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(54) A HEAT PUMP DISHWASHER

WÄRMEPUMPENGESCHIRRSPÜLER
LAVE-VAISSELLE À POMPE À CHALEUR

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Description

[0001] The present invention relates to a heat pump dishwasher wherein the exhaust air is effectively discharged.

[0002] In dishwashers, the use of hot water for the washing process improves the washing performance. In conventional dishwashers, the heating of the washing water is performed by means of a heater. In heat pump dishwashers, the washing water is heated by using the heat pump system. In this case, energy saving is provided compared to conventional dishwashers. The basic components of the heat pump system are compressor, evaporator, condenser, capillary tube and fan.

[0003] In the heat pump dishwasher, when the heat pump is active, the compressor pressurizes the refrigerant fluid and directs the same to the condenser. The condenser condenses the refrigerant fluid and heats the water which is in direct contact with the condenser. At the condenser outlet, the refrigerant fluid enters the capillary tube. While passing through the capillary tube, the refrigerant fluid loses pressure, expands and enters the evaporator. While passing through the evaporator pipes, the refrigerant fluid draws heat from the ambient air directed thereon, evaporates and cools the surrounding air. The cooled air is blown out of the dishwasher after the evaporator. The ambient air is sucked by means of a fan and passed over the evaporator. Thus, the ambient heat is drawn onto the heat pump and used to heat the water. The faster the air is sucked in at a high flow rate and the faster the same is discharged from the dishwasher at a higher flow rate, the higher the operating efficiency of the heat pump, hence the water heating efficiency of the dishwasher becomes. During the discharge of the cooled exhaust air from the dishwasher, the air is discharged from the cabinet opening to the environment. This opening is provided on the left or right side of the dishwasher. The water intake hose outlet and the water discharge hose outlet of the dishwasher are provided on the left or right side of the dishwasher rear wall. Said hoses move between the rear wall of the dishwasher and the cabinet and come out of the opening. An obstacle encountered during the discharge of the cold exhaust air reduces the efficiency of the heat pump. In particular, the water inlet hose and the water discharge hose remaining between the adjacent wall of the cabinet or the environment wherein the dishwasher is placed and the rear wall of the dishwasher create an obstacle against the air flow line while discharging the exhaust air.

[0004] In the state of the art German Patent Application No. DE102019100004, the formation of an air flow path is disclosed, by means of a sealing member which is provided on the air outlet between a heat pump dishwasher and the cabinet, which is provided between the rear wall of the dishwasher and the wall of the cabinet.

[0005] In the state of the art European Patent No. EP3427628, a dishwasher is disclosed, comprising a base, and a fan and an evaporator provided an air duct

extending from said base. In this embodiment, the air duct extends from the front of the dishwasher to the back thereof and an air opening is provided at the back side.

[0006] Another state of the art embodiment is disclosed in the European Patent No. EP2777474. In this embodiment, a heat pump dishwasher is disclosed, wherein the air sucked through the air inlet is guided towards the evaporator by passing through an opening with guiding surfaces and a dust holder.

[0007] The aim of the present invention is the realization of a heat pump dishwasher wherein the exhaust air is effectively discharged.

[0008] The dishwasher realized in order to attain the aim of the present invention, explicated in the first claim and the respective claims thereof, is a heat pump dishwasher, and comprises a washing tub; an evaporator; a rear wall; an opening which aligns with the part of the rear wall whereon the evaporator is disposed; a water inlet hose; a water discharge hose; and at least one hose holder for each of the water inlet and discharge hoses, fixed onto the rear wall and enabling the water inlet and discharge hoses onto the rear wall such that the opening remains between the water inlet hose and the water discharge hose. Thus, the water inlet and discharge hoses are prevented from covering the opening, creating an obstacle in front of the opening and decreasing the air passage cross-sectional area of the opening. Thus, the flow rate of the air discharged out of the dishwasher is prevented from being adversely affected, and the efficiency of the heat pump, hence of the dishwasher is increased.

[0009] In accordance with the present invention, the dishwasher comprises two channels as the hose holder which are arranged above and below the opening such that the opening remains therebetween, which extend parallel to each other along the rear wall, such that one receives the water inlet hose and the other receives the discharge hose. In a version of this embodiment of the present invention, the dishwasher comprises at least one fixing member in the form of a clamp which passes over the hose in the channel and which is fixed with fixing elements to the rear wall so as to prevent the hose placed in the channel from being detached from the channel. In another version, the fixing member is flat. In this embodiment, the hose is entirely embedded into the channel. In this embodiment of the present invention, the fixing member is fixed to the rear wall from two ends thereof such that the hose placed into the channel remains therebetween. In another version, the fixing member is fixed to the rear wall from a single end thereof while the other end has a jointed structure so as to rotate around the end fixed to the rear wall. Thus, the hose can be quickly and easily fitted into the channel and detached from the channel.

[0010] In another embodiment of the present invention, the dishwasher comprises hook-and-loop fasteners as the hose holder. In this embodiment of the present invention, one surface of the hook-and-loop fasteners is

fixed to the rear wall such that the hose remains there-between, and after the hose is placed onto the rear wall, the other surface of the hook-and-loop fasteners is brought onto the first surface over the hose to fix the same.

[0011] By means of the present invention, the water inlet and discharge hoses are positioned efficiently so as not to block the air outlet such that the air leaving the evaporator has a high flow rate. Since there is no obstacle in front of the cold exhaust air to prevent the same from being discharged through the air outlet, unwanted cooling in the dishwasher is avoided and the efficiency of the heat pump is increased by preventing the drying performance from being adversely affected. Thus, the washing time of the dishwasher is decreased.

