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(54) **HEATING ELEMENT HOLDER**

(57) Disclosed herein is a holding arrangement (100) for a heating element (110) in a laundry processing machine (200), said holding arrangement (100) comprising a first part (120) protruding from a wall of the outer drum (220) in a direction towards the inner drum (210) a second part (130) attached to the first part (120), wherein the first part (120) comprises a first surface (121) facing the inner drum (210) and configured to support the heat-

ing element (110) in a first direction and the second part (130) comprises a second surface (131) facing the outer drum (220) and configured to support the heating element (110) in a second direction, and wherein the heating element (110) is maintained in an intended position elevated relative the wall of the outer drum (220) between the first surface (121) of the first part (120) and the second surface (131) of the second part (130).

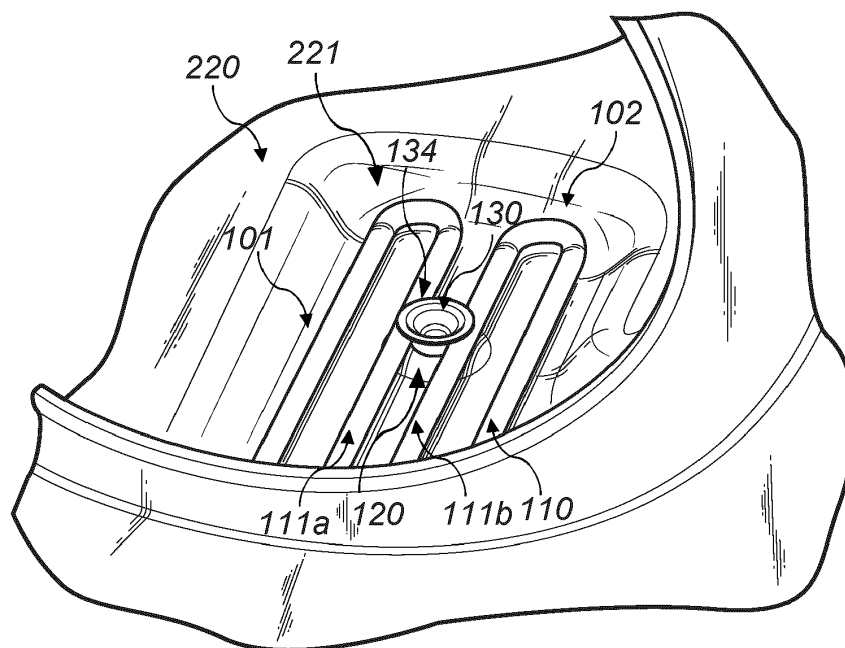


Fig. 3a

Description

Technical Field

[0001] The invention generally relates to laundry processing machines and, more specifically, to a holding arrangement for a heating element in a laundry processing machine.

Background

[0002] One of the standard components of conventional laundry processing machines are heating elements, used for heating water inside the drum. The heating element is usually installed the bottom part of a housing of the laundry processing machine, in close proximity to an outer surface of the drum. The heating element is typically attached with some type of holder, which may be a separate part designed to hold the heating element in place. The holder may for example be a type of bracket, or a simple clip. The holder may be fastened using for example nuts or bolts, or through a hole in the bottom part of the laundry processing machine.

[0003] Further, the heating element holder may be designed to create a distance between the heating element and a bottom floor of the housing, preventing the heating element from laying against the bottom floor. In this way, water may flow around the heating element in all directions. The housing of the laundry processing machine may form part of the fluid communication between the inside of the drum and the outside of the drum. It is therefore difficult to keep the housing completely sealed, why lint from the clothes, dust, or other particles may circulate in the housing. A problem with this is that lint and/or dust may get stuck and collect around the holder and the heating element. As mentioned, the holder is typically a separate component, with fastening means such as screws, nuts or bolts, why small edges and pockets are easily formed where lint may be collected. Further, the distance between the bottom floor and the heating element means that fluid containing lint particles may flow around the heating element from all directions and therefore lint may get stuck around or on the heating elements. In the long term, this may cause malfunction of the heating element.

Summary

[0004] In the light of the above, it is desired to provide alternate solutions for installation of a heating element holder, especially for heating element holder in laundry processing machines. These and other objects are achieved by providing a heating element holder having the features in the independent claims. Preferred embodiments are defined in the dependent claims.

[0005] Hence, according to a first aspect of the present invention, there is provided a holding arrangement for a

heating element in a laundry processing machine having an inner drum coaxially arranged with an outer drum, the heating element comprising at least one tubular element and extends in a space between the outer and the inner drum. The holding arrangement comprises a first part protruding from a wall of the outer drum in a direction towards the inner drum, a second part attached to the first part, wherein the first part comprises a first surface facing the inner drum and configured to support the heating element in a first direction and the second part comprises a second surface facing the outer drum and configured to support the heating element in a second direction, and the heating element is maintained in an intended position elevated relative the wall of the outer drum between the first surface of the first part and the second surface of the second part. The present invention is associated with a number of advantages, for example that it provides a firm securement of the heating element in its intended position. The firm securement decreases the risk of misplacement or damaging during use of the laundry processing machine, or during transportation of the laundry processing machine. Thus, the safety of the laundry processing machine may advantageously be increased. Further, the holding arrangement is simple in its construction, with a first part and a second part, which simplifies the installation of the heating element. Few parts further enables a more efficient assembly of the laundry processing machine, while decreasing the risk of one of the parts malfunctioning. Even further, the holding arrangement of the present invention prevents lint and dust from getting stuck on or around the heating elements or the holding arrangement during use of the laundry processing machine. This enables a prolonged lifetime of the heating elements, which do not have to be exchanged as often. Further, the same heating efficiency may be maintained throughout its lifetime, instead of decreasing as a result of time as lint builds up, as may be the case where lint is not prevented from getting stuck on or around the heating elements.

[0006] By "laundry processing machine" is herein meant any machine suitable for processing laundry and including one or more heating elements. The laundry processing machine may for example be a washing machine.

[0007] The laundry processing machine comprises an inner drum and an outer drum, which may have a cylindrical shape. The inner drum may enclose a washing chamber where laundry may be placed to be processed. The outer drum may at least partially enclose the inner drum and provide a housing for one or more heating elements. The outer drum may be stationary arranged in the laundry processing machine, while the inner drum may rotate around a central axis coinciding with a central axis of the inner drum. The heating element(s) may have the function of heating a washing fluid. The washing fluid may be provided to the outer drum from an external fluid supply, connected to fluid supply connectors in the laundry processing machine. The washing fluid may then flow

in a flow path from the fluid supply, through the outer and inner drum, and then out through a drain in the laundry processing machine. The drain may be arranged in the outer drum. The washing fluid may be water, or water mixed with a detergent, depending on the different stages in a washing cycle. The washing fluid may flow pass the heating elements where it is heated and, downstream the heating elements, the washing fluid may enter the inner drum to process the laundry, for example. In another example, the detergent is added directly to the inner drum, and the washing fluid flowing in the outer drum is therefore mainly water. The temperature of the washing fluid may vary depending on a washing cycle chosen by an operator of the laundry processing machine, for example depending on the material of the laundry in the washing chamber. The washing fluid may continuously be supplied from the fluid supply to the washing chamber, while passing the heating element(s). Thus, there may be a space between the outer drum and the inner drum, for housing the heating element(s) and providing a space for the washing fluid to flow through.

