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(54) **LABYRINTH-TYPE STEAM CHAMBER FOR A STEAMING DEVICE**

(57) The invention relates to a steaming device comprising a hand unit to release steam to a garment. The hand unit comprises a steam chamber (102). The steam chamber comprises a fluid entry (104) arranged at a rear part (102A) of the steam chamber to receive water and/or steam, and a fluid exit (106) arranged at a front part (102B) of the steam chamber. First and second lateral sides (108A, 108B) of the steam chamber face each other and extend between the rear part and the front part. At least one first wall portion (110A, 110B, 110C) curvedly extends from the first lateral side (108A) towards the second lateral side (108B) and terminates at a first extremity (112A, 112B, 112C) spaced apart from the second lateral side. At least one second wall portion (114A, 114B) curvedly extends from the second lateral side towards the first lateral side and terminates at a second extremity (116A, 116B) spaced apart from the first lateral side. The first and second wall portions are successively and alternately arranged from the rear part to the front part and are spaced apart from each other such that, together with the spacing between each said first extremity and the second lateral side and said spacing between each said second extremity and the first lateral side, a winding fluid passage from the fluid entry to the fluid exit is defined. The first and second wall portions curvedly extend parallel to each other.

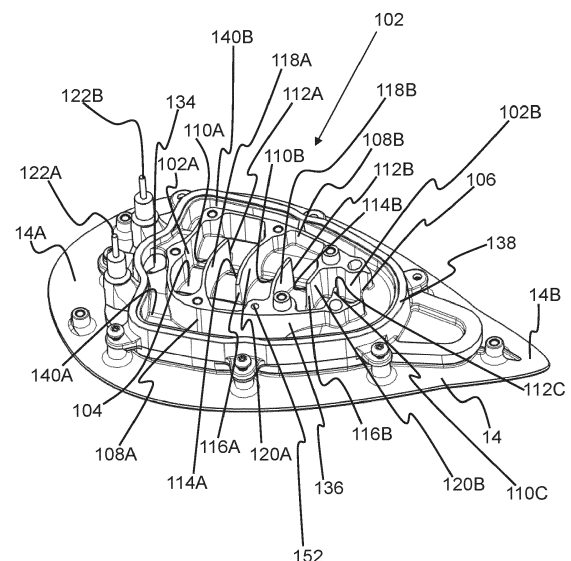


FIG.2

Description

FIELD OF THE INVENTION

[0001] The invention relates to a steaming device having a labyrinth-type steam chamber.

[0002] The invention may be used in the field of garment care.

BACKGROUND OF THE INVENTION

[0003] Steaming devices vaporise water to generate steam. The steam can be used for steaming garments, for example to assist in removing wrinkles from the garments. Various types of steaming device are known, such as so-called stand steamers. Stand steamers typically include a base unit, a hand unit having at least one steam vent, and a hose cord connecting the steam generator in the base unit to the hand unit.

[0004] Steaming devices have a steam chamber in which water supplied to the steam chamber is vaporised to generate steam and/or in which steam supplied to the steam chamber is re-heated. Various different types of steam chamber design are known. Some steam chambers have a labyrinth-type design in which fluid is required to follow a winding fluid path defined in the steam chamber.

[0005] Whilst such a winding fluid path can have various advantages, such as enhanced heat transfer to fluid following the winding fluid path, challenges have been encountered in terms of minimising spitting of water from the steaming device, e.g. towards a garment being treated using the steaming device. A further challenge relates to extension of the operating lifetime of steaming devices having such labyrinth-type steam chamber designs, since the steam chamber can relatively quickly become choked by scale deposited during the vaporisation of water.

[0006] It would also be desirable to improve operation of such steaming devices when the steam chamber is at various different orientations, for example to improve operation both when the steam chamber is vertically orientated for steaming hanging garments and horizontally orientated for ironing garments, for instance garments laid on a horizontally orientated ironing board.

[0007] In some known steaming devices, the problem of spitting can be exacerbated by the orientation of the steam chamber. For example, spitting may be worse when the steam chamber is horizontally orientated as compared to when the steam chamber is vertically orientated.

OBJECT AND SUMMARY OF THE INVENTION

[0008] It is an object of the invention to propose a steaming device that avoids or mitigates one or more of the above-mentioned problems.

[0009] The invention is defined by the independent

claims. The dependent claims define advantageous embodiments.

[0010] To this end, the steaming device according to the invention comprises a hand unit to release steam to a garment. The hand unit comprises a steam chamber. The steam chamber comprises:

- a fluid entry arranged at a rear part of the steam chamber to receive water and/or steam,
 - a fluid exit arranged at a front part of the steam chamber,
 - first and second lateral sides of the steam chamber facing each other and extending between the rear part and the front part,
 - at least one first wall portion, each of the at least one first wall portion curvedly extending from the first lateral side towards the second lateral side and terminating at a first extremity spaced apart from the second lateral side, and
 - at least one second wall portion, each of the at least one second wall portion curvedly extending from the second lateral side towards the first lateral side and terminating at a second extremity spaced apart from the first lateral side,
- wherein the first and second wall portions are successively and alternately arranged from the rear part to the front part and are spaced apart from each other such that, together with said spacing between each said first extremity and the second lateral side and said spacing between each said second extremity and the first lateral side, a winding fluid passage from the fluid entry to the fluid exit is defined, and wherein the first and second wall portions curvedly extend parallel to each other.

[0011] The winding fluid passage assists to extend the path of the water and/or steam through the steam chamber from the fluid entry to the fluid exit, and thus assists to minimise the risk of spitting of water onto, for example, a garment being treated using the steaming device.

[0012] The term "curvedly extend from" can be regarded as meaning that the curvature of the respective wall portion is provided from where the respective wall portion adjoins the respective lateral side.

[0013] The curvedly extending first and second wall portions can mean that fluid flow in the winding fluid passage introduces a centrifugal force. This centrifugal force can assist to force water droplets into contact with the steam chamber walls, and can thus help water molecules to gain energy that assists with the phase change from liquid to vapour.

[0014] The parallel first and second wall portions can assist to provide the winding fluid passage with a relatively uniform width, so as to minimise flow restrictions and/or choking by scale along the winding fluid passage. Alternatively or additionally, the parallel first and second wall portions can assist to maximise the length of the winding fluid passage. In these ways, the parallel first

and second wall portions can contribute to enhanced steaming efficiency and operating lifetime of the steaming device.

[0015] In some embodiments, adjacent, in other words nearest neighbour, first and second wall portions are spaced apart from each other by a distance in the range [5; 20] millimetres.

[0016] This distance in between the adjacent first and second wall portions may be sufficiently large to avoid scale accumulation, whilst also being sufficiently small to enable the steam chamber to be relatively compact.

[0017] In some embodiments, a total number of the first and second wall portions is greater than two.

[0018] Greater than two wall portions can assist to minimise the risk of spitting of water onto, for example, a garment being treated using the steaming device.

[0019] In some embodiments, the steam chamber has three first wall portions, and two second wall portions, with a first wall portion closest to the rear part of the steam chamber being spaced from a second wall portion, and with a subsequent first wall portion being disposed between the second wall portion and a subsequent second wall portion, and with the subsequent second wall portion being disposed between the subsequent first wall portion and a further first wall portion that is closest to the front part of the steam chamber.

[0020] In such embodiments, a total of five alternately arranged wall portions are included in the steaming device.

[0021] This can provide a favourable balance between minimising water spitting and physical simplicity of design.

[0022] In at least some embodiments, a longitudinal axis of the steam chamber extends from the rear part to the front part of the steam chamber.

[0023] It is noted that arrangement of the fluid entry at the rear part of the steam chamber can facilitate use of the steaming device for both horizontal steaming in which the longitudinal axis of the steam chamber is generally parallel with the horizontal, and vertical steaming in which the longitudinal axis is generally parallel with the vertical, with the fluid entry being either above or below the fluid exit in such a vertical orientation.

[0024] In some embodiments, a concave surface of each of the curvedly extending first and second wall portions faces towards the front part of the steam chamber.

[0025] Arranging the concave surfaces of each of the curvedly extending first and second wall portions in this manner can assist with introduction of the centrifugal force by the fluid flow in the winding fluid passage, so as to make vaporisation more effective and minimise the risk of spitting.

[0026] Moreover, arranging the concave surfaces in this manner can mean that the first and second wall portions can each act as a bucket or scoop in which water is collectible, rather than freely flowing towards, and pooling at, the rear part of the steam chamber during vertical steaming with the rear part being below the front part.

[0027] In some embodiments, the main tangential direction of each of the curvedly extending wall portions is perpendicular to the longitudinal axis that extends from the rear part to the front part of the steam chamber.

[0028] In some embodiments, at least some, e.g. each, of the first and second wall portions has a radius of curvature less than 32 millimetres. This has been found to increase the centrifugal force so that particularly effective spitting reduction can be achieved.

[0029] For example, at least some, e.g. each, of the first and second wall portions has a radius of curvature in the range of [30; 32] millimetres.

[0030] A heating element arranged to heat the steam chamber is preferably aligned with at least part of the winding fluid passage.

[0031] By aligning the heating element with at least part of the winding fluid passage, heat can be efficiently supplied from the heating element to the fluid passing through the winding fluid passage.

[0032] The term "aligned" in this context can be regarded as meaning that a vertical projection of the fluid passage coincides with the heating element.

[0033] The heating element is preferably a tubular heating element.

[0034] In some embodiments, the heating element, irrespective of whether or not the heating element aligns with part of the winding fluid passage, is a U-shaped heating element connected to first and second electrical connections that are each arranged proximal to the rear part of the steam chamber.

[0035] For example, the U-shaped heating element is bisected by the longitudinal axis that extends from the front part to the rear part of the steam chamber.

[0036] The heating element preferably extends from the first electrical connection to a turning point proximal to the front part, and from the turning point back to the second electrical connection, with the fluid exit aligning with the turning point.

[0037] Thus, heating from the heating element can be directly applied to fluid exiting the steam chamber via the fluid exit.