[0012] A dishwasher realized in order to attain the aim of the present invention is illustrated in the attached figures, with figures 6-8 showing an embodiment of a dishwasher according to the invention, and figures 1-5 and 9 showing examples useful for understanding the present invention, where:

- Figure 1 - is the rear view of a dishwasher.
- Figure 2 - is the view of the detail A of Figure 1.
- Figure 3 - is the view of the embodiment of the clamp-shaped hose holder.
- Figure 4 - is the view of detail B in Figure 3.
- Figure 5 - is the view of the embodiment of the channel and the fixing member.
- Figure 6 - is the view of the another version of the embodiment of the channel and the fixing member.
- Figure 7 - is the view of yet another version of the embodiment of the channel and the fixing member.
- Figure 8 - is the view of another version of the present invention.
- Figure 9 - is the view of another embodiment of the hose holder.

[0013] The elements illustrated in the figures are numbered as follows:

1. Dishwasher
2. Rear wall
3. Opening
4. Inlet hose
5. Discharge hose
6. Hose holder
7. Orifice
8. Housing
9. Base
10. Step
11. Holder
12. Channel
13. Fixing member

[0014] The dishwasher (1) of the present invention is a heat pump dishwasher (1), and comprises a washing tub; an evaporator; a rear wall (2); an opening (3) which aligns

with the part of the rear wall (2) whereon the evaporator is disposed; an inlet hose (4); a discharge hose (5); and at least one hose holder (6) for each of the inlet and discharge hoses (4 and 5), fixed onto the rear wall (2) and

5 enabling the inlet and discharge hoses (4 and 5) onto the rear wall (2) such that the opening (3) remains between the inlet hose and the discharge hose (4 and 5). Thus, the inlet and discharge hoses (4 and 5) are prevented from covering the opening (3), creating an obstacle in front of 10 the opening (3) and decreasing the air passage cross-sectional area of the opening (3). Thus, the flow rate of the air discharged out of the dishwasher (1) is prevented from being adversely affected, and the efficiency of the heat pump, hence of the dishwasher (1) is increased.

15 **[0015]** In an example, the dishwasher (1) comprises the C-shaped hose holder (6), wherein the hose holder (6) comprises an orifice (7) through which the inlet and discharge hoses (4 and 5) pass, a housing (8) wherein the inlet and discharge hoses (4 and 5) are fitted after 20 passing through the orifice (7), and a base (9) which is positioned outside the housing (8) and which enables the hose holder (6) to be fixed to the rear wall (2). The inlet and discharge hoses (4 and 5) are passed through the orifice (7) to be fitted into the housing (8) in the hose 25 holder (6) fixed to the rear wall (2) of the dishwasher (1) by means of the base (9). As the inlet and discharge hoses (4 and 5) pass through the orifice (7), the two opposite edges of the orifice (7) are stretched, and by means of this stretching, the inlet and discharge hoses (4 and 5) are 30 easily fitted into the housing (8). After the inlet and discharge hoses (4 and 5) pass through the orifice (7), the orifice (7) moves back and returns to the initial position, and the inlet and discharge hoses (4 and 5) fitted into the housing (8) are prevented from being detached from the 35 housing (8) by themselves. It is possible to remove the inlet and discharge hoses (4 and 5) by stretching the orifice (7). In this example, the dishwasher (1) comprises at least two, preferably three hose holders (6) for each of the inlet hose (4) and the discharge hose (5) on the same 40 line, enabling the inlet and discharge hoses (4 and 5) to extend parallel to each other at the top and bottom of the opening (3) (Figure 1 and Figure 2).

45 **[0016]** In another example, the hose holder (6) comprises a clamp-shaped step (10) which is fixed to the rear wall (2) and which supports the inlet and discharge hoses (4 and 5) from bottom, and a holder (11) which is disposed onto the step (10) and which covers the inlet and discharge hoses (4 and 5) from above to be fixed to the step (10) (Figure 3 and Figure 4).

50 **[0017]** In accordance with the present invention, the hose holder (6) comprises two channels (12) which are arranged above and below the opening (3) such that the opening (3) remains therebetween, which extend parallel to each other along the rear wall (2), such that one receives the inlet hose (4) and the other receives the discharge hose (5). In a version of this embodiment of the present invention, the dishwasher (1) comprises at least one fixing member (13) preferably in the form of a clamp 55

which passes over the inlet and discharge hoses (4 and 5) in the channel (12) and which is fixed with fixing elements to the rear wall (2) so as to prevent the inlet and discharge hoses (4 and 5) placed in the channel (12) from being detached from the channel (12) (Figure 5). In another version of the present invention, the fixing member (13) is flat and in the form of a plate. In this embodiment, the inlet and discharge hoses (4 and 5) are completely embedded into the channel (12). In this embodiment of the present invention, the fixing member (13) is fixed to the rear wall (2) from two ends thereof such that the inlet and discharge hoses (4 and 5) placed into the channel (12) remain therebetween (Figure 6). In another version, the fixing member (13) is fixed to the rear wall (2) from a single end thereof while the other end has a jointed structure so as to rotate around the end fixed to the rear wall (2). Thus, the inlet and discharge hoses (4 and 5) can be quickly and easily fitted into the channel (12) and detached from the channel (12). In this version of this embodiment, the fixing member (13) above the opening (3) is fixed to the rear wall (2) at the top by means of fixing elements while the fixing member (13) below the opening (3) is fixed to the rear wall (2) at the bottom (Figure 7). In another embodiment of the present invention, in order to enable the inlet and discharge hoses (4 and 5) to be properly fitted into the channel (12) and prevent the same from being detached from the channel (12) unintentionally, the dishwasher (1) comprises the C-shaped fixing member (13) disposed in the channel (12) (Figure 8).

