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(54) **STEAMING DEVICE WITH MODIFIED STEAM CHAMBER**

(57) The invention relates to a steaming device (100) comprising a steam chamber (102) for generating steam. A steaming surface (104) is arranged in the steam chamber for vaporizing water. The steaming surface extends along a longitudinal axis (LA) from a rear part (104B) of the steaming surface to a front part (104A) of the steaming surface. The steaming surface forms a surface area being delimited by an outer peripheric wall (106). The steaming device further comprises at least one wall (A1, A2; B1) protruding from the steaming surface and being arranged inside said surface area. The at least one wall extends from the rear part towards the front part and in a direction substantially parallel to said longitudinal axis.

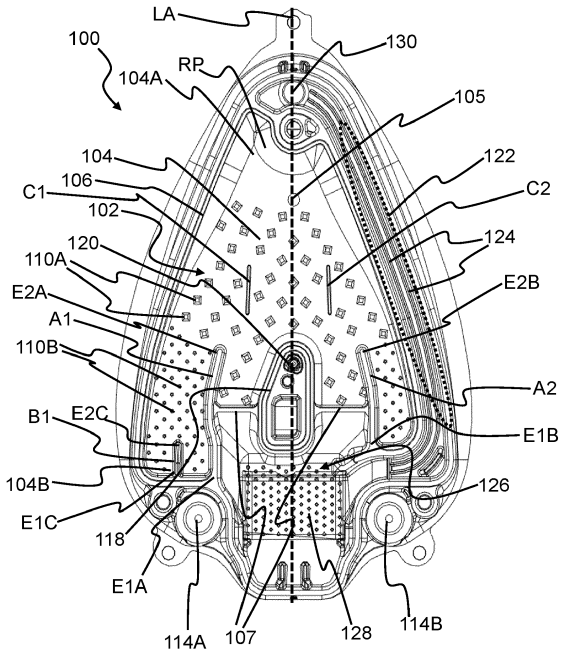

FIG.5

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Description

FIELD OF THE INVENTION

[0001] The invention relates to a steaming device.

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

BACKGROUND OF THE INVENTION

[0003] Stand steaming devices (with or without inclinable ironing board) are known. Such steaming devices include a base unit and a steamer head connected to the base unit via a flexible hose cord. The steamer head includes a treatment plate, also known as a soleplate or ironing plate, delimiting one or more steam vents through which steam can exit the steamer head.

[0004] One type of such stand steaming device has a single steam generator included in, e.g. located at, either the base unit or the steamer head. An alternative type of such stand steaming device includes twin steam generators, with one steam generator being included in, e.g. located at, the base unit, and another steam generator being included in, e.g. located at, the steamer head.

[0005] High performance stand steaming devices tend to utilise the twin steam generator architecture to achieve a higher steam rate, e.g. above 40 g/minute, with minimal or no spitting of non-vaporized water onto the garment being treated. In such a twin steam generator architecture, the primary steam generator tends to be included in the base unit and its main function is to vaporize water to generate steam. The primary steam generator is typically designed as a pressurised boiler or a flash boiling engine.

[0006] A secondary steam generator is included in the steamer head and is connected to the primary steam generator included in the base unit via a steam hose included in the above-mentioned hose cord. The main functions of the secondary steam generator are: (i) to reheat the steam received via the steam hose, thereby to minimise water condensation, and (ii) to maintain an optimal treatment plate temperature to enhance the device's de-wrinkling performance.

[0007] Cheaper stand steaming devices tend to utilise the single steam generator architecture in which the steam generator is included in the steamer head. The single steam generator thus fulfils both functions of generating steam and heating the treatment plate for steaming and ironing of garments. Typically such single steam generators have a so-called labyrinth steam engine layout designed to accommodate dynamic movement and orientation adjustment of the steamer head during ironing and steaming.

[0008] Generally, the steam rate of stand steaming devices having the single steam generator architecture is relatively low, typically 20 to 25 g/minute, in particular lower than in the case of the stand steaming devices having the twin steam generator architecture. This may be due to the single steam generator being required to fulfil the additional function of heating the treatment plate. However, size constraints and the dynamic movement and orientation adjustment of the steamer head during ironing and steaming can constitute the main reason for the relatively low steam rate.

[0009] Another problem associated with stand steaming devices having the single steam generator architecture is the limitation on operating lifetime due to scale build-up, particularly when such steaming devices are used in regions with higher water hardness. This may be due to a relatively small scale deposition volume within the steam generator, in particular when the steam generator is included in the steamer head. Some stand steaming devices on the market utilise a water cartridge for softening the water, although this can result in higher running costs for such devices.

OBJECT AND SUMMARY OF THE INVENTION

[0010] It is an object of the invention to propose a steaming device which 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 steaming device according to the invention comprises

- a steam chamber for generating steam,
- a steaming surface arranged in the steam chamber for vaporizing water, the steaming surface extending along a longitudinal axis from a rear part of the steaming surface to a front part of the steaming surface, the steaming surface forming a surface area being delimited by an outer peripheric wall, and
- at least one wall protruding from the steaming surface and being arranged inside said surface area, the at least one wall extending from said rear part towards said front part and in a direction substantially parallel to said longitudinal axis.

[0013] The at least one wall can thus be regarded as being arranged to divide the steaming surface into portions, with each of the portions extending alongside the at least one wall between the front part and the rear part.

[0014] The longitudinal axis can be regarded as a central axis extending from the front part to the rear part bisecting the steaming surface into a pair of elongate areas.

[0015] The term "in a direction substantially parallel to said longitudinal axis" may mean that a notional line drawn between an extremity of each of the at least one wall closest to the rear part and an extremity of the respective wall closest to the front part extends at an angle with respect to the longitudinal axis of at most 10 degrees.

[0016] As an alternative to the characterisation of the at least one wall in terms of it extending substantially

parallel to the longitudinal axis, the extension of the at least one wall can be regarded as partitioning the steaming surface into one or more pockets extending from the rear part to the front part of the steaming surface.

[0017] For example, each of the pocket(s) is arranged in one of the elongate areas defined by the longitudinal axis bisecting the steaming surface.

[0018] In order to collect non-vaporized water therein, each of the pocket(s) extends towards the front part from the rear part of the steaming surface, for example extends in a generally straight manner towards the front part from the rear part of the steaming surface.

[0019] Partitioning the steaming surface via the at least one wall has been found to assist heat transfer to the water on the steaming surface and can assist, in some embodiments, to manage movement of water on the steaming surface during dynamic movement and orientation adjustment of the steaming device, thereby facilitating maintaining of a relatively high steam rate in spite of such movement and orientation.

