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(54) **HOUSEHOLD APPLIANCE COMPRISING DESICCANT MATERIAL**

HAUSHALTSGERÄT MIT EINEM TROCKENMITTELMATERIAL

APPAREIL ÉLECTROMÉNAGER POURVU D'UN MATÉRIAU DESSÉCHANT

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Description

[0001] The present invention relates to a household appliance comprising desiccant material.

[0002] In heat pump household appliances wherein closed cycle drying process is applied, such as laundry dryers or dishwashers, the heat pump used for drying the laundry or the dishes is composed of heat exchangers named as evaporator and condenser. During the drying process, hot and dry air is passed over the tub wherein the articles to be dried are placed. Humid air leaving the tub 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 heats up with the removal of its moisture is sent into the tub throughout the drying cycle. 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 lower water collection chamber under the evaporator. However, the collected water, until it is discharged, humidifies the processing air and decreases the drying performance of the household appliance and cause generation of undesired bad odors.

[0003] In the state of the art Patent Application No. JP2009247600, a laundry dryer is explained, wherein the discharge of the water condensing in the evaporator is facilitated.

[0004] The aim of the present invention is the realization of a household appliance wherein the drying efficiency is increased.

[0005] The household appliance realized in order to attain the aim of the present invention, explicated in the first claim and the respective claims thereof, comprises a body, a tub that is disposed in the tub and wherein the articles to be dried are placed, an air duct that enables the air received from the tub to be carried, a fan that is disposed on the air duct, an evaporator that condenses the process air by drawing heat and a condenser that heats the process air received from the evaporator. The household appliance furthermore comprises a receptacle that is disposed between the fan and the evaporator and that carries a desiccant material retaining the moisture of the air carried to the evaporator through the air duct. The drying air carried through the air duct is directed towards the evaporator by means of the fan. By means of the desiccant material in the receptacle disposed between the fan and the evaporator, the moisture of the drying air is retained and a desiccated air is delivered to the evaporator. Thus, the amount of condensation of the evaporator surface is decreased. The household appliance further comprises a heater that is disposed on the receptacle. The desiccant material reaching the saturation point during desiccation is regenerated by means of the heater and becomes usable again.

[0006] In an embodiment of the present invention, the receptacle is disposed near the evaporator on the air duct. The air, that is desiccated by means of the desiccant material in the receptacle disposed in the vicinity of the

evaporator, is delivered to the evaporator without drawing moisture once again through the air duct and the amount of condensation on the evaporator is decreased.

[0007] In an embodiment of the present invention, the household appliance comprises a valve that is disposed on the air duct and that enables the air in the outer environment to be received into the tub for drying. By means of the valve, during the drying process, the air received from the outer environment is guided to the heat pump composed of the evaporator, the condenser and the compressor directly or after being mixed with the air in the tub. The amount of condensation that may occur on the evaporator is decreased by passing the drying air received from the outer environment and/or the tub through the receptacle that is disposed before the evaporator and that carries the desiccant material.

[0008] In an embodiment of the present invention, the household appliance comprises a water collection tank that is disposed under the evaporator and that enables the water condensed on the evaporator to be collected thereon. By means of the desiccant material, the moisture in the drying air is retained, thus the amount of condensation on the evaporator surface is reduced and the volume of the water collection tank is decreased.

[0009] In an embodiment of the present invention, zeolite material is used as the desiccant material.

[0010] In an embodiment of the present invention, the desiccant material is a super absorbent polymer. The regeneration duration and the thermal energy required for the regeneration of the desiccant material decrease thanks to the property of the super absorbent polymer being able to be regenerated at low temperatures.

[0011] The household appliance 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 household appliance.

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

1. Household appliance
2. Body
3. Tub
4. Air duct
5. Fan
6. Evaporator
7. Condenser
8. Receptacle
9. Water collection tank
10. Heater

11. Valve

[0013] The household appliance (1) comprises a body (2); a tub (3) disposed inside the body (2) and wherein the drying process is performed; an air duct (4) wherein the circulation of the process air is performed; a fan (5) that is disposed on the air duct (4) and that provides the circulation of the process air; an evaporator (6) that is disposed inside the air duct (4) and that condenses the humid process air and a condenser (7) that is disposed on the air duct (4) and that heats the process air desiccated in the evaporator (6). The household appliance (1) of the present invention comprises a receptacle (8) that is disposed between the fan (5) and the evaporator (6) on the air duct (4) and that carries a desiccant material. The desiccant material is adapted to retain the moisture of the air carried to the evaporator (6) through the air duct (4). Thus, the humid air carried through the air duct (4) leaves its moisture by being passed over the desiccant material before reaching the evaporator (6). The humid air received from the tub (3) is carried through the air duct (4) and directed to the receptacle (8) containing the desiccant material by means of the fan (6). Heat is emanated while moisture, carried by air, is bonded with the desiccant material due to the thermophysical property of the desiccant material. The air, that is dehumidified and the temperature of which increases due to the heat emanated during dehumidification, is directed onto the evaporator (6). Thus, the moisture in the air is prevented from condensing on the evaporator (6). The household appliance (1) further comprises a heater (10) that is disposed on the receptacle (8). The desiccant material reaching the saturation point during desiccation is regenerated by means of the heater (10) and becomes usable again.

