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(54) **LAUNDRY DEVICE COMPRISING AN ACTIVE COOLING ELEMENT**

(57) The present disclosure is directed to a laundry device (100), comprising a housing (101), which delimits an interior space (103) of the laundry device (100), and which comprises a door opening (107), a laundry drum (109), which is arranged in the interior space (103) of the laundry device (100), and which is adapted to receive wet laundry (113), a door (111), which is adapted to close the door opening (107), wherein the door (111) comprises a projecting section (119), which projects through the door opening (107) into the interior space (103) of the laundry device (100) in a closed state of the door (111), wherein the projecting section (119) comprises a con-

densing surface (133), which faces towards the interior space (103) of the laundry device (100), an active cooling element (141, 141-1, 141-2), which is arranged in the door (111), and which is adapted to actively cool the condensing surface (133), and a ventilation and heating unit (125), which is adapted to heat air and to direct a flow of the heated air through the wet laundry (113) received in the laundry drum (109), in order to obtain heated air with an increased humidity, which in turn is directed towards the condensing surface (133), so that liquid from the heated air with an increased humidity condenses at the condensing surface (133).

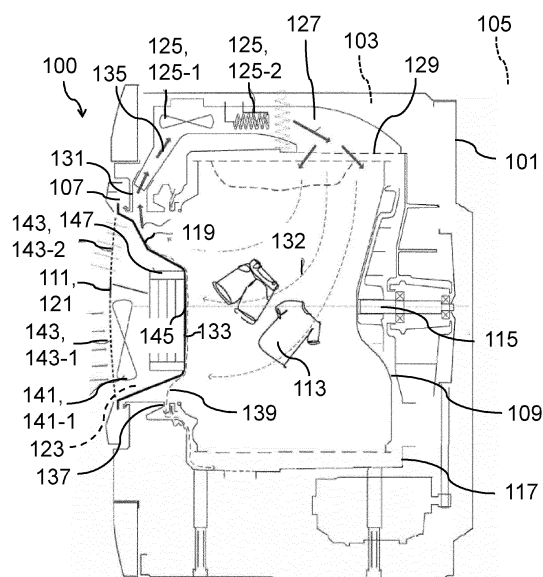


Fig. 2

Description

[0001] The present disclosure relates to a laundry device, in particular to a dryer or wash-dryer, comprising an active cooling element.

BACKGROUND

[0002] In conventional laundry devices, such as dryers or wash-dryers, wet laundry is introduced into a laundry drum. During the drying process the liquid content of the wet laundry has to be reduced for example by removing liquid from the laundry.

[0003] However, in conventional laundry devices, such as dryers or wash-dryers, such liquid removal elements often require complex elements and devices, which require an increased installation space within the laundry device, which are expensive, and which reduce the installation space within the laundry device.

[0004] In US 2,328,256 a vented dryer with a fan is disclosed.

SUMMARY

[0005] It is therefore an object of the present disclosure to provide a laundry device, in particular a dryer or wash-dryer, which allows for an efficient reduction of the liquid content of wet laundry during a drying process.

[0006] This object is achieved by way of the features of the independent patent claim. Advantageous developments are the subject matter of the dependent claims, the description, and the appended figures.

[0007] The present disclosure is based on the finding that the above object can be achieved by a condensing surface of the door of the laundry device, wherein said condensing surface is actively cooled by an active cooling element of the laundry device, and wherein said actively cooled condensing surface faces the interior of the laundry device. Therefore, when heated air is directed towards the wet laundry received in the laundry drum, said heated air can absorb liquid from the wet laundry, in order to obtain heated air with an increased humidity. The liquid of said heated air with an increased humidity can condense at the actively cooled condensing surface of the door, wherein said condensed liquid in particular can be forwarded for example to a liquid container of the laundry device.

[0008] Consequently, the liquid of the wet laundry received in the laundry drum of the laundry device can be efficiently removed from the laundry, thereby allowing for an efficient drying process.

[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. In particular the laundry device

according to the present disclosure is a wash-dryer, which is adapted to wash laundry and to dry laundry.

[0010] According to an aspect, the present disclosure relates to a laundry device, comprising a housing, which delimits an interior space of the laundry device, and which comprises a door opening, a laundry drum, which is arranged in the interior space of the laundry device, and which is adapted to receive wet laundry, and a door, which is adapted to close the door opening, wherein the door comprises a projecting section, which projects through the door opening into the interior space of the laundry device in a closed state of the door, wherein the projecting section comprises a condensing surface, which faces towards the interior space of the laundry device, an active cooling element, which is arranged in the door, and which is adapted to actively cool the condensing surface, and a ventilation and heating unit, which is adapted to heat air and to direct a flow of the heated air through the wet laundry received in the laundry drum, in order to obtain heated air with an increased humidity, which in turn is directed towards the condensing surface, so that liquid from the heated air with an increased humidity condenses at the condensing surface.

[0011] As a result of the actively cooled condensing surface of the door, liquid can be efficiently removed from the circulating flow of heated air within the interior space of the laundry device by condensation. The condensed liquid can then be transferred from the condensation surface, for example by flowing down the condensation surface due to the force of gravity, so that the condensed liquid can subsequently flow to a laundry container of the laundry device and/or the condensed liquid can be subsequently conducted out of the laundry device.

[0012] Since the condensing surface is already part of the door, which is mandatory in conventional laundry devices for accessing the interior space of the laundry device, no additional liquid removal elements have to be introduced into the laundry device according to the present disclosure thereby simplifying the overall design of the laundry device, which allows for an increased interior space of the laundry device and also for a significant cost reduction.

