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(54) **STEAM GENERATOR COMPRISING A STEAM EXIT STRUCTURE**

(57) The invention relates to a steam generator (100) comprising a heated steaming surface (102) for vaporizing water to generate steam, a front wall portion (104), a rear wall portion (106) facing the front wall portion, with the heated steaming surface extending between the front wall portion and the rear wall portion. The steam generator also comprises a pair of side wall portions (108, 110) facing each other, with the heated steaming surface laterally extending between the pair of side wall portions. A cover is spaced apart from the heated steaming surface. The cover, the front wall portion, the rear wall portion, and the pair of side wall portions define an en-

closed steam chamber. A steam exit structure (116) comprises a steam channel protruding into the steam chamber from the front wall portion and being arranged for allowing steam to exit the steam chamber. The steam exit structure comprises a fluid barrier portion (120) arranged at an end of the steam channel. At least one opening (122A, 122B, 122C) is provided for allowing steam in the steam chamber to pass into the steam channel. The at least one opening is arranged along the steam exit structure in-between the fluid barrier portion and the front wall portion.

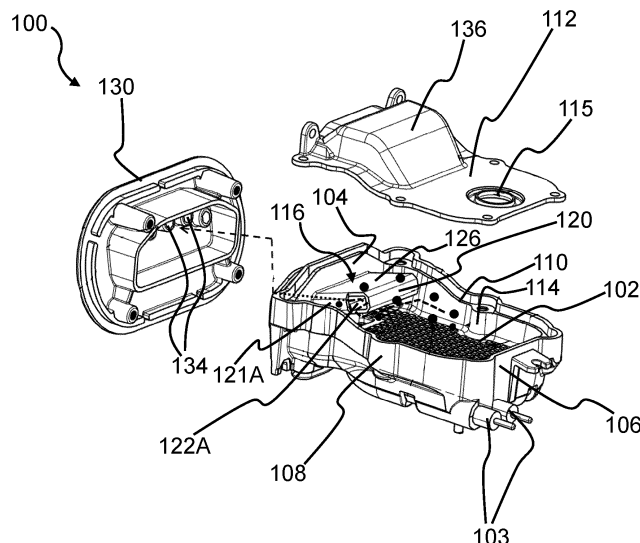


FIG.2A

Description

FIELD OF THE INVENTION

[0001] The invention relates to a steam generator having a steam chamber and a steam exit structure protruding into the steam chamber and being arranged for allowing steam to exit the steam chamber.

[0002] The invention further relates to a garment steaming device comprising such a steam generator.

[0003] The invention may be used in the field of garment care.

BACKGROUND OF THE INVENTION

[0004] Steam generators can be used for various household purposes. In particular, the steam generated by such steam generators can be convenient for treating and refreshing fabric or garments.

[0005] It is desirable for such steam generators to deliver steam at relatively high steam rates, since this may allow, for example, users to finish fabric/garment refreshing or treatment more quickly. However, higher steam rates can increase the risk of non-vaporized water being unintentionally released from the steam generator. In the context of garment steaming devices, "spitting" of non-vaporized water can cause undesirable marking or staining of the fabric/garment.

[0006] This "spitting" issue is particularly problematic when the steam generator is included in a hand unit capable of being moved by a user over a garment being treated. This is because fitting the steam generator in such a hand unit necessitates the steam generator being relatively compact, and the risk of release of non-vaporized water may generally increase as the size of the steam generator decreases.

[0007] Various types of steam generator are known. Some steam generators have a labyrinth-type design in which fluid is required to follow a winding fluid path defined in the steam generator's steam chamber. Such a labyrinth-type design can benefit from being relatively robust with respect to changing orientation of the steam generator during use. However, one of the biggest drawbacks of the labyrinth-type design is that non-vaporized water can exit from the steam generator if it is not converted into steam by the time the water reaches the end of the defined fluid (non-vaporized water and steam) path. Accordingly, users may experience hot water being released from the steam generator together with steam.

[0008] Another type of steam generator has a heated steaming surface with no labyrinth. In this case, water dosed into the steam generator is spread on the heated steaming surface, steam is thus generated, and the steam enters a steam channel defined in a steam exit structure, e.g. a chimney. The steam may be carried along the steam channel and emitted via steam vent(s) provided in a treatment plate/steam plate. No defined fluid flow path may be provided with this type of steam

generator: water is free to move in an open steam chamber in order to be vaporized. The robustness of this design with respect to handling surplus water being dosed into the steam generator may make provide an advantage over the labyrinth-type design.

[0009] However, during vaporization, water droplets that have not yet been vaporized can jump on the heated steaming surface, with some of the water droplets following the steam flow and entering the steam channel defined in the steam exit structure, e.g. chimney. This can eventually result in non-vaporized water exiting the steam generator.

OBJECT AND SUMMARY OF THE INVENTION

[0010] It is an object of the invention to propose a steam generator that avoids or mitigates one or more of the above-mentioned problems.

[0011] The invention is defined by the independent claims. The dependent claims define advantageous embodiments.

[0012] To this end, the steam generator according to the invention comprises

- a heated steaming surface for vaporizing water to generate steam,
- a front wall portion,
- a rear wall portion facing the front wall portion, the heated steaming surface extending between the front wall portion and the rear wall portion,
- a pair of side wall portions facing each other, the heated steaming surface laterally extending between the pair of side wall portions,
- a cover spaced apart from the heated steaming surface,
- the cover, the front wall portion, the rear wall portion and the pair of side wall portions defining an enclosed steam chamber,
- a steam exit structure comprising a steam channel protruding into the steam chamber from the front wall portion and being arranged for allowing steam to exit the steam chamber, the steam exit structure comprising a fluid barrier portion arranged at an end of the steam channel, and
- at least one opening for allowing steam in the steam chamber to pass into the steam channel, the at least one opening being arranged along the steam exit structure in-between the fluid barrier portion and the front wall portion.

[0013] The fluid barrier portion can assist to prevent non-vaporized water travelling towards the front wall portion, from directly entering the steam channel via the end of the steam channel. Thus, the fluid barrier portion can help to minimize the risk of non-vaporized water exiting the steam chamber via the steam channel.

[0014] Steam in the steam chamber is nonetheless permitted to enter the steam channel via at least one

opening arranged along the steam exit structure in-between the fluid barrier portion and the front wall portion. However, the positioning of the opening(s) in-between the fluid barrier portion and the front wall portion can force non-vaporized water travelling towards the front wall portion to move around the fluid barrier portion in order to enter the steam channel via the opening(s). This more tortuous route to reach the opening(s) may increase the likelihood of the non-vaporized water being vaporized by the time it has reached the opening(s).

[0015] In some embodiments, the steam exit structure comprises a first lateral portion extending from the front wall portion towards the fluid barrier portion, with a first front side region of the steam chamber being defined in-between the first lateral portion and a first side wall portion of the pair of side wall portions. In other words, the first lateral portion of the steam exit structure is spaced apart from the first side wall portion that partly delimits the steam chamber.

[0016] In such embodiments, the at least one opening preferably comprises a first side opening for admitting steam from the first front side region into the steam channel, with the first side opening being defined along the first lateral portion. Thus, the first side opening can admit steam into the steam channel from a position along a length, rather than at the upstream end, of the steam channel.

[0017] In some embodiments, the steam exit structure comprises a second lateral portion extending from the front wall portion towards the fluid barrier portion, with a second front side region of the steam chamber being defined in-between the second lateral portion and a second side wall portion of the pair of side wall portions. In other words, the second lateral portion of the steam exit structure is spaced apart from the second side wall portion that partly delimits the steam chamber.

[0018] In such embodiments, the at least one opening preferably comprises a second side opening for admitting steam from the second front side region into the steam channel, with the second side opening being defined in the second lateral portion. Thus, the second side opening can admit steam into the steam channel from a position along the length, rather than at the upstream end, of the steam channel.