[0018] In an example, the hose holder (6) comprises hook-and-loop fasteners, wherein one surface of the hook-and-loop fasteners is fixed to the rear wall (2), the other surface is passed over the inlet and discharge hoses (4 and 5) to be brought onto the first surface after the inlet and discharge hoses (4 and 5) are placed onto the rear wall (2) such that the inlet and discharge hoses (4 and 5) remain therebetween (Figure 9).

[0019] By means of the present invention, the inlet and discharge hoses (4 and 5) are positioned efficiently so as not to block the air outlet such that the air leaving the evaporator has a high flow rate. Since there is no obstacle in front of the cold exhaust air to prevent the same from being discharged through the air outlet, unwanted cooling in the dishwasher (1) is avoided and the efficiency of the heat pump is increased by preventing the drying performance from being adversely affected. Thus, the washing time of the dishwasher (1) is decreased.

Claims

1. A heat pump dishwasher (1) comprising a washing tub; an evaporator; a rear wall (2); an opening (3) which aligns with the part of the rear wall (2) whereon the evaporator is disposed; **characterised in that** the dishwasher further comprises an inlet hose (4); and a discharge hose (5); at least one hose holder (6) for each of the inlet and discharge hoses (4, 5), fixed

5 onto the rear wall (2) and enabling the inlet and discharge hoses (4, 5) to be placed onto the rear wall (2) such that the opening (3) remains between the inlet hose (4) and the discharge hose (5), wherein the hose holder (6) comprising two channels (12) which are arranged above and below the opening (3) such that the opening (3) remains therebetween, which extend parallel to each other along the rear wall (2), such that one receives the inlet hose (4) and the other receives the discharge hose (5).

2. A dishwasher (1) as in Claim 1, **characterized by** comprising at least one fixing member (13) which passes over the inlet and discharge hoses (4, 5) in the channel (12) and which is fixed with fixing elements to the rear wall (2) so as to prevent the inlet and discharge hoses (4, 5) placed in the channel (12) from being detached from the channel (12).
3. A dishwasher (1) as in Claim 2, **characterized by** the fixing member being a clamp-shaped fixing member (13).
4. A dishwasher (1) as in Claim 2, **characterized by** the fixing member being a plate-shaped flat fixing member (13).
5. A dishwasher (1) as in any one of Claims 2 to 4, **characterized by** the fixing member (13) which is fixed to the rear wall (2) from two ends thereof such that the inlet and discharge hoses (4, 5) placed into the channel (12) remain therebetween.
6. A dishwasher (1) as in Claim 2, **characterized by** the fixing member (13) which is fixed to the rear wall (2) from a single end thereof while the other end has a jointed structure so as to rotate around the end fixed to the rear wall (2).
7. A dishwasher (1) as in Claim 2, **characterized by** the fixing member being a C-shaped fixing member (13) which is provided in the channel (12).
8. A dishwasher (1) as in any one of the above claims, **characterized by** comprising at least two hose holders (6) for each of the inlet hose (4) and the discharge hose (5) on the same line, enabling the inlet and discharge hoses (4, 5) to extend parallel to each other at the top and bottom of the opening (3).

Patentansprüche

1. Ein Wärmepumpen-Geschirrspüler (1) **umfasst** eine Waschwanne; einen Verdampfer; eine Rückwand (2); eine Öffnung (3), die mit dem Teil der Rückwand (2) fluchtet, an dem der Verdampfer angeordnet ist; **gekennzeichnet dadurch, dass** der Geschirrspüler

weiterhin einen Zulaufschlauch (4); und einen Ablaufschlauch (5) umfasst, mindestens einen Schlauchhalter (6) für jeden der Zulauf- und Ablaufschläuche (4, 5), der an der Rückwand (2) befestigt ist und es ermöglicht, die Zulauf- und Ablaufschläuche (4, 5) an der Rückwand (2) zu platzieren, so dass die Öffnung (3) zwischen dem Zulaufschlauch (4) und dem Ablaufschlauch (5) verbleibt, **wobei** der Schlauchhalter (6) zwei Kanäle (12) umfasst, die oberhalb und unterhalb der Öffnung (3) angeordnet sind, so dass die Öffnung (3) dazwischen verbleibt, die sich parallel zueinander entlang der Rückwand (2) erstrecken, so dass einer den Zulaufschlauch (4) und der andere den Ablaufschlauch (5) aufnimmt.

2. Eine Geschirrspülmaschine (1) wie in Anspruch 1 aufgeführt, **ist dadurch gekennzeichnet, dass** sie mindestens ein Befestigungselement (13) umfasst, das über die Zulauf- und Ablaufschläuche (4, 5) in dem Kanal (12) verläuft und das mit Befestigungselementen an der Rückwand (2) befestigt ist, um zu verhindern, dass die in dem Kanal (12) platzierten Zulauf- und Ablaufschläuche (4, 5) von dem Kanal (12) gelöst werden.
3. Eine Geschirrspülmaschine (1) wie in Anspruch 2 aufgeführt, **ist dadurch gekennzeichnet, dass** das Befestigungselement ein klammerförmiges Befestigungselement (13) ist.
4. Eine Geschirrspülmaschine (1) wie in Anspruch 2 aufgeführt, **ist dadurch gekennzeichnet, dass** das Befestigungselement ein plattenförmiges flaches Befestigungselement (13) ist.
5. Eine Geschirrspülmaschine (1) wie in einem der Ansprüche 2 bis 4 aufgeführt, **ist dadurch gekennzeichnet, dass** das Befestigungselement (13), das an zwei Enden der Rückwand (2) befestigt ist, so dass die in den Kanal (12) eingelegten Zu- und Ablaufschläuche (4, 5) dazwischen verbleiben.
6. Eine Geschirrspülmaschine (1) wie in Anspruch 2 aufgeführt, **ist dadurch gekennzeichnet, dass** das Befestigungselement (13), das an der Rückwand (2) von einem einzigen Ende aus befestigt ist, während das andere Ende eine gelenkige Struktur aufweist, so dass es sich um das an der Rückwand (2) befestigte Ende drehen kann.
7. Eine Geschirrspülmaschine (1) wie in Anspruch 2 aufgeführt, **ist dadurch gekennzeichnet, dass** das Befestigungselement ein C-förmiges Befestigungselement (13) ist, das in dem Kanal (12) vorgesehen ist.
8. Eine Geschirrspülmaschine (1) wie in einem der vorherigen Ansprüchen aufgeführt, **ist dadurch ge-**