[0013] In particular, the condensing surface and the projecting section are formed as one piece.

[0014] In particular, the condensing surface and the projecting section are formed from a thermally conducting material, in particular from steel.

[0015] However, to achieve an efficient condensation effect, the condensing surface has to be actively cooled by the active cooling element. The active cooling element is positioned in the door of the laundry device and allows for an active removal of heat from the condensing surface of the door towards an exterior space of the laundry device. To allow for such active cooling, the active cooling element in particular is thermally connected to the condensing surface, or is thermally connected to the projecting section of the door, wherein said projecting section of the door in turn is thermally connected to the condens-

ing surface.

[0016] In particular, the active cooling element does not extend into the interior of the laundry device.

[0017] In particular, the active cooling element comprises an additional ventilation unit, which is adapted to direct a flow of air towards the projecting section of the door, in order to cool the projecting section and the condensing surface of the projecting section.

[0018] In particular, the active cooling element comprises a thermally conductive element, which is in physical contact with the projecting section and the condensing surface of the projecting section in order to conduct heat from the condensing surface through the projecting section and through the thermally conductive element away from the interior of the laundry device, in particular to an exterior of the laundry device, for example to a heat sink.

[0019] The flow of heated air within the laundry device is provided by a ventilation and heating unit of the laundry device. The ventilation and heating unit directs the flow of heated air, in particular dry, heated air through the wet laundry, which is received in the laundry drum, so that the heated air takes up moisture from the wet laundry, and so that subsequently heated air with increased humidity is obtained.

[0020] Said heated air with increased humidity is then directed by the flow of the ventilation and heating unit of towards the condensing surface, so that liquid from the heated air with increased humidity condenses at the condensing surface, which results in that a heated air with reduced humidity is obtained. Said heated air with reduced humidity is then conducted back to the ventilation and heating unit of the laundry device to close the ventilation cycle.

[0021] According to an embodiment, the door comprises an external section, which faces away from the projecting section, wherein the external section and the projecting section delimit an interior space of the door, wherein the active cooling element is at least partially arranged in the interior space of the door.

[0022] As a result, by arranging the active cooling element in the interior space of the door, the active cooling element is in an optimal position to actively cool the condensing surface of the projecting section.

[0023] In particular, the external section of the door faces towards an exterior space of the laundry device. In particular, the external section of the door is at least partially formed by a glass frame of the door.

[0024] According to an embodiment, the external section comprises a plurality of air exchange openings, which are adapted to allow for an air exchange between the interior space of the door and an exterior space of the laundry device.

[0025] As a result, the plurality of air exchange openings allow for an efficient heat dissipation from the interior space of the door to the exterior space of the laundry device.

[0026] In particular, air from the exterior space of the

laundry device can enter the interior space of the door through a first plurality of air openings formed in the external section. In particular, air from the interior space of the door can exit the interior space of the door through a second plurality of air openings formed in the external section to the exterior space of the laundry device.

[0027] According to an embodiment, the active cooling element comprises an additional ventilator, which is arranged in the door, in particular in the interior space of the door, and which is adapted to direct a flow of air towards the projecting section of the door, in order to actively cool the condensing surface.

[0028] As a result, by the flow of air, which is directed by the additional ventilator towards the projecting section, heat from the condensing surface of the projecting section can be efficiently dissipated.

[0029] In particular, the additional ventilator is adapted to suck in air from an exterior space of the laundry device, through a first plurality of air exchange openings in the door into the interior space of the door, and direct said flow of air towards the projecting section of the door, in order to absorb heat from the condensing surface of the projecting section, and to obtain heated air, wherein said heated air is directed from the interior space of the door through a second plurality of air exchange openings in the door to the exterior space of the laundry device.

[0030] According to an embodiment, the active cooling element comprises a thermally conductive element, which is arranged in the door, in particular in the interior space of the door, and which is in contact with the projecting section of the door, in order to actively cool the condensing surface.

[0031] As a result, the thermally conductive element as an alternative to the additional ventilator or in addition to the additional ventilator allows for an efficient heat dissipation from the condensing surface.

[0032] In particular, said thermally conductive element extends from an exterior space of the laundry device through the interior space of the door to the projecting section of the door, which allows for an efficient removal of heat from the condensing surface, when said thermally conductive element for example is attached to a heat sink.

[0033] According to an embodiment, a heat-dissipating element is arranged in the door, in particular in the interior space of the door, wherein the heat-dissipating element is connected to the projecting section in a thermally conducting manner, in order to cool the condensing surface, and wherein the active cooling element in particular is adapted to actively cool the heat-dissipating element and therefore cool the condensing surface.

[0034] As a result, by the thermal contact to the projecting section, the heat-dissipating element allows for an efficient heat removal from the condensing surface of the projecting surface, in particular when the active cooling element actively cools the heat-dissipating element.

[0035] In particular, the heat-dissipating element comprises a plurality of fins, which increase the heat-dissi-

pating surface of the heat-dissipating element. In particular, the heat-dissipating element is made from aluminum. In particular, the heat-dissipating element is connected with the projecting section in a materially bonded manner, in particular by a thermally conductive epoxy material.

[0036] According to an embodiment, the ventilation and heating unit is arranged in an air channel of the laundry device, wherein the air channel is delimited by the housing, wherein the air channel is connected to an air insertion section of the liquid container, and wherein the air channel is connected to an air exhaustion section of the liquid container, in order to direct the flow of heated air through the air insertion section into the laundry drum, and in order return humidity-reduced air after condensation through the air exhaustion section back to the air channel.