[0019] The positioning of the first side opening and the second side opening can assist to minimize the risk of non-vaporized water travelling towards the front wall portion from directly entering the steam channel. In particular, the positioning of the first side opening and the second side opening can mean that these side opening(s) do not receive, or at least receive only a limited amount of, water droplets upwardly ejected from the heated steaming surface and water droplets that have fallen downwardly from the cover.

[0020] In some embodiments, the steam chamber extends along a central longitudinal axis, with the central longitudinal axis extending from the front wall portion to the rear wall portion. For example, the central longitudinal

axis bisects the steaming surface.

[0021] In such embodiments, one or more of the at least one opening is preferably arranged to receive steam, generated in the steam chamber, into the steam channel in a direction transverse, e.g. perpendicular, to the central longitudinal axis.

[0022] Thus, the opening(s) can be arranged to force steam and/or non-vaporized water initially following a path along or parallel to the central longitudinal axis to deviate from this path in order to enter the steam channel. This re-direction of the non-vaporized water can assist to minimize the risk of the non-vaporized water entering the steam channel.

[0023] In some embodiments, the steam exit structure comprises a fluid impermeable bottom portion extending from the front wall portion to the fluid barrier portion, with a front bottom region of the steam chamber being defined in-between the fluid impermeable bottom portion and the heated steaming surface. The fluid impermeable bottom portion can block non-vaporized water from entering the steam channel from underneath the steam exit structure.

[0024] In a first set of embodiments, the steam exit structure comprises a fluid impermeable top portion extending from the front wall portion to the fluid barrier portion, with a front top region of the steam chamber being defined in-between the fluid impermeable top portion and the cover. The fluid impermeable top portion can block non-vaporized water, e.g. non-vaporized water clinging to an underside of the cover, from downwardly entering the steam channel from above the steam exit structure.

[0025] In a second set of embodiments, the steam exit structure comprises a top portion extending from the front wall portion to the fluid barrier portion, with a front top region of the steam chamber being defined in-between the top portion and the cover, and the at least one opening comprising a top side opening for admitting steam from the front top region into the steam channel. In this second set of embodiments, the top side opening is defined in the top portion of the steam exit structure.

[0026] The positioning of the top side opening can mean that the top side opening does not receive, or at least receives only a limited amount of, water droplets upwardly ejected from the heated steaming surface.

[0027] In some embodiments, the at least one opening comprises the top side opening and one or both of the first and second side openings.

[0028] In some embodiments, the steam exit structure extends from the front wall portion at an angle that causes the steam exit structure to slope away from the heated steaming surface and towards the cover. This sloping of the steam exit structure has been found to minimize the risk of non-vaporized water in the steam chamber entering the steam channel.

[0029] For example, the angle of the steam exit structure can allow the opening(s) to be defined in portion(s) of the steam exit structure that is/are further from the heated steaming surface due to the steam exit structure sloping

away from the heated steaming surface.

[0030] In alternative embodiments, the steam exit structure extends parallel with the heated steaming surface.

[0031] In such embodiments, a constant distance between the fluid impermeable bottom portion and the heated steaming surface can be maintained between the front wall portion and the fluid barrier portion.

[0032] In some embodiments, the steam generator comprises a treatment plate having an exterior surface for contacting garments, with the treatment plate delimiting one or more steam vents in fluid communication with the steam channel. Steam is deliverable via the steam vent(s), e.g. towards a garment.

[0033] In some embodiments, the steam exit structure extends from the treatment plate into the steam chamber. In such embodiments, the heated steaming surface preferably protrudes away from a plane of the treatment plate. This may provide a relatively compact arrangement of the steam generator.

[0034] Alternatively or additionally, the treatment plate can be arranged adjacent to the front wall portion. For example, the water received via the water inlet at/proximal to the rear wall portion may flow on the heated steaming surface towards the front wall portion and the treatment plate arranged adjacent to the front wall portion.

[0035] In some embodiments, a water inlet for delivering water towards the heated steaming surface is arranged in the cover and/or is arranged proximal to the rear wall portion. Arranging the water inlet at/proximal to the rear wall portion can assist to minimize the risk of non-vaporized water exiting the steam chamber via the steam channel, due to the water being required to travel through the steam chamber from where the water is dosed at the rear of the steam chamber to where the steam channel is positioned at the front of the steam chamber.

[0036] It is noted that the steam generator may not include an arrangement of internal partition walls that protrude from the heated steaming surface to reach the cover, and define a winding fluid path between the water inlet and the opening(s).

[0037] In such embodiments, the steam generator can be regarded as not being a labyrinth-type steam generator.

[0038] A height of the steam chamber is preferably increased with greater distance away from the rear wall portion, with at least part of the steam exit structure being arranged where the steam chamber's height is increased. This increased height of the steam chamber can, for example, assist to accommodate the above-described sloping of the steam exit structure away from the heated steaming surface and towards the cover.

[0039] The at least one opening can have any suitable dimensions. In some embodiments, one or more of the at least one opening each has an area in the range of [24; 70] mm² or [24; 150] mm².

[0040] For example, one or both of the first side open-

ing and the second side opening has/have an area in the range of [24; 70] mm².

[0041] Alternatively or additionally, the top side opening can have an area in the range of [24; 150] mm².

[0042] The at least one opening can have any suitable shape. In some embodiments, one or more of the at least one opening each has a circular, rectangular, rounded rectangular, trapezoid or rounded trapezoid shape.

[0043] According to another aspect there is provided a garment steaming device comprising a hand unit for moving over a garment, with the hand unit including the steam generator according to any of the embodiments described herein.

[0044] In some embodiments, the hand unit comprises a water tank and a water delivery system, e.g. a water delivery system comprising a pump, for delivering water from the water tank to the steam generator.

[0045] In alternative embodiments, the garment steaming device comprises a hose cord, and a base unit comprising a water tank. The hose cord is for extending between the base unit and the hand unit, so that water is deliverable from the base unit to the steam generator via the hose cord.

[0046] Detailed explanations and other aspects of the invention will be given below.

BRIEF DESCRIPTION OF THE DRAWINGS

[0047] Particular aspects of the invention will now be explained with reference to the embodiments described hereinafter and considered in connection with the accompanying drawings, in which identical parts or sub-steps are designated in the same manner:

Fig.1 schematically depicts a garment steaming device according to an example,
Figs.2A to 2E depict a steam generator according to a first example, and
Figs.3A and 3B depict a steam generator according to a second example.

DETAILED DESCRIPTION OF THE INVENTION

[0048] The invention relates to a steam generator comprising a heated steaming surface for vaporizing water to generate steam, a front wall portion, a rear wall portion facing the front wall portion, with the heated steaming surface extending between the front wall portion and the rear wall portion. The steam generator also comprises a pair of side wall portions facing each other, with the heated steaming surface laterally extending between the pair of side wall portions. A cover is spaced apart from the heated steaming surface. The cover, the front wall portion, the rear wall portion, and the pair of side wall portions define an enclosed steam chamber. A steam exit structure comprises a steam channel protruding into the steam chamber from the front wall portion and being arranged for allowing steam to exit the steam

chamber. The steam exit structure comprises a fluid barrier portion arranged at an end of the steam channel. At least one opening is provided for allowing steam in the steam chamber to pass into the steam channel. The at least one opening is arranged along the steam exit structure in-between the fluid barrier portion and the front wall portion.

[0049] Fig. 1 depicts a garment steaming device 10 comprising a hand unit 12 for moving over a garment being treated using the garment steaming device 10. Also referring to Figs.2A to 2E, the hand unit 12 includes a steam generator 100 whose design will be explained in more detail herein below.

[0050] The steam generator 100 can be alternatively termed a "steam engine".

[0051] The hand unit 12 can be alternatively termed a "steamer head".

[0052] The term "the hand unit 12 includes a steam generator 100" can mean, for instance, that the steam engine is mounted in the steamer head.

[0053] In some embodiments (not shown in the Figures), the hand unit 12 comprises a water tank and a water delivery system, e.g. a pump, for delivering water from the water tank to the steam generator 100. Thus, the steam generator 100 can be regarded as being included in a handheld garment steaming device, with the steam generator 100, the water tank and the water delivery system, e.g. pump, being integrated in the handheld garment steaming device.

