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(54) **A HEAT PUMP DISHWASHER**

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(57) **ABSTRACT**

The present invention relates to a dishwasher comprising a body; a heat pump that is disposed inside the body, that provides the heating of the water to be used in the washing step and that has a first heat exchanger, a second heat exchanger transferring the heat received from the first heat exchanger to the wash water and a compressor fluidly connected to the first heat exchanger and the second heat exchanger, realizing the refrigerant cycle, and a tank wherein the first heat exchanger or the second heat exchanger is placed.

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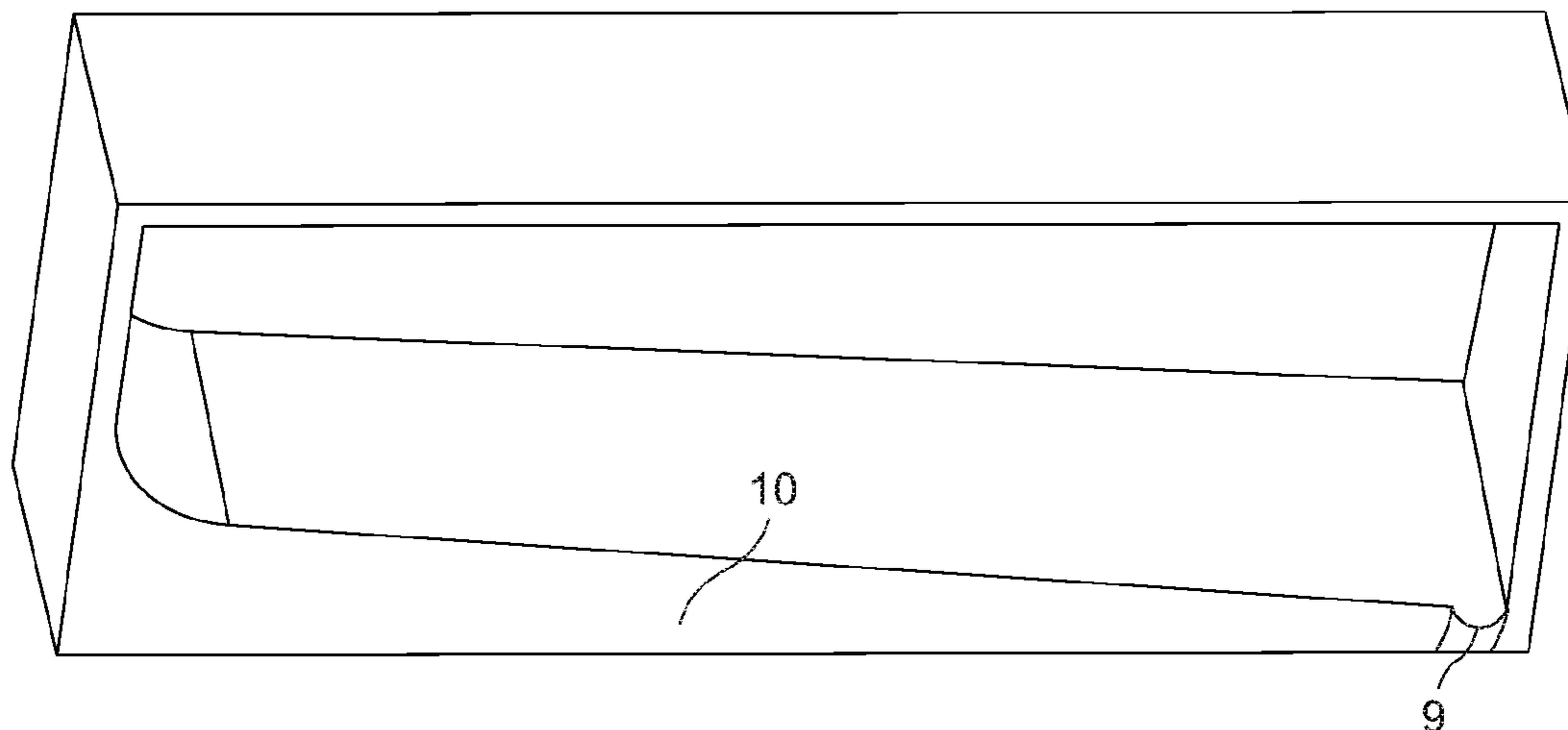