[0038] In some embodiments, the steam chamber comprises a bottom part in which the heating element is arranged.

[0039] The bottom part can be formed from any suitable material capable of transferring heat from the heating element to the steam chamber. Preferably, the bottom part is formed from a metal material, such as aluminium.

[0040] In some embodiments, a surface of the bottom part comprises a convex portion that faces upwards and follows a shape of the heating element received in the base.

[0041] For example, the convex portion follows a rounded shape of the tubular heating element.

[0042] The term "faces upwards" in this context can be regarded as meaning the convex portion bulges into the steam chamber.

[0043] For example, the convex portion is part of the

metal material, e.g. metal casting, around the heating element, which metal material follows the rounded shape of the tubular heating element.

[0044] In some embodiments, the fluid exit is aligned with a front section of the convex portion.

[0045] In some embodiments, the convex portion comprises a first lateral section extending along the first lateral side, and a second lateral section extending along the second lateral side, with the first and second lateral sections being arranged at the space(s) between the first extremity and the second lateral side, and at the space(s) between the second extremity and the first lateral side.

[0046] With such a design, fluid passing along the winding fluid passage can pass over the heating element where changes in direction take place. During such changes in direction, water droplets can be slowed down and easily trapped by the first and second lateral sections of the convex portion. Such trapped water droplets can be efficiently heated by each of the lateral portions of the heating element that align with the first and second lateral sections of the convex portion.

[0047] The first and second lateral sections are preferably elevated relative to a central area of the steam chamber that is arranged in between the first and second lateral sections.

[0048] Alternatively or additionally, the at least one first wall portion can extend towards the second lateral side such that the first extremity reaches the second lateral section, and/or the at least one second wall portion can extend towards the first lateral side such that the second extremity reaches the first lateral section.

[0049] In some embodiments, the fluid entry is aligned with a first area of one of the first and second lateral sections of the convex portion.

[0050] Thus, steam and/or water may be dosed onto a region of the surface of the base that is aligned with the heating element. This can assist energy transfer to the initially dosed steam and/or water.

[0051] In at least some embodiments, the fluid exit arranged at the front part of the steam chamber is defined in between the first and second lateral sides.

[0052] In such embodiments, an outer peripheral wall preferably extends around the first and second lateral sides, with a steam channel being defined between the outer peripheral wall and one or both of the lateral sides. The steam channel can thus extend from the fluid exit to a steam outlet arranged at a rear portion of the steam channel.

[0053] This can assist to provide a longer path to maximise water vaporisation prior to steam exiting the steam outlet.

[0054] In some embodiments, the outer peripheral wall upstands from a base surface of the steam channel, with the steam outlet being defined in an elevated surface portion of the base surface.

[0055] The elevated surface portion can assist to retain heavier particles in the steam channel, since such particles may have less propensity to ascend the elevated

surface portion and be transported out of the steaming device via the steam outlet.

[0056] Such particles could be water droplets, scale particles and/or steam promoter particles, such as alkali metal silicate and/or polysaccharide particles, that have flaked off surface(s) of the steam chamber.

[0057] Xylan is an example of a polysaccharide that can be used in a steam promoter coating.

[0058] In embodiments in which the steaming device includes the convex portion, the elevated surface portion preferably extends from a first channel section of the convex portion across to a second channel section of the convex portion that is opposite to the first channel section.

[0059] More generally, in embodiments in which the steam chamber includes the convex portion, the convex portion preferably protrudes in the steam channel proximal to the steam outlet.

[0060] This may enhance heat transfer to the fluid prior to the fluid being expelled via the steam outlet, and thereby assist to lessen the risk of spitting.

[0061] In some embodiments, the steam channel comprises a first steam channel extending from the front part towards the rear part along the first lateral side, and a second steam channel extending from the front part towards the rear part along the second lateral side.

[0062] Splitting the fluid path in this manner can assist to lower the steam velocity so that water droplets can easily descend by gravity, rather than being carried out of the steam exit. Moreover, the parallel flow provided by the first and second steam channels can assist to increase the heat transfer area.

[0063] In some embodiments, the turning point of the heating element aligns with a splitting location where the fluid passage bifurcates to the first steam channel and the second steam channel.

[0064] Since the turning point may be a higher power density zone of the heating element, aligning the turning point with the splitting location can assist energy transfer to water droplets entrained in the steam exiting the fluid exit.

[0065] In at least some embodiments, the hand unit comprises a cover for closing the steam chamber and mounting portions for mounting the cover to close the steam chamber.

[0066] In such embodiments, at least some of the mounting portions are arranged at positions along the first and second lateral sides, from which positions at least some of the first and second wall portions curvedly extend.

[0067] Such positioning of the mounting portions, e.g. screw bosses, may mean that they are located at corners of the first and second wall portions near dead ends along the fluid passage. Such dead ends can be regarded as regions where no scale deposition and no vaporisation take place. Such locations can therefore be advantageously utilised for the mounting portions.

[0068] In some embodiments, the fluid entry is at least partly defined by a location in the steam chamber that

initially receives fluid dosed into the steam chamber via a dosing head provided at the cover.

[0069] In at least some embodiments, the steaming device is a garment steaming device.

[0070] In some embodiments, the steaming device comprises:

- a base unit for supplying water and/or steam,
- a hand unit comprising the steam chamber and having a treatment plate delimiting at least one steam vent, and
- a hose cord for carrying said water and/or steam to said steam chamber, with the steam chamber being arranged to heat the water and/or steam carried to the steam chamber via the hose cord for generating steam via the at least one steam vent.

[0071] Detailed explanations and other aspects of the invention will be given below.

BRIEF DESCRIPTION OF THE DRAWINGS

[0072] 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:

Figs. 1A and 1B depict a steaming device according to the invention,

Fig.2 provides a perspective view of a steam chamber of a steaming device according to the invention, Fig.3A provides a plan view of the steam chamber shown in Fig.2,

Figs.3B to 3G provide cross-sectional views of the steam chamber shown in Figs.2 and 3A,

Fig.4 provides a perspective view of part of the steam chamber shown in Figs.2 and 3A to 3G, and

Fig.5 provides a plan view showing a cover covering a steam chamber of a steaming device according to the invention.

DETAILED DESCRIPTION OF THE INVENTION

[0073] Figs.1A and 1B depict a steaming device 100 according to the invention. In this non-limiting example, the steaming device 100 comprises a base unit 10 for supplying water and/or steam to a hand unit 12 via a hose cord 13.

[0074] The function of the hand unit 12 is to generate steam from the water and/or steam supplied by the base unit 10. The hand unit 12 has a treatment plate 14 that delimits at least one steam vent from where the steam is released. In this way, the steam generated by the hand unit 12 can be released to a garment for treatment.

[0075] The steaming device 100 shown in Figs.1A and 1B can be regarded as a stand steamer. In this non-limiting example, the steaming device 100 comprises an

ironing board 16 which is tiltable between a vertical orientation, as shown in Fig.1A and represented by the dotted lines 18 in Fig.1B, and a horizontal orientation, as shown in Fig.1B.

[0076] In some embodiments, the base unit 10 comprises a steam generator (not visible in the Figures) and the hand unit 12 comprises a steam chamber 102 (not visible in Figs.1A and 1B) arranged to re-heat the steam received from the steam generator, prior to the steam exiting the hand unit 12 via the at least one steam vent.

[0077] In such embodiments, the steam chamber can assist to minimise spitting of water onto the garment being treated using the steaming device 100, as will be explained in more detail herein below.

[0078] In alternative embodiments, the base unit 10 comprises a water tank (not visible in the Figures) and the hand unit 12 comprises a steam chamber 102 (not visible in Figs.1A and 1B) arranged to generate steam from the water received from the water tank (e.g. via a water pump).

[0079] In the non-limiting example shown in Figs. 1A and 1B, the steaming device 100 includes a holder 20 for supporting the hand unit 12 while the hand unit 12 is not being held by the user. Such a holder 20 can be mounted on the ironing board 16, as shown.

[0080] More generally, and referring to Fig.2, the steam chamber 102 comprises a fluid entry 104 arranged at a rear part 102A of the steam chamber 102 to receive water and/or steam, and a fluid exit 106 arranged at a front part 102B of the steam chamber 102.

[0081] In at least some embodiments, and as shown in Fig.3A, a longitudinal axis LA of the steam chamber 102 extends from the rear part 102A to the front part 102B of the steam chamber 102.

[0082] Arrangement of the fluid entry 104 at the rear part 102A of the steam chamber 102 can facilitate use of the steaming device 100 for both horizontal steaming in which the longitudinal axis LA of the steam chamber 102 extends generally parallel with the horizontal, and vertical steaming in which the longitudinal axis LA extends generally parallel with the vertical, with the fluid entry 104 being either above or below the fluid exit 106 in such a vertical orientation.

[0083] In some embodiments, such as that shown in Figs.2 and 3A, the treatment plate 14 comprises a wider rear end 14A and a narrower front end 14B. In such embodiments, the rear part 102A is closer to the wider rear end 14A than the narrower front end 14B, and the front part 102B is closer to the narrower front end 14B than the wider rear end 14A.

[0084] The water and/or steam received at the fluid entry 104 is, for example, supplied from the base unit 10 via the hose cord 13 to the steam chamber 102, when the steam chamber 102 is included in the hand unit 12 of a steaming device 100 of the type shown in Figs. 1A and 1B.

[0085] Water received at the fluid entry 104 can be vaporised to steam during passage of the water through

the steam chamber 102 from the fluid entry 104 to the fluid exit 106.

[0086] Alternatively or additionally, steam received at the fluid entry 104 can be re-heated during passage of the steam through the steam chamber 102 from the fluid entry 104 to the fluid exit 106.

[0087] First and second lateral sides 108A, 108B of the steam chamber 102 face each other and extend between the rear part 102A and the front part 102B, as shown in Figs.2 and 3A.