[0054] In alternative embodiments, such as shown in Fig.1, the garment steaming device 10 comprises a hose cord 14, and a base unit 16 comprising a water tank. The hose cord 14 can deliver water from the base unit 16 to the steam generator 100.

[0055] The garment steaming device 10 shown in Fig.1 can be regarded as a stand steamer. In some embodiments (not shown), the garment steaming device 10 comprises an ironing board, e.g. a tiltable ironing board that is tiltable between a vertical orientation for upright steaming and a horizontal orientation for ironing.

[0056] As best shown in Figs.2A and 2E, the steam generator 100 comprises a heated steaming surface 102 for vaporizing water to generate steam. The heated steaming surface 102 can be heated in any suitable manner. For example, a heating element 103 is arranged beneath, and is in thermal communication with, the heated steaming surface 102.

[0057] In some embodiments, such as shown in Figs.2A to 2E, the heating element 103 is a tubular heating element 103, e.g. a tubular heating element 103 having a nested double loop shape.

[0058] Such a nested double loop shaped heating element 103 can assist to provide relatively uniform heating across the area of the heated steaming surface 102.

[0059] The steam generator 100 preferably includes a pattern of spatially separated protrusions 105 protruding from the heated steaming surface 102.

[0060] Such protrusions 105 can assist spread of non-vaporized water on the heated steaming surface 102 and/or can help with controlling the speed of water movement on the heated steaming surface 102. The protrusions 105 can have any suitable shape, such as conical, truncated conical, pyramidal and/or truncated pyramidal.

[0061] More generally, the steam generator 100 comprises a front wall portion 104, and a rear wall portion 106 facing the front wall portion 104. The heated steaming surface 102 extends, for example longitudinally extends, between the front wall portion 104 and the rear wall portion 106.

[0062] In some embodiments, such as shown in Figs.2A to 2E, the heated steaming surface 102 is an elongate heated steaming surface 102 whose length extends between the front wall portion 104 and the rear wall portion 106.

[0063] Fig.2E shows a central longitudinal axis LA extending between the front wall portion 104 and the rear wall portion 106. For example, the central longitudinal axis LA bisects the steaming surface 102.

[0064] The steam generator 100 comprises a pair of side wall portions 108, 110 that face each other, with the heated steaming surface 104 laterally extending between the pair of side wall portions 108, 110.

[0065] In embodiments in which the length of the elongate heated steaming surface 102 extends between the front wall portion 104 and the rear wall portion 106, the width of the elongate steaming surface 102 extends between the pair of side wall portions 108, 110. The width is shorter than the elongate steaming surface's 102 length.

[0066] As shown in Figs.2A to 2D, the steam generator 100 has a cover 112 spaced apart from the heated steaming surface 102. The cover 112, the front wall portion 104, the rear wall portion 106 and the pair of side wall portions 108, 110 define an enclosed steam chamber 114.

[0067] The base of the steam generator 100 that includes the steaming surface 102, as well as the cover 112, the front wall portion 104, the rear wall portion 106 and the pair of side wall portions 108, 110 can be formed from any suitable material capable of withstanding the conditions inside the steam chamber 114. Preferably, the base, the cover 112, the front wall portion 104, the rear wall portion 106 and the pair of side wall portions 108, 110 are each formed from a metal material, such as aluminium.

[0068] A seal, for example a rubber gasket and/or sealing paste, can be provided between the cover 112 and the wall portion(s) 104, 106, 108, 110 supporting the cover 112 so as to sealingly close the steam chamber 114.

[0069] Water can be delivered into the steam chamber 114 in any suitable manner. For example, a water inlet 115 for delivering water towards the heated steaming surface 102 is arranged in the cover 112 and/or is arranged proximal to the rear wall portion 106.

[0070] In some embodiments, and referring to Figs.2B to 2D, the water is delivered into the steam chamber 114 via a connector element 117 provided at, for example mounted on, the cover 112. For instance, the connector element 117 cooperates with the water inlet 115 so that water is deliverable into the steam chamber 114 via the connector element 117 and the water inlet 115.

[0071] The connector element 117 can have any suitable design. In some embodiments, the connector element 117 comprises a tube connector for connecting to a water tube, e.g. a water tube for delivering water from the water tank to the steam generator 100.

[0072] A steam exit structure 116 protrudes into the steam chamber 114 from the front wall portion 104. As shown in Figs.2B to 2D, a steam channel 118 is defined within the steam exit structure 116. The steam channel 118 allows steam to exit the steam chamber 114.

[0073] It is noted that arranging the water inlet 115 at/proximal to the rear wall portion 106 can assist to minimize the risk of non-vaporized water exiting the steam chamber 114 via the steam channel 118, due to the water being required to travel through the steam chamber 114 from where the water is dosed at the rear of the steam chamber 114 to where the steam channel 118 is positioned at the front of the steam chamber 114.

[0074] Moreover, the steam exit structure 116 comprises a fluid barrier portion 120 arranged at an end, in other words an upstream end, of the steam channel 118. The fluid barrier portion 120 can, for instance, be regarded as capping the end of the steam channel 118.

[0075] The fluid barrier portion 120 can assist to prevent non-vaporized water travelling towards the front wall portion 104 from directly entering the steam channel 118 via the upstream end of the steam channel 118. Thus, the fluid barrier portion 120 can help to minimize the risk of non-vaporized water exiting the steam chamber 114 via the steam channel 118.

[0076] Steam in the steam chamber 114 is nonetheless permitted to enter the steam channel 118 via at least one opening 122A, 122B arranged along the steam exit structure 116 in-between the fluid barrier portion 120 and the front wall portion 104. However, the positioning of the opening(s) 122A, 122B in-between the fluid barrier portion 120 and the front wall portion 104 can force non-vaporized water travelling towards the front wall portion 104 to move around the fluid barrier portion 120 in order to enter the steam channel 118 via the opening(s) 122A, 122B. This more tortuous route to reach the opening(s) 122A, 122B can increase the likelihood of the non-vaporized water being vaporized by the time it has reached the opening(s) 122A, 122B.

[0077] In some embodiments, and as shown in Fig.2E, one or more of the at least one opening 122A, 122B is arranged to receive steam, generated in the steam chamber 114, into the steam channel 118 in a direction transverse, e.g. perpendicular, to the central longitudinal axis LA. Thus, the opening(s) 122A, 122B can be arranged to force steam and/or non-vaporized water following a path

along or parallel to the central longitudinal axis LA to deviate from this path in order to enter the steam channel 118. This re-direction of the non-vaporized water can assist to minimize the risk of the non-vaporized water entering the steam channel 118.

[0078] In some embodiments, and as best shown in Fig.2E, the steam exit structure 116 comprises a first lateral portion 121A extending from the front wall portion 104 towards the fluid barrier portion 120, with a first front side region 123A of the steam chamber 114 being defined in-between the first lateral portion 121A and a first side wall portion 108 of the pair of side wall portions 108, 110. In other words, the first lateral portion 121A of the steam exit structure 116 is spaced apart from the first side wall portion 108 that partly delimits the steam chamber 114. In such embodiments, the at least one opening 122A, 122B preferably comprises a first side opening 122A for admitting steam from the first front side region 123A into the steam channel 118, with the first side opening 122A being defined along the first lateral portion 121A. Thus, the first side opening 122A can admit steam into the steam channel 118 from a position along a length, rather than at the upstream end, of the steam channel 118.

[0079] In other words, the first side opening 122A can face the first side wall portion 108.

[0080] In some embodiments, and with continued reference to Fig.2E, the steam exit structure 116 comprises a second lateral portion 121B extending from the front wall portion 104 towards the fluid barrier portion 120, with a second front side region 123B of the steam chamber 114 being defined in-between the second lateral portion 121B and a second side wall portion 110 of the pair of side wall portions 108, 110. In other words, the second lateral portion 121B of the steam exit structure 116 is spaced apart from the second side wall portion 110 that partly delimits the steam chamber 114.