Figure 1

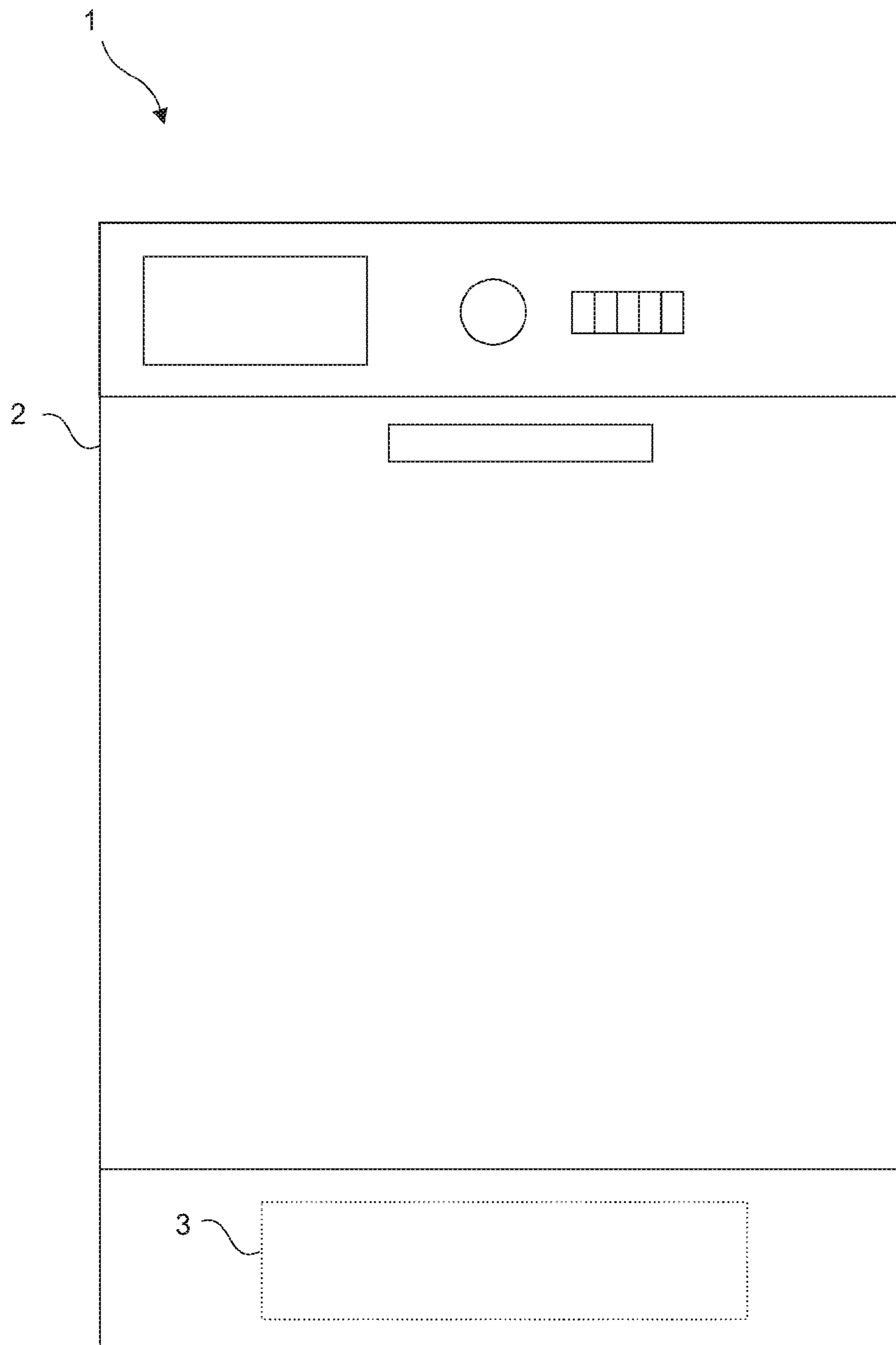


Figure 2

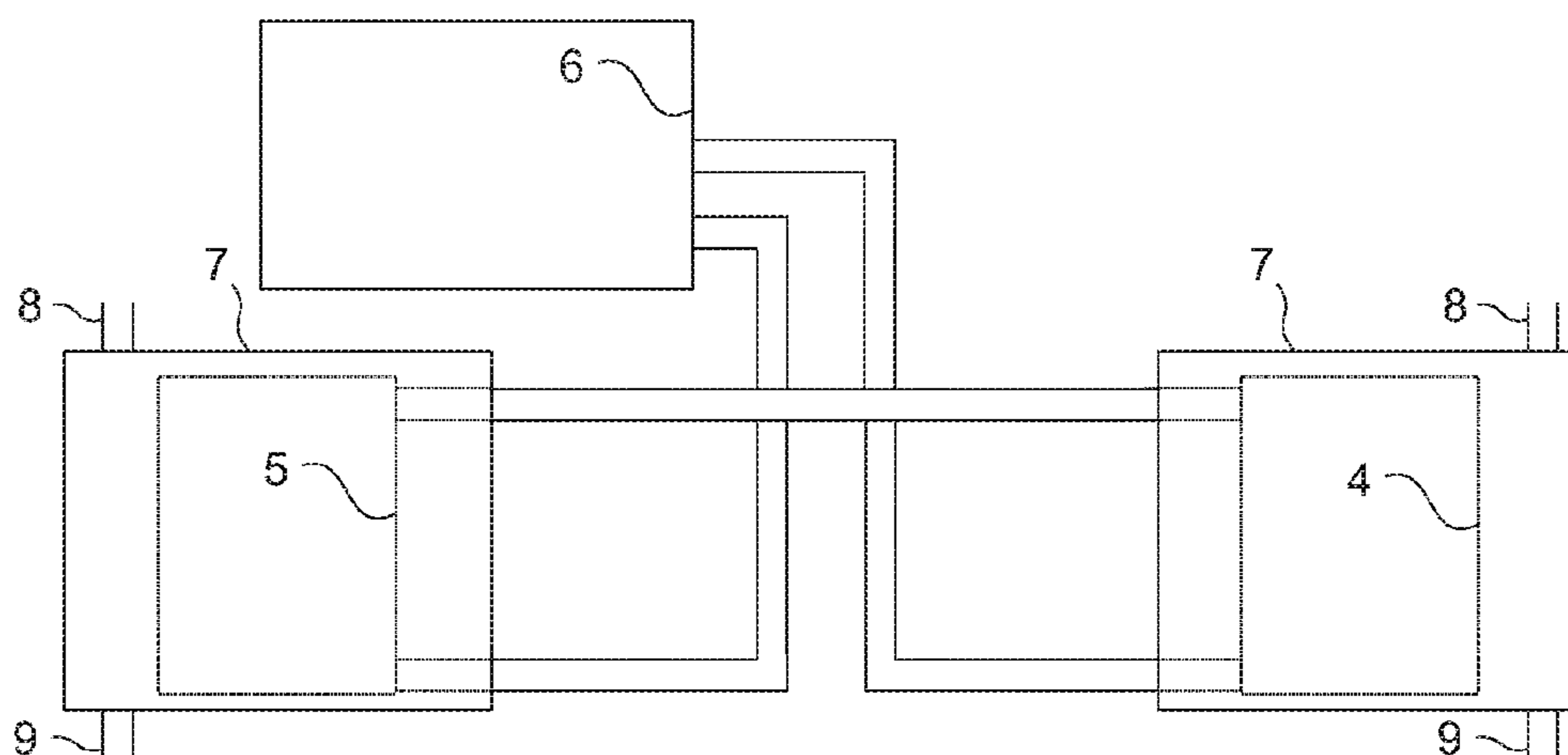


Figure 3

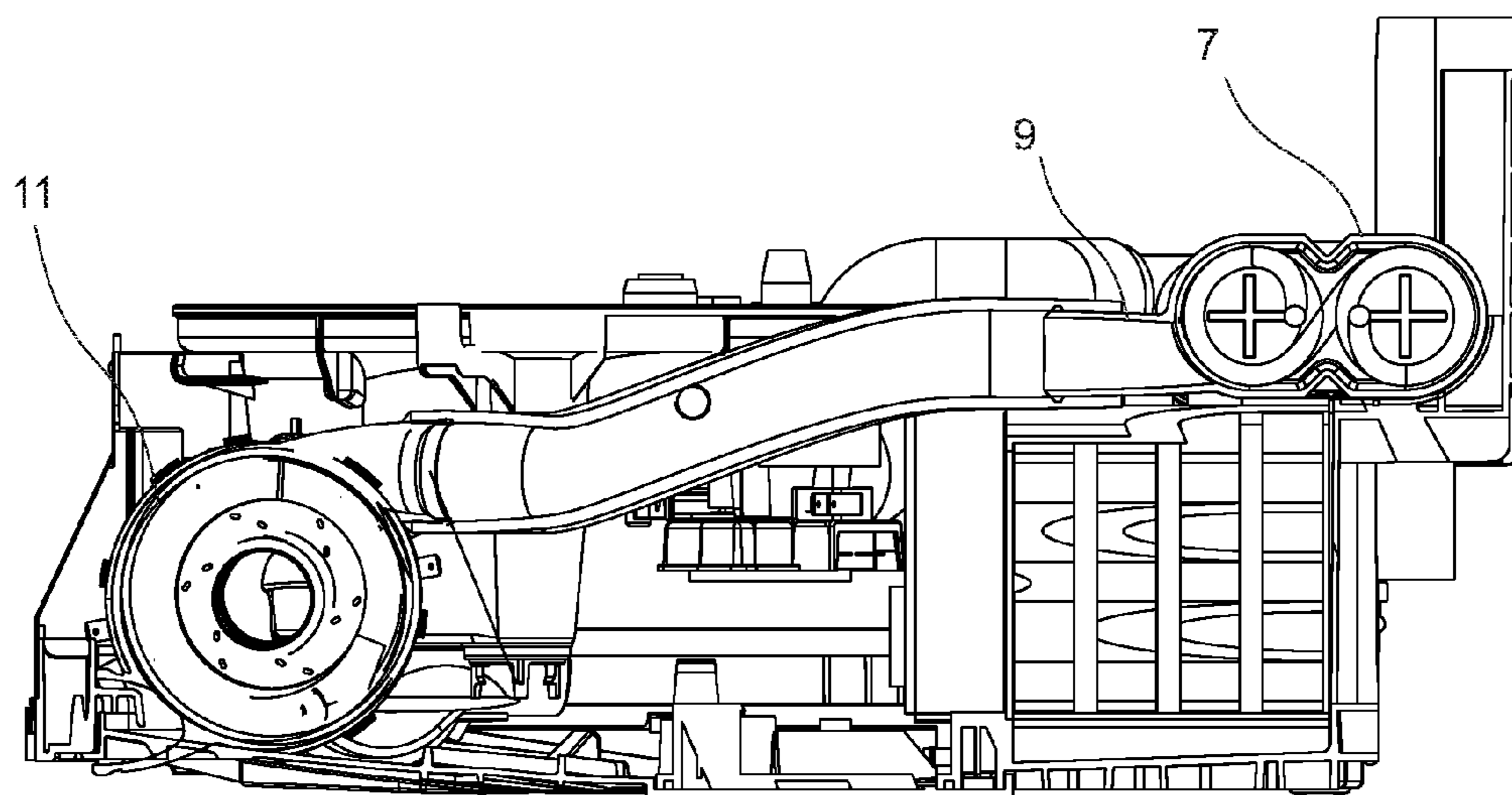


Figure 4

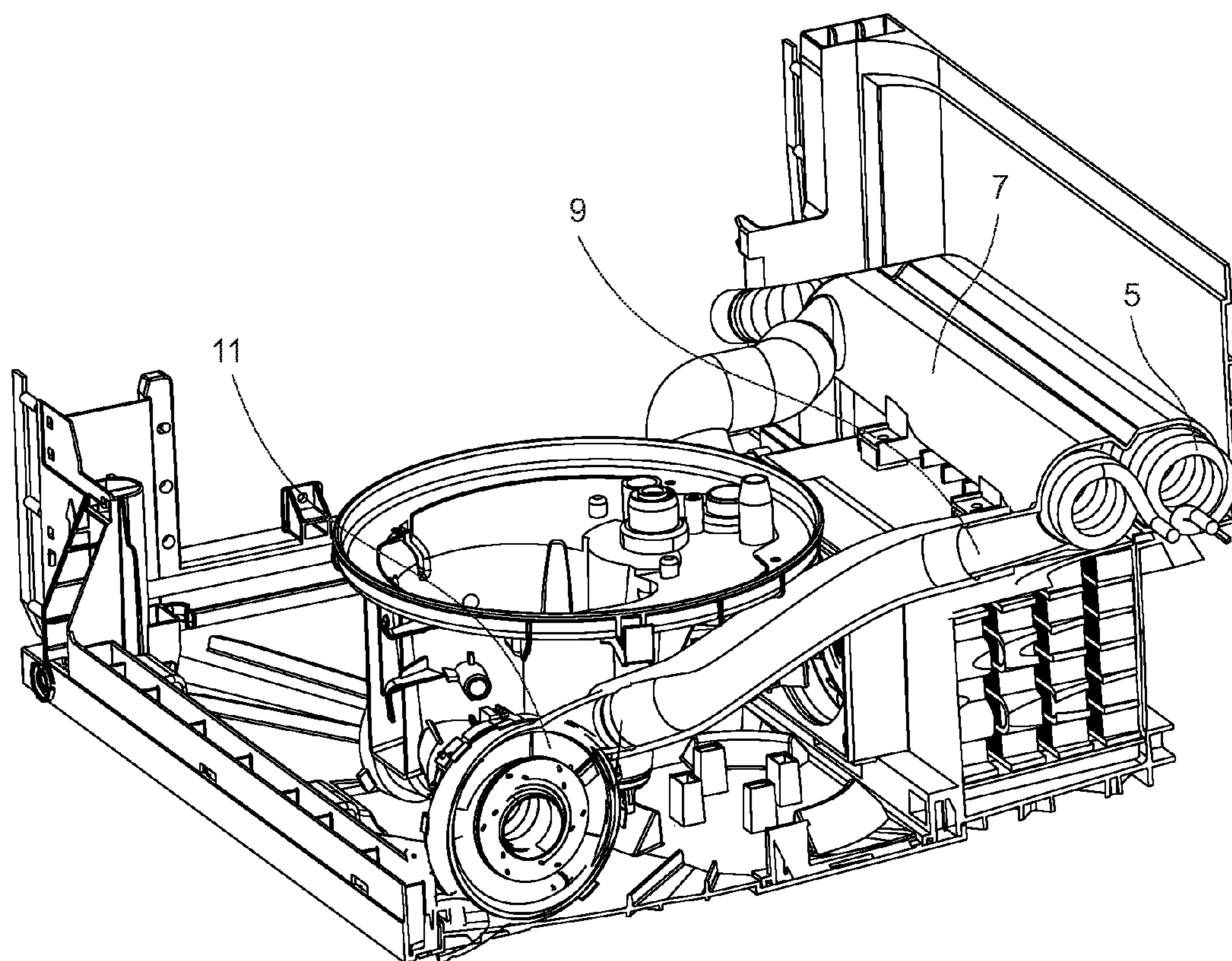


Figure 5

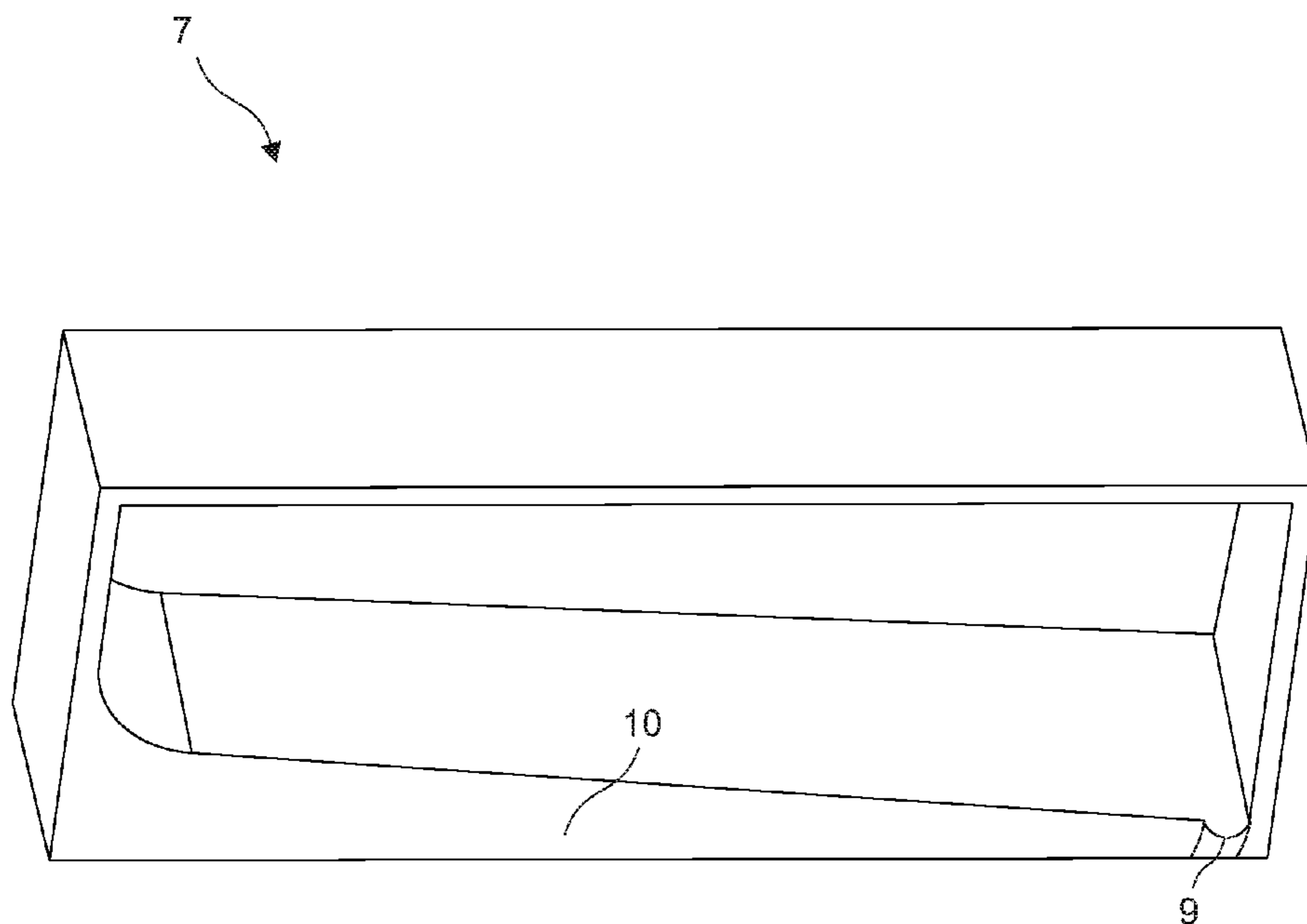


Figure 6

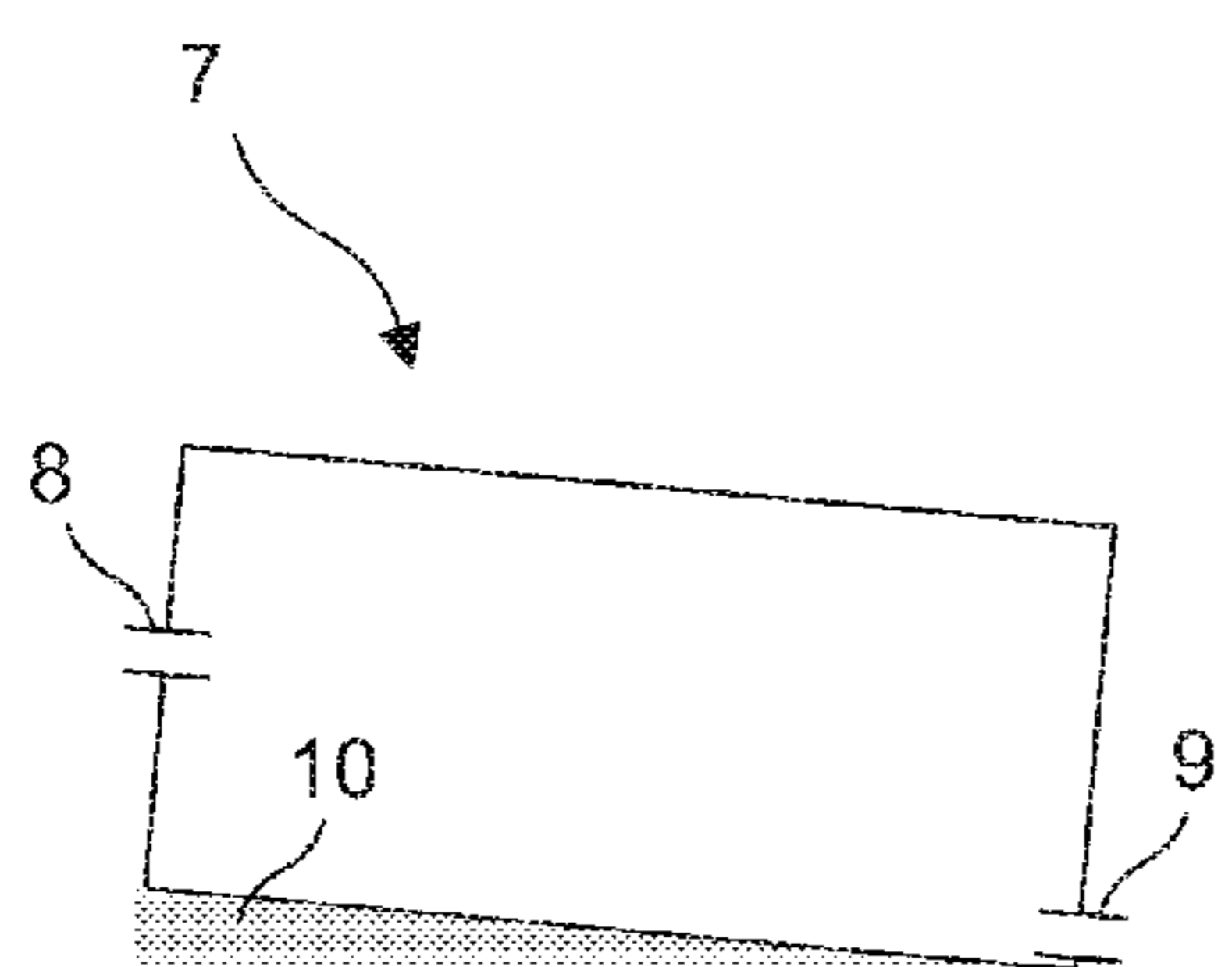