[0014] In an embodiment of the present invention, the receptacle (8) is disposed near the evaporator (6) on the air duct (4). The air, that is desiccated by means of the desiccant material in the receptacle (8) disposed in the vicinity of the evaporator (6), is delivered to the evaporator (6) without drawing moisture once again through the air duct (4) and the amount of condensation on the evaporator (6) is decreased.

[0015] In an embodiment of the present invention, the household appliance (1) comprises a valve (11) that is disposed on the air duct (4) and that enables the air in the outer environment to be received into the tub (3) for drying. The valve (11) is opened/closed during the drying process depending on the operation algorithm of the household appliance (1) predetermined by the producer, enabling the air in the outer environment to fill into the air duct (4). The humid air carried through the air duct (4) leaves its moisture by being passed over the desiccant material before reaching the evaporator (6), thus the amount of condensation on the evaporator (6) is decreased.

[0016] In an embodiment of the present invention, the household appliance (1) comprises a water collection tank (9) that is disposed under the evaporator (6) and

that enables the condensed water that cannot be sucked by the desiccant material to be collected thereon. Since the amount of moisture condensing on the evaporator (6) is reduced by means of the desiccant material, the amount of water collected in the water collection (8) is decreased, thus enabling the use of a water collection tank (9) with a smaller volume. By decreasing the amount of water collected, the amount of pathogen growing in the water collection tank (8) is reduced.

[0017] In an embodiment of the present invention, zeolite material is used as the desiccant material.

[0018] In an embodiment of the present invention, the desiccant material is a super absorbent polymer. The heat requirement for the endothermic regeneration process of the super absorbent polymer is low, thus energy saving is provided by operating the heater (10) less. The requirement for a powerful heater (10) is eliminated since the desiccant material is regenerated at low temperatures. Moreover, the need for using high temperature resistant materials is eliminated and material cost is decreased since the temperature the components near the heater (10) are subjected to during the regeneration process decreases.

[0019] In an embodiment of the present invention, the household appliance (1) is a dishwasher.

[0020] In an embodiment of the present invention, the household appliance (1) is a laundry dryer.

[0021] In an embodiment of the present invention, the household appliance (1) is a laundry washing and drying machine.

[0022] In the household appliance (1) of the present invention, by means of the desiccant material disposed on the air duct (4), the moisture of the air received from the tub (3) and/or the outer environment is retained, thus the desiccated air is delivered to the evaporator (6). Thus, the drying performance of the household appliance (1) is improved by preventing the moisture carried by the air from condensing on the cold surface of the evaporator (6). Moreover, by using the desiccant material, the volume of the water collection tank (8) is reduced.

Claims

1. A household appliance (1) comprising a body (2); a tub (3) disposed inside the body (2) and wherein the drying process is performed; an air duct (4) wherein the circulation of the process air is performed; a fan (5) that is disposed on the air duct (4) and that provides the circulation of the process air; an evaporator (6) that is disposed inside the air duct (4) and that condenses the humid process air; a condenser (7) that is disposed on the air duct (4) and that heats the process air desiccated in the evaporator (6); a receptacle (8) that is disposed between the fan (5) and the evaporator (6) on the air duct (4) and that comprises a desiccant material; **characterized in that** said desiccant material is adapted to retain the mois-

ture of the air carried to the evaporator (6) through the air duct (4) and that a heater (10) is disposed in the receptacle (8).

2. A household appliance (1) as in Claim 1, **characterized in that** the receptacle (8) that is disposed close to the evaporator (6) on the air duct (4).
3. A household appliance (1) as in Claim 1 or Claim 2, **characterized in that** a valve (11) that is disposed on the air duct (4) and that enables the air in the outer environment to be received into the tub (3) for drying.
4. A household appliance (1) as in any one of the above claims, **characterized in that** a water collection tank (9) that is disposed under the evaporator (6) and that enables the condensed water that cannot be sucked by the desiccant material to be collected thereon.
5. A household appliance (1) as in any one of the above claims, **characterized in that** the desiccant material that is zeolite.
6. A household appliance (1) as in any one of the Claims 1 to 4, **characterized in that** the desiccant material that is super absorbent polymer.
7. A household appliance (1) as in any one of the above claims, which is a dishwasher.
8. A household appliance (1) as in any one of the Claims 1 to 6, which is a laundry dryer.
9. A household appliance (1) as in any one of the Claims 1 to 6, which is a laundry washing and/or drying machine.