[0081] In such embodiments, the at least one opening 122A, 122B preferably comprises a second side opening 122B, e.g. in addition to the above-described first side opening 122A, for admitting steam from the second front side region 123B into the steam channel 118, with the second side opening 122B being defined along the second lateral portion 121B. Thus, the second side opening 122B can admit steam into the steam channel 118 from a position along the length, rather than at the upstream end, of the steam channel 118.

[0082] In other words, the second side opening 122B can face the second side wall portion 108.

[0083] For example, a periphery of each of the opening(s) 122A, 122B forms a planar surface, with a normal/perpendicular to this surface defining a direction of fluid flow through the respective opening 122A, 122B.

[0084] For instance, the planar surface formed by the periphery of the first side opening 122A faces the first side wall portion 108.

[0085] Alternatively or additionally, the planar surface formed by the periphery of the second side opening 122B can face the second side wall portion 110.

[0086] The positioning of the first side opening 122A and the second side opening 122B can assist to minimize the risk of non-vaporized water travelling towards the front wall portion 104 from directly entering the steam channel 118. In particular, the positioning of the first side opening 122A and the second side opening 122B can mean that these side opening(s) 122A, 122B do not receive, or at least receive only a limited amount of, water droplets WD upwardly ejected from the heated steaming surface 102 and water droplets WD that have fallen downwardly from the cover 112.

[0087] Fig.2B schematically shows that water droplets WD have less chance of entering the steam exit structure's 116 side opening(s) 122A, 122B, since a change in flow direction is required as a consequence of inclusion of the fluid barrier portion 120, rather than an opening at the upstream end of the steam channel 118, extending orthogonally to the flow direction.

[0088] Fig.2C schematically depicts the change of direction of the water droplets WD needed for them to enter the steam channel 118 via the side opening(s) 122A, 122B. Water droplets WD with higher mass may have less propensity to change direction and flow into side opening(s) 122A, 122B.

[0089] Fig.2D schematically illustrates that water droplets WD on the cover 112 can have less chance of entering the steam channel 118 via the side opening(s) 122A, 122B.

[0090] In at least some embodiments, and as shown in Figs.2B to 2D, the steam exit structure 116 comprises a fluid impermeable bottom portion 124 extending from the front wall portion 104 to the fluid barrier portion 120, with a front bottom region 125 of the steam chamber 114 being defined in-between the fluid impermeable bottom portion 124 and the heated steaming surface 102. The fluid impermeable bottom portion 124 can block non-vaporized water from entering the steam channel 118 from underneath the steam exit structure 116.

[0091] In some embodiments, and as best shown in Figs.2B to 2D, the steam exit structure 116 extends from the front wall portion 104 at an angle that causes the steam exit structure 116 to slope away from the heated steaming surface 102 and towards the cover 112. This sloping of the steam exit structure 116 has been found to minimize the risk of non-vaporized water in the steam chamber 114 entering the steam channel 118.

[0092] For example, the angle of the steam exit structure 116 can allow the opening(s) 122A, 122B to be defined in portion(s) of the steam exit structure 116 that is/are further from the heated steaming surface 102 due to the steam exit structure 116 sloping away from the heated steaming surface 102.

[0093] In alternative embodiments (not shown in the Figures), the steam exit structure 116 extends parallel with the heated steaming surface 102. In such embodiments, a constant distance between the fluid impermeable bottom portion 124 and the heated steaming surface 102 can be maintained between the front wall portion 104

and the fluid barrier portion 120.

[0094] In a first set of embodiments, such as shown in Figs.2A to 2E, the steam exit structure 116 comprises a fluid impermeable top portion 126 extending from the front wall portion 104 to the fluid barrier portion 120, with a front top region 127 of the steam chamber 114 being defined in-between the fluid impermeable top portion 126 and the cover 112. The fluid impermeable top portion 126 can block non-vaporized water, e.g. non-vaporized water clinging to an underside of the cover 112, from entering the steam channel 118 downwardly from above the steam exit structure 116.

[0095] In a second set of embodiments, such as shown in Figs.3A and 3B, the steam exit structure 116 comprises a top portion 126A extending from the front wall portion 104 to the fluid barrier portion 120, with a front top region 127A of the steam chamber 114 being defined in-between the top portion 126A and the cover 112, and the at least one opening 122A, 122B, 122C comprising a top side opening 122C for admitting steam from the front top region 127A into the steam channel 118. In this second set of embodiments, the top side opening 122C is defined in the top portion 126A of the steam exit structure 116.

[0096] The positioning of the top side opening 122C can mean that the top side opening 122C does not receive, or at least receives only a limited amount of, water droplets upwardly ejected from the heated steaming surface 102.

[0097] In some embodiments, such as shown in Figs.3A and 3B, the at least one opening 122A, 122B, 122C comprises the top side opening 122C and one or both of the first and second side openings 122A, 122B.

[0098] It is noted that the at least one opening 122A, 122B, 122C can have any suitable dimensions. In some embodiments, one or more of the at least one opening 122A, 122B, 122C each has an area in the range of [24; 70] mm² or [24; 150] mm².

[0099] For example, one or both of the first side opening 122A and the second side opening 122B has/have an area in the range of [24; 70] mm².

[0100] Alternatively or additionally, the top side opening 122C can have an area in the range of [24; 150] mm².

[0101] The at least one opening 122A, 122B, 122C can have any suitable shape. In some embodiments, one or more of the at least one opening 122A, 122B, 122C each has a circular, rectangular, rounded rectangular, trapezoid or rounded trapezoid shape.

[0102] In at least some embodiments, such as shown in Figs.1 to 3B, the garment steaming device 10 and/or the steam generator 100 include(s) a treatment plate 130 having an exterior surface 132 for contacting garments, with the treatment plate 130 delimiting one or more steam vents 134 for releasing steam. In such embodiments, the one or more steam vents 134 is or are in fluid communication with the steam channel 118 to enable steam generated in the steam chamber 114 to reach the garment being treated.

[0103] The steam exit structure 116 preferably extends

from the treatment plate 130 into the steam chamber 114, as best shown in Figs. 2A to 2D and 3A. In such embodiments, the heated steaming surface 102 preferably protrudes away from a plane of the treatment plate 130. This may provide a relatively compact arrangement of the steam generator 100.

[0104] Alternatively or additionally, the treatment plate 130 can be arranged adjacent to the front wall portion 104. For example, the water received via the water inlet 115 at/proximal to the rear wall portion 106 may flow on the heated steaming surface 102 towards the front wall portion 104 and the treatment plate 130 arranged adjacent to the front wall portion 104.

[0105] In some embodiments, and as best shown in Figs. 2B to 2D and 3A, a height of the steam chamber 114 is increased with greater distance away from the rear wall portion 106, with at least part of the steam exit structure 116 being arranged where the steam chamber's 114 height is increased. This increased height of the steam chamber 114 can, for example, assist to accommodate the above-described sloping of the steam exit structure 116 away from the heated steaming surface 102 and towards the cover 112.

[0106] In such embodiments, the cover 112 may include a higher portion 136 that is elevated relative to other portions of the cover 112, so as to contribute to or provide the increased height of the steam chamber 114.

[0107] It is noted that the steam generator 100 may not include an arrangement of internal partition walls that protrude from the heated steaming surface 102 to reach the cover 112, and define a winding fluid path between the water inlet 115 and the opening(s) 122A, 122B.

[0108] In such embodiments, the steam generator 100 can be regarded as not being a labyrinth-type steam generator.

[0109] The above embodiments as described are only illustrative, and not intended to limit the technique approaches of the present invention. Although the present invention is described in detail referring to the preferable embodiments, those skilled in the art will understand that the technique approaches of the present invention can be modified or equally displaced without departing from the protective scope of the claims of the present invention. In particular, although the invention has been described based on a garment steaming device, it can be applied to any household appliance in which steam generation functionality is to be incorporated. In the claims, the word "comprising" does not exclude other elements or steps, and the indefinite article "a" or "an" does not exclude a plurality. Any reference signs in the claims should not be construed as limiting the scope.