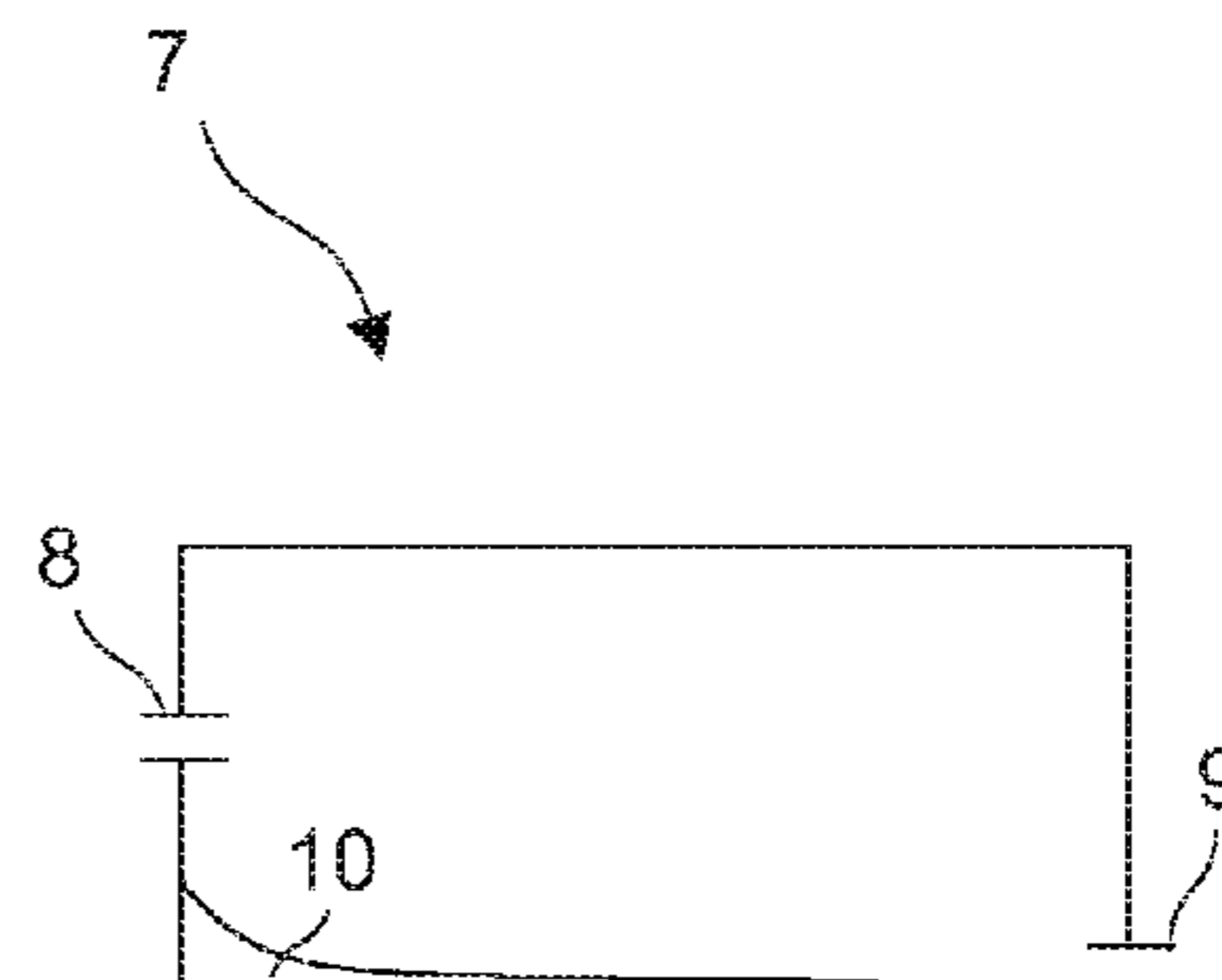


Figure 7



A HEAT PUMP DISHWASHER

[0001] The present invention relates to a dishwasher comprising a heat pump providing the heating of the wash water.

[0002] In dishwashers wherein a heat pump is used for heating the wash water, by circulating the wash water through a water tank wherein the heat exchanger is disposed, heat is transferred to the wash water from the heat exchanger. If the water in the tank cannot be completely discharged at the end of the washing process, the water remaining inside the tank causes corrosion on the plates of the heat exchanger, preferably produced from copper, thus shortening the lifespan of the heat exchanger. Moreover, the water in the tank becoming green due to its contact with copper contaminates the wash water in the following washing cycles. Moreover, the water collected in the tank causes formation of bacteria and bad odors, leading to problems in terms of hygiene. One other factor that makes it difficult to solve these problems is that the heat pump and the tank must be placed into a small volume at the base of the dishwasher, preventing structural freedom required for simple solutions.