[0008] By "heating element" is herein meant any heating element suitable for laundry processing machines, and more specifically, having at least one tubular element, for example a type of tubular heater. The heating element may have cylindrical tubes, which may be bent and shaped into a desired shape. For example, the tubes may be bent into one or more u-shapes, having parallel legs. The heating element may be made of a durable material such as stainless steel. The heating element may comprise a thermostat or sensor for maintaining a consistent water temperature throughout the washing cycle. Further, the tubes may enclose a metal wire coil or ceramic rod, for example, both of which generate heat when an electric current passes through it. A laundry processing machine may include one or more heating elements.

[0009] According to an exemplifying embodiment of the present disclosure, the first part of the holding arrangement is arranged in a recess in the outer drum, the recess being configured to house the heating element. The first part may thus be arranged in the space between the outer drum and the inner drum. Thus, the recess may be formed by the space between the inner drum and the outer drum at least partially enclosing the inner drum. Thus, the inner drum and the outer drum may have substantially the same shape, for example cylindrical. The inner and outer drums may have a circular cross section arranged around a rotational axis in the center of the circular cross section. In one example, the recess is formed in the outer drum as a protrusion in the cylindrical shape, for example protruding axially outwards from the rotational axis. The recess may thus function as a space or a "pocket" for housing the heating element and the holding arrangement. The first part of the holding arrangement may be arranged in the recess, for example on a surface of the recess facing the inner drum.

[0010] According to an exemplifying embodiment of

the present disclosure, the first part forms an integral part of the outer drum. The first part may thus be formed in the outer drum of the laundry processing machine. As discussed above, the outer drum may comprise a recess, and thus the first part of the holding arrangement may be arranged in said recess, or form an integral part of the recess. In this example, the first part may comprise a protrusion protruding axially towards the rotational axis in the center of the outer drum, i.e. the opposite direction of the protrusion of the recess. The first part may thus form a raised portion inside the recess in the space between the outer drum and the inner drum. The present embodiment is advantageous in that the holding arrangement may be formed using less components. The first part of the holding arrangement may be formed in the outer drum during manufacturing of the outer drum, for example by punching, bending or similar. The first part may be formed to have a soft, rounded shape without sharp edges. Thus, the first part may advantageously decrease the risk of lint getting stuck on or around the heating element. Since the first part does not need to be attached to the outer drum, but instead forms an integral part of the drum, the need for additional fastening means such as screws and/or bolts is removed, further decreasing the risk of lint getting stuck on sharp edges. This further ensures that the outer drum is leak-tight, since there are no holes needed to fasten or insert the first part, why there are fewer connections that may give rise to a leakage in the outer drum.

[0011] According to an exemplifying embodiment of the present disclosure, the at least one tubular element comprises at least two legs, wherein one leg of the at least one tubular element of the heating element is arranged on a first side of the holding arrangement, and a second leg of the at least one tubular element is arranged on a second side of the holding arrangement, said first and second sides being opposite to each other. The at least two legs of the at least one u-shaped coils may be tubes, for example in the case where the heating element is a tubular heater. In that way, the holding arrangement may be sandwiched between a pair of legs of the heating element. In another example, the at least one tubular element of the heating element may comprise more than one u-shape, for example two u-shaped tubes. In that example, one leg of one of the u-shaped tubes may be arranged on a first side of the holding arrangement, and one leg of a second u-shaped tube may be arranged on a second side of the holding arrangement. In an even further example, the laundry processing machine may comprise more than one heating element, for example two heating elements. In that example, one leg of one u-shaped tube of a first heating element may be arranged on a first side of the holding arrangement, and one leg of one u-shaped tube of a second heating element may be arranged on a second side of the holding arrangement. In that way, the holding arrangement may secure two heating elements in the laundry processing machine. In other examples, the laundry processing machine may comprise more than one holding arrangement, for example

one holding arrangement for each heating element in the laundry processing machine, or one holding arrangement per two heating elements in the laundry processing machine. In one example, a heating element may be shaped to comprise two levels of tubes, for example two u-shapes stacked on top of each other. In the present example, a holding arrangement may be arranged to secure the first level of the tubular element of the heating element, the second level of the tubular element resting on top of the holding arrangement.

[0012] Further, there may also be more than one holding arrangement per heating element, for example one holding arrangement per u-shaped tube in the heating element. The present arrangement of the holding arrangement, i.e. one leg per side, is advantageous in that it increases stability of the heating element securement, and also ensures that the heating element is supported from two directions. Furthermore, the forces between the heating element and the holding arrangement are symmetric if two legs of the same heating element are in contact with the holding arrangement on two opposite sides.

[0013] According to an exemplifying embodiment of the present disclosure, the first part comprises a flat portion, and wherein the second part is attached to the first part via said flat portion. The flat portion provides a smooth surface for the second part to be attached to. The flat portion prevents lint from getting stuck on or around the heating element(s) or the holding arrangement, since a smooth surface lacks sharp edges, pockets or shape for the lint to stick onto. In the example where the first part forms an integral part of the outer drum, the flat portion may form a part of this structure.

[0014] According to an exemplifying embodiment of the present disclosure, the second part is attached to the first part by one of welding, soldering or by an adhesive. Welding, soldering or adhering the second part to the first part to form an attachment therebetween provides a secure attachment. Further, neither welding, soldering or adhering requires making a hole in the material to form the attachment. Thereby, the first part and the second part may be attached to each other while ensuring a leak-tight attachment. Further, a weld seam, a solder and an adhering are all smooth and thus decrease the number of sharp edges where lint is prone to get stuck. Thus, the attachment by welding, soldering or an adhesive provide a secure, leak-tight attachment while simultaneously preventing lint from getting stuck on or around the heating elements and/or the holding arrangement. In a preferred embodiment, the first part is attached to the second part by welding.

[0015] According to an exemplifying embodiment of the present disclosure, the first part further comprises an inclined or curved portion, and wherein the inclined or curved portion comprises the first surface. That is, the first part comprises at least a flat portion and an inclined or curved portion. The flat portion functions as a portion for attachment of the second part to the first part. The in-

clined or curved portion comprises a first surface, which may function as a support for the heating element in a first direction. The first surface may face the inner drum. Thus, the inclined portion may provide a support for the heating element when installed in the laundry processing machine, and thus the heating element may rest on the first surface. The second part may comprise more than one inclined portions. For example, the first part may have a circular base, and protrude radially from the outer drum towards a center of the inner drum. The flat portion may be arranged on one end of the protrusion, closest to the inner drum, and the circular base may be at the other end. The inclined portion may then extend around a periphery of the protrusion and the flat portion, meaning that the first surface may be comprised by the entirety of the inclined portion. Thus, one leg of the at least one tubular element of the heating element may rest on one part of the first surface, and another leg of the at least one tubular element may rest on another part of the first surface, on an opposite side of the second part of the holding arrangement.