[0088] At least one first wall portion 110A, 110B, 110C curvedly extends from the first lateral side 108A towards the second lateral side 108B and terminates at a first extremity 112A, 112B, 112C spaced apart from the second lateral side 108B. Thus, a space, in other words a gap, is provided between each said first extremity 112A, 112B, 112C and the second lateral side 108B.

[0089] Similarly, at least one second wall portion 114A, 114B curvedly extends from the second lateral side 108B towards the first lateral side 108A and terminates at a second extremity 116A, 116B spaced apart from the first lateral side 108A. Hence, a space, in other words a gap, is also provided between each said second extremity 116A, 116B and the first lateral side 108A.

[0090] The term "curvedly extend from" can be regarded as meaning that the curvature of the respective wall portion 110A, 110B, 110C; 114A, 114B is provided from where the respective wall portion 110A, 110B, 110C; 114A, 114B adjoins the respective lateral side 108A, 108B.

[0091] With continued reference to Figs.2 and 3A, the first and second wall portions 110A, 110B, 110C; 114A, 114B are successively and alternately arranged from the rear part 102A to the front part 102B and are spaced apart from each other such that, together with the spacing between each said first extremity 112A, 112B, 112C and the second lateral side 108A and said spacing between each said second extremity 116A, 116B and the first lateral side 108B, a winding fluid passage FP from the fluid entry 104 to the fluid exit 106 is defined.

[0092] The winding fluid passage FP assists to extend the path of the water and/or steam through the steam chamber 102 from the fluid entry 104 to the fluid exit 106, and thus assists to minimise the risk of spitting of water onto, for example, a garment being treated using the steaming device 100.

[0093] The curvedly extending first and second wall portions 110A, 110B, 110C; 114A, 114B can mean that fluid flow in the winding fluid passage FP introduces a centrifugal force. This centrifugal force can assist to force water droplets into contact with the steam chamber walls, and can thus help water molecules to gain energy that assists with the phase change from liquid to vapour.

[0094] As shown in Figs.2 and 3A, the first and second wall portions 110A, 110B, 110C; 114A, 114B curvedly extend parallel to each other.

[0095] Such parallel first and second wall portions 110A, 110B, 110C; 114A, 114B can assist to provide the

winding fluid passage FP with a relatively uniform width, so as to minimise flow restrictions and/or choking by scale along the winding fluid passage FP. Alternatively or additionally, the parallel first and second wall portions 110A, 110B, 110C; 114A, 114B can assist to maximise the length of the winding fluid passage FP. In these ways, the parallel first and second wall portions 110A, 110B, 110C; 114A, 114B can contribute to enhanced steaming efficiency and operating lifetime of the steaming device 100.

[0096] In some embodiments, adjacent, in other words nearest neighbour, first and second wall portions 110A, 114A; 114A, 110B; 110B, 114B; 114B, 110C are spaced apart from each other by a distance in the range [5; 20] millimetres.

[0097] This distance in between the adjacent first and second wall portions 110A, 114A; 114A, 110B; 110B, 114B; 114B, 110C may be sufficiently large to avoid scale accumulation, whilst also being sufficiently small to enable the steam chamber 102 to be relatively compact.

[0098] In some embodiments, a total number of the first and second wall portions 110A, 110B, 110C; 114A, 114B is greater than two. Greater than two wall portions 110A, 110B, 110C; 114A, 114B can assist to minimise the risk of spitting of water onto, for example, a garment being treated using the steaming device 100.

[0099] In some embodiments, such as that shown in Figs.2 and 3A, the steam chamber 102 has three first wall portions 110A, 110B, 110C, and two second wall portions 114A, 114B, with a first wall portion 110A closest to the rear part 102A of the steam chamber 102 being spaced from a second wall portion 114A, and with a subsequent first wall portion 110B being disposed between the second wall portion 114A and a subsequent second wall portion 114B, and with the subsequent second wall portion 114B being disposed between the subsequent first wall portion 110B and a further first wall portion 110C that is closest to the front part 102B of the steam chamber 102.

[0100] Hence in such embodiments, five alternately arranged wall portions 110A, 114A, 110B, 114B, 110C are included in the steam chamber 102. This can provide a favourable balance between minimising water spitting and physical simplicity of design.

[0101] More generally, any (non-zero) number of the at least one first wall portion 110A, 110B, 110C and any (non-zero) number of the at least one second wall portion 114A, 114B can be contemplated.

[0102] For example, the steam chamber 102 has only one first wall portion and only one second wall portion in a simplest case. In another example, the steam chamber has two first wall portions and one second wall portion in between the two first wall portions. In still another example, the steam chamber has two first wall portions and two second wall portions. In yet another example (and as shown in Figs.2 and 3A), the steam chamber has three first wall portions 110A, 110B, 110C and two second wall portions 114A, 114B. In a further example, the steam

chamber has three first wall portions and three second wall portions.

[0103] In some embodiments, such as that shown in Figs.2 and 3A, a concave surface 118A, 118B; 120A, 120B of each of the curvedly extending first and second wall portions 110A, 110B, 110C; 114A, 114B faces towards the front part 102B of the steam chamber 102.

[0104] Arranging the concave surfaces 118A, 118B; 120A, 120B of each of the curvedly extending first and second wall portions 110A, 110B, 110C; 114A, 114B in this manner can assist with introduction of the centrifugal force by the fluid flow in the winding fluid passage FP, so as to make vaporisation more effective and minimise the risk of spitting.

[0105] Moreover, arranging the concave surfaces 118A, 118B; 120A, 120B in this manner can mean that the first and second wall portions 110A, 110B, 110C; 114A, 114B can each act as a bucket or scoop in which water is collectible, rather than freely flowing towards, and pooling at, the rear part 102A of the steam chamber 102 during vertical steaming with the rear part 102A being below the front part 102B.

[0106] In some embodiments, such as that shown in Figs.2 and 3A, the main tangential direction of each of the curvedly extending wall portions 110A, 110B, 110C; 114A, 114B is perpendicular to the longitudinal axis LA that extends from the rear part 102A to the front part 102B of the steam chamber 102.

[0107] In some embodiments, at least some, e.g. each, of the first and second wall portions 110A, 110B, 110C; 114A, 114B has a radius of curvature less than 32 millimetres. This has been found to increase the centrifugal force so that particularly effective spitting reduction can be achieved.

[0108] For example, at least some, e.g. each, of the first and second wall portions 110A, 110B, 110C; 114A, 114B has a radius of curvature in the range of [30; 32] millimetres.

[0109] Alternatively or additionally, the steam chamber 102 can have a length in the range of [100; 150] millimetres, such as about 120 millimetres.

[0110] With reference to Figs.2 and 3A together with the cross-sectional views provided in Figs.3B to 3G, a heating element 121 that is arranged to heat the steam chamber 102 is preferably aligned with at least part of the winding fluid passage FP.

[0111] By aligning the heating element 121 with at least part of the winding fluid passage FP, heat can be efficiently supplied from the heating element 121 to the fluid passing through the winding fluid passage FP.

[0112] The term "aligned" in this context can be regarded as meaning that a vertical projection of the fluid passage FP coincides with the heating element 121.

[0113] The heating element 121 can have any suitable design. In at least some embodiments, such as that shown in Figs.2 and 3A to 3G, the heating element 121 is a tubular heating element 121.

[0114] In some embodiments, the heating element

121, irrespective of whether or not the heating element 121 aligns with part of the winding fluid passage FP, is a U-shaped heating element 121 connected to first and second electrical connections 122A, 122B that are each arranged proximal to the rear part 102A of the steam chamber 102.

[0115] For example, the U-shaped heating element 121 is bisected by the longitudinal axis LA that extends from the rear part 102A to the front part 102B of the steam chamber 102.

[0116] In some embodiments, and with reference to Figs.2, 3A and 3F, the heating element 121 extends from the first electrical connection 122A to a turning point 124 proximal to the front part 102B of the steam chamber 102, and from the turning point 124 back to the second electrical connection 122B.

[0117] In such embodiments, the fluid exit 106 preferably aligns with the turning point 124. Thus, heating from the heating element 121 can be directly applied to fluid exiting the steam chamber 102 via the fluid exit 106.

[0118] In some embodiments, such as that shown in Figs.2 and 3A to 3G, the steam chamber 102 comprises a bottom part 126 in which the heating element 121 is arranged.

[0119] The bottom part 126 can be formed from any suitable material capable of transferring heat from the heating element 121 to the steam chamber 102. Preferably, the bottom part 126 is formed from a metal material, such as aluminium.

[0120] In at least some embodiments, the bottom part 126 is formed, at least in part, via a casting, for example die-casting, process. In a specific non-limiting example, the bottom part 126 is formed from die-cast aluminium.

[0121] The bottom part 126 preferably has a surface 130 comprising a convex portion 132 that faces upwards and follows a shape of the heating element 121 received in the bottom part 126.

[0122] For example, the convex portion 132 follows a rounded shape of the tubular heating element 121.

[0123] The term "faces upwards" in this context can be regarded as meaning the convex portion 132 bulges into the steam chamber 102.

[0124] For example, the convex portion 132 is part of the metal material, e.g. metal casting, around the heating element 121, which metal material follows the rounded shape of the tubular heating element 121.

[0125] In some embodiments, and referring to Fig.3A, the fluid exit 106 is aligned with a front section 132A of the convex portion 132.

[0126] Fig.3B shows cross-section AA, Fig.3C shows cross-section BB, Fig.3D shows cross-section CC, and Fig.3G shows cross-section DD of Fig.3A.

[0127] In some embodiments, and referring to Figs.3B to 3E, the convex portion 132 comprises a first lateral section 132B extending along the first lateral side 108A, and a second lateral section 132C extending along the second lateral side 108B, with the first and second lateral sections 132B, 132C being arranged at the space(s) be-

tween the first extremity 112A, 112B, 112C and the second lateral side 108B, and at the space(s) between the second extremity 116A, 116B and the first lateral side 108A.

[0128] With such a design, fluid passing along the winding fluid passage FP can pass over the heating element 121 where changes in direction take place. During such changes in direction, water droplets can be slowed down and easily trapped by the first and second lateral sections 132B, 132C of the convex portion 132. Such trapped water droplets can be efficiently heated by each of the lateral portions of the heating element 121 that align with the first and second lateral sections 132B, 132C of the convex portion 132.