[0020] In some embodiments, each of the at least one wall comprises a first extremity being in contact with the outer peripheric wall, and a second extremity reaching a location located inside said surface area. Thus, the above-described pocket(s) is or are delimited by the at least one wall and the outer peripheric wall.

[0021] The at least one pocket can assist to hold non-vaporized water therein, in particular when the steam chamber is oriented vertically. Thus, when the steam chamber is oriented vertically, spread of non-vaporized water by gravity throughout the entire steam chamber can be lessened. Holding, in other words retaining, the non-vaporized water in the pocket(s) in this manner can provide sufficient time and space for at least some of this water to be vaporized. This may assist to minimize non-vaporized water exiting the steam chamber, and thereby help with alleviating spitting of water onto a garment being treated using the steaming device.

[0022] Moreover, the at least one wall can provide a greater heat transfer surface for transferring heat to the non-vaporized water held in the at least one pocket. This can assist in vaporizing the non-vaporized water held in the pocket(s), and thereby help to reduce water accumulation.

[0023] The at least one wall preferably protrudes from the steaming surface to a height of the outer peripheric wall.

[0024] The at least one wall preferably comprises a pair of walls arranged on each side of the longitudinal axis. In other words, one wall of the pair of walls is arranged on one side of the longitudinal axis, and the other wall of the pair of walls is arranged on the other side of the longitudinal axis.

[0025] In such embodiments, one pocket is defined between one wall of the pair of walls and the outer peripheric wall, in particular between said one wall of the pair of walls and a lateral portion of the outer peripheric wall, and another pocket is defined between the other wall of the pair of walls and the outer peripheric wall, in particular between said other wall of the pair of walls and a further lateral portion of the outer peripheric wall.

[0026] Each wall of the pair of walls preferably protrudes from the steaming surface to a height of the outer peripheric wall.

[0027] In some embodiments, each wall of the pair of walls adjoins the outer peripheric wall and extends from the outer peripheric wall towards the front part of the steaming surface.

[0028] In such embodiments, the second extremity of each of the pair of walls preferably bends towards the longitudinal axis. This can facilitate diversion of non-vaporized water flowing centrally on the steaming surface into the pockets arranged at lateral sides of the steam chamber.

[0029] In some embodiments, the pair of walls are arranged substantially symmetrically compared to the longitudinal axis. In other words, a spacing of one of the pair of walls from the longitudinal axis corresponds to, e.g. is the same as or within 10% of, a spacing of the other of the pair of walls from the longitudinal axis.

[0030] Thus, a pair of pockets, in other words two rear pockets, are created on the lateral left side and lateral right side of the steam chamber.

[0031] Vertical orientation of the steam chamber can cause non-vaporized water on the steaming surface to collect in the pockets, with tilting in one direction causing at least some of the water held by the one of the pockets, as well as newly dosed water, to be transferred into the other pocket. In this way, downstream passage of non-vaporized water during such tilting can be alleviated.

[0032] In some embodiments, the at least one wall further comprises an additional wall extending from the rear part towards the front part of the steaming surface, with the additional wall being arranged between the outer peripheric wall, in other words a lateral portion of the outer peripheric wall, and a wall selected from said pair of walls.

[0033] In other words, the additional wall is a partition arranged in one of the pockets. This additional wall can assist to increase heat transfer to non-vaporized water present in the respective pocket in which the additional wall is arranged.

[0034] The additional wall preferably has a length shorter than a length of each wall of said pair of walls. In this way, the additional wall may avoid unduly restricting movement of water on the steaming surface in the respective pocket in which the additional wall is arranged.

[0035] In some embodiments, the steaming device comprises a pair of flow guiding walls arranged inside the surface area, with each of the flow guiding walls having extremities not contacting the outer peripheric wall. The flow guiding walls can assist to guide flow of non-vaporized water on the steaming surface and increase the heat transfer surface for transferring heat to the non-vaporized water.

[0036] The flow guiding walls preferably extend in a direction substantially parallel to said longitudinal axis.

[0037] In embodiments in which the at least one wall includes the pair of walls and the steaming device includes the flow guiding walls, each of the pair of flow guiding walls may be arranged, e.g. angled, to guide non-vaporized water on the steaming surface towards one of the pockets.

[0038] In at least some embodiments, the pair of flow guiding walls are arranged substantially symmetrically compared to the longitudinal axis of the steaming surface. In other words, a spacing of one of the flow guiding walls from the longitudinal axis corresponds to, e.g. is the same as or within 10% of, a spacing of the other of the flow guiding walls from the longitudinal axis. This arrangement of the flow guiding walls may facilitate uniform water spreading on steaming surface.

[0039] Alternatively or additionally, each of the flow guiding walls protrudes, for example, from the steaming surface to a height lower than the height of the outer peripheric wall.

[0040] Such shorter flow guiding walls can assist to avoid unduly restricting movement of water on the steaming surface in the vicinity of the flow guiding walls.

[0041] In some embodiments, the steaming device comprises a thermistor and a thermal fuse.

[0042] In such embodiments, the thermistor is included to enable the steam chamber's temperature to be regulated via thermistor control. The thermal fuse is arranged to prevent overheating of the steam chamber, e.g. should the steaming device fail or malfunction.

[0043] The thermistor and the thermal fuse are preferably arranged at a central area of the steam chamber. This placement can make for safer and more effective control over the temperature of the steam chamber.

[0044] In some embodiments, the steaming device comprises:

- a treatment plate comprising one or more steam vents,
- a steam channel fluidly connected to a steam exit of the steam chamber for carrying steam towards the one or more steam vents, and
- at least one rib extending along the steam channel and protruding from a bottom surface of the steam channel.

[0045] The at least one rib can improve heat transfer to steam passing through the steam channel. This can assist to maintain steam temperature and can also help to reduce the temperature of hotspots in the steaming device.

[0046] Each of the at least one rib preferably protrudes to a height from the bottom surface of the steam channel that is less than half, more preferably less than one third, of the height of the outer peripheric wall.

[0047] In some embodiments, the at least one rib extends all along the steam channel. This can assist to minimise or prevent turbulent flow of the steam, and thereby can reduce scale deposition along the steam channel.

[0048] The at least one rib preferably comprises two ribs extending parallel with each other. Such a pair of ribs can be straightforwardly accommodated within the steam channel, and can provide a larger heat transfer surface than, for instance, a single rib.