kennzeichnet, dass sie mindestens zwei Schlauchhalter (6) für den Zulaufschlauch (4) und den Ablaufschlauch (5) auf derselben Linie aufweist, die es ermöglichen, dass der Zulauf- und der Ablaufschlauch (4, 5) oben und unten in der Öffnung (3) parallel zueinander verlaufen.

Revendications

1. Un lave-vaisselle à pompe à chaleur (1) **comprenant** une cuve de lavage ; un évaporateur ; une paroi arrière (2) ; une ouverture (3) qui s'aligne avec la partie de la paroi arrière (2) sur laquelle est disposé l'évaporateur ; **caractérisé en ce que** le lave-vaisselle comprend en outre un tuyau d'arrivée d'eau (4) ; un tuyau d'évacuation (5) ; au moins un support de tuyau (6) pour chacun des tuyaux d'arrivée et d'évacuation d'eau (4, 5), fixé sur la paroi arrière (2) et permettant de positionner lesdits tuyaux d'arrivée et d'évacuation (4, 5) sur la paroi arrière (2) de manière à ce que l'ouverture (3) reste entre le tuyau d'arrivée d'eau (4) et le tuyau d'évacuation (5), dans lequel le support de tuyau (6) comprenant deux canaux (12) qui sont disposés respectivement en haut et en bas de l'ouverture (3) de sorte que l'ouverture (3) reste entre les deux, qui s'étendent parallèlement l'un à l'autre le long de la paroi arrière (2), de manière à ce que l'un reçoive le tuyau d'arrivée d'eau (4) et l'autre le tuyau d'évacuation (5).
2. Un lave-vaisselle (1) selon la Revendication 1, **caractérisé par** la présence d'au moins un élément de fixation (13) qui passe par-dessus les tuyaux d'arrivée et d'évacuation d'eau (4, 5) dans le canal (12) et qui est fixé à la paroi arrière (2) à l'aide d'éléments de fixation de manière à empêcher les tuyaux d'arrivée et d'évacuation d'eau (4, 5) placés dans le canal (12) de se détacher du canal (12).
3. Un lave-vaisselle (1) selon la Revendication 2, **caractérisé par** l'élément de fixation qui est un élément de fixation en forme de pince (13).
4. Un lave-vaisselle (1) selon la Revendication 2, **caractérisé par** l'élément de fixation qui est un élément de fixation plat en forme de plaque (13).
5. Un lave-vaisselle (1) selon l'une quelconque des Revendications 2 à 4, **caractérisé par** l'élément de fixation (13) qui est fixé à la paroi arrière (2) par ses deux extrémités de sorte que les tuyaux d'arrivée et d'évacuation d'eau (4, 5) placés dans le canal (12) restent entre elles.
6. Un lave-vaisselle (1) selon la Revendication 2, **caractérisé par** l'élément de fixation (13) qui est fixé à la paroi arrière (2) par une seule extrémité, tandis

que l'autre extrémité possède une structure articulée lui permettant de pivoter autour de l'extrémité fixée à la paroi arrière (2).

7. Un lave-vaisselle (1) selon la Revendication 2, **caractérisé par** l'élément de fixation qui est un élément de fixation en forme de C (13) qui est disposé dans le canal (12).
8. Un lave-vaisselle (1) selon l'une quelconque des revendications précédentes, **caractérisé par** la présence d'au moins deux supports de tuyau (6) pour chacun des tuyaux d'arrivée d'eau (4) et d'évacuation d'eau (5), disposés sur une même ligne, permettant aux tuyaux d'arrivée et d'évacuation d'eau (4, 5) de s'étendre parallèlement l'un à l'autre en haut et en bas de l'ouverture (3).

