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(54) **HEAT PUMP LAUNDRY DRYER**

**WÄRMEPUMPENWÄSCHETROCKNER**

**SÈCHE-LINGE À POMPE DE CHALEUR**

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## Description

**[0001]** The present invention relates to a heat pump laundry dryer.

**[0002]** In heat pump laundry dryers wherein closed cycle drying process is applied, the heat pump used for drying the laundry is composed of the compressor that moves the refrigerant fluid and heat sinks named as evaporator and condenser. The laundry-drying process is performed by passing hot and dry air (processing air, drying air) over the laundry. Humid air leaving the laundry leaves its moisture while passing over the evaporator that works as the condenser and warms while passing over the condenser that works as the heater. The air that leaves its moisture and warms up is sent onto the laundry throughout the drying cycle. The evaporator is composed of a refrigerant tube in serpentine form and fins arranged on the refrigerant tube. The humid air condensing on the evaporator fins trickles down as water droplets due to the effect of the gravity and these droplets accumulate in the drain channel between the evaporator and the condenser. The air passing over the evaporator gets humid again by contacting the water in the drain channel and causes the condenser to get wet and its heating performance to decrease.

**[0003]** In the state of the art Japanese Patent Application No. JP2006122466, a laundry washer/dryer is explained, wherein the processing air is prevented from entering into the drain channel that provides the discharge of the water condensing in the evaporator.

**[0004]** In the state of the art Japanese Patent Application No. JP2009247600, a laundry dryer is explained, wherein the discharge of the water condensing in the evaporator is facilitated.

**[0005]** The state of the art Japanese Patent Application No. JP2004240737 relates to a heat pump laundry dryer, the drying performance of which is improved.

**[0006]** The aim of the present invention is the realization of a heat pump laundry dryer wherein the heating efficiency of the condenser thereof is improved.

**[0007]** The laundry dryer realized in order to attain the aim of the present invention, explicated in the first claim and the respective claims thereof comprises a ventilation duct wherein the processing air cycle is realized and an evaporator and a condenser placed into the said channel and the humid air condensing at the evaporator trickles down from the evaporator as water droplets and these droplets accumulate in the drain channel extending between the evaporator and the condenser. The laundry dryer furthermore comprises a guiding means that extends from the condenser towards the evaporator with a downward inclination by at least partially covering the drain channel, that prevents the air coming from the evaporator from entering into the drain channel and that, at the same time, guides the condensation water scattered from the evaporator due to the effect of the airflow, towards the drain channel without entering into the condenser.

**[0008]** In an embodiment of the present invention, the laundry dryer comprises a conduit arranged between the guiding means and the evaporator, that provides the condensation water guided downward by the guiding means due to its inclination, to flow into the drain channel. The guiding means extends on the drain channel, between the condenser and the conduit.

**[0009]** In another embodiment of the present invention, the guiding means is L-shaped, arranged in the ventilation duct, at the lower part of the condenser; and the parts of the guiding means that guide the air and the water protrude outwards from the lower edges of the condenser.

**[0010]** In the laundry dryer of the present invention, the guiding means arranged between the condenser and the evaporator so as to cover the drain channel prevents the processing air coming from the evaporator from being humidified and guides it to the condenser, and, thanks to its downward inclined shape, prevents the condensate water that is scattered from the evaporator towards the condenser as droplets with the airflow and that falls downwards through the gap between the evaporator and the condenser with the effect of the gravity, from moving towards the condenser and thus prevents the condenser from getting wet, increasing the heating efficiency of the condenser.

**[0011]** The laundry dryer realized in order to attain the aim of the present invention is illustrated in the attached figures, where:

Figure 1 - is the schematic view of a heat pump laundry dryer.

Figure 2 - is the perspective view of the part of the ventilation duct in a heat pump laundry dryer wherein the evaporator and the condenser are placed.

Figure 3 - is the schematic view of the part of the ventilation duct in a heat pump laundry dryer wherein the evaporator and the condenser are placed, and the schematic view of the L-shaped guiding means placed under the condenser.