[0037] As a result, both connections of the air channel effectively close the air cycle during the drying process of the laundry device.

[0038] According to an embodiment, the laundry drum comprises a plurality of drum holes, in particular at a close vicinity to the air insertion section of the liquid container, to allow for an efficient flow of heated air into the laundry drum.

[0039] As a result, heated air which is conducted by the ventilation and heating unit, in particular through the air channel, can enter the laundry drum through said plurality of drum holes in order to allow for an efficient drying of the laundry.

[0040] According to an embodiment, the laundry device comprises a flow regulator, which is in particular arranged at the air insertion section of the liquid container and/or at the plurality of drum holes of the laundry drum, and wherein said flow regulator allows for an efficient distribution of heated air within the laundry drum.

[0041] As a result, the flow regulator allows for efficient optimization of the flow of air, which is directed towards the wet laundry received in the laundry drum, so that an efficient drying is achieved in respect to all parts of the laundry.

[0042] According to an embodiment, a separating plate is arranged at a side of the condensing surface, which faces towards the laundry drum, wherein in particular the condensed liquid is collected in a collecting region between the condensing surface and the separating plate.

[0043] As a result, the separating plate prevents a contact of laundry within the laundry drum with the condensing surface.

[0044] In particular, the separating plate is arranged at a distance from the condensing surface, and wherein the condensing surface and the separating plate delimit the collecting region.

[0045] In particular, the separating plate comprises a plurality of holes, which ensure that the air flow within the interior of the laundry device is not interrupted.

[0046] According to an embodiment, a condensing channel is formed at the condensing surface, wherein

said condensing channel is adapted to conduct condensed liquid away from the condensing surface, preferably into a liquid container of the laundry device.

[0047] As a result, the condensing channel allows for a directed removal of the condensed liquid from the condensing surface.

[0048] According to an embodiment, the laundry device comprises a liquid container, which is arranged in the interior space of the laundry device, wherein the laundry drum is positioned in the liquid container, wherein the condensing surface in particular is arranged vertically above a bottom part of the liquid container and wherein condensed liquid flows from the condensing surface into the liquid container by the force of gravity.

[0049] As a result, the liquid container serves as a reservoir of the condensed liquid, which flows from the condensing surface.

[0050] According to an embodiment, the condensing surface is formed to direct the condensed liquid towards an opening between the housing and the laundry drum.

[0051] As a result, it can be prevented that the condensed surface enters a machine compartment of the laundry device.

[0052] According to an embodiment, the opening is connected to a liquid container by a fluid channel, so that condensed liquid can flow from the condensing surface through the opening and through the fluid channel into the liquid container of the laundry device.

[0053] As a result, the fluid channel allows for an efficient flow of the condensed liquid into the liquid container.

[0054] According to an embodiment, the condensing surface is formed from a thermally conductive material, preferably a metal.

[0055] As a result, an effective condensation of liquid at the condensing surface can be ensured.

BRIEF DESCRIPTION OF THE DRAWINGS

[0056] 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 schematic representation of a laundry device with an active cooling element according to an embodiment; and

Fig. 3 shows a schematic representation of a laundry device with an active cooling element according to an embodiment.

DETAILED DESCRIPTION OF THE DRAWINGS

[0057] Fig. 1 shows a schematic representation of a laundry device according to an embodiment.

[0058] The laundry 100 device, which is only schemat-

ically shown in Fig. 1, comprises a housing 101, which delimits an interior space 103 of the laundry device 100 from an exterior space 105 of the laundry device 100. The laundry device 100 further comprises a door opening 107 through which a user of the laundry device 100 can introduce laundry into the interior space 103 of the laundry device 100, in particular into to a schematically shown laundry drum 109, which is arranged in the interior space 103 of the laundry device 100.

[0059] During a laundry treatment process, the laundry, which is received in the laundry drum 109 is treated and afterwards the treated laundry can be taken out by the user from the laundry drum 109 and through the door opening 107.

[0060] The laundry device 100 further comprises a door 111, which is adapted to close the door opening 107, so that in the closed state of the door 111 an efficient treatment of laundry during the laundry treatment process can be ensured. On the other side, the door 111 can be opened, so that the user of the laundry device 100 can access the interior space 103 of the laundry device 100 through the door opening 107 to insert laundry into the interior space 103 or to take out laundry from the interior space 103.

[0061] The laundry device 100 according to the present disclosure in particular refers to a laundry device 100, which is adapted to dry wet laundry, in particular by removing or at least significantly reducing the amount of water attached to the wet laundry. In particular the laundry device 100 according to the present disclosure is a dryer, which is adapted to dry laundry. In particular the laundry device 100 according to the present disclosure is a wash-dryer, which is adapted to wash laundry and to dry laundry.

[0062] For further details in respect to the laundry device 100 further reference to figures 2 and 3 is provided.

[0063] Fig. 2 shows a schematic representation of a laundry device with an active cooling element according to an embodiment.

[0064] In figure 2 a cross-section through the laundry device 100 is shown. The laundry device 100 shown in figure 2 is a wash-dryer, which is adapted to wash laundry 113 and to dry laundry 113. However, it is within the scope of the embodiment that the laundry device 100 shown in figure 2 is a dryer, which is only adapted to dry laundry 113 and is not adapted to wash laundry 113.

[0065] The laundry device 100 comprises a housing 101, which delimits an interior space 103 of the laundry device 100 from an exterior space 105 of the laundry device 100. In the interior space 103 a laundry drum 109 is positioned, wherein said laundry drum 109 is adapted to receive laundry 113. Said laundry device 100 further comprises a drive shaft 115 through which said laundry drum 109 can be rotated during the drying process.