[0049] In some embodiments, the at least one rib, e.g. each of the at least one rib, has a square or rectangular cross-sectional shape.

[0050] In some embodiments, the steaming device comprises a heating element arranged to heat the steaming surface.

[0051] The heating element is preferably arranged to heat the treatment plate and the steaming surface.

[0052] In some embodiments, the at least one wall is aligned with part of the heating element or is aligned with a region extending adjacent and parallel to the part of the heating element. This can assist to enhance the heat transfer to the steam chamber provided by the at least one wall.

[0053] In some embodiments, the heating element aligns with one or more portions of the steaming surface extending alongside a wall of the pair of walls. Part, or respective parts, of the heating element preferably align(s) with the steaming surface in the pocket(s).

[0054] This can assist to enhance vaporization of the water held in the pocket(s).

[0055] In some embodiments, the additional wall aligns with part of the heating element. This can enhance heat transfer from the heating element to non-vaporized water held in the pocket in which the additional wall is arranged.

[0056] In some embodiments, each of the pair of flow guiding walls aligns with a respective part of the heating element. Thus, the flow guiding walls can assist to increase the heat transfer rate to the steaming surface, so as to facilitate attainment of a higher steam rate.

[0057] In at least some embodiments, the steam chamber is fluidly closed by a steam cover.

[0058] In such embodiments, each of the pair of walls preferably extends upwards compared to the steaming surface up to contacting the steam cover. Thus, the outer peripheric wall and each of the pair of walls contact the steam cover.

[0059] In some embodiments, the steaming device comprises a steam exit to allow steam to exit the steam chamber, with the steam exit being proximal to the rear part of the steaming surface.

[0060] In such embodiments, the steam exit is preferably arranged in-between the pair of walls, for example in-between the first extremity of each of said pair of walls. Thus, the steam can escape from the steam chamber via the centrally positioned steam exit, while non-vaporized water can collect in the pockets at the lateral sides of the steam chamber.

[0061] In some embodiments, the steam exit is partly delimited by a dam portion protruding from the steaming surface. The dam portion comprise of two walls perpendicular to the longitudinal direction and protrude from steam surface.

[0062] The term "dam portion" is intended to mean a barrier protrusion protruding from the steaming surface at the steam exit of the steam chamber. This barrier protrusion serves to retain any water not fully vaporized.

[0063] More generally, the steaming device preferably includes:

- a base unit comprising a water tank,
- a steamer head comprising the steam chamber,
- a flexible hose cord between the base unit and the steamer head, and
- a pump arranged to pump water from the water tank to the steam chamber via the flexible hose cord.

[0064] In at least some embodiments, the steamer head comprises the treatment plate, e.g. with the heating element being arranged to heat the treatment plate and the steaming surface.

[0065] Detailed explanations and other aspects of the invention will be given below.

BRIEF DESCRIPTION OF THE DRAWINGS

[0066] 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 provides a perspective view of an interior of a steaming device according to an example,
Fig.2A provides a plan view of the interior of the steaming device shown in Fig.1,
Fig.2B provides the plan view shown in Fig.2A with a dotted line representing passage of steam in a steam channel of the steaming device,
Fig.3 schematically depicts movement of water in a steam chamber of the steaming device shown in Figs.1 and 2,
Fig.4 provides a cross-sectional view of a steaming device according to another example, and
Fig.5 provides a plan view of an interior of a steaming device according to a further example.

DETAILED DESCRIPTION OF THE INVENTION

[0067] Fig.1 provides an interior view of a steaming device 100 comprising a steam chamber 102 for generating steam. A steaming surface 104 is arranged in the steam chamber 102 for vaporizing water. The steaming surface 104 extends from a front part 104A of the steaming surface 104 to a rear part 104B of the steaming surface 104.

[0068] In at least some embodiments, such as that shown in Fig.1, the steaming surface 104 comprises a dosing point 105 arranged to initially receive the water dosed onto the steaming surface 104. In such embodiments, the dosing point 105 is arranged at the front part 104A of the steaming surface 104.

[0069] For example, the dosing point 105 is arranged to receive water dosed into the steam chamber 102 via a water dosing hole (not visible).

[0070] Such a water dosing hole is, for example, defined in a dosing connector. Such a dosing connector can connect the steam chamber 102 to a water tank via a hose that fits onto the dosing connector. The dosing connector is, for instance, mounted on a steam cover (not visible) of the steam chamber 102.

[0071] In some embodiments, such as that shown in Fig.1, the dosing point 105 comprises a dome-shaped portion of the steaming surface 104.

[0072] Such a dome-shaped portion may assist to immediately spread the water dosed onto the dosing point 105 of the steaming surface 104.

[0073] A pump (not visible) is preferably employed to control the dosing of water from the water tank into the steam chamber 102.

[0074] The water dosing hole preferably has a diameter of 0.5 to 3 mm, such as about 1.5 mm.

[0075] Such a relative small diameter water dosing hole, particularly in combination with a pump capable of pumping the water at a relatively high pressure, can assist in achieving more efficient water spreading on the steaming surface 104.

[0076] The steaming surface 104 can be regarded as forming a surface area delimited by an outer peripheric wall 106, in other words an outer peripheral wall 106. The outer peripheric wall 106 assists to retain steam within the steam chamber 102.

[0077] In at least some embodiments, such as that shown in Fig.1, a steam exit 107 is arranged in the outer peripheric wall 106 to allow steam to exit the steam chamber 102. In such embodiments, the steam exit 107 is proximal to the rear part 104B of the steaming surface 104.

[0078] In embodiments in which the dosing point 105 is arranged at the front part 104A of the steaming surface 104 and the steam exit 107 is proximal to the rear part 104B of the steaming surface 104, the water can be vaporized on the steaming surface 104 as it passes from the front part 104A towards the rear part 104B.

[0079] In such embodiments, the front part 104A can be regarded as an upstream part of the steaming surface 104 and the rear part 104B can be regarded as a downstream part of the steaming surface 104.

[0080] The steam exit 107 is preferably arranged between a dam portion DP and the steam cover of the steam chamber 102, with the dam portion DP protruding from the steaming surface 104. Thus, the steam exit 107 is partly delimited by the dam portion DP protruding from the steaming surface 104. The dam portion DP is made of two walls perpendicular to the longitudinal direction and which protrude from steam surface 104.

[0081] The dam portion DP may assist to minimise passage of non-vaporized water on the steaming surface 104 out of the steam exit 107.