**[0012]** The elements illustrated in the figures are numbered as follows:

1. Laundry dryer
2. Drum
3. Ventilation duct
4. Fan
5. Compressor
6. Evaporator
7. Condenser
8. Pump
9. Drain channel
10. Guiding means
11. Conduit

**[0013]** The heat pump laundry dryer (1) comprises a drum (2) wherein the laundry to be dried is placed, a

ventilation duct (3) wherein the processing air (drying air) cycle is realized, a fan (4) providing the circulation of the processing air, a compressor (5) providing the refrigerant cycle, an evaporator (6) placed into the ventilation duct (3), that condenses the humid processing air, a condenser (7) placed into the ventilation duct (3), that heats the processing air dehumidified at the evaporator (6) and a pump (8) providing the condensate water to be discharged.

**[0014]** The laundry dryer (1) of the present invention comprises a drain channel (9) that extends between the evaporator (6) and the condenser (7) and that provides the condensate water coming from the evaporator (6) to be delivered to the pump (8) in order to be discharged and a guiding means (10) that extends from the condenser (7) towards the evaporator (6) by at least partially covering the drain channel (9), that prevents the air coming from the evaporator (6) from entering into the drain channel (9) and guides it to the condenser (7) and that prevents the condensate water coming from the evaporator (6) due to the effect of the processing air from entering into the condenser (7) and guides it to the drain channel (9).

**[0015]** In the drying process realized in the heat pump laundry dryer (1), the processing air humidified by passing over the laundry in the drum (2) is passed over the evaporator (6) and the condenser (7) in the ventilation duct (3). The evaporator (6) condenses and dehumidifies the processing air, and the condenser (7) heats the dehumidified processing air coming from the evaporator (6). The processing air coming from the evaporator (6) passes over the drain channel (9) located between the condenser (7) and the evaporator (6), and the guiding means (10) placed onto the drain channel (9) prevents the processing air from contacting the water accumulating in the drain channel (9) and provides it to be guided to the condenser (7) without being humidified. The guiding means (10), furthermore, prevents the droplets that condense in the evaporator (6), scattered towards the condenser (7) from the evaporator (6) due to the effect of the processing air, and that fall down through the gap between the evaporator (6) and the condenser (7) due to the effect of the gravity, from moving towards the condenser (7), and guides the water to the drain channel (9). The guiding means (10) separately guides the processing air and the condensate water coming from the evaporator (6), thus the heating efficiency is increased by preventing the condenser (7) from getting wet.

**[0016]** The laundry dryer (1), furthermore, comprises a conduit (11) arranged between the guiding means (10) and the evaporator (6), that provides the condensate water coming from the evaporator (6) and guided by the guiding means (10) to flow into the drain channel (9).

**[0017]** In an embodiment of the present invention, the guiding means (10) extends from the condenser (7) towards the evaporator (6), between the condenser (7) and the conduit (11) with a downwards inclination (Figure 1, Figure 2). Thus, the condensate water moving from the

evaporator (6) towards the condenser (7) by passing over the conduit (11) without flowing downwards through the conduit (11) due to the effect of the processing air is provided to move backwards due to the effect of the guiding means (10) inclined in a direction opposite to the moving direction of the water and to flow from the conduit (11) into the drain channel (9).

**[0018]** In another embodiment of the present invention, the guiding means (10) is L-shaped, arranged in the ventilation duct (3), at the lower part of the condenser (7); and the parts of the guiding means (10) that are inclined, meaning the parts that guide the air and the water protrude outwards from the lower edges of the condenser (7) (Figure 3). The guiding means (10) serves as a supporting means that maintains the position of the condenser (7) in the ventilation duct (3).

**[0019]** In the laundry dryer (1) of the present invention, the guiding means (10) extending from the condenser (7) towards the evaporator (6) prevents the processing air coming from the evaporator (6) from contacting the water in the drain channel (9) thus from getting wet and guides it to the condenser (7), prevents the condensate water discharged from the evaporator (6) from moving towards the condenser (7) due to its downward inclined structure, thus preventing the condenser (7) from getting wet, and increases the processing-air-heating efficiency of the condenser (7).

**[0020]** It is to be understood that the present invention is not limited by the embodiments disclosed above and a person skilled in the art can easily introduce different embodiments. These should be considered within the scope of the protection disclosed by the claims of the present invention.