[0129] The first and second lateral sections 132B, 132C are preferably elevated relative to a central area of the steam chamber 102 that is arranged in between the first and second lateral sections 132B, 132C.

[0130] Alternatively or additionally, the at least one first wall portion 110A, 110B, 110C can extend towards the second lateral side 108B such that the first extremity 112A, 112B, 112C reaches the second lateral section 132C, and/or the at least one second wall portion 114A, 114B can extend towards the first lateral side 108A such that the second extremity 116A, 116B reaches the first lateral section 132B.

[0131] In some embodiments, the fluid entry 104 is aligned with a first area of one of the first and second lateral sections 132B, 132C of the convex portion 132.

[0132] Thus, steam and/or water, e.g. supplied from the base unit 10, may be dosed onto a region of the surface 130 of the bottom part 126 that is aligned with the heating element 121. This can assist energy transfer to the initially dosed steam and/or water.

[0133] In at least some embodiments, and referring again to Figs.2 and 3A, the fluid exit 106 arranged at the front part 102B of the steam chamber 102 is defined in between the first and second lateral sides 108A, 108B.

[0134] The first and second lateral sides 108A, 108B can be regarded as being included in an inner peripheral wall 136 that extends around the steam chamber 102.

[0135] In some embodiments, an outer peripheral wall 138 extends around the first and second lateral sides 108A, 108B, with a steam channel 140A, 140B being defined between the outer peripheral wall 138 and one or both of the lateral sides 108A, 108B. The steam channel 140A, 140B can thus extend from the fluid exit 106 at the front part 102B of the steam chamber 102 to a steam outlet 134 arranged at a rear portion of the steam channel 140A, 140B.

[0136] This can assist to provide a longer path to maximise water vaporisation prior to steam exiting the steam outlet 134.

[0137] In embodiments in which the steam chamber 102 is included in a hand unit 12 of a steaming device 100, such as in the hand unit 12 of the steaming device 100 shown in Figs. 1A and 1B, the steam outlet 134 can supply steam to at least one steam vent delimited by a

treatment plate 14 of the hand unit 12.

[0138] In some embodiments, and referring to Figs.3G and 4, the outer peripheral wall 138 upstands from a base surface 142 of the steam channel 140A, 140B, with the steam outlet 134 being defined in an elevated surface portion 144 of the base surface 142.

[0139] The elevated surface portion 144 can assist to retain heavier particles in the steam channel 140A, 140B, since such particles may have less propensity to ascend the elevated surface portion 144 and be transported out of the steaming device 100 via the steam outlet 134.

[0140] Such particles could be water droplets, scale particles and/or steam promoter particles, such as alkali metal silicate and/or polysaccharide particles, that have flaked off surface(s) of the steam chamber 102.

[0141] Xylan is an example of a polysaccharide that can be used in a steam promoter coating.

[0142] In embodiments in which the steam chamber includes the convex portion 132, the elevated surface portion 144 preferably extends from a first channel section 132E of the convex portion 132 across to a second channel section 132F of the convex portion 132 that is opposite to the first channel section 132E.

[0143] More generally, in embodiments in which the steam chamber includes the convex portion 132, the convex portion 132 preferably protrudes in the steam channel 140A, 140B proximal to the steam outlet 132. This can enhance heat transfer to the fluid prior to the fluid being expelled via the steam outlet 134, and thereby assist to lessen the risk of spitting.

[0144] In some embodiments, such as that shown in Figs.2, 3A to 3G and 4, the steam channel 140A, 140B comprises a first steam channel 140A extending from the front part 102B towards the rear part 102A along the first lateral side 108A, and a second steam channel 140B extending from the front part 102B towards the rear part 102A along the second lateral side 108B.

[0145] Splitting the fluid path in this manner can assist to lower the steam velocity so that water droplets can easily descend by gravity, rather than being carried out of the steam exit 134. Moreover, the parallel flow provided by the first and second steam channels 140A, 140B can assist to increase the heat transfer area.

[0146] In some embodiments, the turning point 124 of the heating element 121 aligns with a splitting location where the fluid passage FP bifurcates to the first steam channel 140A and the second steam channel 140B.

[0147] Since the turning point 124 may be a higher power density zone of the heating element 121, aligning the turning point 124 with the splitting location can assist energy transfer to water droplets entrained in the steam exiting the fluid exit 106.

[0148] In at least some embodiments, the hand unit 12 comprises a cover 146 for closing the steam chamber 102, and mounting portions 148A, 148B; 150A, 150B for mounting the cover 146 to close the steam chamber 102. Such a cover 146 is shown closing the steam chamber 102 in Fig.5.

[0149] The cover 146 can be formed from any suitable material capable of withstanding the conditions inside the steam chamber 102. Preferably, the cover 146 is formed from a metal material, such as aluminium.

[0150] In at least some embodiments, the cover 146 is formed, at least in part, via a casting, for example die-casting, process. In a specific non-limiting example, the cover 146 is formed from die-cast aluminium.

[0151] A seal, for example a rubber gasket and/or sealing paste, can be provided between the cover 146 and the mounting portions 148A, 148B; 150A, 150B so as to sealingly close the steam chamber 102.

[0152] In some embodiments, at least some of the mounting portions 148A, 148B; 150A, 150B are arranged at positions along the first and second lateral sides 108A, 108B, from which positions at least some of the first and second wall portions 110A, 110B; 114A, 114B curvedly extend.

[0153] Such positioning of the mounting portions 148A, 148B; 150A, 150B, e.g. screw bosses, may mean that they are located at corners of the first and second wall portions 110A, 110B; 114A, 114B near dead ends along the fluid passage FP. Such dead ends can be regarded as regions where no scale deposition and no vaporisation take place. Such locations can therefore be advantageously utilised for the mounting portions 148A, 148B; 150A, 150B.

[0154] In some embodiments, the fluid entry 104 is at least partly defined by a location in the steam chamber 102 that initially receives fluid dosed into the steam chamber 102. In some embodiments, and referring to Fig.5, this fluid is dosed via a dosing head 151 provided at the cover 146.

[0155] In some embodiments, and as best shown in Figs.2 and 3A, a temperature sensing recess 152 is defined in one the mounting portions 148A, 148B; 150A, 150B, and in particular in the mounting portion 148B that is centrally positioned along the longitudinal axis LA.

[0156] Referring to Figs.3E and 5, a temperature sensor 154 protrudes into the temperature sensing recess 152. The temperature sensed by the temperature sensor 154 can be used to control the heating element 121.

[0157] 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 details 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 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 steaming device (100) comprising a hand unit (12) to release steam to a garment, the hand unit comprising a steam chamber (102), the steam chamber comprising:
 - a fluid entry (104) arranged at a rear part (102A) of the steam chamber to receive water and/or steam,
 - a fluid exit (106) arranged at a front part (102B) of the steam chamber,
 - first and second lateral sides (108A, 108B) of the steam chamber facing each other and extending between the rear part and the front part,
 - at least one first wall portion (110A, 110B, 110C), each of the at least one first wall portion curvedly extending from the first lateral side (108A) towards the second lateral side (108B) and terminating at a first extremity (112A, 112B, 112C) spaced apart from the second lateral side, and
 - at least one second wall portion (114A, 114B), each of the at least one second wall portion curvedly extending from the second lateral side towards the first lateral side and terminating at a second extremity (116A, 116B) spaced apart from the first lateral side,
 wherein the first and second wall portions are successively and alternately arranged from the rear part to the front part and are spaced apart from each other such that, together with said spacing between each said first extremity and the second lateral side and said spacing between each said second extremity and the first lateral side, a winding fluid passage (FP) from the fluid entry to the fluid exit is defined, and wherein the first and second wall portions curvedly extend parallel to each other.
2. The steaming device (100) according to claim 1, wherein a concave surface (118A, 118B; 120A, 120B) of each of the curvedly extending first and second wall portions (110A, 110B, 110C; 114A, 114B) faces towards the front part (102B) of the steam chamber (102).
3. The steaming device (100) according to claim 1 or claim 2, comprising a heating element (121) arranged to heat the steam chamber (102), the heating element being aligned with at least part of said winding fluid passage (FP).
4. The steaming device (100) according to claim 3, wherein the heating element (121) is a U-shaped heating element connected to first and second electrical connections (122A, 122B) being arranged proximal to the rear part (102A) of the steam cham-

ber (102), the heating element extending from said first electrical connection (122A) to a turning point (124) proximal to the front part, and from the turning point back to the second electrical connection (122B), wherein said fluid exit (106) aligns with said turning point.

5. The steaming device (100) according to claim 3 or claim 4, comprising a bottom part (126) in which the heating element (121) is arranged, the base having a surface (130) comprising a convex portion (132) facing upwards and following a shape of the heating element received in the base.
6. The steaming device (100) according to claim 5, wherein said fluid exit (106) is aligned with a front section (132A) of said convex portion (132).
7. The steaming device (100) according to claim 5 or claim 6, wherein the convex portion (132) comprises a first lateral section (132B) extending along the first lateral side (108A), and a second lateral section (132C) extending along the second lateral side (108B), the first and second lateral sections being arranged at the space(s) between the first extremity (112A, 112B, 112C) and the second lateral side, and at the space(s) between the second extremity (116A, 116B) and the first lateral side.
8. The steaming device (100) according to claim 7, wherein the fluid entry (104) is aligned with a first area of one of the first and second lateral sections (132B, 132C) of the convex portion (132).
9. The steaming device (100) according to any one of claims 1 to 8, wherein:
 - the fluid exit (106) is defined in between said first and second lateral sides (108A, 108B), and
 - an outer peripheral wall (138) extends around the first and second lateral sides, a steam channel (140A, 140B) being defined between the outer peripheral wall and one or both of the lateral sides, the steam channel extending from the fluid exit to a steam outlet (134) arranged at a rear portion of the steam channel.
10. The steaming device (100) according to claim 9, wherein the outer peripheral wall (138) upstands from a base surface (142) of the steam channel (140A, 140B), the steam outlet (134) being defined in an elevated surface portion (144) of said base surface.
11. The steaming device (100) according to claim 9 or claim 10, wherein a first steam channel (140A) extends from the front part (102B) towards the rear part (102A) along the first lateral side (108A), and a sec-

ond steam channel (140B) extends from the front part towards the rear part along the second lateral side (108B).