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Figure 1

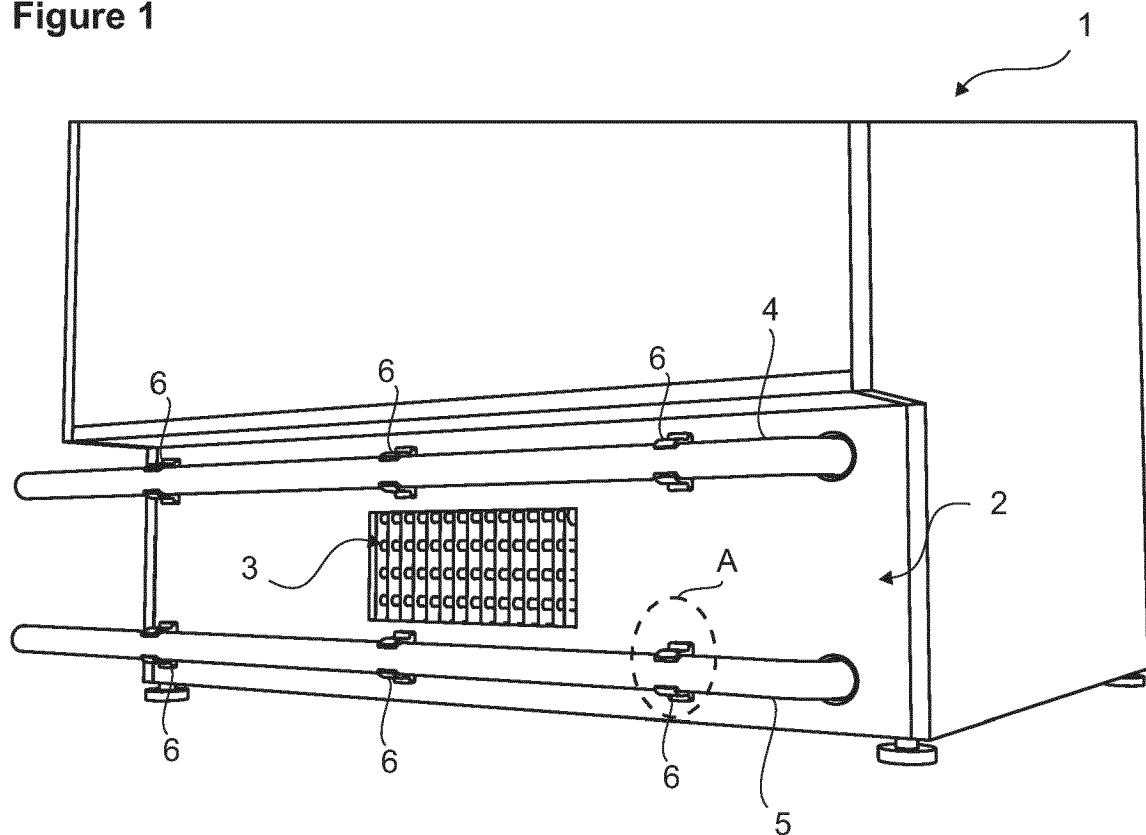


Figure 2

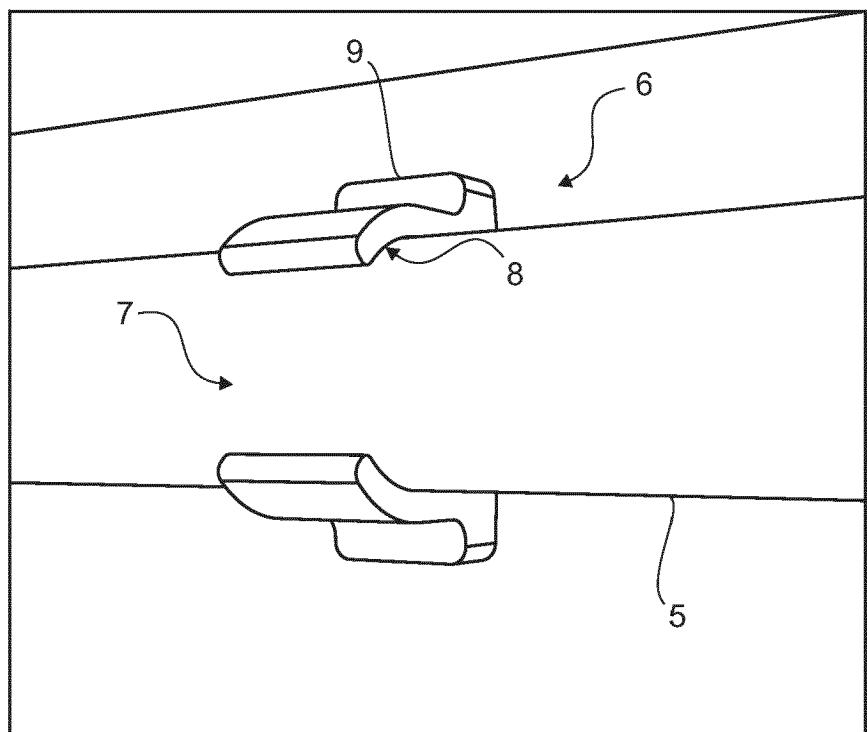