## Claims

1. A laundry dryer (1) comprising a drum (2) wherein the laundry to be dried is placed, a ventilation duct (3) wherein the processing air cycle is realized, a fan (4) providing the circulation of the processing air, a compressor (5) providing the refrigerant cycle, an evaporator (6) placed into the ventilation duct (3), that condenses the humid processing air, a condenser (7) placed into the ventilation duct (3), that heats the processing air dehumidified at the evaporator (6) a pump (8) providing the condensate water to be discharged, and

- a drain channel (9) that extends between the evaporator (6) and the condenser (7) and that provides the condensate water coming from the evaporator (6) to be delivered to the pump (8) in order to be discharged and **characterized by**
- a guiding means (10) that extends from the condenser (7) towards the evaporator (6) by at least partially covering the drain channel (9), that prevents the air coming from the evaporator (6)

from entering into the drain channel (9) and guides it to the condenser (7) and that prevents the condensate water coming from the evaporator (6) from entering into the condenser (7) and guides it to the drain channel (9).

2. A laundry dryer (1) as in Claim 1, **characterized in that** a conduit (11) is arranged between the guiding means (10) and the evaporator (6) and provides the condensate water coming from the evaporator (6) and guided by the guiding means (10) to flow into the drain channel (9).
3. A laundry dryer (1) as in Claim 1 or 2, **characterized in that** the guiding means (10) extends from the condenser (7) towards the evaporator (6) in a downwards inclination.
4. A laundry dryer (1) as in any one of claims 2 or 3, **characterized in that** the guiding means (10) extends between the condenser (7) and the conduit (11).
5. A laundry dryer (1) as in any one of the above claims, **characterized in that** the guiding means (10) is L-shaped, arranged in the ventilation duct (3), at the lower part of the condenser (7), of which the parts that guide the air and the water protrude outwards from the lower edges of the condenser (7).

das verhindert, dass das Kondensatwasser vom Verdampfer (6) in den Kondensator (7) gelangt, und es zum Ablasskanal (9) leitet.

2. Wäschetrockner (1) nach Anspruch 1, **dadurch gekennzeichnet, dass** eine Leitung (11) zwischen dem Führungsmittel (10) und dem Verdampfer (6) angeordnet ist und es ermöglicht, dass das Kondensatwasser, das vom Verdampfer (6) kommt und von dem Führungsmittel (10) gelenkt wird, in den Ablasskanal (9) fließt.
3. Wäschetrockner (1) nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** sich das Führungsmittel (10) mit einer Abwärtsneigung vom Kondensator (7) zum Verdampfer (6) erstreckt.
4. Wäschetrockner (1) nach einem der Ansprüche 2 oder 3, **dadurch gekennzeichnet, dass** sich das Führungsmittel (10) zwischen dem Kondensator (7) und der Leitung (11) erstreckt.
5. Wäschetrockner (1) nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** das Führungsmittel (10) L-förmig ist, im Lüftungskanal (3) am unteren Teil des Kondensators (7) angeordnet ist und dessen Teile, die die Luft und das Wasser lenken, von den unteren Kanten des Kondensators (7) nach außen ragen.

#### Patentansprüche

1. Wäschetrockner (1), umfassend eine Trommel (2), in die die zu trocknende Wäsche gegeben wird, einen Lüftungskanal (3), in dem der Arbeitsluftzyklus erzielt wird, ein Gebläse (4), das die Zirkulation der Arbeitsluft ermöglicht, einen Kompressor (5), der den Kühlzyklus bereitstellt, einen Verdampfer (6), der im Lüftungskanal (3) angeordnet ist und die feuchte Arbeitsluft kondensiert, einen Kondensator (7), der im Lüftungskanal (3) angeordnet ist und die vom Verdampfer (6) entfeuchtete Arbeitsluft erwärmt, eine Pumpe (8), die das Ablassen des Kondensatwassers ermöglicht, und

- einen Ablasskanal (9), der sich zwischen dem Verdampfer (6) und dem Kondensator (7) erstreckt und ermöglicht, dass das Kondensatwasser vom Verdampfer (6) an die Pumpe (8) geleitet wird, um abgelassen zu werden, und **gekennzeichnet durch**

- ein Führungsmittel (10), das sich von dem Kondensator (7) zu dem Verdampfer (6) erstreckt, indem es wenigstens teilweise den Ablasskanal (9) abdeckt und verhindert, dass die Luft von dem Verdampfer (6) in den Ablasskanal (9) eindringt, und sie zum Kondensator (7) leitet, und