[0082] In embodiments in which the steaming device

100 includes the steam cover of the steam chamber 102 (irrespective of the inclusion or otherwise of the above-mentioned dosing connector and/or dam portion DP), the outer peripheric wall 106 and the steam cover engage each other in order to close the steam chamber 102.

[0083] Preferably, a sealing material (not visible), such as a gasket and/or sealing paste, is arranged between the outer peripheric wall 106 and the steam cover to enable the steam chamber 102 to be sealingly closed.

[0084] Thus, in more general terms, the steam chamber 102 is preferably fluidly closed by the steam cover.

[0085] The steam chamber 102, for example the steam chamber 102 including the steam cover, is preferably formed by a casting process using a suitable metal or metal alloy. The steam chamber 102 can, for instance, be cast in aluminium.

[0086] The steaming device 100 preferably includes a treatment plate 108. Such a treatment plate 108 comprises, in other words delimits, one or more steam vents (not visible) through which steam generated in the steam chamber 102 can exit the steaming device 100.

[0087] In some embodiments, such as that shown in Fig.1, the treatment plate 108 comprises a narrower front end 108A and a wider rear end 108B. In such embodiments, the front part 104A of the steaming surface 104 is closer to the narrower front end 108A than the wider rear end 108B, and the rear part 104B of the steaming surface 104 is closer to the wider rear end 108B than the narrower front end 108A.

[0088] The steaming surface 104 can be arranged in any suitable manner in order to vaporize the water received thereon. In some embodiments, such as that shown in Fig.1, the steaming surface 104 is a planar surface, which planar surface is parallel to an external surface of the treatment plate 108.

[0089] In alternative embodiments, the steaming surface 104 is inclined such that, when the steam chamber 102 is horizontally orientated, water dosed onto the steaming surface 104 descends by gravity from the front part 104A towards the rear part 104B. In such embodiments, the angle of incline is, for instance, 2 to 10 degrees relative to the external surface of the treatment plate 108.

[0090] The steaming device 100 preferably includes a pattern of spatially separated protrusions 110A, 110B protruding from the steaming surface 104.

[0091] Such protrusions 110A, 110B can assist spread of non-vaporized water on the steaming surface 104 and/or can help with controlling the speed of water movement on the steaming surface 104. The protrusions 110A, 110B can have any suitable shape, such as conical, truncated conical, pyramidal and truncated pyramidal.

[0092] In some embodiments, such as that shown in Fig.1, the pattern of spatially separated protrusions 110A, 110B comprises truncated pyramidal protrusions 110A.

[0093] Such truncated pyramidal protrusions 110A can assist lateral spreading of the non-vaporized water on the steaming surface 104 and assist to slow the descent of the water on the steaming surface 104 when the steam chamber 102 is vertically orientated, e.g. for steaming a hanging garment.

[0094] Such truncated pyramidal protrusions 110A have also been found to facilitate flaking of relatively small fragments of scale from the steaming surface 104 that are more easily washed away by the non-vaporized water thereon. This can assist to alleviate scale build-up in the steam chamber 102.

[0095] Any suitable dimensions can be selected for the protrusions 110A, 110B. For example, each of the truncated pyramidal protrusions 110A has a 2 mm by 2 mm square base and protrudes to a height of 1 mm from the steaming surface 104.

[0096] In some embodiments, the pattern of spatially separated protrusions 110A, 110B comprises conical protrusions 110B.

[0097] Such conical protrusions 110B can assist with relatively wide lateral spreading of the non-vaporized water on the steaming surface 104. Moreover, scale has been found to be less able to build up on such conical protrusions, and flaking of scale from the steaming surface 104 between such conical protrusions can be facilitated.

[0098] In embodiments in which the pattern of spatially separated protrusions 110A, 110B comprises the truncated pyramidal protrusions 110A and the conical protrusions 110B, a first sub-pattern of the conical protrusions 110B can be arranged proximal to the rear part 104B of the steaming surface 104, with a second sub-pattern of the truncated pyramidal protrusions 110A being arranged between the first sub-pattern and the front part 104A of the steaming surface 104. An example of this is shown in Fig.-2A, with the arrows in this figure representing the directions along which water is spread on the steaming surface 104.

[0099] A density of the spatially separated protrusions 110A, 110B preferably increases closer to the rear part 104B of the steaming surface 104. In other words, the spacing between nearest neighbour protrusions 110A, 110B decreases closer to the rear part 104B of the steaming surface 104.

[0100] This may assist to increase the heat transfer area and slow the non-vaporized water down closer to the rear part 104B to promote conversion to steam.

[0101] In some embodiments, such as that shown in Fig.1, the conical protrusions 110B of the first sub-pattern are more densely arranged that the truncated pyramidal protrusions 110A of the second sub-pattern.

[0102] It is noted that such protrusions 110A, 110B may not be provided at every region of the steaming surface 104. In some embodiments, such as that shown in Fig. 1, a protrusion-free zone is provided at the front part 104A of the steaming surface 104.

[0103] Such a protrusion-free zone can assist to promote scale flaking from the front part 104A steaming surface 104 and assist with movement of water at the front part 104A of the steaming surface 104.

[0104] In some embodiments, such as that shown in

Fig.1, the outer peripheric wall 106 is connected to the front part 104A of the steaming surface via a rounded portion RP.

[0105] Such a rounded portion RP may assist to minimise scale growth and accumulation at the front part 104A of the steaming surface 104.

[0106] Referring to Figs.2A and 2B, the steaming surface 104 extends along a longitudinal axis LA from the rear part 104B of the steaming surface 104 to the front part 104A of the steaming surface 104.

[0107] The longitudinal axis LA can be regarded as a central axis extending from the front part 104A to the rear part 104B bisecting the steaming surface 104 into a pair of elongate areas.

[0108] At least one wall A1, A2; B1 protrudes from the steaming surface 104, with the at least one wall A1, A2; B1 being arranged inside the surface area of the steaming surface 104 delimited by the outer peripheric wall 106.

[0109] In other words, the at least one wall A1, A2; B1 is arranged, together with the steaming surface 104, inside the space bounded by the outer peripheric wall 106.

[0110] The at least one wall A1, A2; B1 extends from the rear part 104B towards the front part 104A of the steaming surface 104 in a direction substantially parallel to the longitudinal axis LA.

[0111] The term "in a direction substantially parallel to said longitudinal axis LA" may mean that a notional line drawn between the first extremity E1A, E1B, E1C of each of the at least one wall A1, A2; B1 closest to the rear part 104B and the second extremity E2A, E2B, E2C of the respective wall A1, A2; B1 closest to the front part 104A extends at an angle with respect to the longitudinal axis LA of at most 10 degrees.