[0016] According to an exemplifying embodiment of the present disclosure, the first surface on said inclined portion at least partially abuts a surface of the at least one tubular element of the heating element. As mentioned above, the heating element may rest on the first surface, and thereby a portion of the heating element may abut the first surface. The legs or tubes of the heating element may have a length which is larger than the size of the holding arrangement, why only a portion of the heating element may be in contact with the holding arrangement. This is advantageous in that the first surface of the inclined portion abutting the at least one u-shaped coil of the heating element enables the heating element to be spaced apart from the outer drum. The heating element may thus be prevented from laying against a wall of the outer drum, and instead allowing washing fluid to flow around the heating element, increasing the heating efficiency with which the heating element heats the washing fluid.

[0017] According to an exemplifying embodiment of the present disclosure, the second part comprises a flat portion, and an inclined or curved portion, wherein the flat portion is attached to the first part. The second part may thus have a cup-like shape, wherein the flat portion of the second part is attached to the first part.

[0018] According to an exemplifying embodiment of the present disclosure, the second part further comprises a flange portion. The flange portion may be arranged on the opposite side of the second part from the flat portion. Further, the flange portion may protrude radially outwards from the second part. The flange portion may be flat and include at least one flat surface. The flange portion may function as a separator in the example where the heating element comprises tubular elements that are arranged in levels stacked on top of each other. The holding arrangement may secure the heating element by securing the lower level of the stacked levels of tubular

elements. The flange portion may then separate the stacked levels, so as to prevent the tubular elements from abutting each other. This is advantageous in that the heating efficiency of the heating element may be increased, since washing fluid is allowed to flow between the levels of tubular elements.

[0019] According to an exemplifying embodiment of the present disclosure, the inclined or curved portion extends between the flat portion and the flange portion. Thus, the inclined or curved portion may extend from the flat portion in a direction towards the inner drum. Further, the flange portion may protrude radially outwards from the inclined or curved portion, forming a flange on the second part.

[0020] According to an exemplifying embodiment of the present disclosure, the second surface of the second part is arranged on the inclined or curved portion. The heating element may therefore be arranged between the inclined or curved portion of the first part and the inclined or curved portion of the second part. This arrangement of the heating element allows the heating element to be slid into place in the holding arrangement, between the first part and the second part. Further, the inclined portion of the first part and the inclined or curved portion of the second part enables the tubes of the heating element to be clamped into place while supported in two directions, thereby securing the heating element in a reliable way in the holding arrangement. This further facilitates insertion and removal of the heating element for an operator, since the heating element may be inserted or removed by simply sliding it in place.

[0021] According to an exemplifying embodiment of the present disclosure, the second surface of the second part is arranged on the flange portion. The heating element may therefore be arranged between the inclined portion of the first part and the flange portion of the second part. This arrangement of the heating element between the inclined portion of the first part and the flange portion on the second part allows the heating element to be slid into place in the holding arrangement. Further, the inclined portion and the flange portion enables the heating element to be advantageously clamped between the two surfaces, securing the heating element in the holding arrangement in a reliable way. This further facilitates installation of the heating element by an operator, in case the heating element needs to be exchanged or removed during the lifetime of the washing machine. This simplified way of exchanging the heating element enables an operator to exchange the heating element by themselves, without the need to call for authorized service personnel or shipping the washing machine to a service location. Moreover, the inclined portion of the first part and the inclined or curved portion of the second part may have substantially mirrored shapes, with the first part forming a cup-like shape with a flat portion being arranged upwards, in a direction towards the inner drum and an inclined portion extending from the flat portion in a direction towards the outer drum, and the flat portion of

the second part being arranged downwards, in a direction towards the outer drum, with the inclined portion extending from the flat portion in a direction towards the inner drum. The flat portion of the first part may thus be attached to the flat portion of the second part, and a space is formed between the flat portions and the inclined portions of the first and second part, respectively. The heating element may then be arranged in said space, clamped between the inclined or curved portion of the second part and the inclined portion of the first part. Thus, the heating element may be maintained in a secure position, spaced away from the bottom of the outer drum.

[0022] According to an exemplifying embodiment of the present disclosure, the flange portion at least partially abuts a surface of the at least one tubular element of the heating element. The flange portion may thus provide a counteracting force on the heating element, in a direction opposite to the direction of the force acting on the heating element from the inclined portion of the first part. Thus, the heating element may be clamped between the first part and the second part without the need for additional fastening means.

[0023] According to an exemplifying embodiment of the present disclosure, the second part has a hollow shape with a circular cross-section. This is advantageous in that it decreases the material needed to manufacture the holding arrangement, and thus provides a more lightweight solution. According to an exemplifying embodiment of the present disclosure, the first part has a rotationally symmetric shape. Therefore, the second part of the holding arrangement may be independent of mounting rotation. Thus, the installation of the holding arrangement may advantageously be simplified. Further, the hollow shape facilitates for the second part to be welded to the first part. A spot weld may be used to weld the flat portion of the second part to the flat portion of the first part, via the hollow shape. According to an exemplifying embodiment of the present disclosure, the flat portion has a first diameter, and the flange portion has a second diameter, and wherein the first diameter is smaller than the second diameter.

[0024] According to an exemplifying embodiment of the present disclosure, the second part has a hollow shape with an oval cross-section. The first part may have a shape corresponding to the flat portion of the second part, and therefore the first part may also be oval. In this case, the first part may be attached to the second part by a two-spot weld, for example. In further examples, the second part may have a rectangular or square shape cross-section.

[0025] According to an exemplifying embodiment of the present disclosure, the first part and the second part are made from the same material. The present embodiment is advantageous since it simplifies welding the two parts together to form a reliable, strong weld seam. In another example, the first part and the second part are made from different materials, for example a ferritic stainless steel in the first part and an austenitic stainless steel

in the second part.

Brief description of the drawings

[0026] Exemplifying embodiments will now be described in more detail, with reference to the following appended drawings, in which:

Figure 1 illustrates a front view of a washing machine comprising a holding arrangement according to an exemplifying embodiment of the present disclosure; Figure 2 illustrates a cross-sectional view of a heating element arranged in a holding arrangement according to an exemplifying embodiment of the present disclosure;

Figures 3a-b illustrates a perspective view and a top view of a heating element arranged in a holding arrangement according to an exemplifying embodiment of the present disclosure;

Figures 4a-c illustrates possible arrangements of a heating element in one or more holding arrangements according to exemplifying embodiments of the present disclosure.

Figures 5a-b illustrates a front view of a heating element with two stacked tubular elements arranged in a holding arrangement according to exemplifying embodiments of the present disclosure.

Detailed description

[0027] As illustrated in the figures, the size of the elements and regions may be exaggerated for illustrative purposes and, thus, are provided to illustrate the general structures of the embodiments. Like reference numerals refer to like elements throughout.

[0028] Exemplifying embodiments will now be described more fully hereinafter with reference to the accompanying figures, in which currently preferred embodiments are shown. The invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein; rather, these embodiments are provided for thoroughness and completeness, and fully convey the scope of the invention to the skilled person.