Figure 3

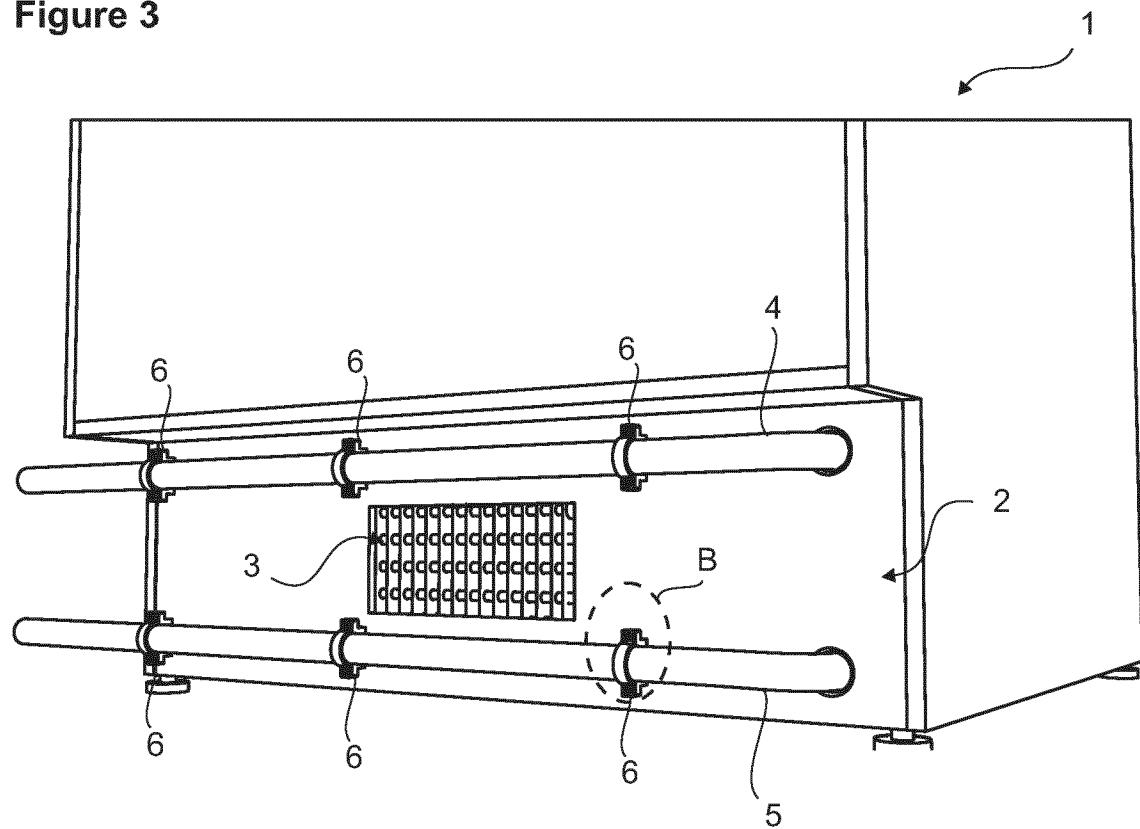


Figure 4

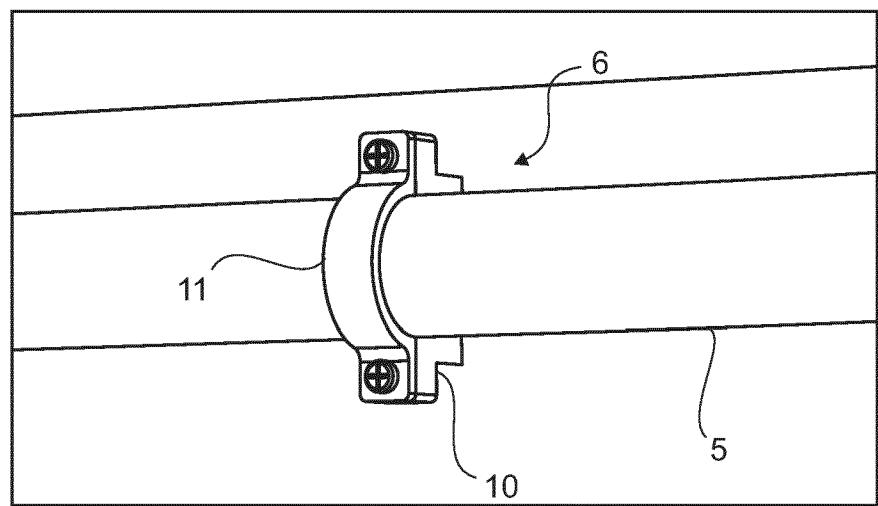


Figure 5

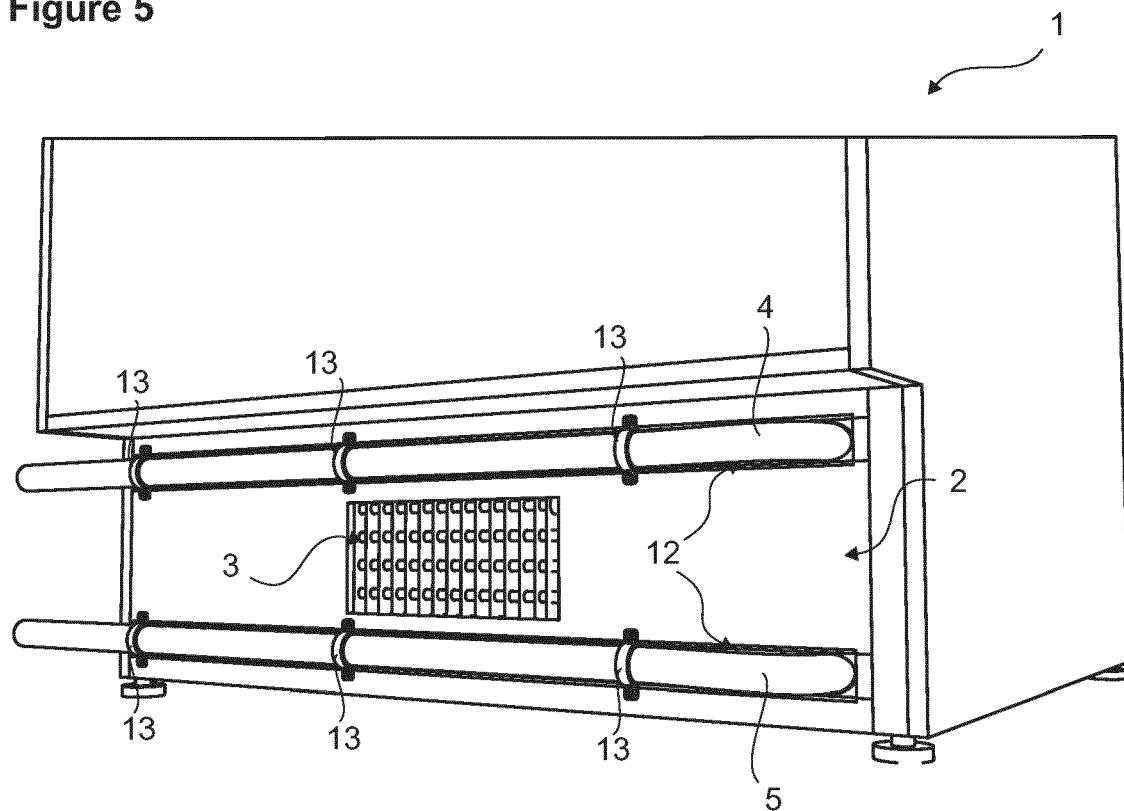