[0112] The at least one wall A1, A2; B 1 can be regarded as being arranged to divide the steaming surface 104 into portions, e.g. longitudinally extending portions, with each of the portions extending alongside the at least one wall A1, A2; B1 between the front part 104A and the rear part 104B.

[0113] As an alternative to the characterisation of the at least one wall A1, A2; B1 in terms of it extending substantially parallel to the longitudinal axis LA, the extension of the at least one wall A1, A2; B1 can be regarded, with reference to Figs.1 and 2A, as partitioning the steaming surface 104 into one or more pockets PI, P2 extending from the rear part 104B to the front part 104A of the steaming surface 104.

[0114] For example, each of the pocket(s) P1, P2 is arranged in one of the elongate areas defined by the longitudinal axis LA bisecting the steaming surface 104.

[0115] In order to collect non-vaporized water therein, each of the pocket(s) P1, P2 extends towards the front part 104A from the rear part 104B of the steaming surface 104, for example extends in a generally straight manner towards the front part 104A from the rear part 104B of the steaming surface 104.

[0116] The at least one pocket P1, P2 can assist to hold non-vaporized water therein, in particular when the steam chamber 102 is oriented vertically. Thus, when the steam chamber 102 is oriented vertically, spread of non-vaporized water by gravity throughout the entire steam chamber 102 can be lessened. Holding, in other words retaining, the non-vaporized water in the pocket(s) P1, P2 in this manner can provide sufficient time and space for at least some of this water to be vaporized. This may assist to minimize non-vaporized water exiting the steam chamber 102, and thereby help with alleviating spitting of water onto a garment being treated using the steaming device 100.

[0117] Moreover, the at least one wall A1, A2; B1 can provide a greater heat transfer surface for transferring heat to the non-vaporized water held in the at least one pocket P1, P2. This can assist in vaporizing the non-vaporized water held in the pocket(s) P1, P2, and thereby help to reduce water accumulation.

[0118] As well as assisting heat transfer to the water on the steaming surface 104, partitioning the steaming surface 104 in this manner can assist, in some embodiments, to manage movement of water on the steaming surface 104 during dynamic movement and orientation adjustment of the steaming device 100, thereby facilitating maintaining of a relatively high steam rate in spite of such movement and orientation.

[0119] For example, the steaming device 100 is configured to provide a steam rate of up to 45 g/minute.

[0120] In some embodiments, such as that shown in Figs.1 and 2A, the protrusions 110B protrude from the steaming surface 104 in the at least one pocket P1, P2, for example protrude from the steaming surface 104 in each of the pocket(s) P1, P2.

[0121] The protrusions 110B protruding from the steaming surface 104 in the pocket(s) P1, P2 are preferably conical protrusions 110B.

[0122] Such conical protrusions 110B can assist to spread the non-vaporized water more widely on the steaming surface 104 in the pocket(s) P1, P2, and scale may be less able to build up on such conical protrusions 110B.

[0123] Alternatively or additionally, the protrusions 110B protruding from the steaming surface 104 in the pocket(s) P1, P2 can be more densely arranged than the protrusions 110A, e.g. truncated pyramidal protrusions 110A, protruding from the steaming surface 104 between the front part 104A and the pocket(s) P1, P2.

[0124] In some embodiments, the first extremity E1A, E1B, E1C of each of the at least one wall A1, A2; B1 is in contact with the outer peripheric wall 106, and the second extremity E2A, E2B, E2C of each of the at least one wall A1, A2; B1 reaches a location located inside the surface area. Thus, the above-described pocket(s) P1, P2 is or are delimited by the at least one wall A1, A2; B1 and the outer peripheric wall 106.

[0125] In some embodiments, and as best shown in Figs.2A and 2B, the second extremity E2A, E2B bends towards the longitudinal axis LA. This can facilitate diversion of non-vaporized water flowing centrally on the

steaming surface 104 into the pocket(s) PI, P2 arranged at lateral side(s) of the steam chamber 102.

[0126] The at least one wall A1, A2; B1 preferably comprises a pair of walls A1, A2 arranged on each side of the longitudinal axis LA. In other words, one wall A1 of the pair of walls A1, A2 is arranged on one side of the longitudinal axis LA, and the other wall A2 of the pair of walls A1, A2 is arranged on the other side of the longitudinal axis LA.

[0127] Each of the pair of walls A1, A2 preferably protrudes from the steaming surface 104 to the height of the peripheric wall 106.

[0128] In embodiments in which the steam chamber 102 is closed by the steam cover, each of the pair of walls A1, A2 protrudes from the steaming surface 104 to reach the steam cover.

[0129] In other words, each of the pair of walls A1, A2 extends upwards compared to the steaming surface 104 up to contacting the steam cover.

[0130] The pockets P1, P2 can thus be formed by full height of the pair of walls A1, A2 and the full height peripheric wall 106 near the rear part 104B of the steaming surface 104.

[0131] This can assist to slow movement of water on the steaming surface 104 in the pocket(s) 104A, 104B, and thereby promote conversion to steam.

[0132] In some embodiments, such as that shown in Figs.1, 2A and 2B, the pair of walls A1, A2 are arranged substantially symmetrically compared to the longitudinal axis LA of the steaming surface 104.

[0133] Thus, a pair of pockets P1, P2, in other words two rear pockets PI, P2, are created on the lateral left side and lateral right side of the steam chamber 102.

[0134] The pair of pockets P1, P2 can be formed by a full height pair of walls A1, A2 and the full height peripheric wall 106 on both lateral sides near the rear part 104B of the steaming surface 104.

[0135] Referring to Fig.3, vertical orientation of the steam chamber 102 can cause non-vaporized water on the steaming surface 104 to collect in the pockets P1, P2, with tilting in the direction represented by the arrow R1 in the upper pane of Fig.3 causing at least some of the water held by the pocket P1, as well as newly dosed water, to be transferred into the pocket P2. Similarly, tilting of the steam chamber 102 in the opposite direction, as represented by the arrow R2 in the lower pane of Fig.3, causes at least some of the water held by the pocket P2, as well as newly dosed water, to be transferred into the pocket P1.

[0136] The term "arranged substantially symmetrically compared to a longitudinal axis LA of the steam surface 104" may refer to a spacing of the wall A1 from the longitudinal axis LA corresponding to, e.g. being the same as or within 10% of, a spacing of the other wall A2 from the longitudinal axis LA.