[0029] With reference to fig. 1, a front view of a washing machine 200 comprising a holding arrangement 100 according to an exemplifying embodiment of the present disclosure is shown. The washing machine 200 may be a conventional washing machine for washing different types of laundry. It may be a domestic washing machine or an industrial washing machine. The washing machine 200 comprises a housing 203 which houses a number of components of the washing machine 200, some of which will not be shown or discussed in relation to this invention. However, the housing 203 for example houses an outer drum 220 and an inner drum 210. Further, the housing 203 houses a suspension arrangement 201, for suspending the outer 220 and inner 210 drums. The suspension

arrangement 201 is attached to the outer drum 220 via an attachment element 202. The washing machine 200 further comprises at least one heating element 110, in the example depicted in Fig. 1 there are two heating elements 110. The heating elements 110 are arranged in a space 215 between the inner drum 210 and the outer drum 220. A washing liquid (not shown) may flow into the space 215 between the inner drum 210 and the outer drum 220, thereby passing the heating elements 110 where it is heated before entering the inner drum 210. The heating elements 110 are secured in the space 215 by holding arrangements (not shown in the present figure). The washing machine 200 may further comprise a water pump, a water inlet valve, a drain valve, a motor, a control unit, etc. As discussed above, the particular components of a washing machine 200 will not be discussed further herein.

[0030] With reference to fig. 2, a cross-sectional view 100a of a heating element 110 arranged in a holding arrangement 100 according to an exemplifying embodiment of the present disclosure is shown. In the example depicted in fig. 2, one heating element 110 installed in the washing machine 200 is shown. The heating element 110 is comprised by a tubular element, comprising two u-shaped parallel tubes extending in the same plane. The u-shaped tubes each have two parallel legs forming the u-shaped tubes. One of the u-shaped tubes is arranged on a first side 101 of the holding arrangement 100, and the other u-shaped tube is arranged on a second side 102 of the holding arrangement 100. Furthermore, one leg 111a of the first u-shaped tube is arranged in the holding arrangement 100 on the first side 101 thereof, and one leg 111b of the second u-shaped tube is arranged in the holding arrangement 100 on the second side 102 thereof.

[0031] The holding arrangement 100 is arranged in the space 215 between the inner drum 210 and the outer drum 220. The outer drum 220 comprises a recess 221 wherein the heating element 110 and the holding arrangement 100 are installed. The recess 221 forms an integral part of the outer drum 220. The space 215 between the inner drum 210 and the outer drum 220 is enlarged by the recess 221. The recess 221 may also function as a bowl for washing liquid to be gathered such that an increased volume of washing liquid may be heated by the heating element 110 simultaneously. The first part 120 of the holding arrangement 100 is arranged in the recess 221. The first part 120 forms an integral part of the recess 221 and thus also of the outer drum 220. While the recess 221 protrudes radially outwards from a center of the inner 210 and outer 220 drums, the first part 120 protrudes radially inwards from the outer drum 220 towards a center of the inner 210 and outer 220 drums. The first part 120 therefore forms an elevation in the recess 221. The first part 120 is shaped like a plateau, with a flat portion 122 and an inclined portion 123. The inclined portion 123 comprises a first surface 121 supporting the heating element 110 in a first direction. The heating element 110 rests on the first surface 121 of the

first part 120, and thus a surface 110' of the heating element 110 abuts the first surface 121. The first surface 121 faces the inner drum 210, and supports the heating element 110 from a bottom side thereof, as seen in fig. 2. Further, one leg 111a of a first u-shaped tube of the heating element 110 is arranged on a first side 101 of the holding arrangement 100, and one leg 111b of a second u-shaped tube of the heating element 110 is arranged on a second side 102 of the holding arrangement 100, the second side 102 being opposite to the first side 101. The legs 111a, 111b of the heating element 110 are supported in a second direction by the second part 130 of the holding arrangement 100. The second part 130 is attached to the first part 120 on the flat portion 122 thereof. The second part 130 is a separate component attached to the first part 120 by welding or soldering, for example. The second part 130 comprises a flat portion 132, an inclined portion 133 and a flange portion 134. The flat portion 132 is attached to the flat portion 122 of the first part 120. The inclined portion 133 is arranged between the flat portion 132 and the flange portion 134, and thus, the second part 130 forms the shape of a bowl. The second part 130 has a hollow interior, and the flat portion 132 of the second part 130 may therefore be attached to the flat portion 122 of the first part 120 through said hollow interior. The inclined portion 133 comprises a second surface 131, supporting the heating element 110 from a second direction. Alternatively, the second surface could be comprised by the flange portion 134. The second surface 131 faces the outer drum 220, thereby supporting the heating element 110 on a top side thereof. The flange portion 134 extends outwards from the inclined portion 133 such that it covers a part of the legs 111a, 111b of the u-shaped tubes of the heating element 110. The distance between the first surface 121 of the first part 120 and the second surface 131 of the second part 130 may be equal to or smaller than a diameter of a leg 111a, 111b of the heating element 110, such that the heating element 110 may be inserted between the first part 120 and the second part 130. The distance may be slightly smaller than the diameter of the legs 111a, 111b such that the heating element 110 may be clamped between the first surface 121 and the second surface 131. The holding arrangement 100 may be made from a material that may be flexible, such as a sheet metal. In addition or alternatively, the heating element 110 may be flexible. The heating element 110 is thus clamped between the first part 120 and the second part 130 of the holding arrangement 100.

[0032] With reference to fig. 3a, a perspective view of a heating element 110 arranged in a holding arrangement 100 according to an exemplifying embodiment of the present disclosure is shown. From this view, it is clearly seen that the heating element 110 comprises two u-shaped tubes, arranged on a first side 101 and a second side 102 of the holding arrangement 100, respectively. Moreover, the holding arrangement 100 secures the first leg 111a of the heating element 110 on the first side 101 of

the holding arrangement 100, and the second leg 111b on the second side 102 of the holding arrangement 100. Fig. 3a further shows the recess 221 in the outer drum 220 forming an integral part of the outer drum 220, having a substantially rectangular shape, following the peripheral shape of the heating element 110. Thus, the recess 221 may be adapted to fit the heating element 110, or heating elements 110 in the example where there are more than one. The first part 120 of the holding arrangement has a substantially circular cross section viewed from a top view, protruding from the floor of the recess 221. Moreover, the second part 130 is attached to the first part 120 via the flat portion 122 on the first part 120. From fig. 3a it is seen that the second part 130 is hollow and has the shape of a bowl. The flange portion 134 partially covers the legs 111a, 111b of the two u-shaped tubes. The holding arrangement 100 holds the heating element 110 in place while preventing lint in the washing fluid from getting stuck on or around the heating element 110. Further, the second part 130 has a circular cross section, when viewed from a top view in its installed position. Thus, the holding arrangement 100 has a rotationally symmetric shape, meaning that the second part 130 is independent of installation orientation, as long as the flat portion 133 is attached to the flat portion 123 of the first part 120. Further, the holding arrangement 100 has smooth edges, since both the first 120 and the second 130 parts have substantially circular cross sections, preventing lint from getting stuck thereon.