Claims

1. A steam generator (100) comprising:

- a heated steaming surface (102) for vaporizing

water to generate steam,

- a front wall portion (104),
- a rear wall portion (106) facing the front wall portion, the heated steaming surface extending between the front wall portion and the rear wall portion,
- a pair of side wall portions (108, 110) facing each other, the heated steaming surface laterally extending between the pair of side wall portions,
- a cover (112) spaced apart from the heated steaming surface,
- the cover, the front wall portion, the rear wall portion and the pair of side wall portions defining an enclosed steam chamber (114),
- a steam exit structure (116) comprising a steam channel (118) protruding into the steam chamber from the front wall portion and being arranged for allowing steam to exit the steam chamber, the steam exit structure comprising a fluid barrier portion (120) arranged at an end of the steam channel, and
- at least one opening (122A, 122B, 122C) for allowing steam in the steam chamber to pass into the steam channel, the at least one opening being arranged along the steam exit structure in-between the fluid barrier portion and the front wall portion.

2. The steam generator (100) according to claim 1, wherein:

- the steam exit structure (116) comprises a first lateral portion (121A) extending from the front wall portion (104) towards the fluid barrier portion (120),
- a first front side region (123A) of the steam chamber (114) is defined in-between the first lateral portion and a first side wall portion (108) of the pair of side wall portions (108, 110), and
- the at least one opening (122A, 122B, 122C) comprises a first side opening (122A) for admitting steam from the first front side region into the steam channel (118), the first side opening being defined along the first lateral portion.

3. The steam generator (100) according to claim 2, wherein:

- the steam exit structure (116) comprises a second lateral portion (121B) extending from the front wall portion (104) towards the fluid barrier portion (120),
- a second front side region (123B) of the steam chamber (114) is defined in-between the second lateral portion and a second side wall portion (110) of the pair of side wall portions (108, 110),

- and
 - the at least one opening (122A, 122B, 122C) comprises a second side opening (122B) for admitting steam from the second front side region into the steam channel (118), the second side opening being defined along the second lateral portion.
4. The steam generator (100) according to any one of claims 1 to 3, wherein the steam chamber (114) extends along a central longitudinal axis (LA) extending from the front wall portion (104) to the rear wall portion (106), one or more of the at least one opening (122A, 122B) being arranged to receive steam, generated in the steam chamber, into the steam channel (118) in a direction transverse to the central longitudinal axis.
5. The steam generator (100) according to any one of claims 1 to 4, wherein:
- the steam exit structure (116) comprises a fluid impermeable bottom portion (124) extending from the front wall portion (104) to the fluid barrier portion (120), and
 - a front bottom region (125) of the steam chamber (114) is defined in-between the fluid impermeable bottom portion and the heated steaming surface (102).
6. The steam generator (100) according to any one of claims 1 to 5, wherein:
- the steam exit structure (116) comprises a fluid impermeable top portion (126) extending from the front wall portion (104) to the fluid barrier portion (120), and
 - a front top region (127) of the steam chamber (114) is defined in-between the fluid impermeable top portion and the cover (112).
7. The steam generator (100) according to any one of claims 1 to 5, wherein:
- the steam exit structure (116) comprises a top portion (126A) extending from the front wall portion (104) to the fluid barrier portion (120),
 - a front top region (127A) of the steam chamber (114) is defined in-between the top portion and the cover (112), and
 - the at least one opening (122A, 122B, 122C) comprises a top side opening (122C) for admitting steam from the front top region into the steam channel (118), the top side opening being defined in the top portion.
8. The steam generator (100) according to any one of claims 1 to 7, wherein the steam exit structure (116) extends from the front wall portion (104) at an angle that causes the steam exit structure to slope away from the heated steaming surface (102) and towards the cover (112).
9. The steam generator (100) according to any one of claims 1 to 8, comprising a treatment plate (130) having an exterior surface (132) for contacting garments, the treatment plate delimiting one or more steam vents (134) for releasing steam, the one or more steam vents being in fluid communication with the steam channel (118).
10. The steam generator (100) according to claim 9, wherein the steam exit structure (116) extends from the treatment plate (130) into the steam chamber (114).
11. The steam generator (100) according to claim 9 or claim 10, wherein the treatment plate (130) is arranged adjacent to the front wall portion (104).
12. The steam generator (100) according to any one of claims 1 to 11, wherein a water inlet (115) for delivering water towards the heated steaming surface (102) is arranged in the cover (112) and/or is arranged proximal to the rear wall portion (106).
13. The steam generator (100) according to any one of claims 1 to 12, wherein a height of the steam chamber (114) is increased with greater distance away from the rear wall portion (106), at least part of the steam exit structure (116) being arranged where the steam chamber's height is increased.
14. The steam generator (100) according to any one of claims 1 to 13, wherein:
- one or more of the at least one opening (122A, 122B, 122C) each has an area in the range of [24; 70] mm² or [24; 150] mm²; and/or
 - one or more of the at least one opening each has a circular, rectangular, rounded rectangular, trapezoid or rounded trapezoid shape.
15. A garment steaming device (10) comprising a hand unit (12) for moving over a garment, the hand unit including the steam generator (100) according to any one of claims 1 to 14; optionally wherein the hand unit comprises a water tank and a water delivery system for delivering water from the water tank to the steam generator.