[0066] The laundry drum 109 is arranged in a liquid container 117 of the laundry device 100, wherein said liquid container 117 is adapted to receive any liquid, which is extracted from the laundry 113 during the drying

process. Since the laundry device 100 is a wash-dryer the liquid container 117 is also adapted to receive any washing liquid, which is supplied to the laundry 113 during a washing process. Any water inlets to and water outlets from the liquid container 117 are not shown in figure 2.

[0067] In figure 2 also the door 111 of the laundry device 100 is shown in a closed state of the door 111, wherein the door 111 closes a door opening 107 of the housing 101. As can be derived from figure 2 the door 111 comprises a projecting section 119, which projects through the door opening 107 into the interior 103 of the laundry device 100. The door 107 further comprises an external section 121, which faces away from the projecting section 119, wherein in particular the external section 121 is at least partially formed by a glass frame of the door 111. The external section 121 and the projecting section 119 of the door 111 delimit an interior space 123 of the door 111.

[0068] Further in figure 2 a ventilation and heating unit 125 of the laundry device 100 is shown, wherein said ventilation and heating unit 125 in particular is positioned in an air channel 127 of the laundry device 100, wherein said air channel 127 is delimited by the housing 101 of the laundry device 100.

[0069] The air channel 127 is connected to an air inserting section 129 of the liquid container 117, and the air channel 127 is connected to an air exhaust section 131 of the liquid container 117.

[0070] The ventilation and heating unit 125 comprises a heater 125-2, which is adapted to heat the air within the air channel 127, and comprises a ventilator 125-1, which is adapted to create a flow of the heated air within the air channel 127.

[0071] As can be derived from the arrows depicted in figure 2, the heated air is directed by the ventilation and heating unit 125 from the air channel 127 and through the air inserting section 129 of the liquid container 117 and further into the laundry drum 109, so that the heated air comes into contact with the wet laundry 113 received in the laundry drum 109. Due to the low humidity of the heated air entering the laundry drum 109, the heated air can uptake humidity of the wet laundry 113 during the drying process, so that a heated air with an increased humidity is obtained. Said airflow from the ventilation and heating unit 125 towards the laundry 113 is designated in figure 2 by a first air flow part 132.

[0072] The heated air with increased humidity is then directed towards a condensing surface 133 of the door 111, wherein said condensing section 113 in particular is positioned at the projecting section 119 of the door 111. Due to the reduced temperature of the condensing surface 133, liquid condenses at the condensing surface 133 from the heated air with increased humidity, so that humidity-reduced air is obtained.

[0073] Said humidity-reduced air is then directed through the air exhaust section 131 of the liquid container 117 back into the air channel 127 and further to

the ventilation and heating unit 125, which is adapted to heat the humidity-reduced air again, thereby closing the air cycle. Said air flow towards from the condensing surface 133 through the air exhaustion section 131 back to the ventilation and heating unit 125 is designated in figure 2 by a second air flow part 135.

[0074] As shown in figure 2, the liquid, which condenses at the condensing surface 133 flows down the condensing surface 133 due to the force of gravity and is directed through a opening 137 between the housing 101 and the laundry drum 109, so that the condensed liquid is received within the liquid container 117. The flow of condensed liquid is designated in figure 2 by a liquid flow 139.

[0075] To allow for an efficient condensation of liquid at the condensing surface 133, the condensing surface 133 has to be actively cooled. To achieve this, the laundry device 100 comprises an active cooling device 141, which is adapted to actively cool the condensing surface 133.

[0076] In the embodiment shown in figure 2, the active cooling device 141 comprises an additional ventilator 141-1, which is adapted to direct a flow of air towards the condensing surface 133. In particular, the additional ventilator 141-1 is arranged in the interior space 123 of the door 111. In particular, the door 111, in particular the external section 121 of door 111 comprises a plurality of air exchange openings 143, which allow for an efficient air exchange between the interior space 123 of the door 111 and the exterior space 105 of the laundry device 100.

[0077] In particular, the additional ventilator 141-1 is adapted to suck in air through a first plurality of air exchange openings 143-1 into the interior space 123 of the door 111 in order to direct the air towards the projecting section 119 of the door 111, in particular to the cooling surface 145 of the projecting section 119, wherein said cooling surface 145 faces towards the interior space 123 of the door 111.

[0078] Since the material of the projecting section 119 of the door 111, wherein said projecting section 119 comprises the condensing surface 133, in particular comprises an efficient thermal conductivity since it is in particular formed from metal, such as steel, the directed flow of air is adapted to cool both the projecting section 119 as well as the condensing surface 133 which is arranged on the side of door 111, which faces towards the interior space 103 of the laundry device 100.

[0079] In particular, a condensing channel, which is not shown in figure 2 might be formed at the condensing surface 133, which is adapted to conduct condensed liquid away from the condensing surface 133, preferably into the liquid container 117 of the laundry device 100.

[0080] In particular, at least a part of the projecting section 119 comprising the condensing surface 133 is formed from stainless steel, which comprises an efficient thermal conductivity of about 50 W/mK, which is corrosion resistant, which allows for an sealing function, which allows for efficient laundry 113 fiber protecting properties

and which is a cost-effective material.

[0081] Even if not shown in figure 2, the active cooling element 141 can comprise a thermally conductive element 141-2, which is in thermally conductive contact with the condensing surface 133, in order to cool the condensing surface 133. In particular, said thermally conductive element 141-2 might extend from an exterior space 105 of the laundry device 100 through the interior space 123 of the door 111 to the projecting section 119 of the door 111, which allows for an efficient removal of heat from the condensing surface 133, when said thermally conductive element 141-2 for example is attached to a heat sink.