12. The steaming device (100) according to any one of claims 9 to 11 when dependent from any one of claims 5 to 8, wherein the convex portion (132) protrudes in the steam channel (140A, 140B) proximal to the steam outlet (134).
13. The steaming device (100) according to any one of claims 1 to 12, comprising a cover (146) for closing the steam chamber (102) and mounting portions (148A, 148B; 150A, 150B) for mounting the cover to close the steam chamber, wherein at least some of the mounting portions are arranged at positions along the first and second lateral sides (108A, 108B), from which positions at least some of the first and second wall portions (110A, 110B; 114A, 114B) curv-
edly extend.
14. The steaming device (100) according to any one of claims 1 to 13, wherein at least some of the first and second wall portions (110A, 110B, 110C; 114A, 114B) has a radius of curvature in the range of [30; 32] millimetres.
15. The steaming device (100) according to any one of claims 1 to 14, comprising:
 - a base unit (10) for supplying water and/or steam,
 - a hand unit (12) comprising said steam chamber (102) and having a treatment plate (14) delimiting at least one steam vent, and
 - a hose cord (13) for carrying said water and/or steam to said steam chamber,the steam chamber being arranged to heat the water and/or steam carried to the steam chamber via the hose cord for generating steam via the at least one steam vent.

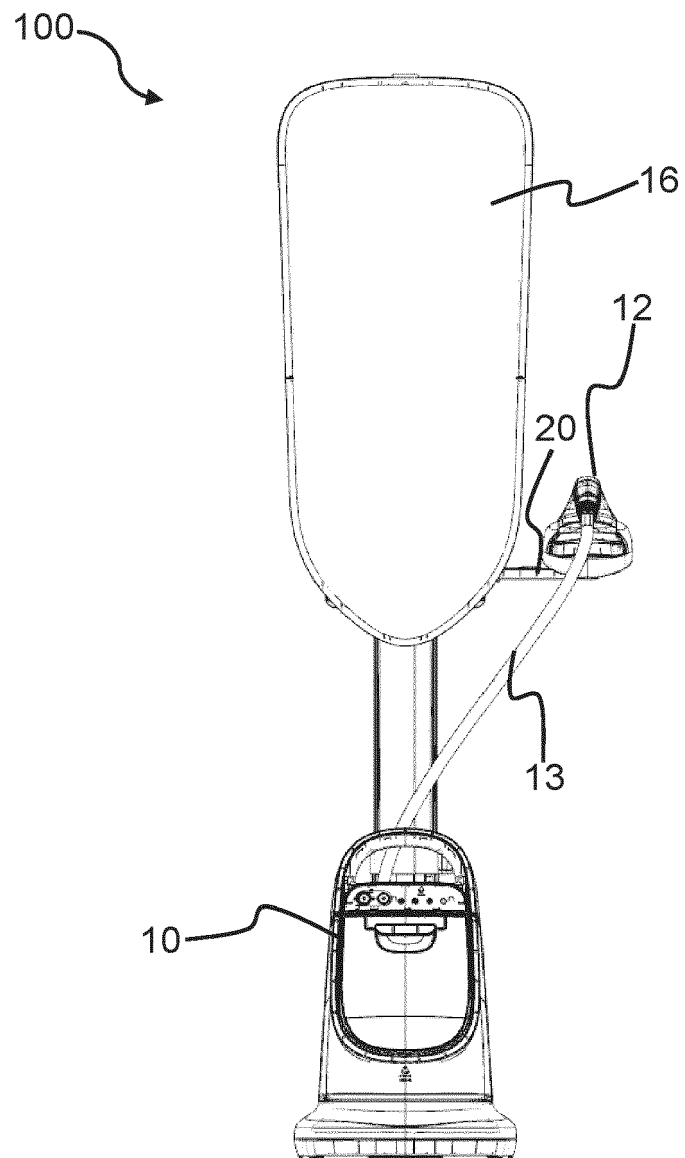


FIG.1A

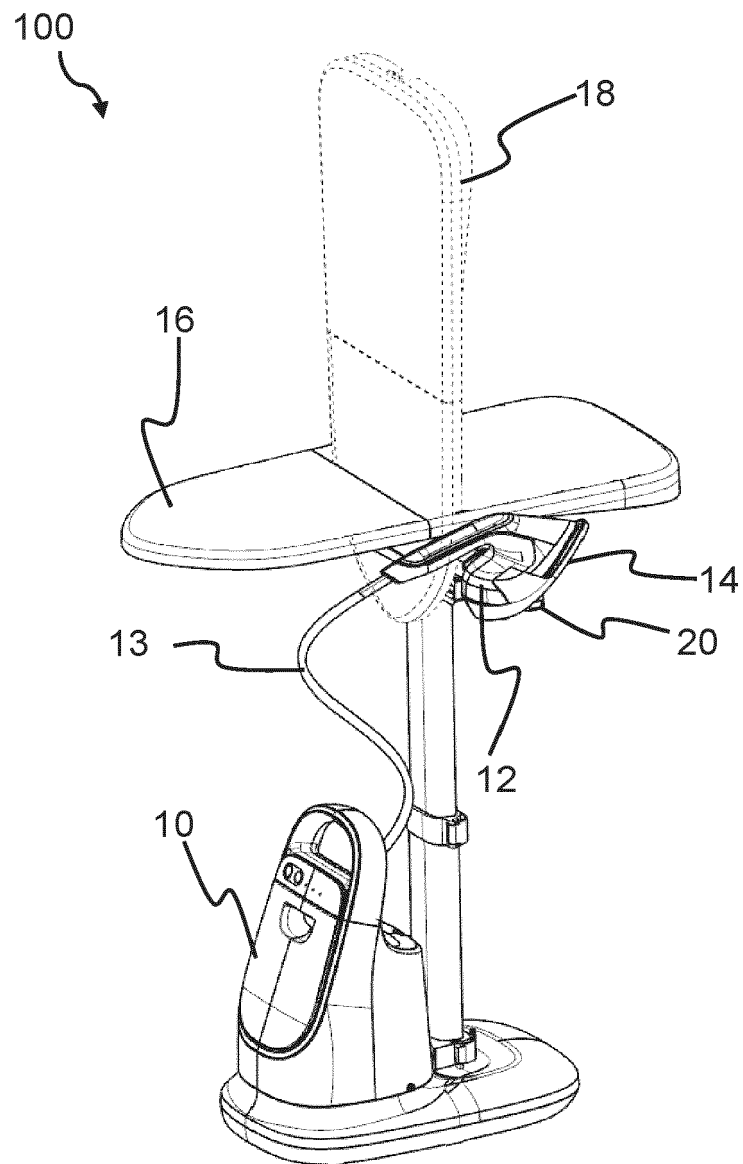


FIG.1B

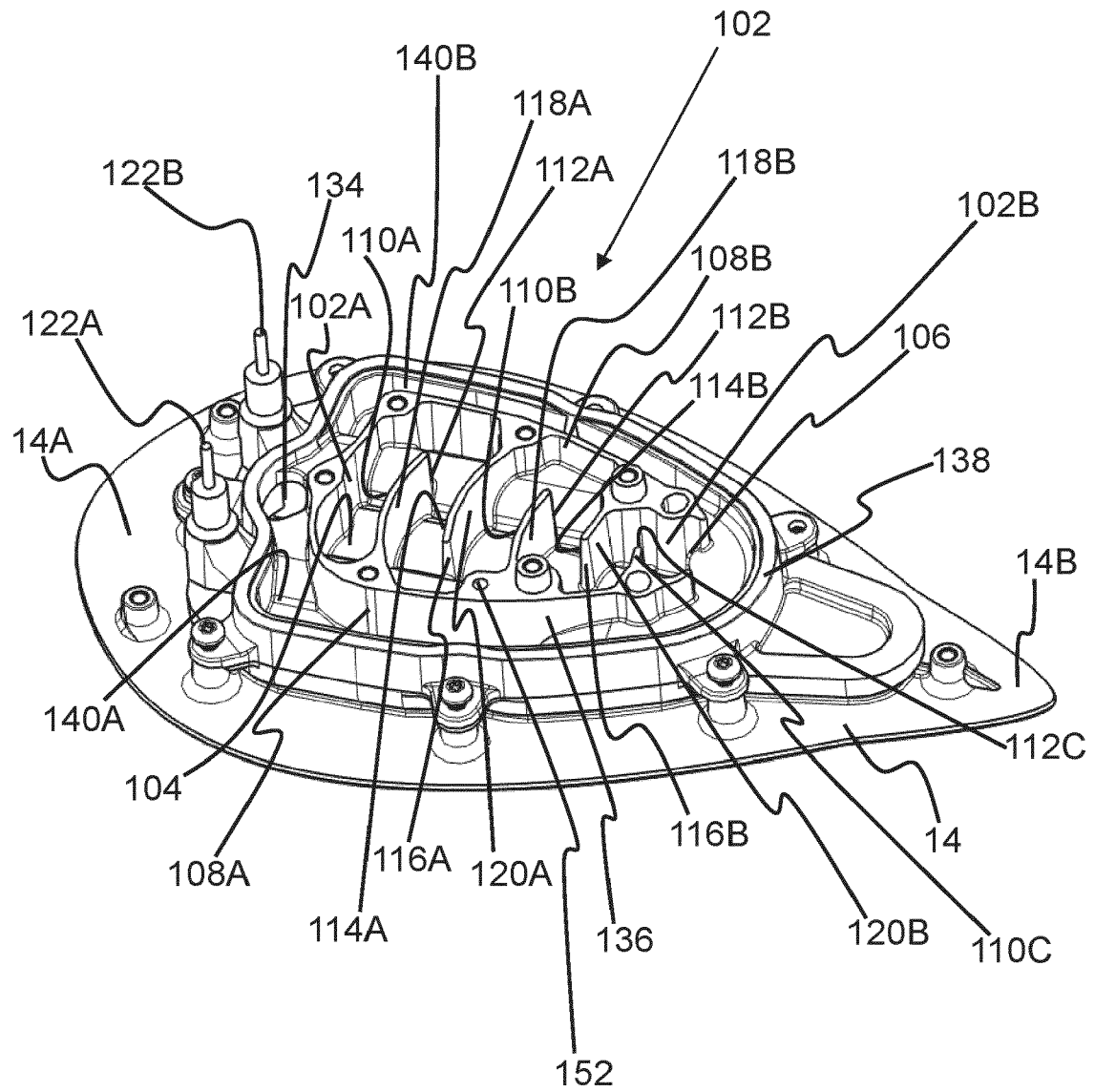


FIG.2

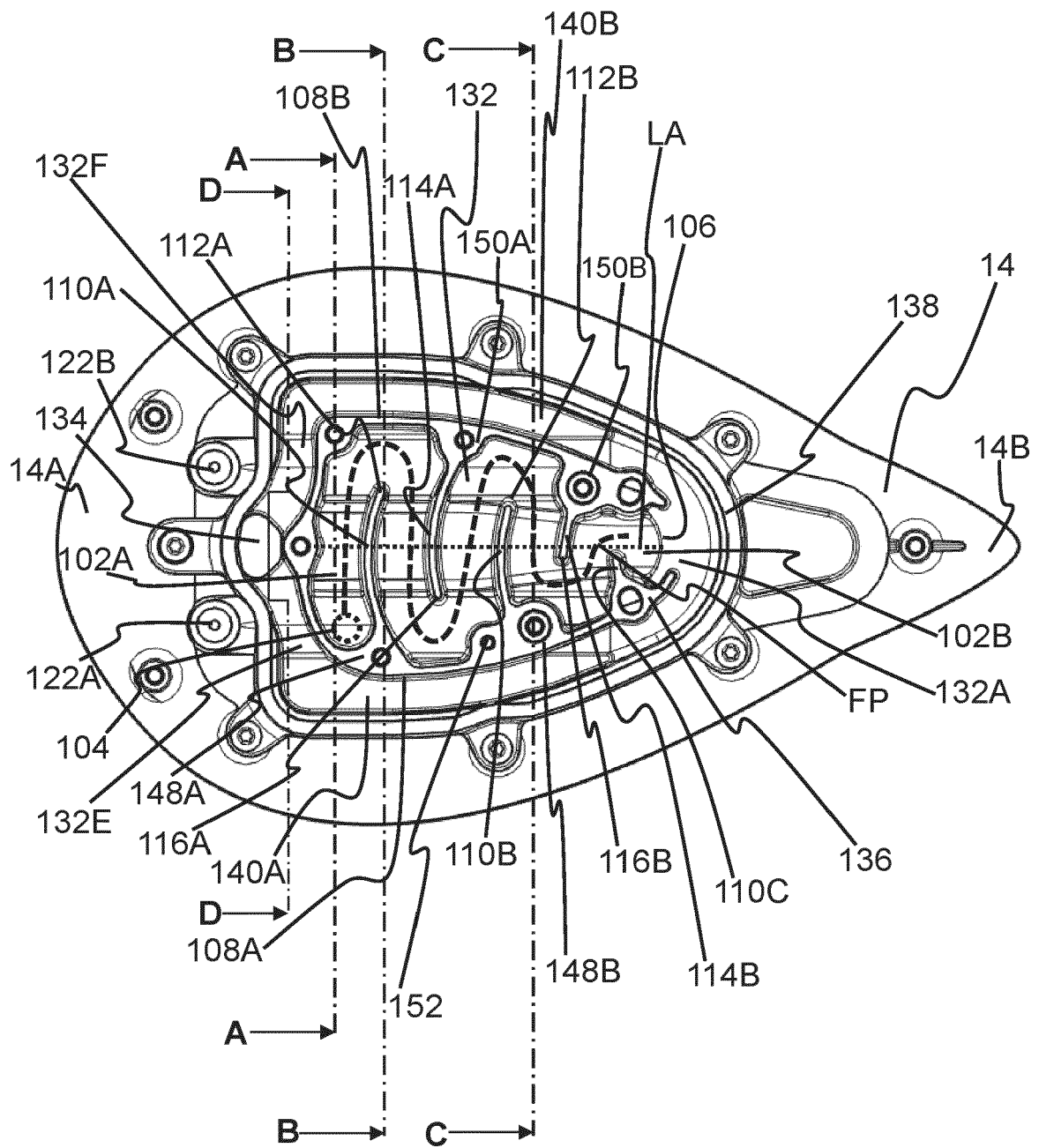


FIG.3A

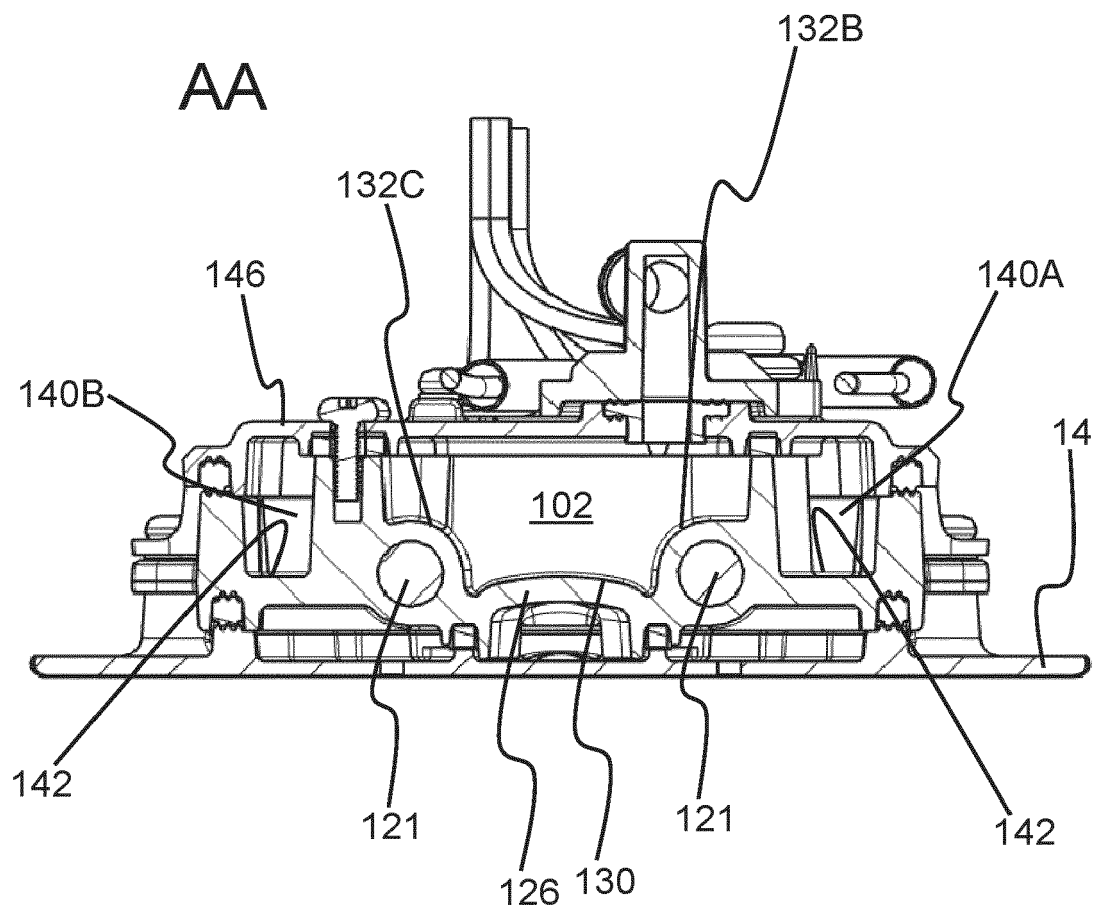


FIG.3B

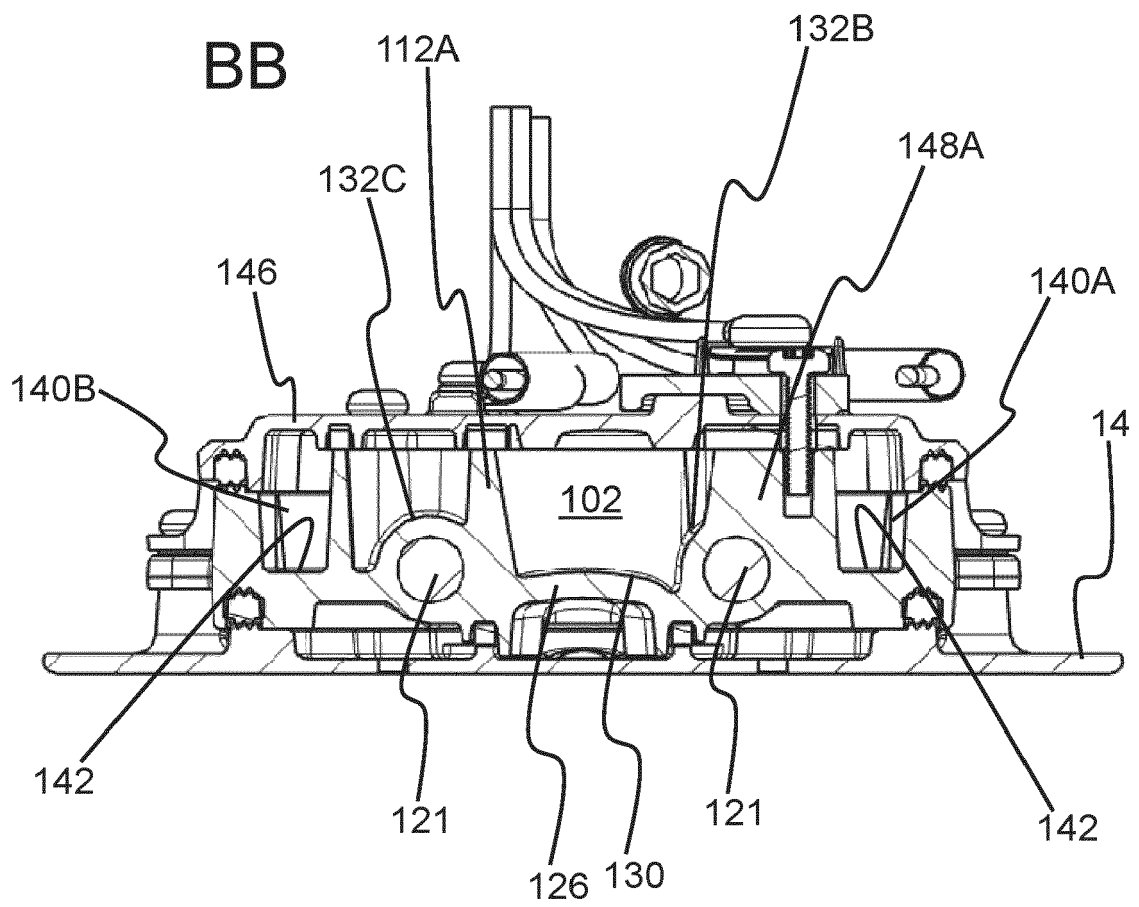