Patentansprüche

1. Ein Haushaltsgerät (1) **umfasst** einen Körper (2), eine Wanne (3), die innerhalb des Körpers (2) angeordnet ist und indessen der Trocknungsprozess durchgeführt wird; einen Luftkanal (4), in dem die Zirkulation der Prozessluft durchgeführt wird; einen Lüfter (5), der an dem Luftkanal (4) angeordnet ist und die Zirkulation der Prozessluft bereitstellt; einen Verdampfer (6), der innerhalb des Luftkanals (4) angeordnet ist und die feuchte Prozessluft kondensiert; einen Kondensator (7), der an dem Luftkanal (4) angeordnet ist und die im Verdampfer (6) ausgetrocknete Prozessluft erwärmt; einen Behälter (8), der zwischen dem Lüfter (5) und dem Verdampfer (6) am Luftkanal (4) angeordnet ist und ein Trockenmittel aufweist; **gekennzeichnet ist es dadurch**, dass das Trocknungsmaterial dafür vorgesehen ist, die Feuchtigkeit der Luft, die durch den Luftkanal (4)

zum Verdampfer (6) befördert wird, zurückzuhalten, und dadurch, dass eine Heizung (10) innerhalb des Behälters (8) angeordnet ist.

2. Ein Haushaltsgerät (1), wie in Anspruch 1 aufgeführt, **ist dadurch gekennzeichnet, dass** der Behälter (8) in der Nähe des Verdampfers (6) an dem Luftkanal (4) angeordnet ist.
3. Ein Haushaltsgerät (1), wie in Anspruch 1 oder 2 aufgeführt, **ist dadurch gekennzeichnet, dass** ein am Luftkanal (4) angeordnetes Ventil (11) die Aufnahme der Luft in der Außenumgebung in die Wanne (3) zum Trocknen ermöglicht.
4. Ein Haushaltsgerät (1), wie in einem der vorherigen Ansprüchen aufgeführt, **ist dadurch gekennzeichnet, dass** ein Wassersammeltank (9) unter dem Verdampfer (6) angeordnet ist, der es ermöglicht, dass das Kondenswasser, das nicht vom Trockenmittel angesaugt werden kann, entfernt und darauf gesammelt wird.
5. Ein Haushaltsgerät (1), wie in einem der vorherigen Ansprüchen aufgeführt, **ist dadurch gekennzeichnet, dass** das Trocknungsmaterial Zeolith ist.
6. Ein Haushaltsgerät (1), wie in den Ansprüchen 1 bis 4 aufgeführt, **ist dadurch gekennzeichnet, dass** das Trockenmittel ein superabsorbierendes Polymer ist.
7. Ein Haushaltsgerät (1), wie in einem der vorherigen Ansprüchen aufgeführt, ist eine Geschirrspülmaschine.
8. Ein Haushaltsgerät (1), wie in den Ansprüchen 1 bis 6 aufgeführt, ist ein Wäschetrockner.
9. Ein Haushaltsgerät (1), wie in den Ansprüchen 1 bis 6 aufgeführt, ist eine Waschmaschine und/oder eine Wäschetrockner.

Revendications

1. Un appareil électroménager (1) comprenant un corps (2); une cuve (3) disposée à l'intérieur du corps (2) et dans laquelle le processus de séchage est effectué; un conduit d'air (4) dans lequel s'effectue la circulation de l'air de procédé; un ventilateur (5) qui est disposé sur le conduit d'air (4) et qui assure la circulation de l'air de procédé; un évaporateur (6) qui est disposé à l'intérieur du conduit d'air (4) et qui condense l'air de procédé humide; un condenseur (7) qui est disposé sur le conduit d'air (4) et qui chauffe l'air de procédé desséché dans l'évaporateur (6); un réceptacle (8) qui est disposé entre le ventilateur

(5) et l'évaporateur (6) sur le conduit d'air (4) et qui comprend un matériau dessiccateur; **caractérisé en ce que** ledit matériau dessiccateur est adapté pour retenir l'humidité de l'air acheminé à l'évaporateur (6) à travers le conduit d'air (4) et **en ce qu'un** dispositif de chauffage (10) est disposé dans le réceptacle (8). 5

2. Un appareil électroménager (1) selon la Revendication 1, **caractérisé en ce que** le réceptacle (8) est disposé à proximité de l'évaporateur (6) sur le conduit d'air (4). 10

3. Un appareil électroménager (1) selon la Revendication 1 ou 2, **caractérisé en ce qu'une** soupape (11) est disposée sur le conduit d'air (4) et permet à l'air de l'environnement extérieur d'entrer dans la cuve (3) pour le séchage. 15