[0137] The longitudinal axis LA can be regarded as a central axis extending from the front part 104A to the rear part 104B bisecting the steaming surface 104 into a pair of elongate areas, with one of the elongate areas comprising one of the pair of pockets P1, P2, and the other of the elongate areas comprising the other of the pair of pockets P2, P1.

[0138] More generally, and with reference to Fig.4, the steaming device 100 comprises a heating element 112 arranged to heat the steaming surface 104.

[0139] In some embodiments, such as those shown in Figs.1 to 5, the heating element 112 is mounted between the steaming surface 104 and the treatment plate 108. Thus, the heating element 112 is arranged to heat both the steaming surface 104 and the treatment plate 108.

[0140] In some embodiments, heat transfer from the heating element 112 to the treatment plate 108 is via a thermal transfer path configured such that the treatment plate 108 is heated at a temperature of 130 to 155 degrees Celsius, while the steam chamber 102 is controlled to have a higher temperature of approximately 180 to 190 degrees Celsius.

[0141] The thickness of a thermal bridge TB between the soleplate and the treatment plate 108 can be adjusted between the narrower front end 108A of the treatment plate 108 and the broader rear end 108B of the treatment plate 108. For example, the thermal bridge is thicker towards the narrower end 108A and thinner towards the broader rear end 108B. This thermal bridge TB facilitates heat transfer.

[0142] This thickness variation can assist to make a temperature distribution across the treatment plate 108 more uniform, in particular more uniform across the length of the treatment plate 108.

[0143] Irrespective of whether or not the heating element 112 is arranged to heat the treatment plate 108 in addition to heating the steaming surface 104, the at least one wall A1, A2; B1, e.g. each of the at least one wall A1, A2; B1 is preferably aligned with part of the heating element 112 or is aligned with a region extending adjacent and parallel to such a part of the heating element 112.

[0144] This can assist to enhance the heat transfer to the steam chamber 102 provided by the at least one wall A1, A2; B1.

[0145] In some embodiments, the heating element 112 aligns with one or more portions of the steaming surface 104 extending alongside a wall of the pair of walls A1, A2. In particular, the heating element 112 preferably aligns with the steaming surface 104 in one or both of the pockets P1, P2. This can assist to enhance vaporization of the water held in the pocket(s) P1, P2.

[0146] In some embodiments, the heating element 112 extends between a pair of electrical connections 114A, 114B arranged proximal to the rear part 104B of the steaming surface 104.

[0147] The pocket(s) P1, P2 is or are preferably aligned with the heating element 112 where the heating element 112 connects to the electrical connections 114A, 114B.

[0148] In this way, the pocket(s) P1, P2 are arranged where the temperature of the steaming surface 104 tends

to be highest, thereby assisting vaporizing of the water held in the pocket(s) P1, P2.

[0149] In some embodiments, such as that shown in Figs.1 to 3, the at least one wall A1, A2; B1 further comprises an additional wall B1 extending from the rear part 104B towards the front part 104A of the steaming surface 104, with the additional wall B1 being arranged between the outer peripheric wall 106 and a wall selected from the pair of walls A1, A2.

[0150] In other words, the additional wall B1 is a partition arranged in one of the pockets P1, P2. This additional wall B1 can assist to increase heat transfer to non-vaporized water present in the respective pocket P1, P2 in which the additional wall B1 is arranged.

[0151] In some embodiments, the additional wall B1 aligns with part of the heating element 112. This can enhance heat transfer from the heating element 112 to non-vaporized water held in the pocket P1, P2 in which the additional wall B1 is arranged.

[0152] In other words, the additional heat exchange surface provided due to the inclusion of the additional wall B1 can, particularly when non-vaporized water is pooling in the pocket P1, P2 in which the additional wall B1 is arranged, assist to increase the steam rate and to reduce hot spot occurrence at the rear part 104B of the steaming surface 104.

[0153] The additional wall B1 preferably has a length shorter than a length of each wall of the pair of walls A1, A2. In this way, the additional wall B1 may avoid unduly restricting movement of water on the steaming surface 104 in the respective pocket P1, P2 in which the additional wall B1 is arranged.

[0154] In some embodiments, and as best shown in Figs.1, 2A and 2B, the additional wall B1 adjoins the outer peripheric wall 106, and in particular adjoins a rear portion of the outer peripheric wall 106 which also adjoins to each of the pair of walls A1, A2.

[0155] In some embodiments (not shown), an additional wall B1 extends between the outer peripheric wall 106 and one wall A1 of the pair of walls A1, A2 and a further additional wall (not visible) extends between the outer peripheric wall 106 and the other wall A2 of the pair of walls A1, A2.

[0156] Preferably, at least part of the additional wall B1 protrudes from the steaming surface 104, but its height is shorter than the height of the peripheric wall 106.

[0157] In embodiments in which the steam chamber 102 is closed by the steam cover, the additional wall(s) B1 protrude(s) from the steaming surface 104 to reach the steam cover.

[0158] Placement of the additional wall(s) B1 at the rear part 104B of the steaming surface 104 can assist to ensure that the additional wall(s) B1 do(es) not impede downstream transport of scale.

[0159] In some embodiments, such as that shown in Fig.5, the steaming device 100 comprises a pair of flow guiding walls C1, C2 having extremities not contacting the outer peripheric wall 106.

[0160] The flow guiding walls C1, C2 preferably extend in a direction substantially parallel to said longitudinal axis LA, as shown in Fig.5.

[0161] In some embodiments, each of the pair of flow guiding walls C1, C2 aligns with a respective part of the heating element 112. This can assist to increase the heat transfer to the steaming surface 104, so as to facilitate attainment of a higher steam rate.

[0162] The flow guiding walls C1, C2 are preferably arranged, e.g. angled, to assist in guiding non-vaporized water on the steaming surface 104 towards the rear part 104B of the steaming surface 104.

[0163] In embodiments in which the at least one wall A1, A2; B1 includes the pair of walls A1, A2, each of the pair of flow guiding walls C1, C2 may be angled to guide non-vaporized water on the steaming surface 104 towards one of the pockets P1, P2.

[0164] In at least some embodiments, the pair of flow guiding walls C1, C2 are arranged substantially symmetrically compared to the longitudinal axis LA of the steaming surface 104. In other words, a spacing of one of the flow guiding walls C1, C2 from the longitudinal axis LA corresponds to, e.g. is the same as or within 10% of, a spacing of the other of the flow guiding walls C2, C1 from the longitudinal axis LA. This arrangement of the flow guiding walls C1, C2 may facilitate uniform water spreading on steaming surface 104.