Figure 6

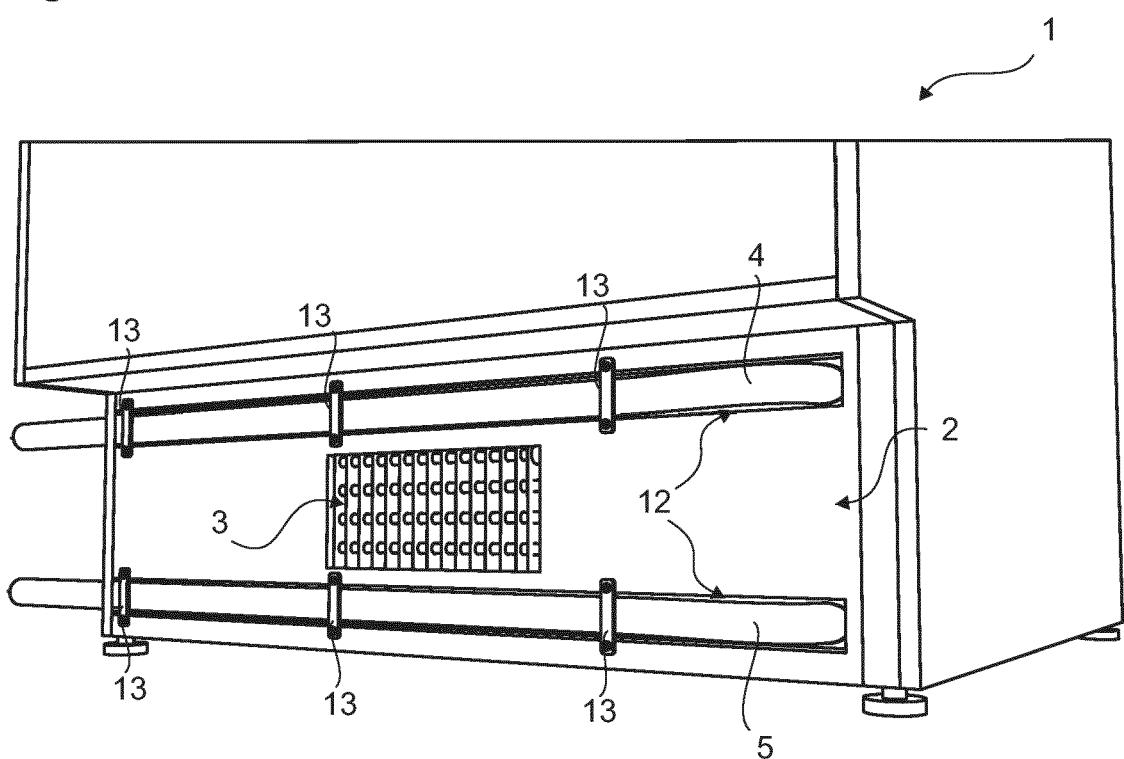


Figure 7

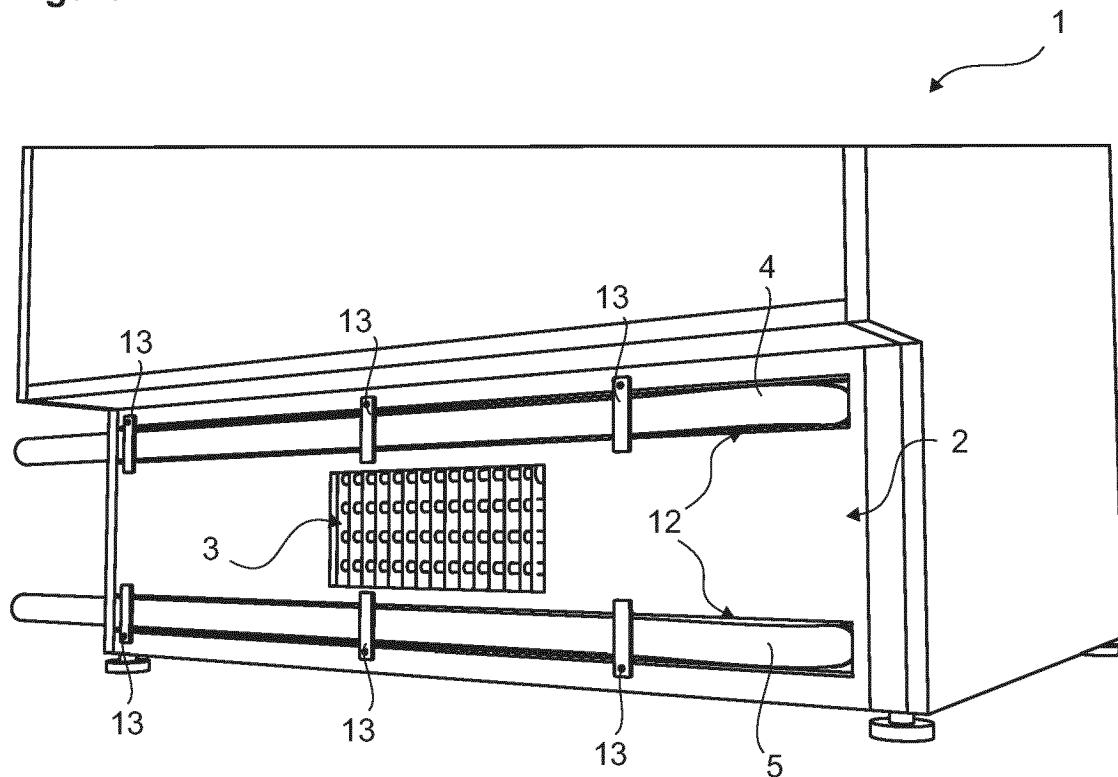


Figure 8

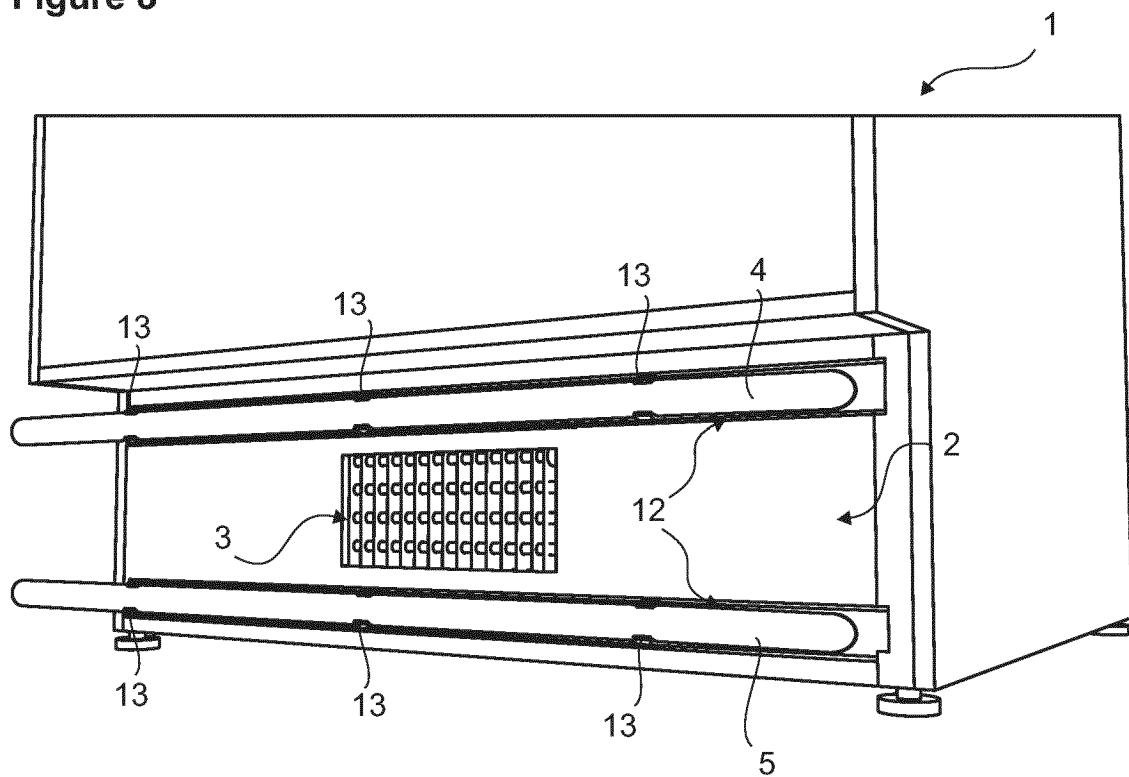