[0033] With reference to fig. 3b, a top view of a heating element 110 arranged in a holding arrangement 100 according to an exemplifying embodiment of the present disclosure is shown. From this top view, it is seen that the first part 120 and the second part 130 both have substantially circular cross sections. The circular base of the first part 120 has a diameter d_3 , which is greater than a first diameter d_1 of the flat portion 132 of the second part 130. Further, the diameter of the flat portion 122 of the first part 120 may be equal to or greater than the first diameter d_1 of the flat portion 132 of the second part 130. The flange portion 134 of the second part 130 has a second diameter d_2 , which is greater than the first diameter d_1 of the flat portion 132 of the second part 130. In the example shown in fig. 3b, the second diameter d_2 is smaller than the diameter d_3 of the base of the first portion 120. However, in other examples, the second diameter d_2 of the flange portion 134 may be equal to or greater than the diameter d_3 of the base of the first portion 120. Further, it can be seen that the diameter d_4 of one leg 111a, 111b of the u-shaped tubes is smaller than the first diameter d_1 of the flange portion 134. The first diameter d_1 of the flange portion 134 is greater than the sum of the diameter d_4 of both legs 111a, 111b, such that the flange portion 134 covers both legs 111a, 111b of the u-shaped tubes of the heating element 110. Moreover, the recess 221 in the outer drum 220 may be connected to a drain 222 where washing fluid (not shown) may be drained from the washing machine 200. In an alternative pre-

ferred embodiment, the cross sections of the first part 120 or of the second part 130 or of both are not circular, as seen from above, but of a different, preferably rounded shape. In particular this shape may be elongated in parallel to the direction of the two legs 111a and 111b of the heating element. In a further preferred embodiment, the cross section has a stadium shape composed of two half circles connected by two straight parallel lines.

[0034] With reference to figs. 4a-c, possible arrangements of a heating element 110 in one or more holding arrangements 100 according to exemplifying embodiments of the present disclosure are shown. Looking at fig. 4a, there is shown a heating element 110 having two parallel tubes 110a, 110b, and possible placements of the holding arrangement 100a-100f. The u-shaped tubes 110a, 110b of the heating element 110 are connected to each other forming one continuous tube.

[0035] The holding arrangements 100 in this figure are represented with cross symbols. The holding arrangement 100 may be placed between the legs 111a', 111a of the first u-shaped tube 110a, as shown by holding arrangements 100a and 100d in the present figure. Similarly, the holding arrangement 100 may be placed between the legs of the second u-shaped tube 110b, as shown by holding arrangements 100c and 100f. The holding arrangement 100 may be placed anywhere along the length of the u-shaped tubes 110a or 110b. Further, there may be one or more holding arrangements 100 arranged between the legs 110a and/or 110b. For example, both holding arrangements 100a and 100d may be arranged between the legs 111a' and 111a. In another example, only holding arrangement 100a or the holding arrangement 100d may be present. The same goes for the holding arrangements 100c and 100f. The holding arrangement 100 may further be arranged between the u-shaped tubes 110a and 110b, i.e. between the leg 111a of the first u-shaped tube 110a, and the leg 111b of the second u-shaped tube 110b, as shown by holding arrangements 100b and 100e in the present figure. The holding arrangements 100b and 100e may be arranged anywhere along the length of the legs 111a and 111b. There may be one holding arrangement 100 or more holding arrangements 100 arranged to secure the heating element 110.

[0036] Turning to figure 4b, another type of heating element 110 is shown. The heating element 110 has two u-shaped tubes 110a, 110b which are formed from two independent tubes. The holding arrangement 100 may be placed in similar positions as the holding arrangement 100 in fig. 4a, shown in fig. 4b with cross symbols and reference numbers 100a-f. Even further, fig. 4c shows another type of heating element 110 comprising one u-shaped tube. Possible placements of the holding arrangement 100 are shown with reference numbers 100a and 100b.

[0037] Moreover, there may be one or more heating elements 110 arranged in the washing machine 200, and one or more holding arrangements 100 may be installed

to hold the one or more heating elements 110.

[0038] With reference to fig. 5a, a front view of a heating element 110 with two stacked tubular elements 110c, 110d arranged in a holding arrangement 100 according to exemplifying embodiments of the present disclosure is shown. The heating element 110 is bent to form two levels of u-shaped tubes 110c, 110d, stacked on top of each other, forming one heating element 110. The first level has two u-shaped tubes 110d, secured in the holding arrangement 100. The second level has two u-shaped tubes 110c stacked on top of the first level, wherein the second level is not secured in the holding arrangement 100. The u-shaped tubes 110c of the second level rest on the flange portion 134 of the second part 130. The flange portion 134 provides a spacer between the u-shaped tubes 110d of the first level and the u-shaped tubes 110c of the second level, preventing them from coming into contact with each other. The heating element 110 is arranged in the recess 215.

[0039] With reference to fig. 5b, a perspective view of the heating element 110 with two stacked tubular elements 110c, 110d arranged in the holding arrangement 100 is shown. The flange portion 134 of the second part 130 is sandwiched between the first level of the u-shaped tubes 110d and the second level of u-shaped tubes 110c. The heating element 110 is arranged in the recess 215, and the first level of u-shaped tubes is secured in the holding arrangement 100. It is further seen that the heating element 110 is spaced apart from the bottom of the recess 215.

[0040] Although features and elements are described above in particular combinations, each feature or element can be used alone without the other features and elements or in various combinations with or without other features and elements.

[0041] Additionally, variations to the disclosed embodiments can be understood and effected by the skilled person in practicing the claimed invention, from a study of the figures, the disclosure, and the appended claims. In the claims, the word "comprising" does not exclude other elements, and the indefinite article "a" or "an" does not exclude a plurality. The mere fact that certain features are recited in mutually different dependent claims does not indicate that a combination of these features cannot be used to advantage.

Claims

1. A holding arrangement (100) for a heating element (110) in a laundry processing machine (200) having an inner drum (210) coaxially arranged with an outer drum (220), the heating element (110) comprising at least one tubular element (115) and extends in a space between the outer (220) and the inner drum (210), said holding arrangement (100) comprising:

a first part (120) protruding from a wall of the

- outer drum (220) in a direction towards the inner drum (210);
 a second part (130) attached to the first part (120);
 wherein the first part (120) comprises a first surface (121) facing the inner drum (210) and configured to support the heating element (110) in a first direction and the second part (130) comprises a second surface (131) facing the outer drum (220) and configured to support the heating element (110) in a second direction; and
 wherein the heating element (110) is maintained in an intended position elevated relative the wall of the outer drum (220) between the first surface (121) of the first part (120) and the second surface (131) of the second part (130).
2. Holding arrangement (100) according to claim 1, wherein the first part (120) is arranged in a recess (221) in the outer drum (220), the recess (221) being configured to house the heating element (110).
 3. Holding arrangement (100) according to any one of the preceding claims, wherein the first part (120) forms an integral part of the outer drum (220).
 4. Holding arrangement (100) according to any one of the preceding claims, wherein the at least one tubular element comprises at least two legs, and wherein one leg (111a) of the at least one tubular element of the heating element (110) is arranged on a first side (101) of the holding arrangement (100), and a second leg (111b) of the at least one tubular element is arranged on a second side (102) of the holding arrangement (100), said first (101) and second (102) sides being opposite to each other.
 5. Holding arrangement (100) according to any one of the preceding claims, wherein the first part (120) comprises a flat portion (122), and wherein the second part (130) is attached to the first part (120) via said flat portion (122).
 6. Holding arrangement (100) according to claim 5, wherein the first part (120) further comprises an inclined or curved portion (123), and wherein the inclined or curved portion (123) comprises the first surface (121).
 7. Holding arrangement (100) according to claim 5 or 6, wherein the first surface (121) on said inclined portion at least partially abuts a surface (110') of the at least one tubular element of the heating element (110).
 8. Holding arrangement (100) according to any one of the preceding claims, wherein the second part (130) is attached to the first part (120) by one of welding, soldering or by an adhesive.
 9. Holding arrangement (100) according to any one of the preceding claims, wherein the second part (130) comprises a flat portion (132), and an inclined or curved portion (133), and wherein the flat portion (132) is attached to the first part (120).
 10. Holding arrangement (100) according to any one of the preceding claims, wherein the second part (130) comprises a flange portion (134).
 11. Holding arrangement (100) according to claim 10, wherein the inclined or curved portion (133) extends between the flat portion (132) and the flange portion (134).
 12. Holding arrangement (100) according to claim 9, wherein the second surface (131) of the second part (130) is arranged on the inclined or curved portion (133).
 13. Holding arrangement (100) according to claim 10, wherein the second surface (131) of the second part (130) is arranged on the flange portion (134).
 14. Holding arrangement (100) according to claim 13, wherein said flange portion (134) at least partially abuts a surface (110') of the at least one tubular element of the heating element (110).
 15. Holding arrangement (100) according to claim 13, wherein the flat portion (132) has a first diameter (d1), and the flange portion (134) has a second diameter (d2), and wherein the first diameter (d1) is smaller than the second diameter (d2).
 16. Holding arrangement (100) according to any one of the preceding claims, wherein the first part (120) has a rotationally symmetric shape.
 17. A laundry processing machine (200) for treating laundry, comprising:
 - an inner drum configured to receive laundry;
 - an outer drum coaxially arranged with the inner drum and configured to at least partially enclose the inner drum;
 - at least one heating element arranged in a space between the inner drum and the outer drum, and configured to heat a washing fluid;
 - at least one holding arrangement according to claim 1, configured to maintain the at least one heating element in an intended position elevated relative a wall of the outer drum.

