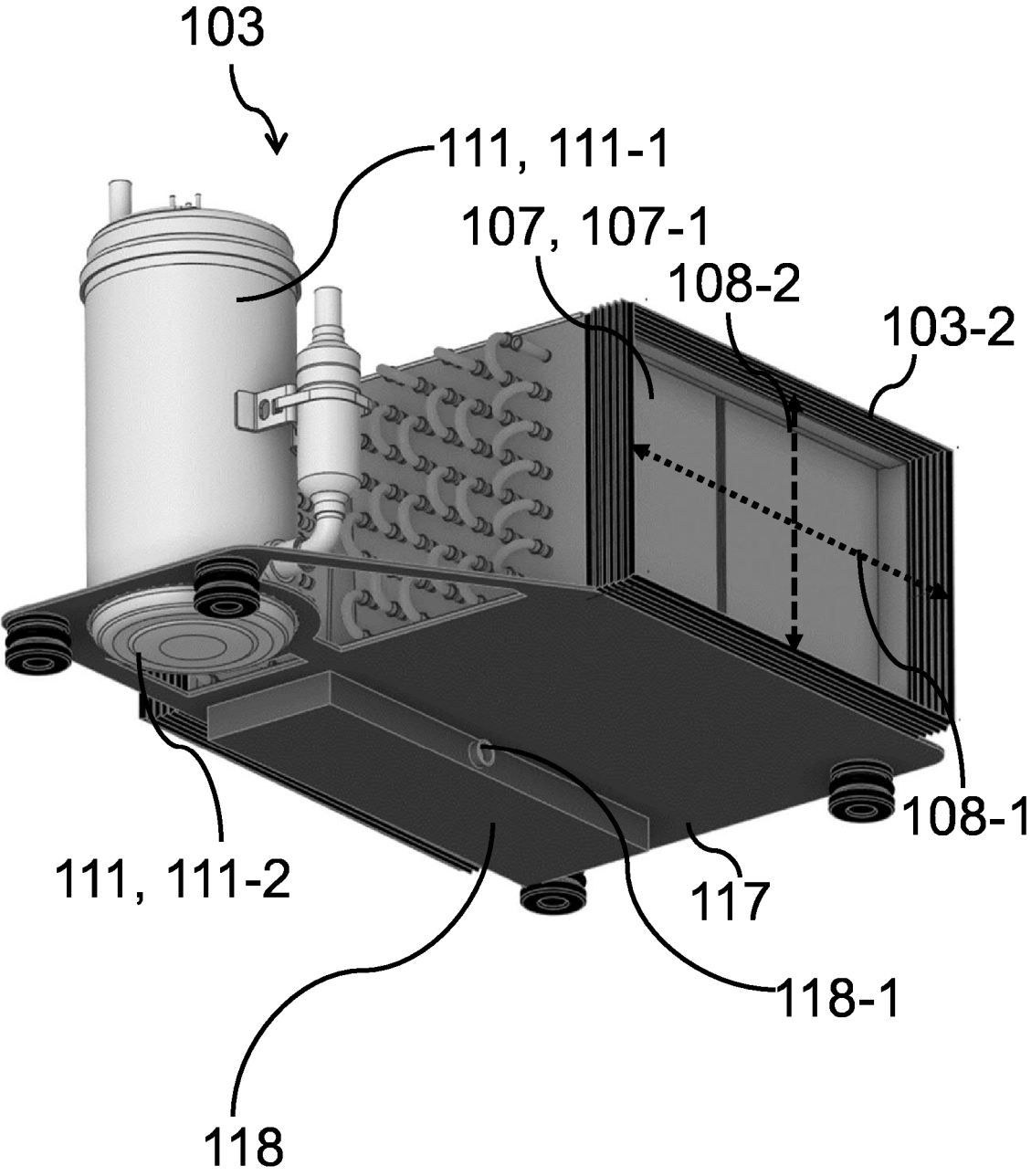


Fig. 5a

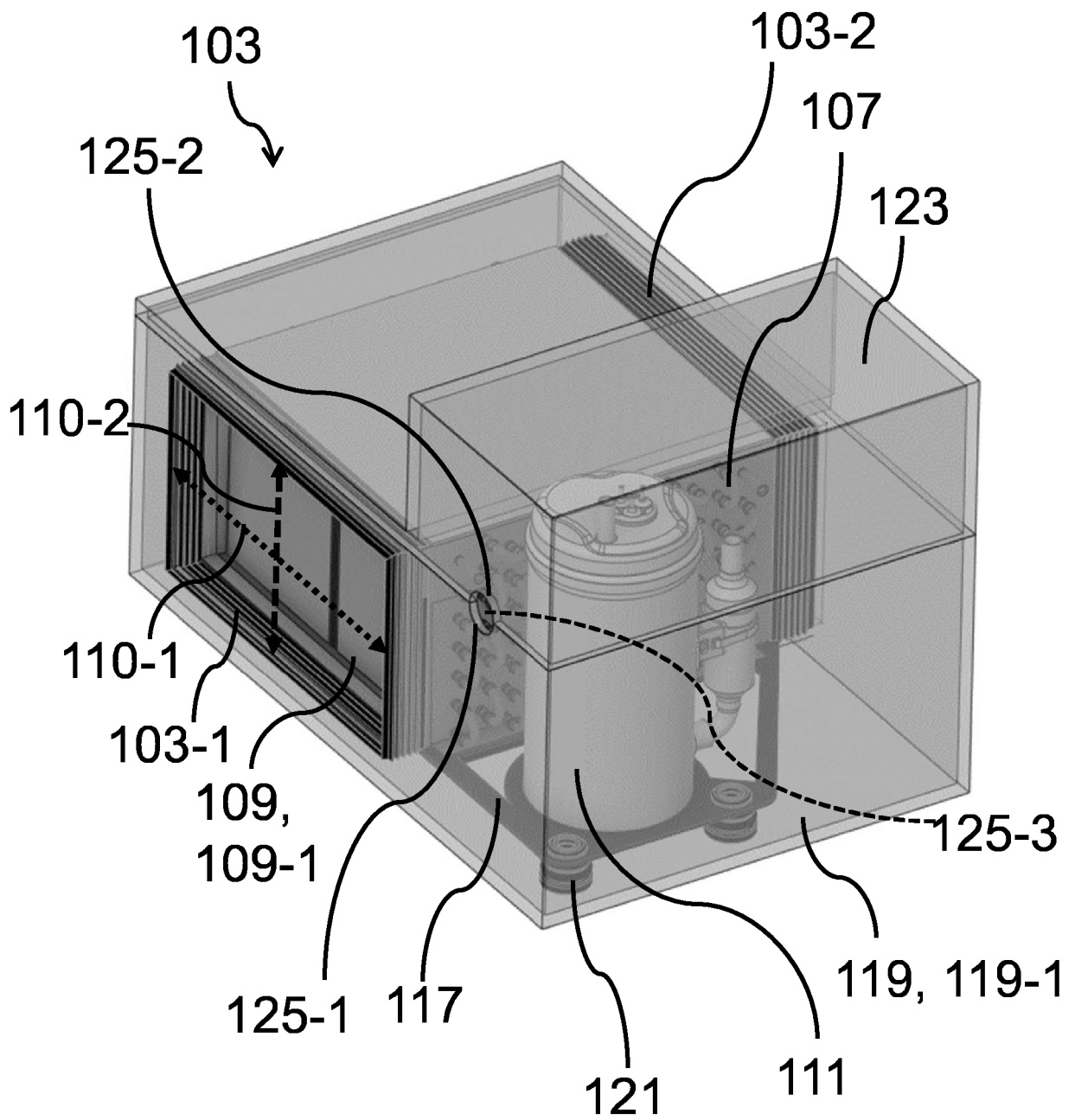


Fig. 5b



EUROPEAN SEARCH REPORT

Application Number

EP 26 17 0480

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			D06F
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
Munich		10 September 2026	Diaz y Diaz-Caneja
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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			
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