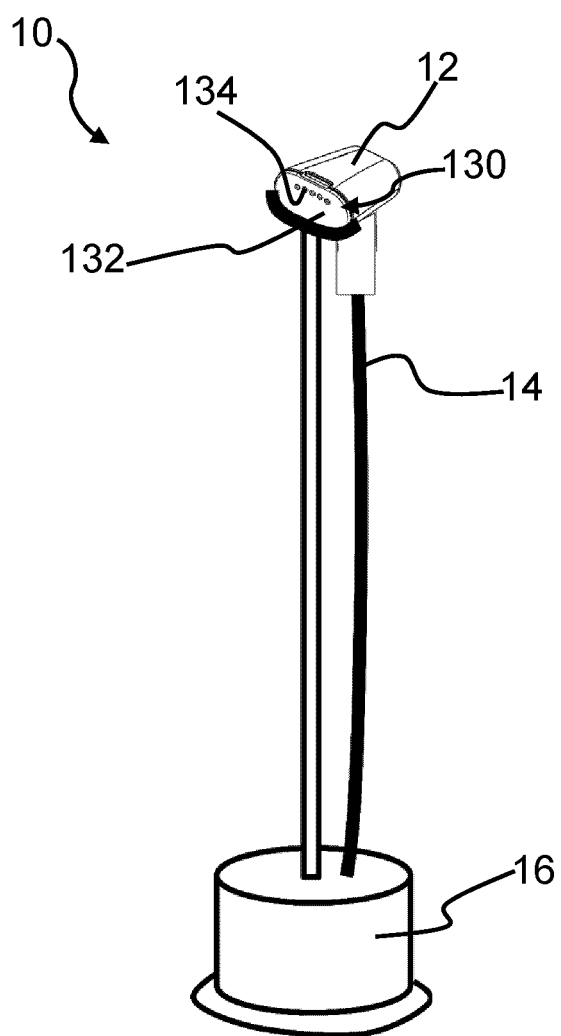


FIG.1

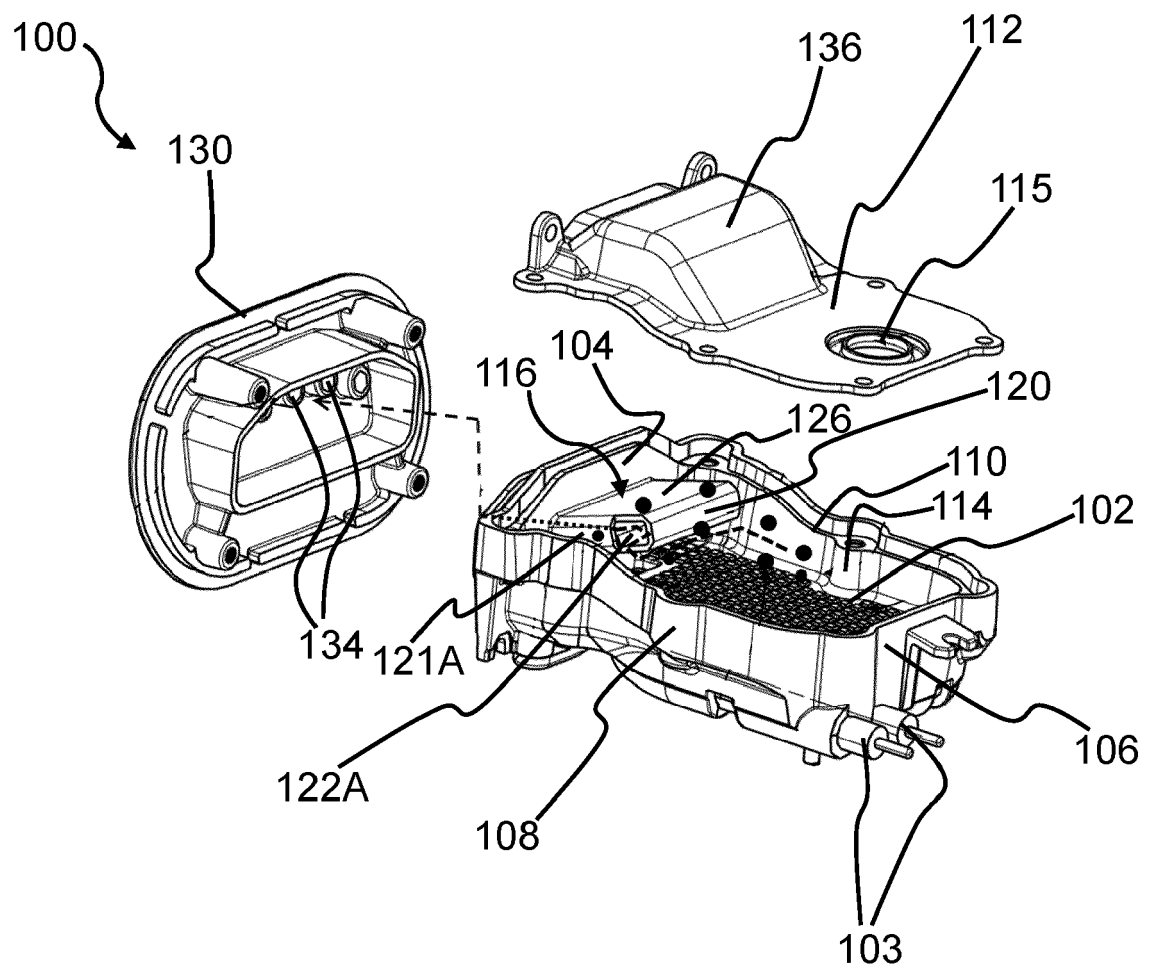


FIG.2A

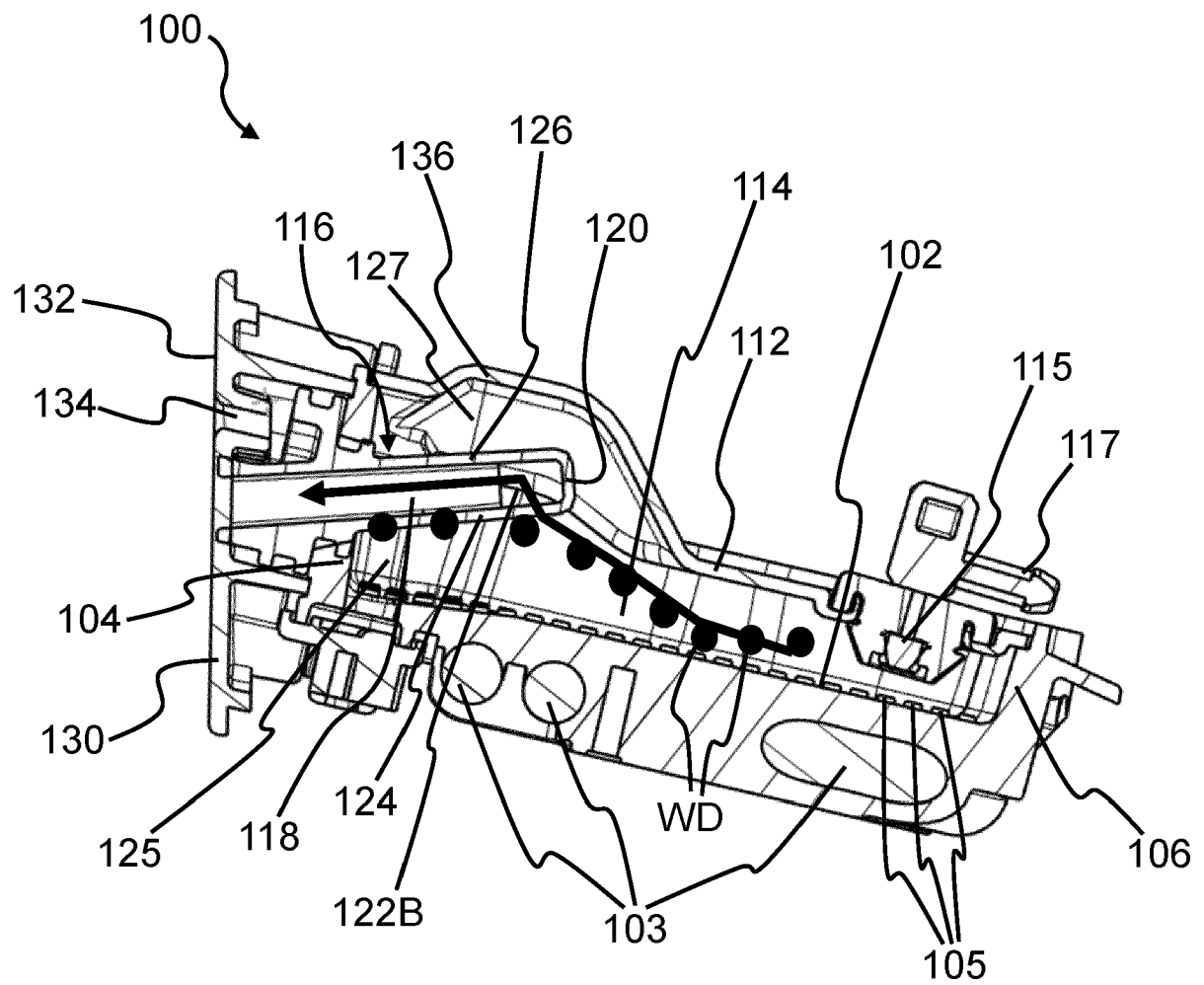


FIG.2B

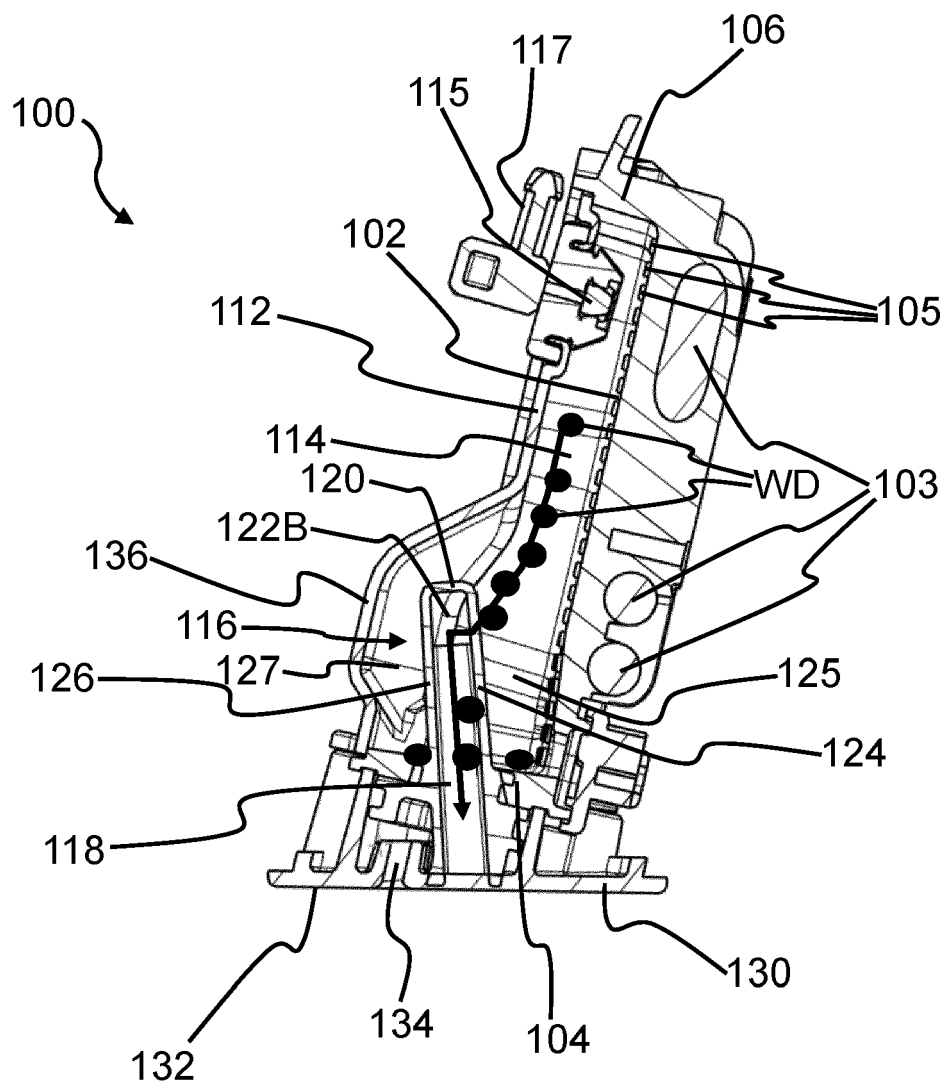


FIG.2C

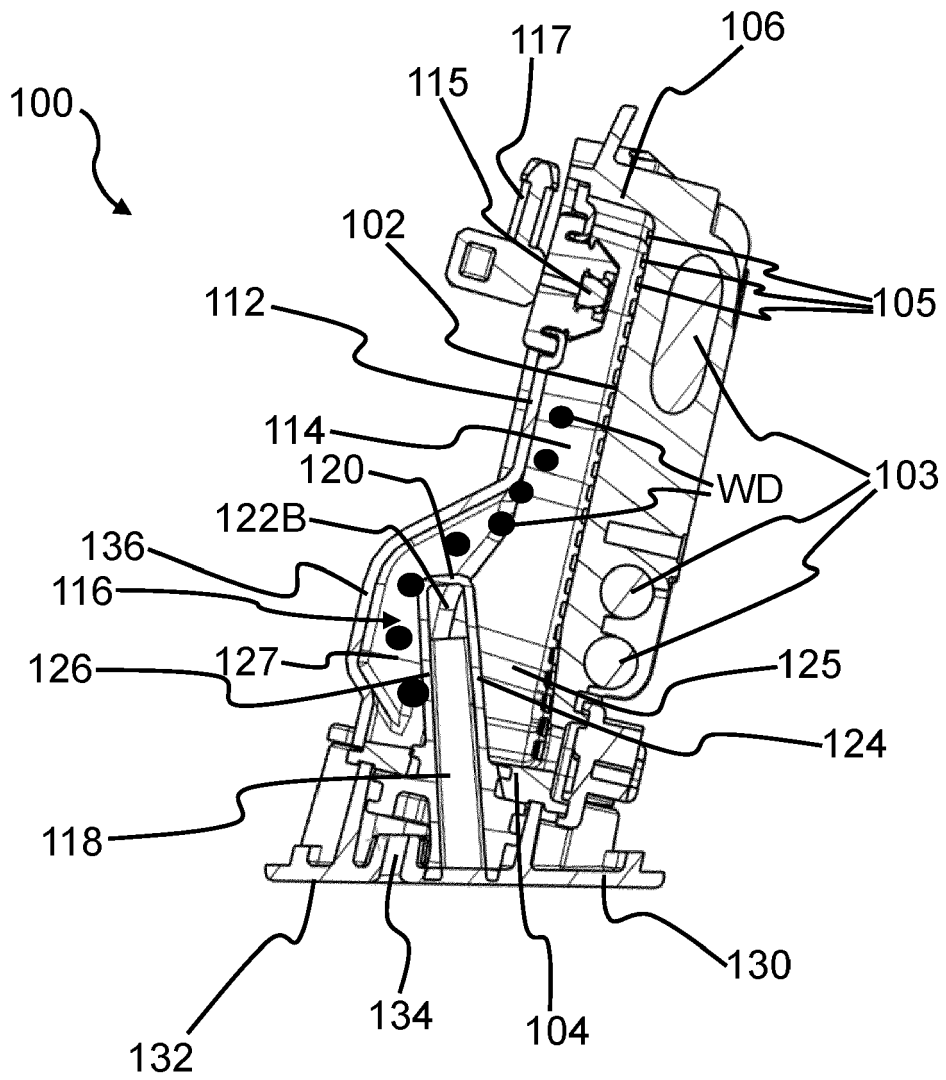


FIG.2D