[0003] In the state of the art Korean Patent Application No. KR101337796, a dishwasher is disclosed, comprising a spiral tank that is disposed at the lowermost point of the outlet port.

[0004] In the state of the art Japanese Patent Application No. JPH0819498, a dishwasher is disclosed, comprising a spiral tank with an outlet port that is arranged at the base thereof and that can be opened/closed by a valve.

[0005] The aim of the present invention is the realization of a dishwasher wherein the tank enclosing the heat exchanger is efficiently discharged.

[0006] The dishwasher realized in order to attain the aim of the present invention, explicated in the first claim and the respective claims thereof, comprises a tank wherein one of the first heat exchanger or the second heat exchanger is placed and that is disposed into the body so that the base thereof is inclined with respect to the floor so as to prevent the accumulation of water therein. With the inclined structure of the tank base, water is prevented from accumulating in the tank and the water inside the tank is enabled to be almost completely discharged.

[0007] In another embodiment of the present invention, a block disposed under the tank provides the inclination of the tank base with respect to the floor. In this embodiment, by means of the block placed under the tank in order to prevent the accumulation of water in the tank, the base of the tank is rendered inclined with respect to the floor.

[0008] In a version of this embodiment, the block is produced integrated with the tank. The upper surface of the block forms the base of the tank. Thus, the base of the tank is rendered inclined with respect to the floor and the water inside the tank is discharged before accumulating.

[0009] In another embodiment of the present invention, the upper surface of the block is curved. With the curved configuration of the upper surface of the block, the tank receives more water.

[0010] In an embodiment of the present invention, an inlet port provide the entry of water into the tank and an outlet port through which the water inside the tank is discharged are oppositely positioned on the two opposite lateral surfaces of the tank. By performing the water intake and discharge into/from the tank through different ports, a flow is provided in the tank. Moreover, the tank is positioned so that the inlet port is at a higher level than the outlet port. By

means of this embodiment, the water received into the tank flows towards the outlet port thanks to the inclination of the base with respect to the floor and the water accumulation in the tank is prevented.

[0011] In another embodiment of the present invention, by means of a pump, the suction level of which is lower than the level of the outlet port in the vertical direction, the water in the tank is discharged to the outside. By positioning the pump under the tank level, the tank is enabled to be completely emptied.

[0012] In another embodiment of the present invention, the pump is a circulation pump providing the circulation of the wash water. In another embodiment of this embodiment, the pump is only a discharge pump providing the discharge of the tank.

[0013] By means of the present invention, by placing the tank into the body at the bottom side of the dishwasher so that the base thereof is inclined towards the outlet port, the water accumulation inside the tank and thus the corrosion of the heat exchanger are prevented.

[0014] The dishwasher realized in order to attain the aim of the present invention is illustrated in the attached figures, where:

[0015] FIG. 1—is the schematic view of a dishwasher.

[0016] FIG. 2—is the schematic view of the heat pump and the tank related to an embodiment of the present invention.

[0017] FIG. 3—is the sideways view of the tank and the pump related to another embodiment of the present invention.

[0018] FIG. 4—is the perspective view of the tank and the pump related to another embodiment of the present invention.

[0019] FIG. 5—is the cross-sectional view of the tank related to another embodiment of the present invention.

[0020] FIG. 6—is the schematic view of the tank related to another embodiment of the present invention.

[0021] FIG. 7—is the schematic view of the tank related to yet another embodiment of the present invention.

[0022] The elements illustrated in the figures are numbered as follows:

[0023] 1. Dishwasher

[0024] 2. Body

[0025] 3. Heat pump

[0026] 4. First heat exchanger

[0027] 5. Second heat exchanger

[0028] 6. Compressor

[0029] 7. Tank

[0030] 8. Inlet port

[0031] 9. Outlet port

[0032] 10. Block

[0033] 11. Pump

[0034] The dishwasher (1) comprises a body (2); a heat pump (3) that is disposed inside the body (2), that provides the heating of the water to be used in the washing step and that has a first heat exchanger (4), a second heat exchanger (5) transferring the heat received from the first heat exchanger (4) to the wash water and a compressor (6) fluidly connected to the first heat exchanger (4) and the second heat exchanger (5), realizing the refrigerant cycle, and a tank (7) wherein the first heat exchanger (4) or the second heat exchanger (5) is placed.

[0035] By placing the first heat exchanger (4) or the second heat exchanger (5) into a tank (7) containing water,

a heat transfer with the water inside the tank (7) is provided. By transferring heat to the water, the water is enabled to be heated, and in the case heat is drawn from the water, the effectiveness of the heat pump (3) is improved. For example, when the wash water is filled into the tank (7) wherein the second heat exchanger (5) is disposed, the wash water is heated or when the mains water is filled into the tank (7) wherein the first heat exchanger (7) is disposed, heat is drawn from the mains water.

[0036] In the dishwasher (1) of the present invention, the tank (7) is placed into the body (2) so that the base thereof is inclined with respect to the floor plane. In the dishwashers (1), the heat pump (3) is preferably located under the tub (not shown in the figures) wherein the washing process is carried out, among water pipes, pumps and water receptacles. With the inclined configuration of the tank (7) base, water is prevented from accumulating in the tank (7) after the washing process, and the water remaining inside the tank (7) at the end of the washing or drying program is enabled to be almost completely discharged.