FIG.3C

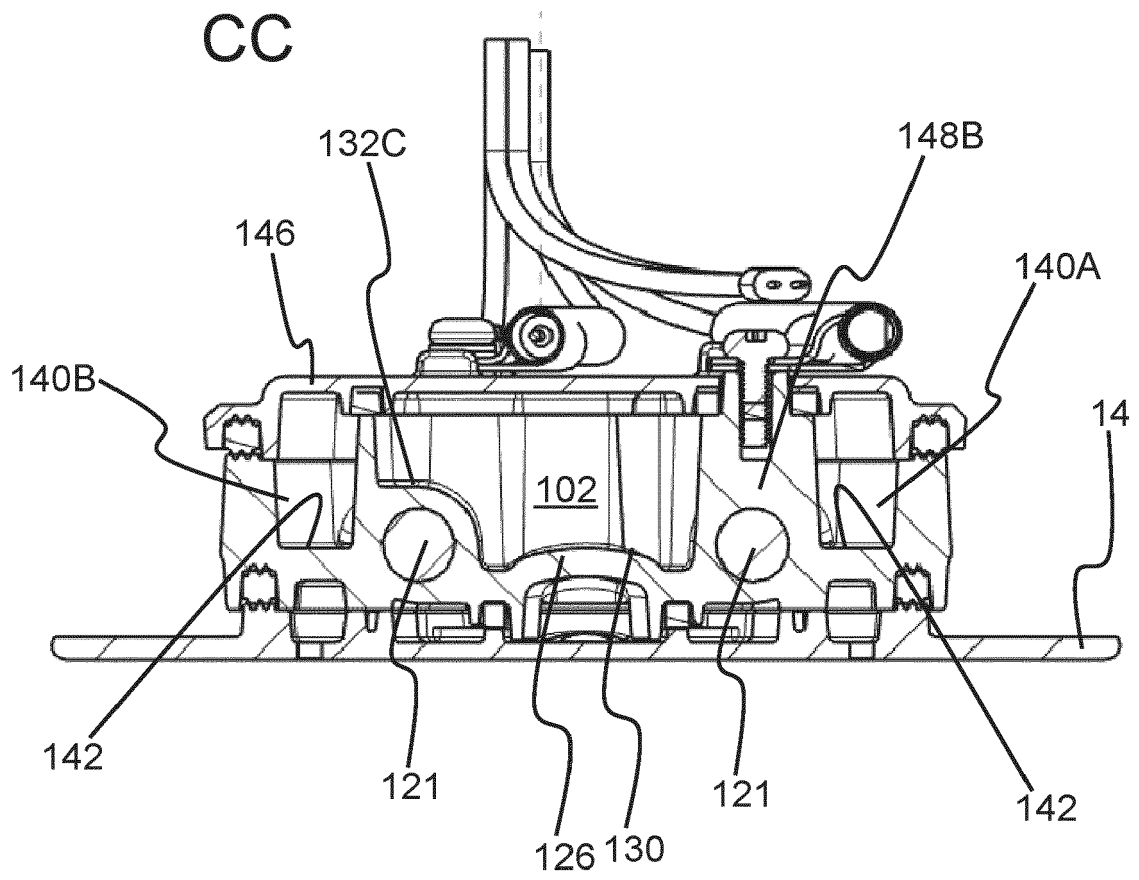


FIG.3D

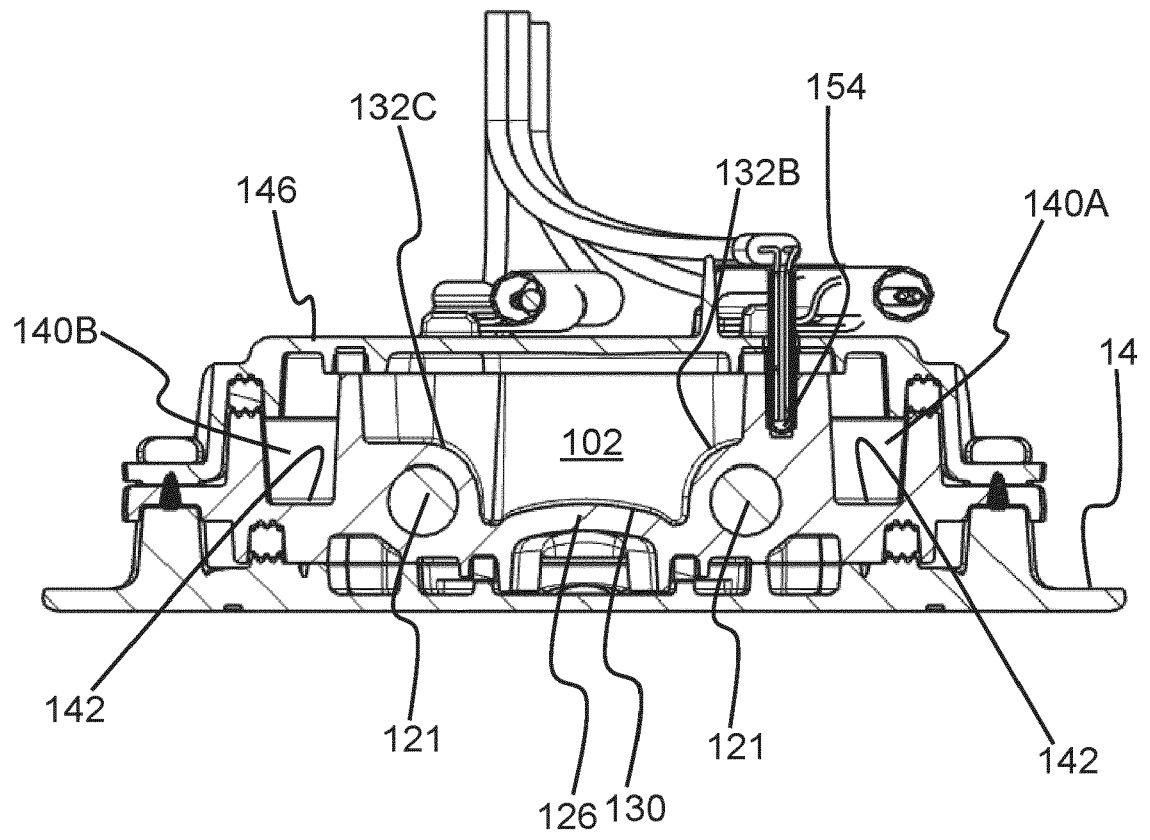


FIG.3E

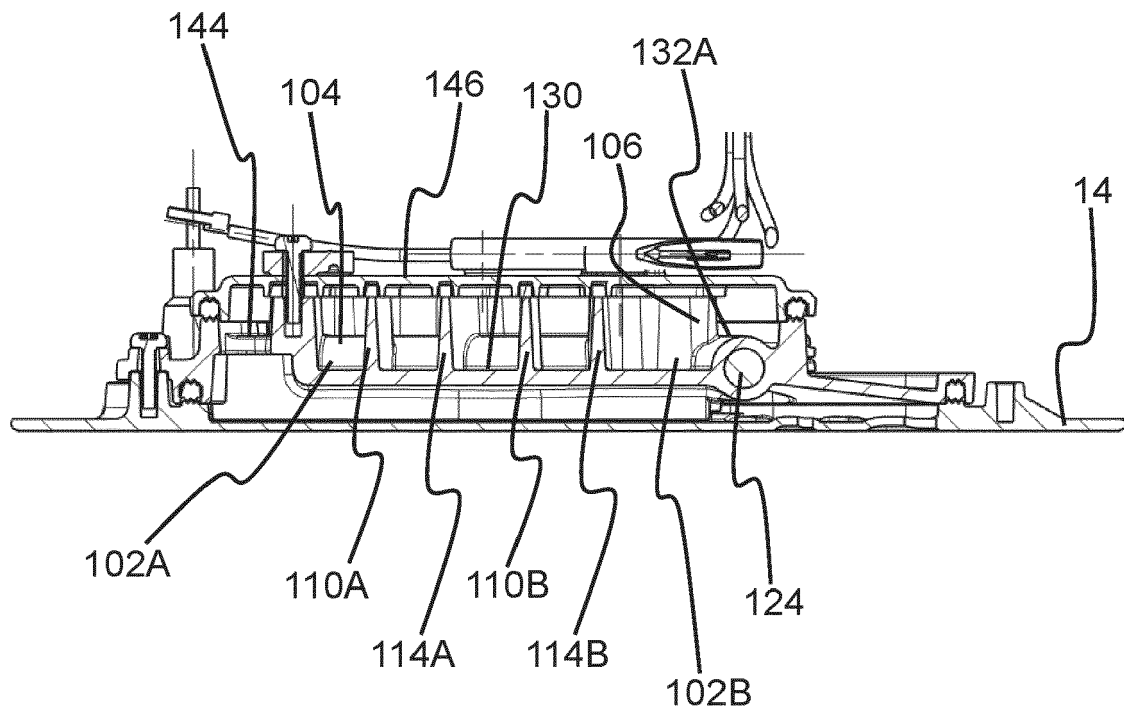


FIG.3F

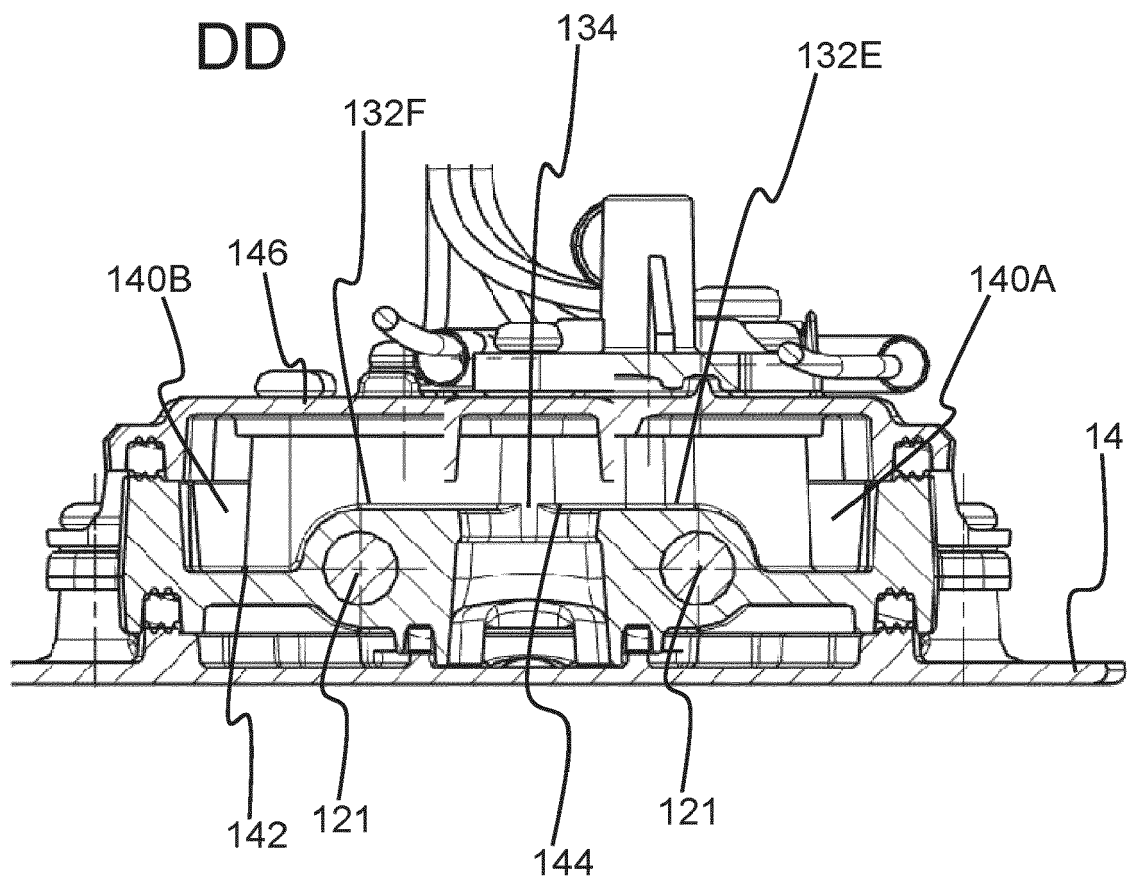


FIG.3G

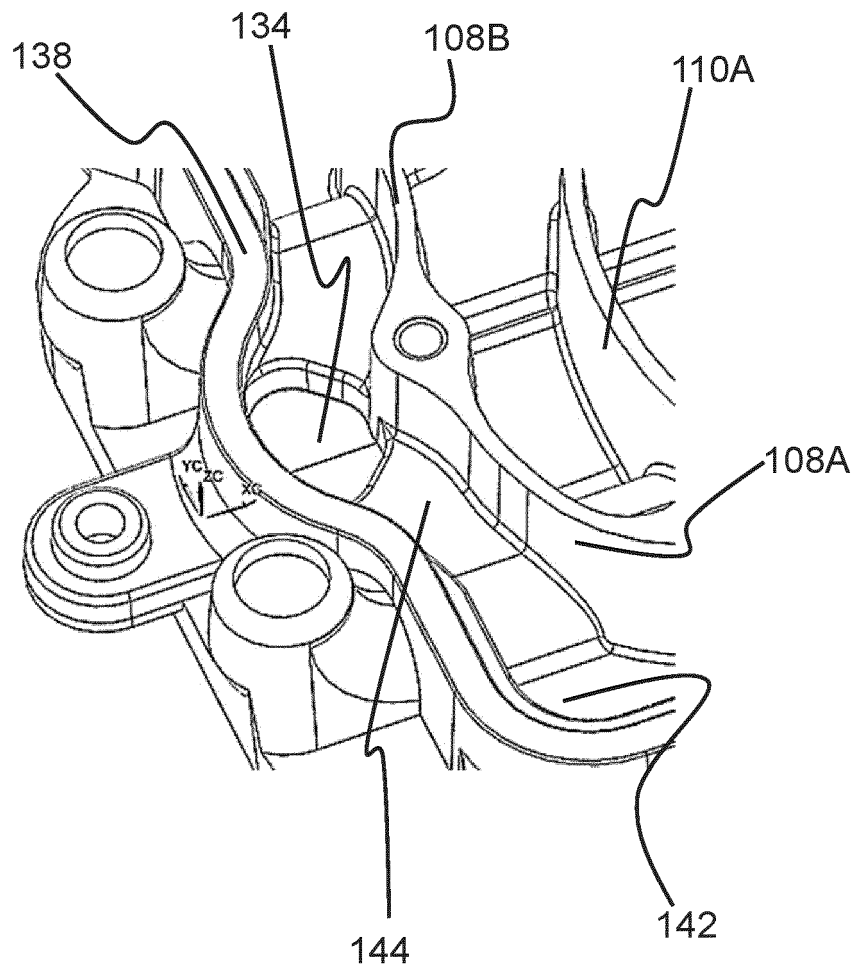


FIG.4

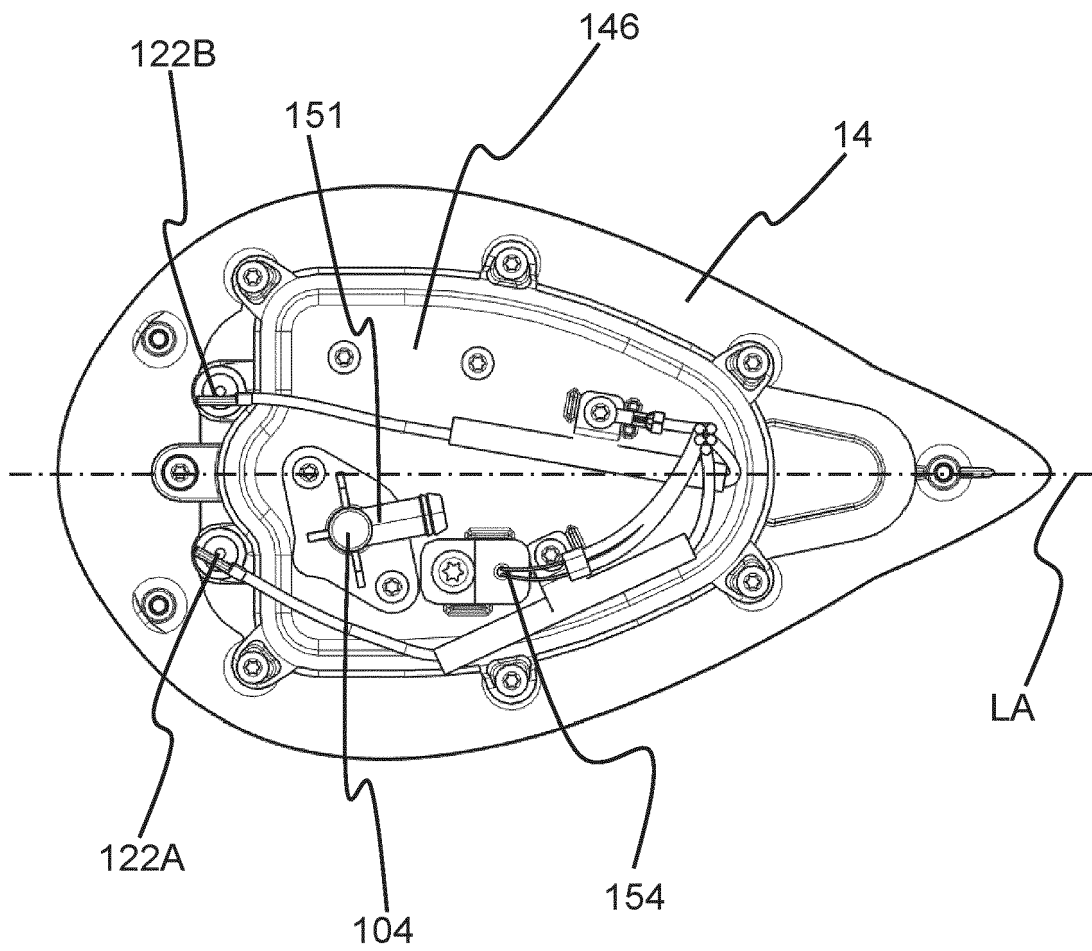


FIG.5



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Y	* paragraphs [0051], [0055], [0056];	2, 4, 9, 11, 15	ADD. D06F75/10
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 30 March 2023	Examiner Popara, Velimir
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