[0082] By cooling the projecting section 119 as well as the condensing surface 133, the cool ambient air is heated up, and the heated-up air is directed from the interior space 123 of the door 111 back to the exterior space 105 the laundry device 100 through a second plurality of air exchange openings 143-2 thereby closing the air cycle.

[0083] As can be derived from figure 2, the door 111 optionally comprises a heat-dissipating element 147, which is positioned in the interior space 123 of the door 111 and which is connected to the condensing surface 133 in a thermally conductive manner, in order to allow for an efficient cooling of the condensing surface 133. The heat-dissipating element 147 in particular is attached to the cooling surface 145 of the projecting section 119 of the door 111.

[0084] The heat-dissipating element 147 in particular comprises a plurality of fins, which thereby increase the heat-dissipating surface of the heat-dissipating element 147. In particular, the heat-dissipating element 147 is made from aluminum. In particular, the heat-dissipating element 147 is connected with the cooling surface 145 in a materially bonded manner, in particular by a thermally conductive epoxy material.

[0085] The additional ventilation unit 141-1 in particular is adapted to direct the flow of air towards the heat-dissipating element 147 in order to allow for an efficient cooling of the condensing surface 133.

[0086] Summarizing, the laundry device 100 according to figure 2 allows for a door-integrated active cooling element 141 for cooling a condensing surface 133 of the door 111 to allow for an efficient liquid removal from heated air with an increased humidity within the laundry device 100.

[0087] The laundry device 100 according to figure 2 allows for maximizing the space utilization of the laundry device 100 due to said simplification of liquid removal. Further, the structural impact to the laundry drum 109 is minimized. The condensing surface 133 is easily accessible for cleaning, since the door 111 only has to be opened to access the condensing surface 133. Comparing with conventional wash-dryers the thermal impact on the gasket is reduced.

[0088] Fig. 3 shows a schematic representation of a laundry device with an active cooling element according to an embodiment.

[0089] The laundry device 100 shown in figure 3 is essentially identical to the laundry device 100 shown in figure 2 except for the following differences.

[0090] The laundry device 100 shown in figure 3 comprises an optional separating plate 149, which is arranged at a side of the condensing surface 133, which faces towards the laundry drum 109. Therefore, a collecting region 151 is delimited from the condensing surface 133 and the separating plate 149, so that liquid, which condenses at the condensing surface 133 of the door 111 is retained in the collecting region 151.

[0091] In particular, a condensing channel, which is not shown in figure 3 might be formed at the condensing surface 133, which condensing channel is adapted to conduct condensed liquid away from the condensing surface 133, preferably into the liquid container 117 of the laundry device 100.

[0092] The laundry device 100 shown in figure 3 comprises an optional plurality of drum holes 153, which are formed in the laundry drum 109, in particular at a close vicinity to the air insertion section 129 of the liquid container 117 to allow for an efficient flow of heated air from the air channel 127 through the insertion section 129 of the liquid container 117 and through the drum holes 153 of the laundry drum 109 into the laundry drum 109.

[0093] The laundry device 100 shown in figure 3 comprises an optional flow regulator 155, which is in particular arranged at the air insertion section 129 of the liquid container 117 and/or at the plurality of drum holes 153 of laundry drum 109, and wherein said flow regulator 155 allows for an efficient distribution of heated air within the laundry drum 109.

[0094] While preferred embodiments of the disclosure have been described herein, many variations are possible which remain within the concept and scope of the disclosure. Such variations would become clear to one of ordinary skill in the art after inspection of the specification and the drawings. The disclosure therefore is not to be restricted except within the spirit and scope of any appended claims.

REFERENCE NUMBERS

[0095]

100	laundry device
101	housing
103	interior space of the laundry device
105	exterior space of the laundry device
107	door opening
109	laundry drum
111	door
113	laundry
115	drive shaft
117	liquid container
119	projecting section of door
121	external section of door
123	interior space of door

125	ventilation and heating unit
125-1	ventilator
125-2	heater
127	air channel
129	air insertion section
131	air exhaustion section
132	first flow part of air
133	condensing surface of door
135	second flow part of air
137	opening between housing and laundry drum
139	liquid flow
141	active cooling element
141-1	additional ventilator
143	plurality of air exchange openings
143-1	first plurality of air exchange openings
143-2	second plurality of air exchange openings
145	cooling surface of projecting section of door
147	heat-dissipating element
149	separating plate
151	collecting region
153	plurality of drum holes
155	flow regulator

25 Claims

1. Laundry device (100), comprising:

a housing (101), which delimits an interior space (103) of the laundry device (100), and which comprises a door opening (107),
 a laundry drum (109), which is arranged in the interior space (103) of the laundry device (100), and which is adapted to receive wet laundry (113), and
 a door (111), which is adapted to close the door opening (107), wherein the door (111) comprises a projecting section (119), which projects through the door opening (107) into the interior space (103) of the laundry device (100) in a closed state of the door (111), wherein the projecting section (119) comprises a condensing surface (133), which faces towards the interior space (103) of the laundry device (100),
 an active cooling element (141, 141-1, 141-2), which is arranged in the door (111), and which is adapted to actively cool the condensing surface (133), and
 a ventilation and heating unit (125), which is adapted to heat air and to direct a flow of the heated air through the wet laundry (113) received in the laundry drum (109), in order to obtain heated air with an increased humidity, which in turn is directed towards the condensing surface (133), so that liquid from the heated air with an increased humidity condenses at the condensing surface (133).