#### Revendications

1. Un sèche-linge (1) comprenant un tambour (2) dans lequel le linge à sécher est placé, un conduit de ventilation (3) dans lequel le cycle de l'air de processus est effectué, un ventilateur (4) qui permet la circulation de l'air de processus, un compresseur (5) qui effectue le cycle du fluide frigorigène, un évaporateur (6) qui est placé dans le conduit de ventilation (3) et qui condense l'air de processus humide, un condenseur (7) qui est placé dans le conduit de ventilation (3) et qui chauffe l'air de processus déshumidifié à l'évaporateur (6), une pompe (8) qui permet l'évacuation de l'eau de condensation, et

- un canal d'évacuation (9) qui s'étend entre l'évaporateur (6) et le condenseur (7) et qui permet à l'eau de condensation venant de l'évaporateur (6) d'être délivrée à la pompe (8) afin d'être évacuée et **caractérisé par**

- un moyen de guidage (10) qui s'étend à partir du condenseur (7) vers l'évaporateur (6) en couvrant au moins partiellement le canal d'évacuation (9), qui permet à l'air venant de l'évaporateur (6) d'entrer dans le canal d'évacuation (9) et le dirige vers le condenseur (7) et qui permet l'eau de condensation venant de l'évaporateur

(6) d'entrer dans le condenseur (7) et le dirige dans le canal d'évacuation (9).

2. Un sèche-linge (1) selon la Revendication 1, **caractérisé en ce qu'un** conduit (11) est arrangé entre le moyen de guidage (10) et l'évaporateur (6) et permet à l'eau de condensation venant de l'évaporateur (6) et guidée par le moyen de guidage (10) d'écouler dans le canal d'évacuation (9).  
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3. Un sèche-linge (1) selon la Revendication 1 ou 2, **caractérisé en ce que** le moyen de guidage (10) s'étend à partir du condenseur (7) vers l'évaporateur (6) dans une inclinaison vers le bas.  
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4. Un sèche-linge (1) selon la Revendication 2 ou 3, **caractérisé en ce que** le moyen de guidage (10) s'étend entre le condenseur (7) et le conduit (11).  
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5. Un sèche-linge (1) selon l'une quelconque des revendications précédentes, **caractérisé par** le moyen de guidage (10) est en forme de L, arrangé dans le conduit de ventilation (3), à la partie inférieure du condenseur (7), dont les parties guidant l'air et l'eau font saillie vers l'extérieur à partir des bords inférieurs du condenseur (7).  
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Figure 1