[0037] In another embodiment of the present invention, the dishwasher (1) comprises a block (10) that is disposed under the tank (7) and that enables the base of the tank (7) to be inclined with respect to the floor. By means of the block (10), the tank (7) is raised from its bottom side, thus the base thereof is enabled to be inclined with respect to the floor and thus the water is prevented from accumulating inside the tank (7).

[0038] In another embodiment of the present invention, the block (10) is produced integrated with the tank (7).

[0039] In an embodiment of the present invention, the upper surface of the block (10) is curved. With the curved configuration of the upper surface of the block (10) integrated with the tank (7), the block (10) is enabled to occupy less space. Thus, while the water is prevented from accumulating inside the tank (7), the tank (7) volume can be used more efficiently.

[0040] In another embodiment of the present invention, the tank (7) has an inlet port (8) that enables the water to enter the tank (7) and an outlet port (9) that enables the water to be discharged out of the tank (7), the inlet port (8) and the outlet port (9) being disposed at the two opposite surfaces of the tank (7). The tank (7) is placed into the body (2) so that the outlet port (9) is at a lower level than the inlet port (8). By providing the water intake into the tank (7) through the inlet port (8) and the water discharge from the tank (7) through the outlet port (9), a flow is provided inside the tank (7). The tank (7) is placed into the body (2) so that the base thereof is inclined with respect to the floor and the water flows from the inlet port (8) towards the outlet port (9). Thus, the water entering the tank (7) flows towards the outlet port (9) by drawing or giving off heat. Moreover, by means of the inclined configuration of the tank (7) base, the water inside the tank (7) is discharged through the outlet port (9) without accumulating on the base thereof.

[0041] In another embodiment of the present invention, the dishwasher (1) comprises a pump (11) that is connected to the outlet port (9), the suction level of which is at a lower level than the outlet port (9). In this embodiment, the water inside the tank (7) is discharged out of the tank (7) by means of a pump (11), the suction level of which is at a level lower than the outlet port (9). With the outlet port (9) of the tank (7) being at a higher level than the pump (11), the water

remaining above the suction level of the pump (11) is prevented from entering the tank (7).

[0042] In another embodiment of the present invention, the pump (11) is a circulation pump providing the circulation of the wash water. In the embodiment wherein the second heat exchanger (5) is provided in the tank (7), the wash water is circulated inside the tank (7) and the discharge of the wash water from the tank (7) is provided by means of the circulation pump (11). In this embodiment, an additional pump is not required for discharging the water inside the tank and by means of the circulation pump (11) providing the circulation of the wash water inside the tank (7) during the heating of the wash water, the water inside the tank (7) is enabled to be discharged.

[0043] In another embodiment of the present invention, the pump (11) is a discharge pump providing the discharge of the tank (7). In this embodiment, preferably the water inside the tank (7) is directly discharged without being sent to the sump of the dishwasher (1). Thus, the waste water containing copper oxides is enabled to be discharged without contacting the dishes.

[0044] In the dishwasher (1) of the present invention, the water is prevented from accumulating in the tank (7) situated at the bottom side of the dishwasher (1), the base of the tank (7) is configured so as to be inclined and the tank (7) is enabled to be discharged by means of the pump (11).

1- A dishwasher comprising a body; a heat pump that is disposed inside the body, that provides the heating of the water to be used in the washing step and that has a first heat exchanger, a second heat exchanger transferring the heat received from the first heat exchanger to the wash water and a compressor fluidly connected to the first heat exchanger and the second heat exchanger, realizing the refrigerant cycle, and a tank wherein the first heat exchanger or the second heat exchanger is placed, characterized by the tank that is placed into the body so that the base thereof is inclined with respect to the floor plane.

2- A dishwasher as in claim 1, characterized by the block that is disposed under the tank and that enables the base of the tank to be inclined with respect to the floor.

3- A dishwasher as in claim 2, characterized by the block that is produced as integrated with the tank.

4- A dishwasher as in claim 3, characterized by the block, the upper surface of which is curved.

5- A dishwasher as in claim 1, characterized by an inlet port that enables the water to enter the tank and an outlet port that enables the water to be discharged out of the tank, the inlet port and the outlet port being disposed at the two opposite surfaces of the tank, and by the tank that is disposed into the body so that the outlet port is at a lower level than the inlet port.

6- A dishwasher as in claim 5, characterized by a pump that is connected to the outlet port, the suction level of which is at a lower level than the outlet port.

7- A dishwasher as in claim 6, characterized by the pump that is a circulation pump providing the circulation of the wash water.

8- A dishwasher as in claim 6, characterized by the pump that is a discharge pump providing the discharge of the tank.

9- A dishwasher as in claim 2, characterized by an inlet port that enables the water to enter the tank and an outlet port that enables the water to be discharged out of the tank, the inlet port and the outlet port being disposed at the two

opposite surfaces of the tank, and by the tank that is disposed into the body so that the outlet port is at a lower level than the inlet port.

10- A dishwasher as in claim **3**, characterized by an inlet port that enables the water to enter the tank and an outlet port that enables the water to be discharged out of the tank, the inlet port and the outlet port being disposed at the two opposite surfaces of the tank, and by the tank that is disposed into the body so that the outlet port is at a lower level than the inlet port.

11- A dishwasher as in claim **4**, characterized by an inlet port that enables the water to enter the tank and an outlet port that enables the water to be discharged out of the tank, the inlet port and the outlet port being disposed at the two opposite surfaces of the tank, and by the tank that is disposed into the body so that the outlet port is at a lower level than the inlet port.

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