2. Laundry device (100) according to claim 1, wherein the door (111) comprises an external section (121), which faces away from the projecting section (119), wherein the external section (121) and the projecting section (119) delimit an interior space (123) of the door (111), wherein the active cooling element (141, 141-1, 141-2) is at least partially arranged in the interior space (123) of the door (111). 5
3. Laundry device (100) according to claim 2, wherein the external section (121) comprises a plurality of air exchange openings (143, 143-1, 143-2), which are adapted to allow for an air exchange between the interior space (123) of the door (111) and an exterior space (105) of the laundry device (100). 10
4. Laundry device (100) according to any of the preceding claims, wherein the active cooling element (141, 141-1, 141-2) comprises an additional ventilator (141-1), which is arranged in the door (111), in particular in the interior space (123) of the door (111), and which is adapted to direct a flow of air towards the projecting section (119) of the door (111), in order to actively cool the condensing surface (133). 15
5. Laundry device (100) according to any of the preceding claims, wherein the active cooling element (141, 141-1, 141-2) comprises a thermally conductive element (141-2), which is arranged in the door (111), in particular in the interior space (123) of the door (111), and which is in contact with the projecting section (119) of the door (111), in order to actively cool the condensing surface (133). 20
6. Laundry device (100) according to any of the preceding claims, wherein a heat-dissipating element (147) is arranged in the door (111), in particular in the interior space (123) of the door (111), wherein the heat-dissipating element (147) is connected to the projecting section (119) in a thermally conducting manner, in order to cool the condensing surface (133), and wherein the active cooling element (141, 141-1, 141-2) in particular is adapted to actively cool the heat-dissipating element (147) and therefore cool the condensing surface (133). 25
7. Laundry device (100) according to any of the preceding claims, wherein the ventilation and heating unit (125) is arranged in an air channel (127) of the laundry device (100), wherein the air channel (127) is delimited by the housing (101), wherein the air channel (127) is connected to an air insertion section (129) of the liquid container (117), and wherein the air channel (127) is connected to an air exhaust section (131) of the liquid container (117), in order to direct the flow of heated air through the air insertion section (129) into the laundry drum (109), and in order to return humidity-reduced air after condensation through the air exhaust section (131) back to the air channel (127). 30
8. Laundry device (100) according to any of the preceding claims, wherein the laundry drum (109) comprises a plurality of drum holes (153), in particular at a close vicinity to the air insertion section (129) of the liquid container (117), to allow for an efficient flow of heated air into the laundry drum (109). 35
9. Laundry device (100) according to any of the preceding claims, wherein the laundry device (100) comprises a flow regulator (155), which is in particular arranged at the air insertion section (129) of the liquid container (117) and/or at the plurality of drum holes (153) of the laundry drum (109), and wherein said flow regulator (155) allows for an efficient distribution of heated air within the laundry drum (109). 40
10. Laundry device (100) according to any of the preceding claims, wherein a separating plate (149) is arranged at a side of the condensing surface (133), which faces towards the laundry drum (109), wherein in particular the condensed liquid is collected in a collecting region (151) between the condensing surface (133) and the separating plate (149). 45
11. Laundry device (100) according to any of the preceding claims, wherein a condensing channel is formed at the condensing surface (133), wherein said condensing channel is adapted to conduct condensed liquid away from the condensing surface (133), preferably into a liquid container (117) of the laundry device (100). 50
12. Laundry device (100) according to any of the preceding claims, wherein the laundry device (100) comprises a liquid container (117), which is arranged in the interior space (103) of the laundry device (100), wherein the laundry drum (109) is positioned in the liquid container (117), wherein the condensing surface (133) in particular is arranged vertically above a bottom part of the liquid container (117), and wherein the condensed liquid flows from the condensing surface (133) into the liquid container (117) by the force of gravity. 55
13. Laundry device (100) according to any of the preceding claims, wherein the condensing surface (133) is formed to direct the condensed liquid towards an opening (137) between the housing (101) and the laundry drum (109).
14. Laundry device (100) according to claim 13, wherein the opening (137) is connected to the liquid container (117) by a fluid channel, so that condensed liquid can flow from the condensing surface (133) through the opening (137) and through the fluid channel in

particular into a liquid container (117) of the laundry device (100).

15. Laundry device (100) according to any of the preceding claims, wherein the condensing surface (133) is formed from a thermally conductive material, preferably a metal.