[0165] Alternatively or additionally, each of the flow guiding walls C1, C2 protrudes, for example, from the steaming surface 104 to a height lower than the height of the outer peripheric wall 106.

[0166] Such shorter flow guiding walls C1, C2 can assist to avoid unduly restricting movement of water on the steaming surface 104 in the vicinity of the flow guiding walls C1, C2.

[0167] In some embodiments, and referring again to Fig.4, the steaming device 100 comprises a thermistor 116 and a thermal fuse. The thermistor 116 is included to enable the steam chamber's 102 temperature to be regulated via thermistor control. The thermal fuse is arranged to prevent overheating of the steam chamber 102, e.g. should the steaming device 100 fail or malfunction.

[0168] In such embodiments, and as best shown in Figs.1, 2A, 2B and 5, the thermistor 116 and the thermal fuse are preferably arranged at a central area 118 of the steam chamber 102.

[0169] Arranging the thermistor 116 at the central area 118 can mean that the thermistor 116 is located near the centre of the heating element 112. This placement can make for more effective control over the temperature of the steam chamber 102.

[0170] In some embodiments, such as those shown in the Figures, the thermistor 116 is received in a cavity 120 of a mounting element arranged at the central area 118 of the steam chamber 102. Such a mounting element preferably projects from the steaming surface 104. Such a mounting element can be termed a "thermistor boss".

[0171] In some embodiments, and as best shown in

Figs.1, 2B and 5, a steam channel 122 is fluidly connected to the steam exit 107, with the steam channel 122 being arranged to carry steam towards the one or more steam vents included in the treatment plate 108.

[0172] In such embodiments, at least one rib 124 preferably extends along, e.g. parallel with, the steam channel 122 and protrudes from a bottom surface of the steam channel 122.

[0173] The at least one rib 124 can improve heat transfer to steam passing through the steam channel 122. This can improve to maintain steam temperature and can also help to reduce the temperature of hotspots in the steaming device 100.

[0174] Each of the at least one rib 124 preferably protrudes to a height from the bottom surface of the steam channel 122 that is less than half, more preferably less than one third, of the height of the outer peripheric wall 106.

[0175] In some embodiments, the at least one rib 124 extends all along the steam channel 122. This can assist to minimise or prevent turbulent flow of the steam, and thereby can reduce scale deposition along, the steam channel 122.

[0176] The at least one rib 124 preferably comprises two ribs extending parallel. Such a pair of ribs can be straightforwardly accommodated within the steam channel 122, and can provide a larger heat transfer surface than, for instance, a single rib.

[0177] In some embodiments, the at least one rib 124, e.g. each of the at least one rib 124, has a square or rectangular cross-sectional shape.

[0178] In at least some embodiments, and as best shown in Figs.1, 2A, 2B and 5, the steaming device 100 comprises a scale deposition chamber 126 arranged between the steam exit 107 and the steam channel 122.

[0179] The operating lifetime of the steaming device 100 can be improved via the inclusion of such a scale deposition chamber 122, for example in combination with a periodic scale rinsing operation to remove smaller scale flakes and softer scale which can be thereby purged from the steaming device 100.

[0180] As an example of such a scale rinsing operation, the above-mentioned pump used to dose water into the steam chamber 102 is controlled to deliver a maximum flow of water in order to cool the steam chamber 102 down from a high temperature, e.g. around a thermistor 116 control point, to a low temperature, e.g. below 100 degrees Celsius.

[0181] The resulting rapid cooling can cause thermal contraction mismatch at an interface between the steaming surface 104 and the scale, and thus encourage the scale to flake from the steaming surface 104. The maximum flow can then assist to transport the loose scale towards the scale deposition chamber 126 and/or through the steam channel 122 and out of the steaming device 100 via the steam vent(s).

[0182] Protrusions, e.g. of the type described above in respect of the steaming surface 104, can protrude from a surface of the scale deposition chamber 126.

[0183] For example, the protrusions protruding from a surface of the scale deposition chamber 126 can be conical protrusions. Alternatively, such protrusions can be truncated pyramidal protrusions, e.g. having a 2 mm by 2 mm square base and protruding to a height of 1 mm from the surface of the scale deposition chamber 126.

[0184] In some embodiments, the protrusions on the surface of the scale deposition chamber 126 are more densely arranged than the protrusions 110A, 110B protruding from the steaming surface 104.

[0185] This can assist to minimise flow of non-vaporized water on the surface of the scale deposition chamber 126 and can assist to maximise heat transfer to the water.

[0186] In some embodiments, a scale filter 128, e.g. a scale filter 128 comprising a scale filter mesh, is arranged in the scale deposition chamber 126.

[0187] Such a scale filter 128 can assist to prevent larger flakes of scale from choking a steam outlet 130 to which the steam channel 122 extends from the scale deposition chamber 126 and/or the steam vent(s) included in the treatment plate 108.

[0188] It is noted that the term "all along the steam channel 122" may mean in this context extension of the at least one rib 124 from where the steam channel 122 begins at the outlet of the scale deposition chamber 126 to where the steam channel 122 terminates at the steam outlet 130.

[0189] The dotted line in Fig.2B represents fluid passage out of the steam exit 107, through the scale deposition chamber 126, and to the steam outlet 130 via the steam channel 122.

[0190] Whilst not shown in the Figures, a steam conduit provided between the steam chamber 102 and the treatment plate 108 connects the steam outlet 130 to the steam vent(s) included in the treatment plate 108.

[0191] The cross-sectional area of the steam conduit may be minimised in order to maintain steam velocity as steam travels along the steam conduit and exits through the steam vent(s).

[0192] In some embodiments, the steam vents include a main steam vent and a plurality of further steam vents. In such embodiments, the main steam vent has a larger diameter than a diameter of each of the further steam vents.

[0193] The main steam vent is preferably aligned with the steam outlet 130.

[0194] Such alignment can permit relatively rapid steam/water flow from the steam outlet 130 directly out of the main steam vent. As such the steam can exit the treatment plate 108 at a faster velocity, thereby causing the user to perceive that the steaming device 100 provides powerful steaming performance.

[0195] 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 particular, although the invention has been described in relation to garment care, it can be applied to any type of household device comprising a steam generator. 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 steam chamber (102) for generating steam,
   - a steaming surface (104) arranged in the steam chamber for vaporizing water, the steaming surface extending along a longitudinal axis (LA) from a rear part (104B) of the steaming surface to a front part (104A) of the steaming surface, the steaming surface forming a surface area being delimited by an outer peripheric wall (106), and
   - at least one wall (A1, A2; B1) protruding from the steaming surface and being arranged inside said surface area, the at least one wall extending from said rear part (104B) towards said front part (104A) and in a direction substantially parallel to said longitudinal axis.