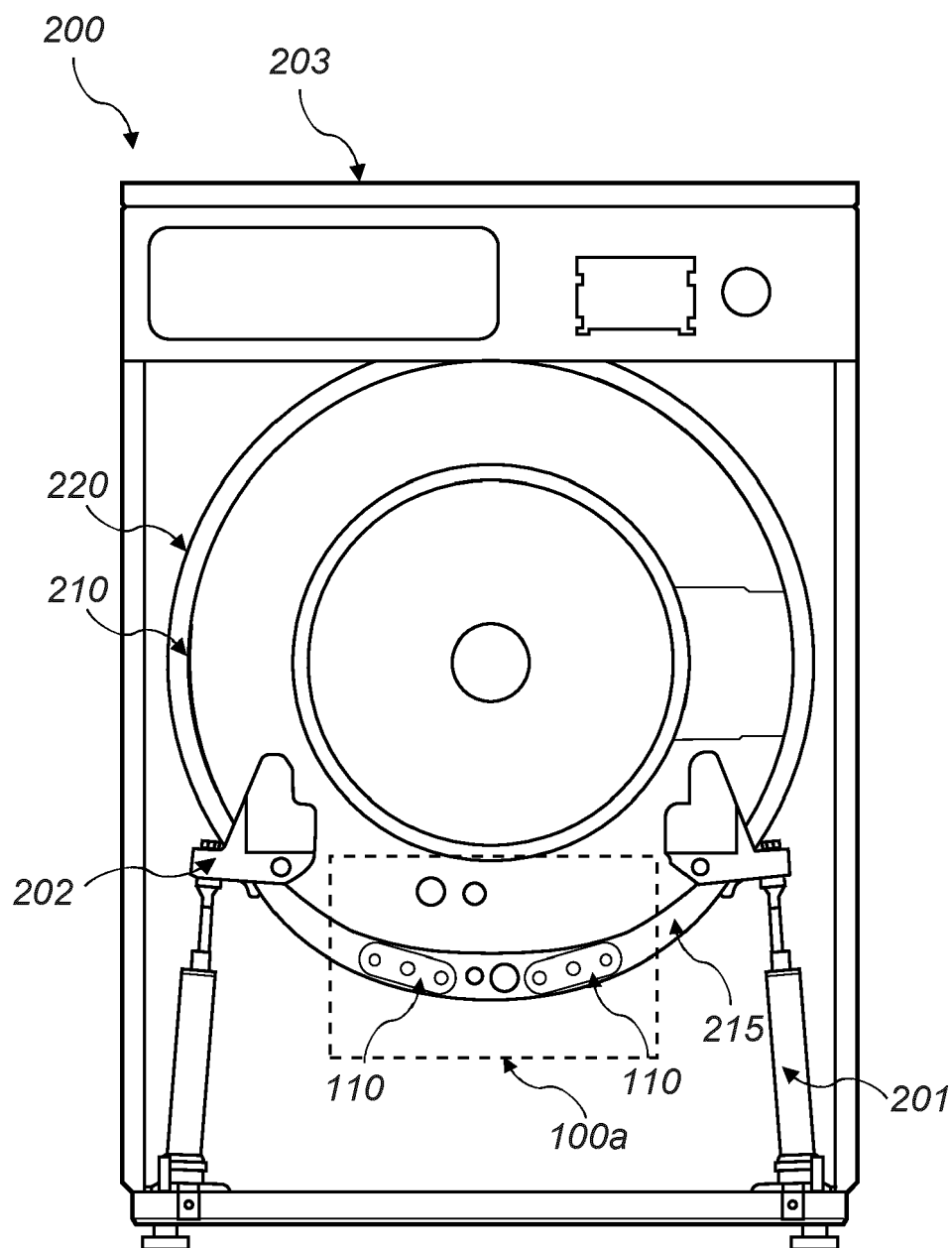


Fig. 1

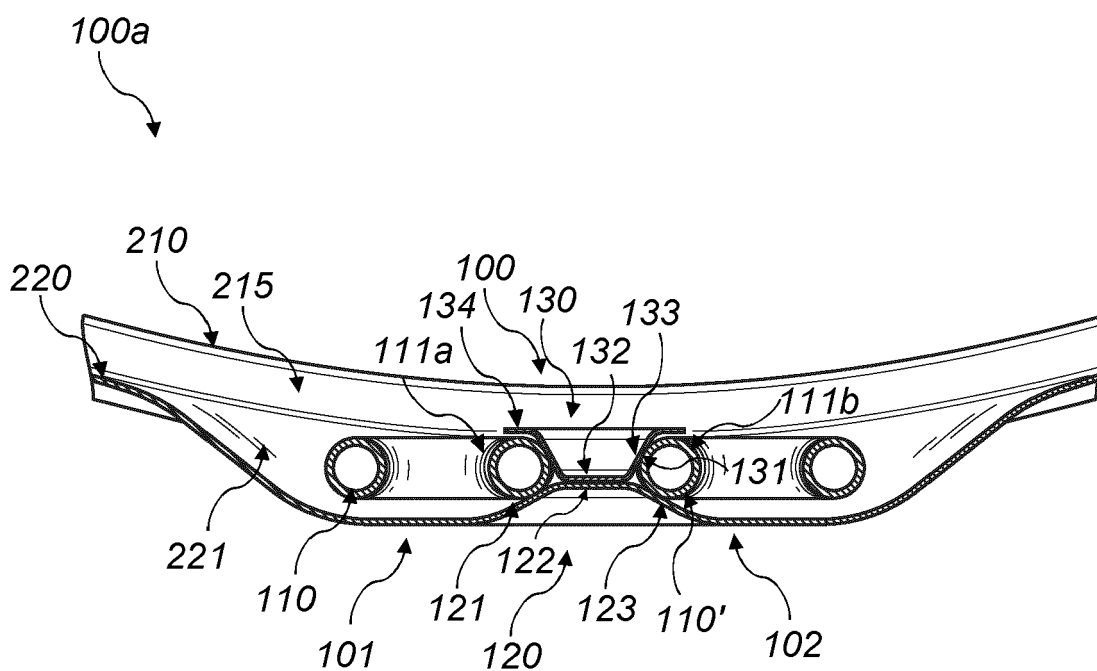


Fig. 2

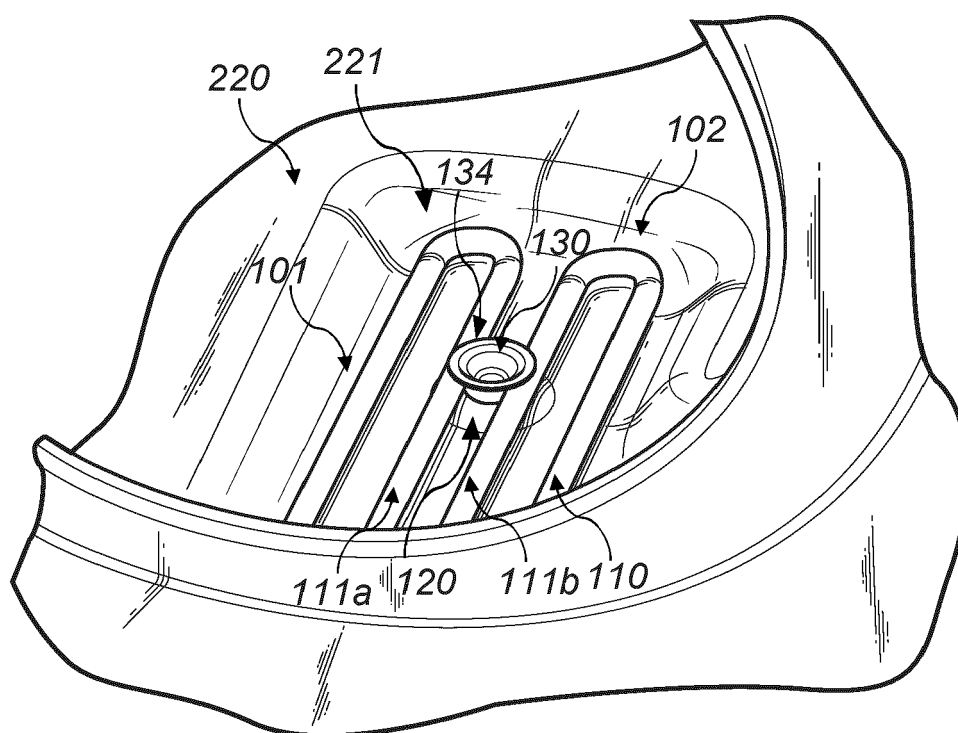


Fig. 3a

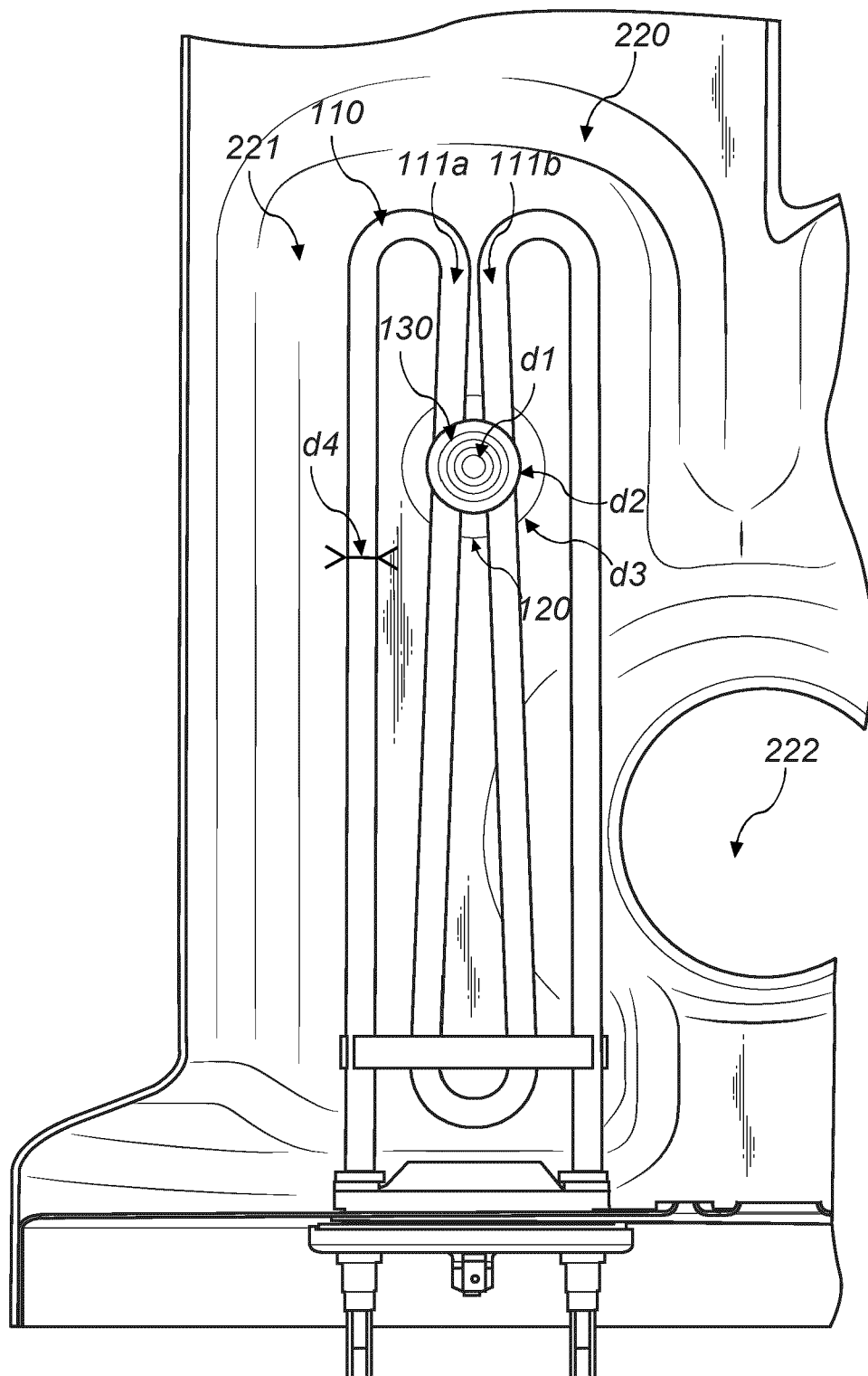


Fig. 3b

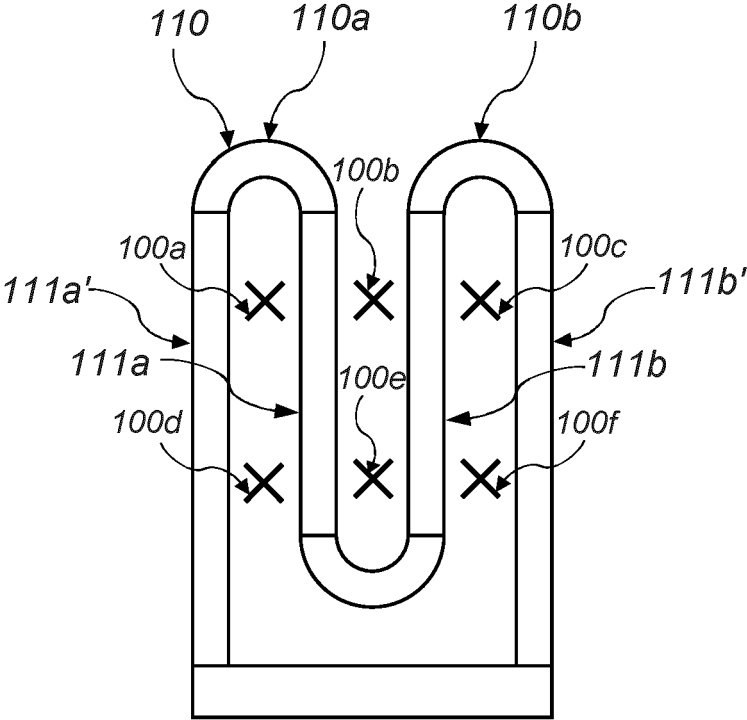


Fig. 4a

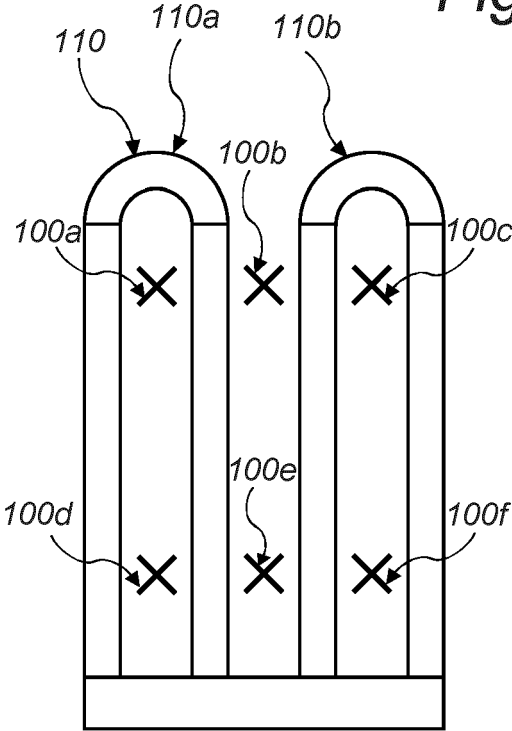


Fig. 4a

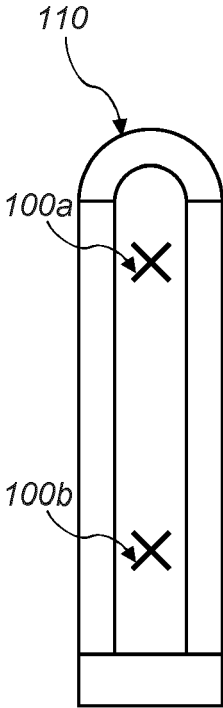


Fig. 4c