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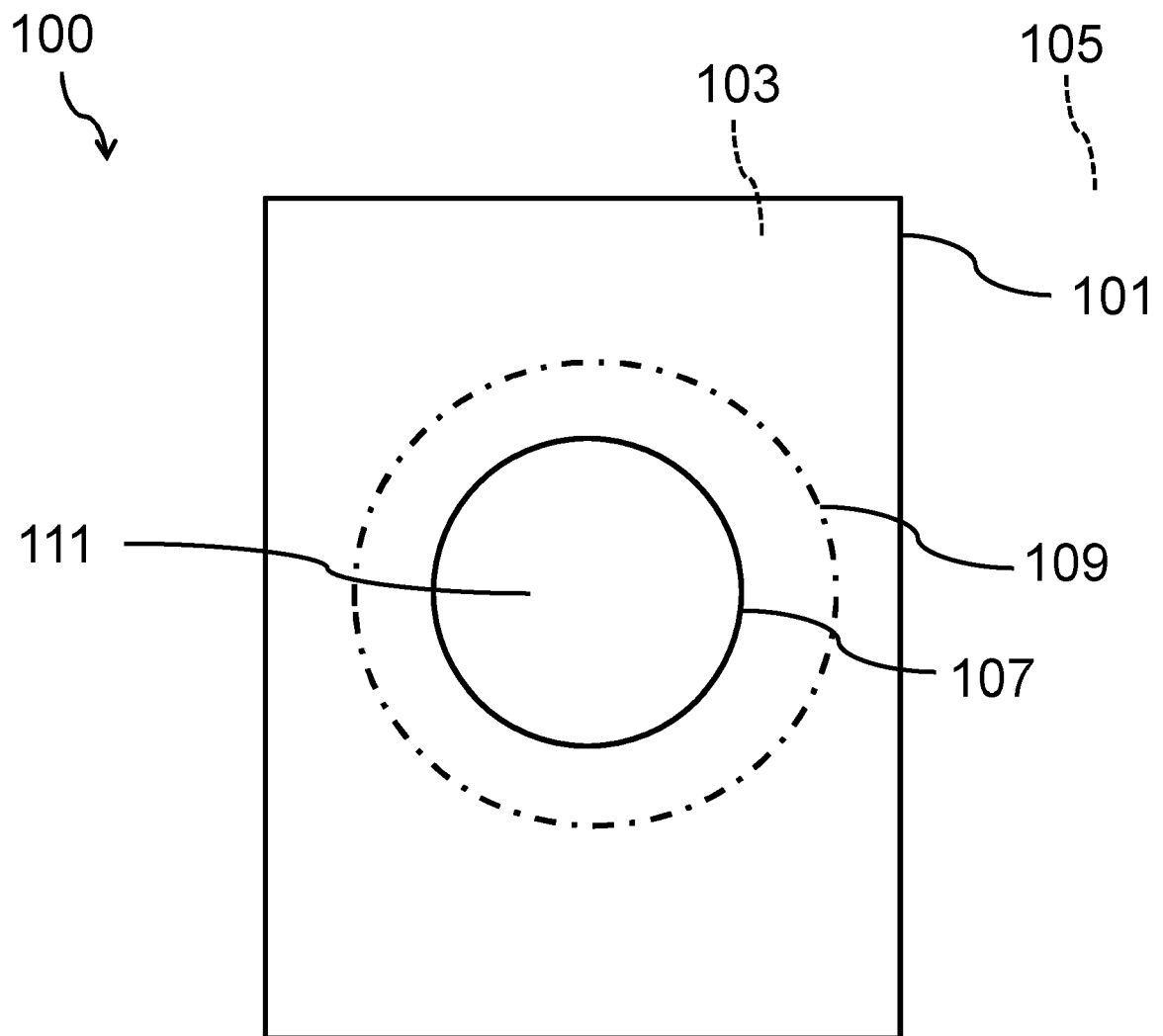