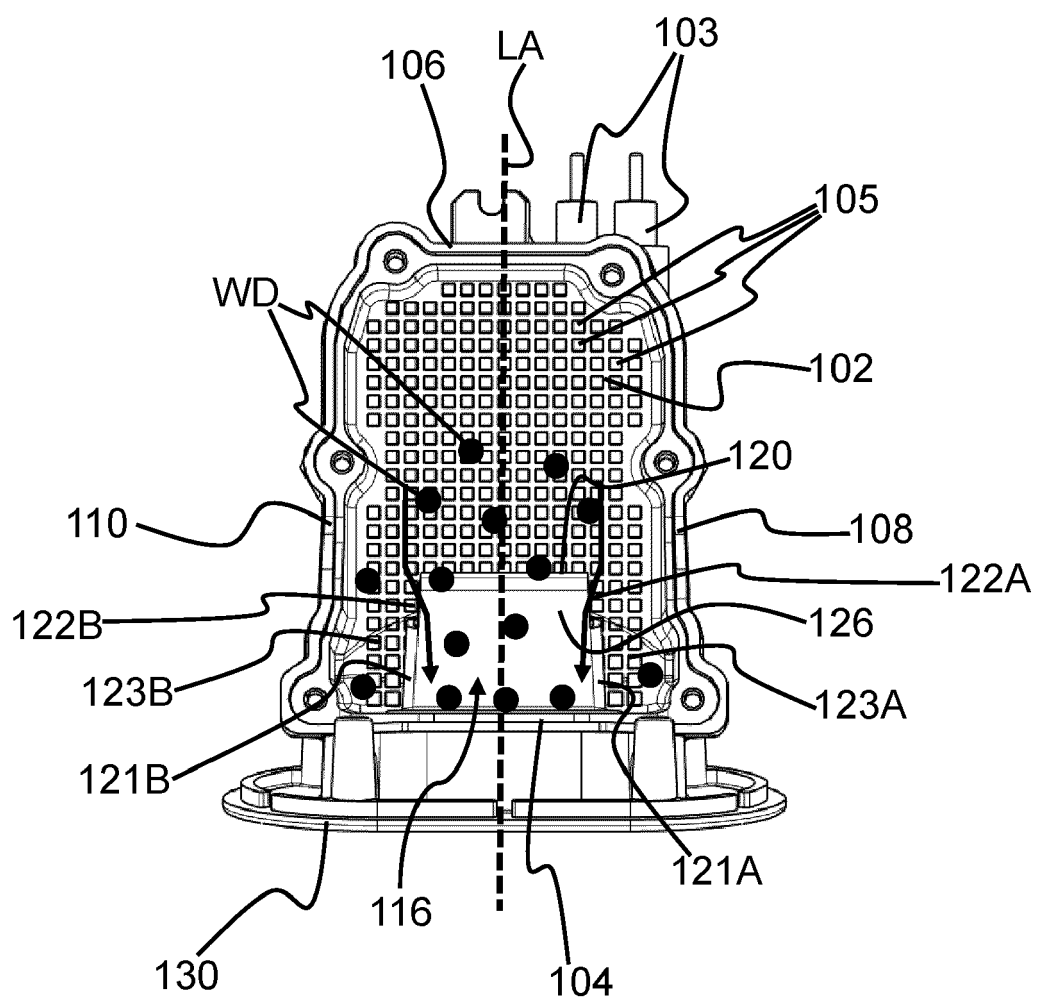


FIG. 2E

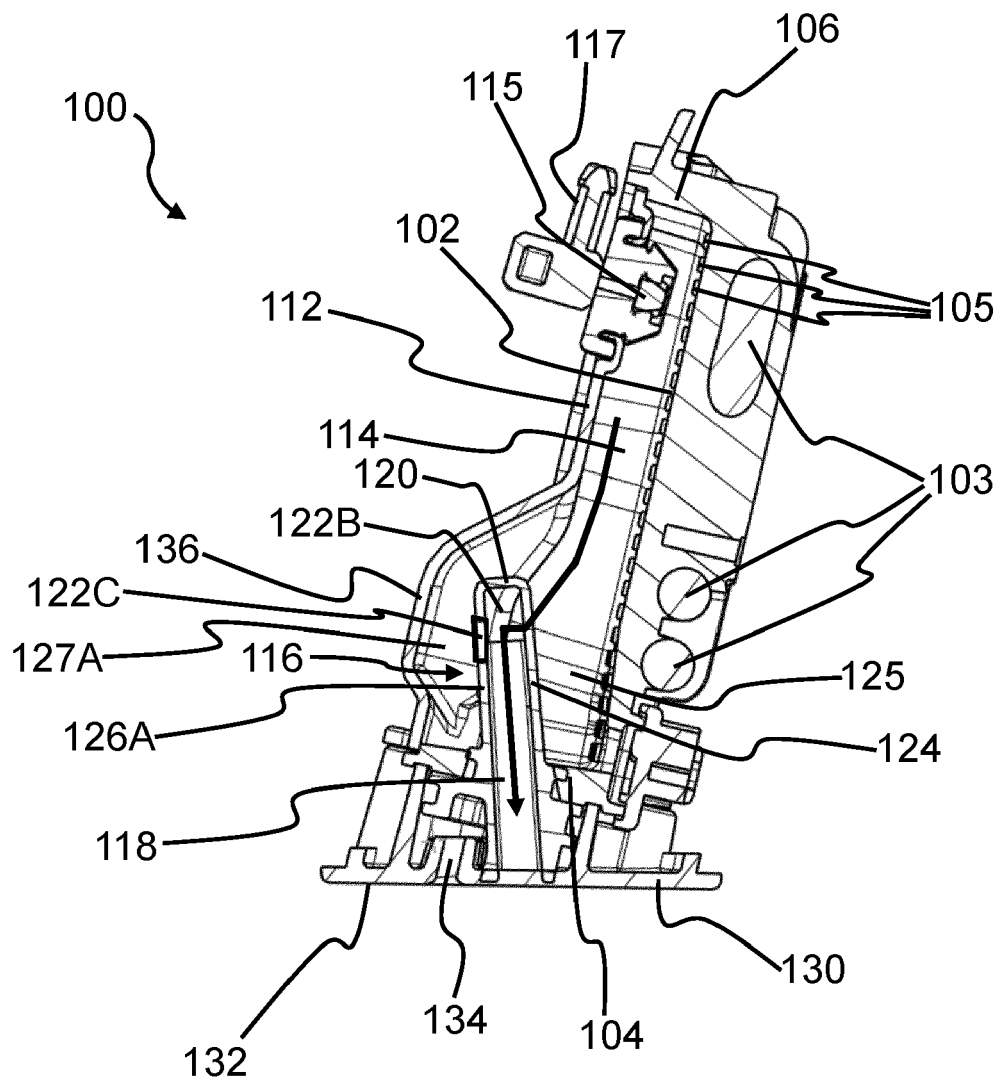


FIG.3A

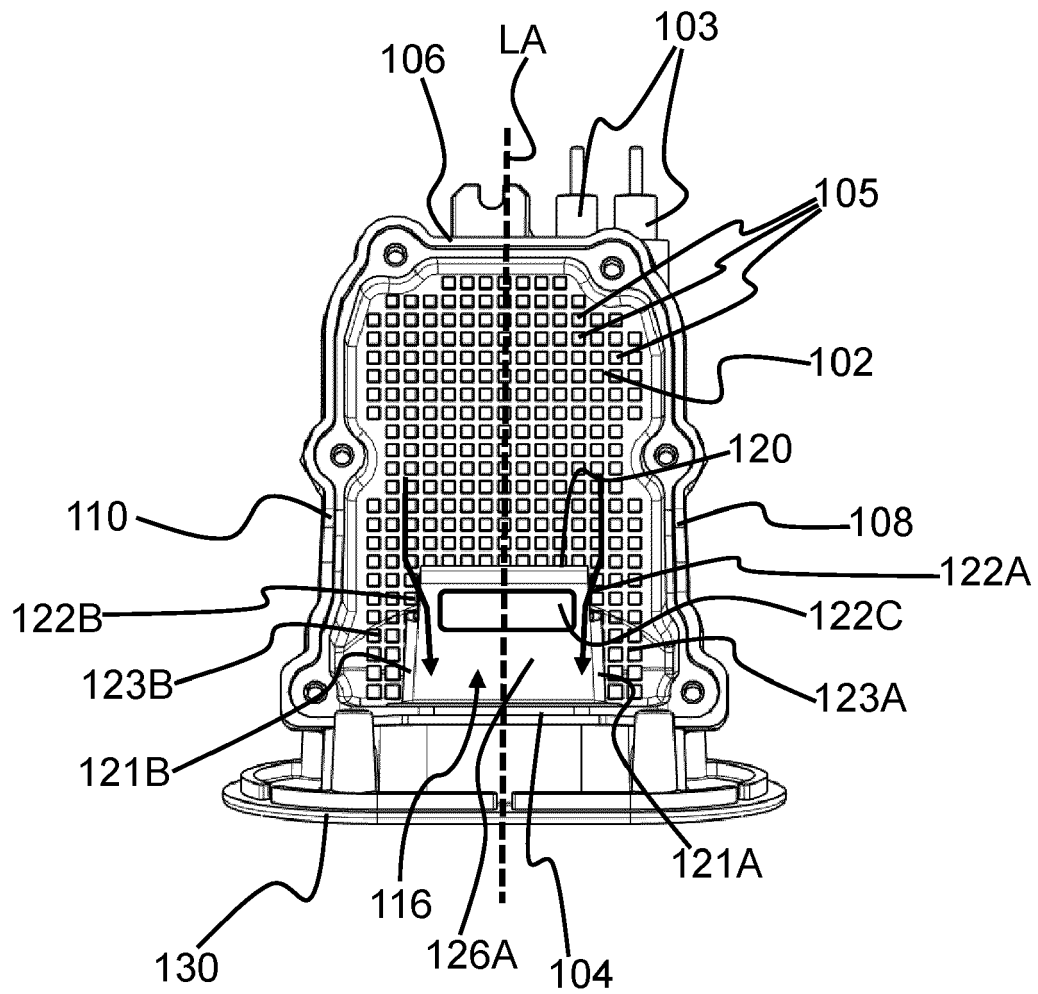


FIG.3B



EUROPEAN SEARCH REPORT

Application Number

EP 23 21 1244

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A	* paragraph [0044] - paragraph [0085]; claims; figures *	2-4, 7	D06F75/10 D06F75/20 D06F87/00
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Place of search Munich		Date of completion of the search 3 May 2024	Examiner Zerf, Georges
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