4. Un appareil électroménager (1) selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'un** réservoir de récupération d'eau (9) est disposé sous l'évaporateur (6) et permet d'y collecter l'eau condensée qui ne peut pas être absorbée par le matériau dessiccateur. 20 25

5. Un appareil électroménager (1) selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le matériau dessiccateur est la zéolithe. 30

6. Un appareil électroménager (1) selon l'une quelconque des Revendications 1 à 4, **caractérisé en ce que** le matériau dessiccateur est un polymère super absorbant. 35

7. Un appareil électroménager (1) selon l'une quelconque des revendications précédentes est un lave-vaisselle.

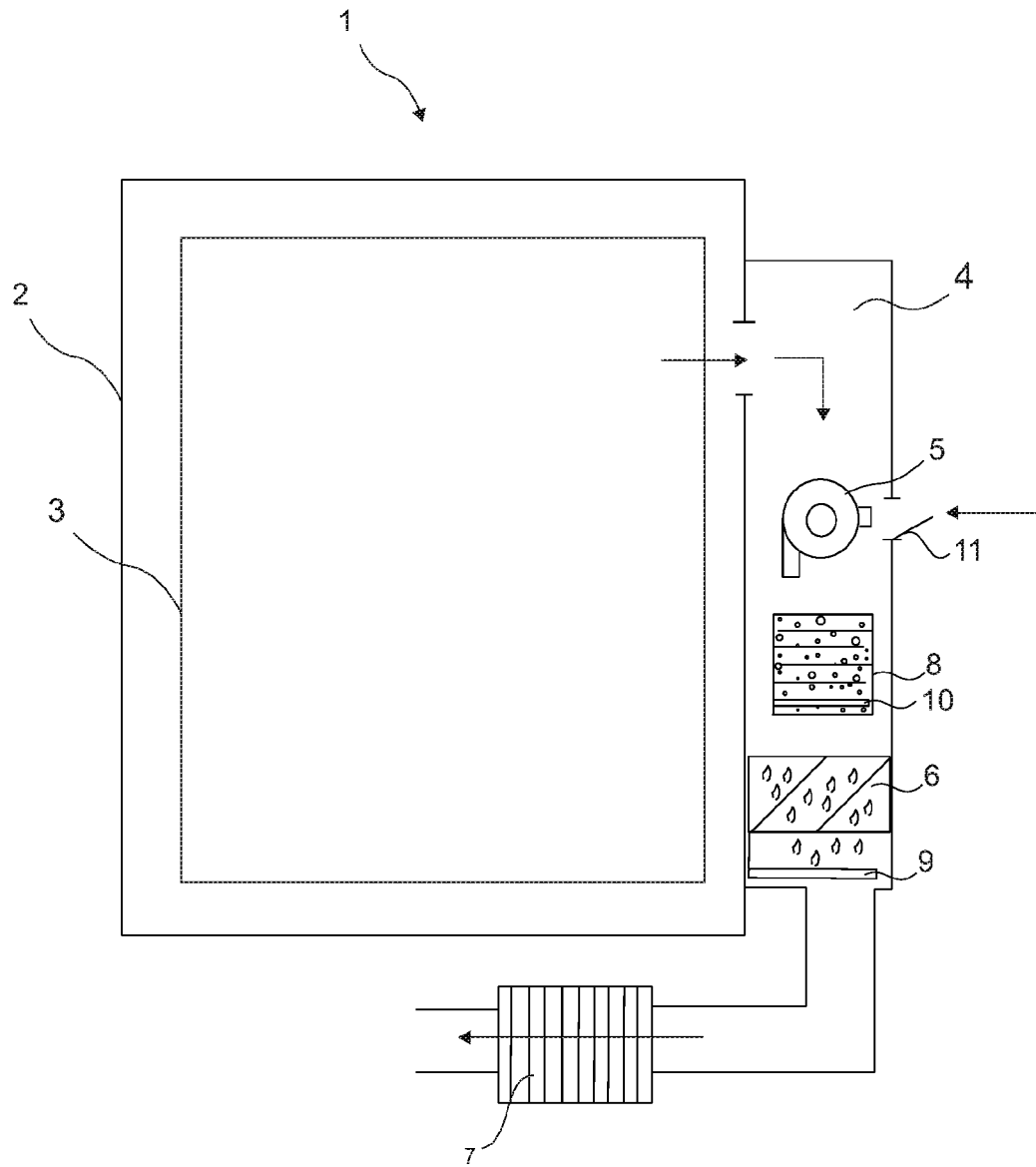
8. Un appareil électroménager (1) selon l'une quelconque des Revendications 1 à 6 est un sèche-linge. 40

9. Un appareil électroménager (1) selon l'une quelconque des Revendications 1 à 6, est une machine à laver et/ou sécher le linge. 45

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Figure 1



REFERENCES CITED IN THE DESCRIPTION

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