Fig. 1

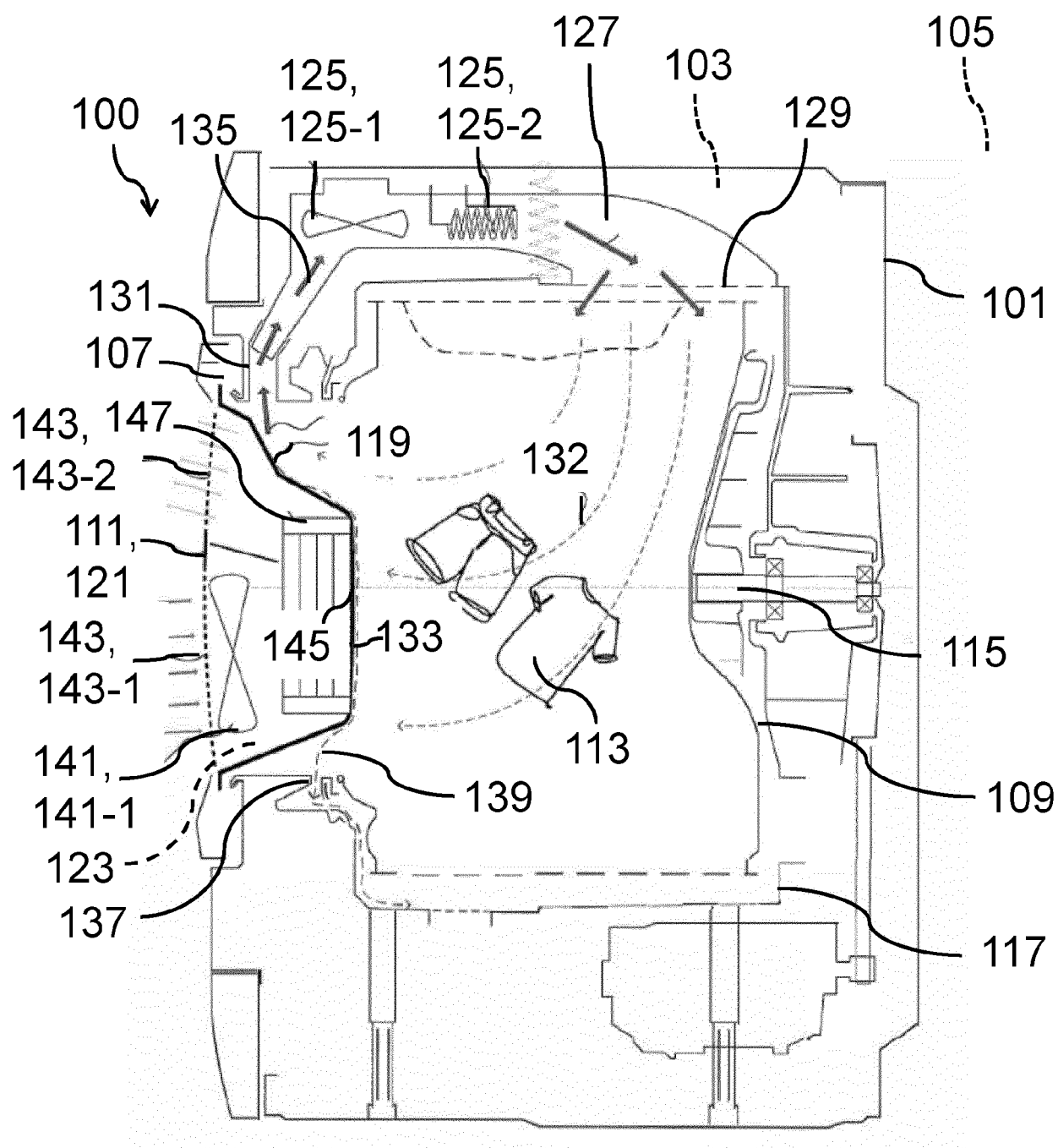


Fig. 2

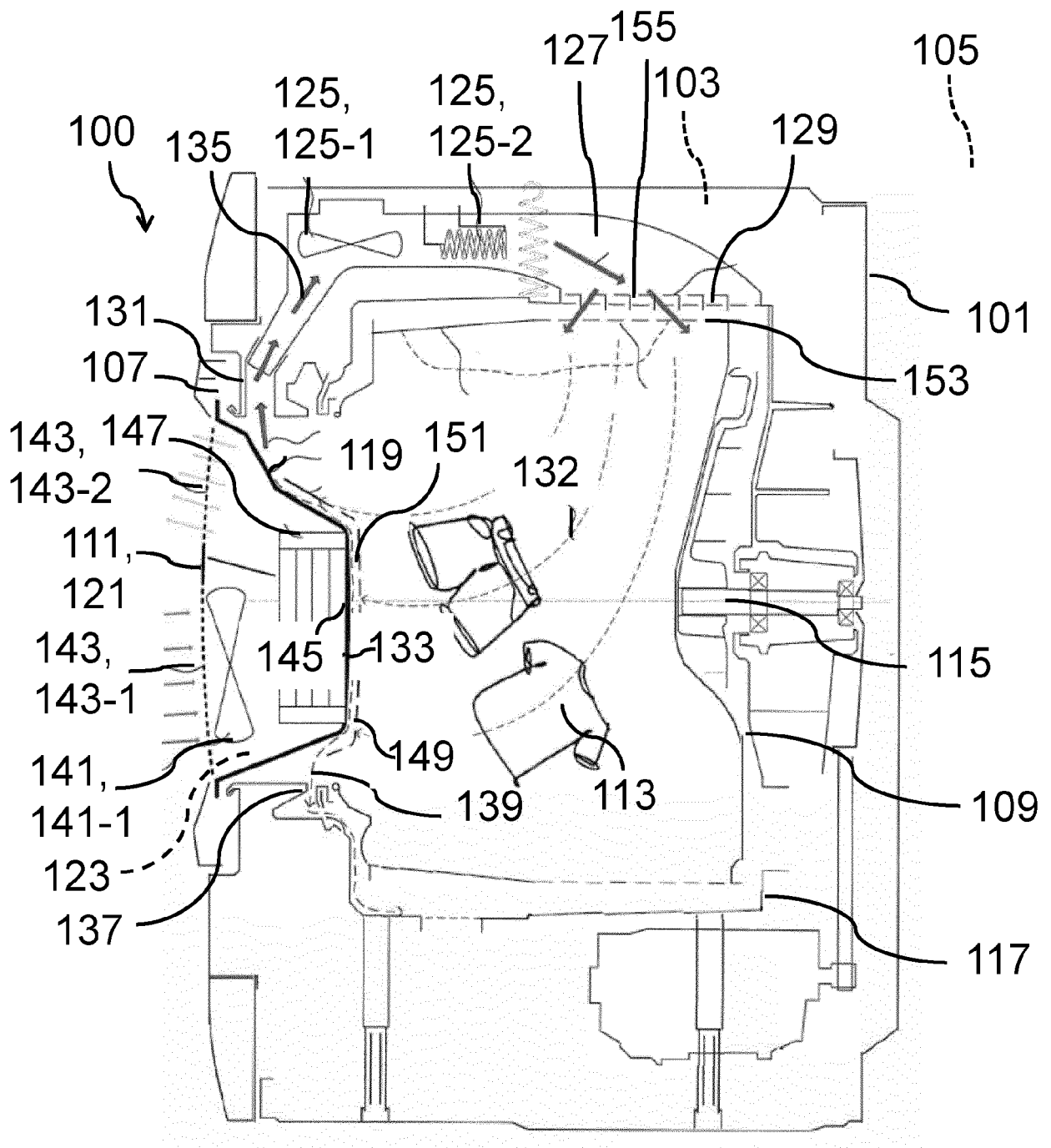


Fig. 3



EUROPEAN SEARCH REPORT

Application Number

EP 22 17 0726

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X,P	EP 3 848 499 A1 (WHIRLPOOL CO [US]) 14 July 2021 (2021-07-14) * paragraph [0020] - paragraph [0038]; figure 2 *	1-6, 11, 15	
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			TECHNICAL FIELDS SEARCHED (IPC)
			D06F

The present search report has been drawn up for all claims

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Place of search

Munich

Date of completion of the search

24 October 2022

Examiner

Diaz y Diaz-Caneja

CATEGORY OF CITED DOCUMENTS

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