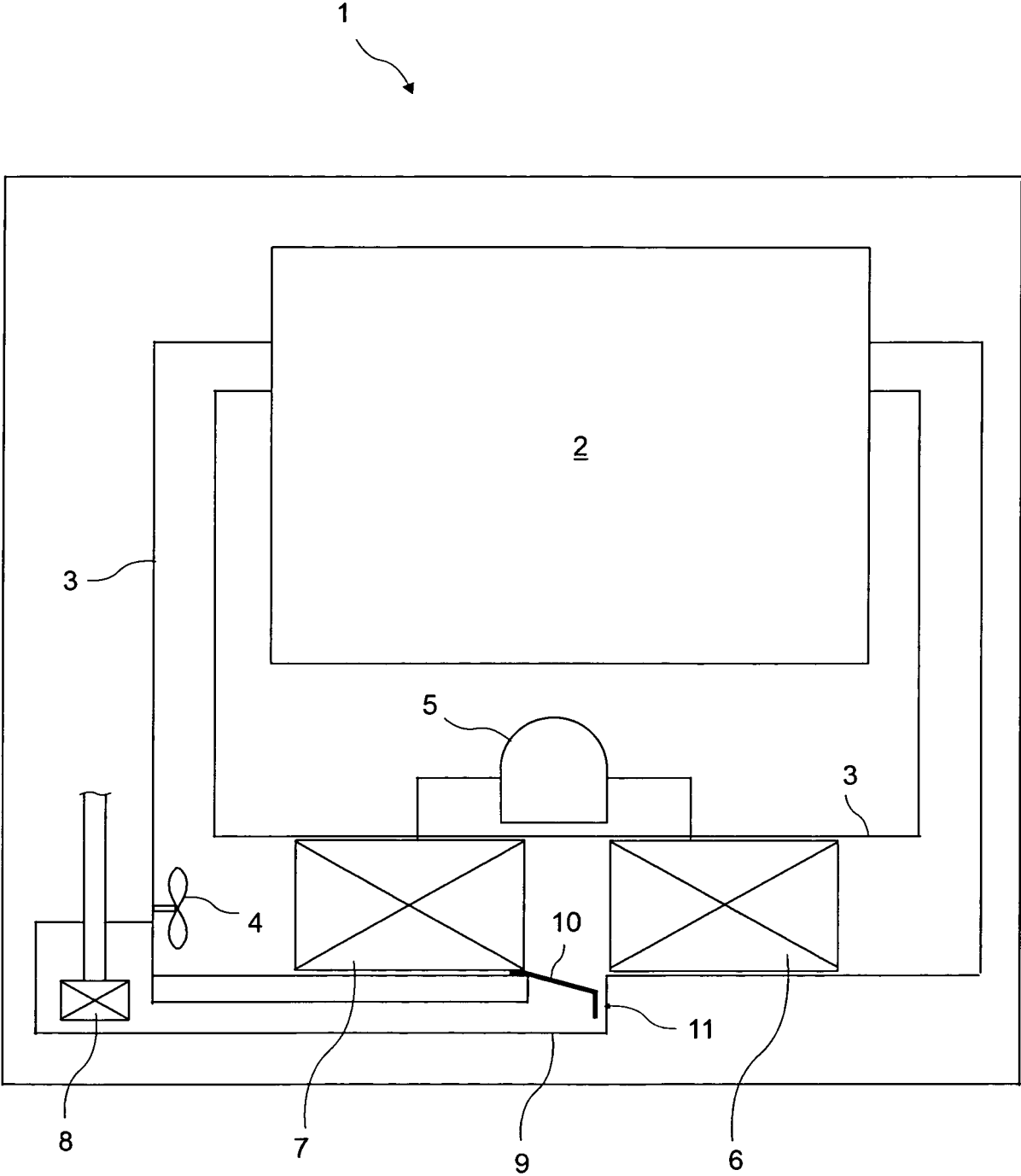


Figure 2

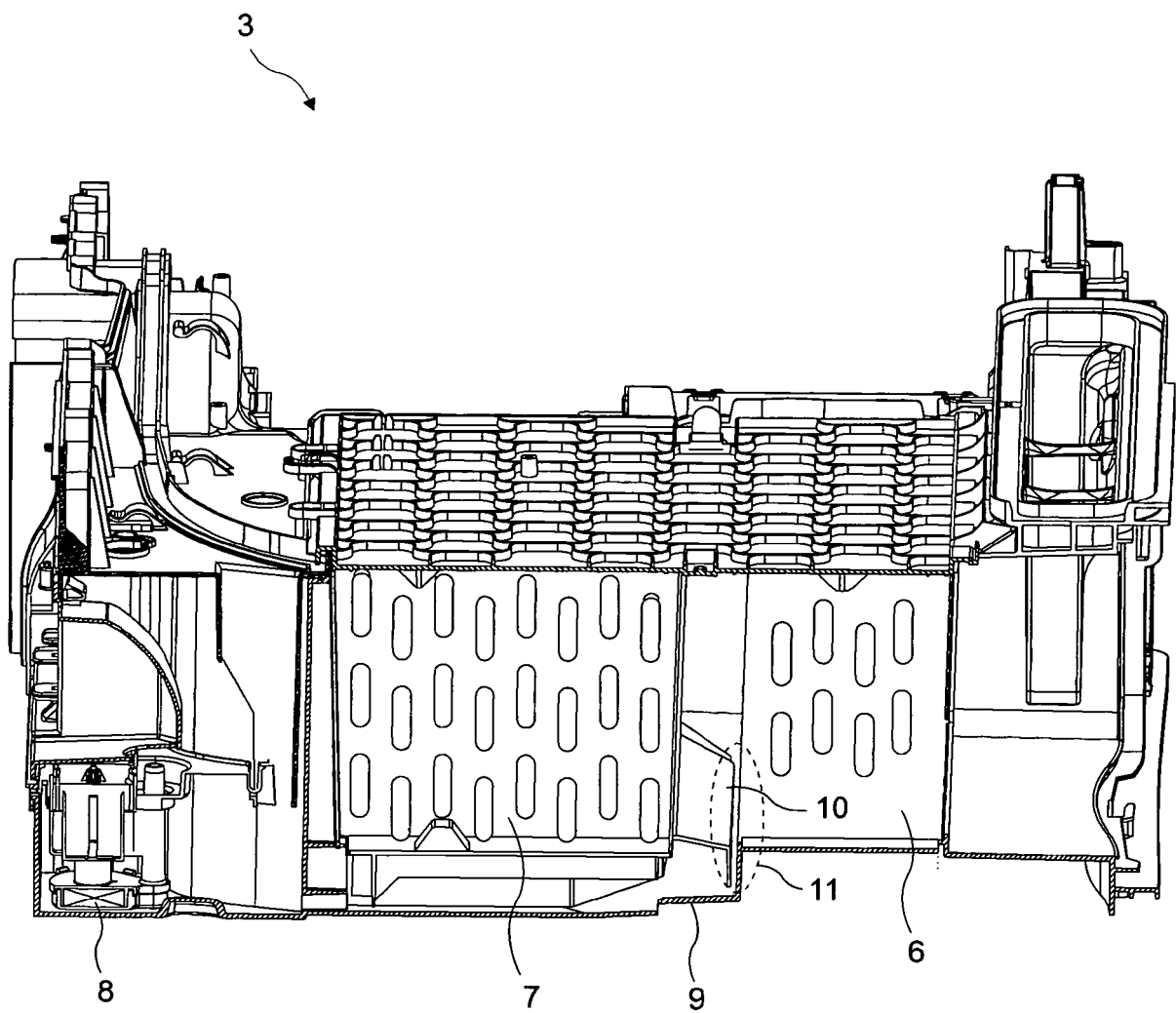
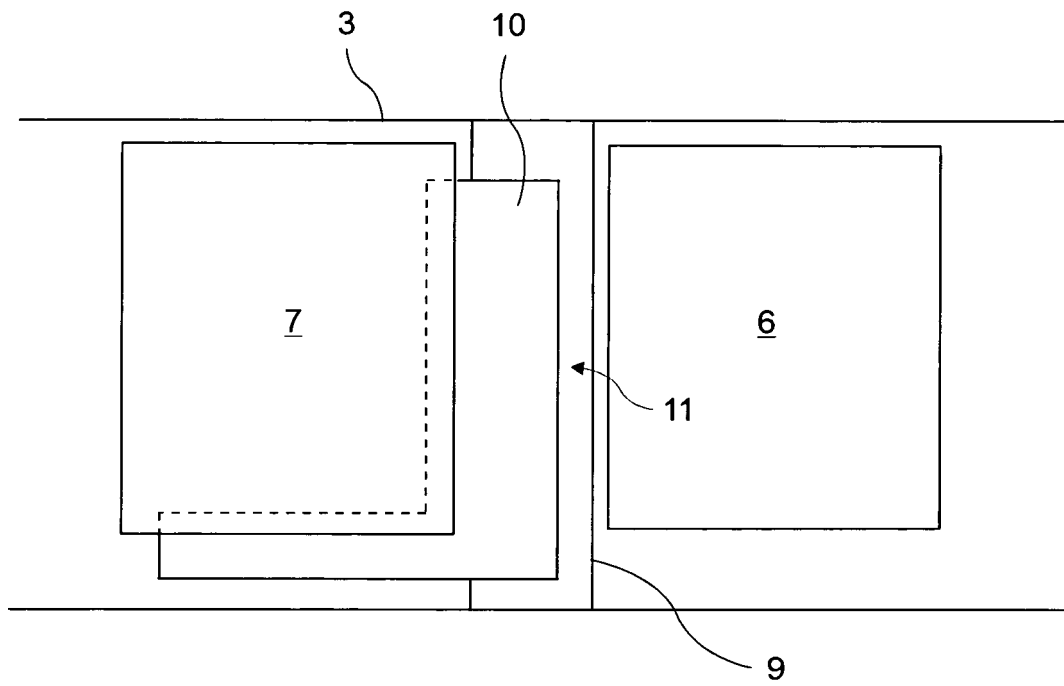


Figure 3



**REFERENCES CITED IN THE DESCRIPTION**

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