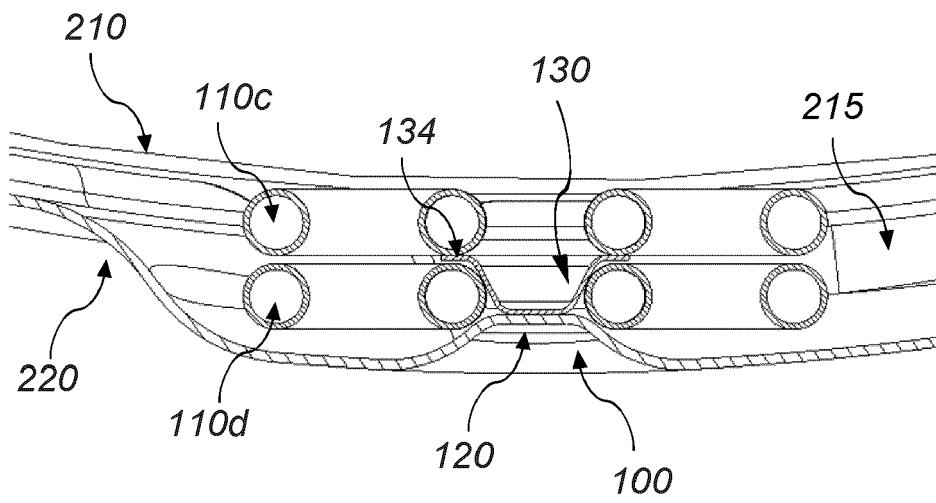


Fig. 5a

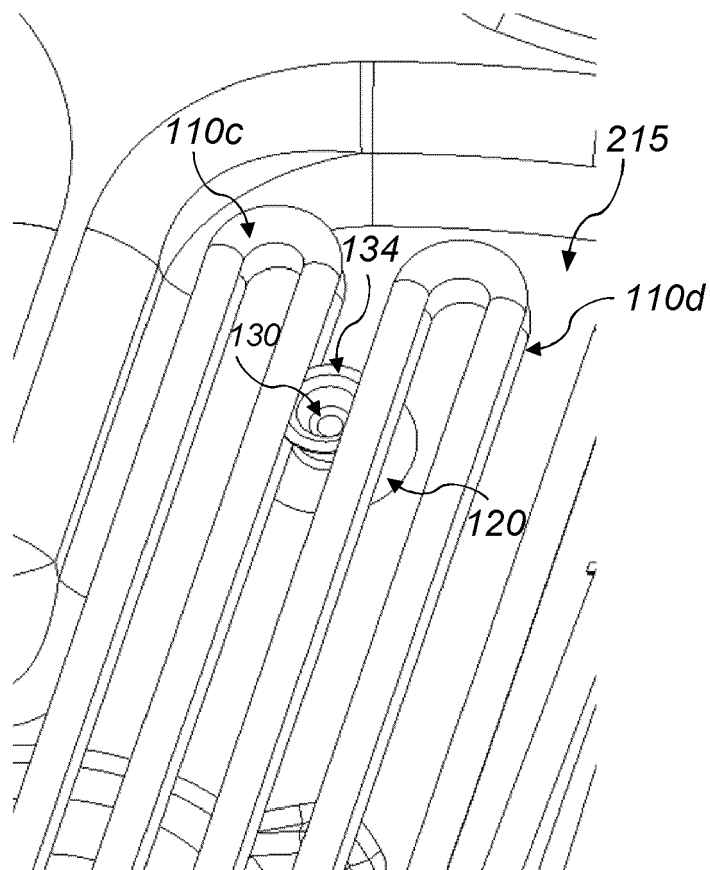


Fig. 5b



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Application Number

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Place of search Munich		Date of completion of the search 12 December 2024	Examiner Popara, Velimir
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