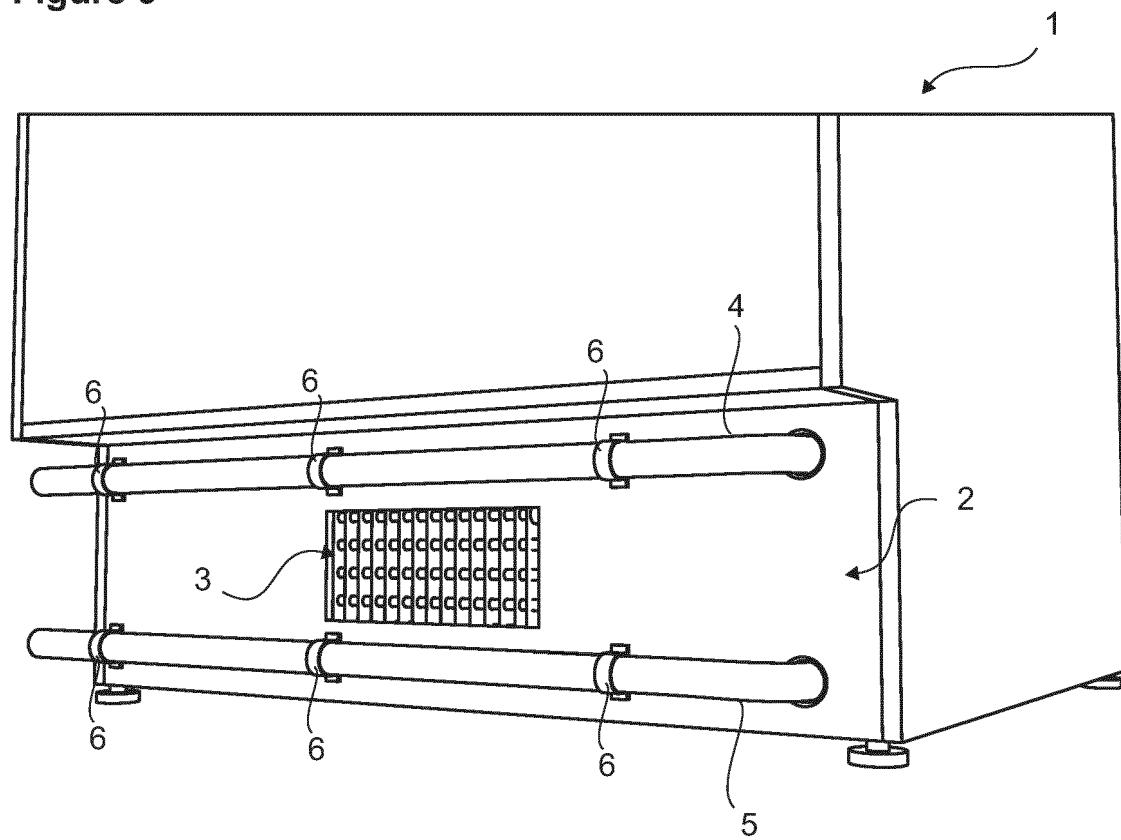


Figure 9



REFERENCES CITED IN THE DESCRIPTION

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