2. The steaming device (100) according to claim 1, wherein each of the at least one wall (A1, A2; B1) comprises a first extremity (E1A, E1B, E1C) being in contact with the outer peripheric wall (106), and a second extremity (E2A, E2B, E2C) reaching a location located inside said surface area.

3. The steaming device (100) according to claim 1 or claim 2, wherein the at least one wall (A1, A2; B1) comprises a pair of walls (A1, A2) arranged on each side of the longitudinal axis (LA).

4. The steaming device (100) according to claim 3, wherein the pair of walls (A1, A2) are arranged substantially symmetrically compared to the longitudinal axis (LA).

5. The steaming device (100) according to claim 3 or claim 4 as according to claim 2, wherein said second extremity (E1A, E1B) of each of said pair of walls (A1, A2) bends towards the longitudinal axis (LA).

6. The steaming device (100) according to any one of claims 3 to 5, wherein the at least one wall (A1, A2; B 1) further comprises an additional wall (B 1) extending from the rear part (104B) towards the front part (104A) of the steaming surface (104), the additional wall being arranged between the outer peripheric wall (106) and a wall selected from said pair of walls (A1, A2).

7. The steaming device (100) according to claim 6, wherein the additional wall (B1) has a length shorter than a length of each of said pair of walls (A1, A2).

8. The steaming device (100) according to any one of the preceding claims, comprising a pair of flow guiding walls (C1, C2) arranged inside the surface area and extending in a direction substantially parallel to said longitudinal axis (LA), the pair of flow guiding walls being arranged substantially symmetrically compared to a longitudinal axis (LA) of the steaming surface (104), each of the flow guiding walls having extremities not contacting the outer peripheric wall (106).

9. The steaming device (100) according to any one of the preceding claims, comprising a heating element (112) arranged to heat the steaming surface (104), the at least one wall (A1, A2; B1) being aligned with part of the heating element or being aligned with a region extending adjacent and parallel to the part of the heating element.

10. The steaming device (100) according to claim 9 as according to any of claims 3 to 7, wherein the heating element (112) aligns with one or more portions of the steaming surface (104) extending alongside a wall of the pair of walls (A1, A2).

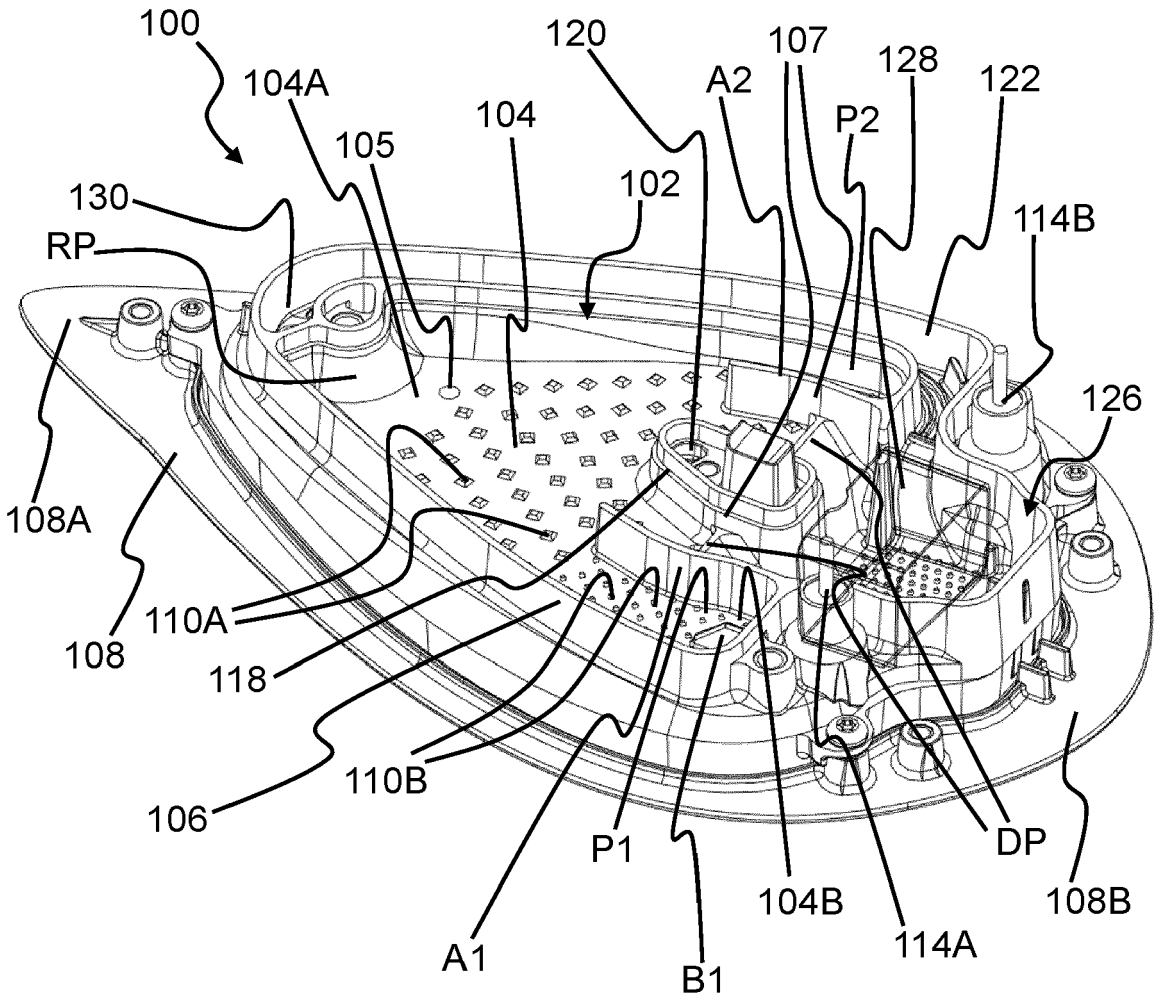
11. The steaming device (100) according to claim 9 as according to claim 6 or claim 7, wherein the additional wall (B1) aligns with part of the heating element (112).

12. The steaming device (100) according to claim 9 as according to claim 8, wherein each of the pair of flow guiding walls (Cl, C2) aligns with a respective part of the heating element (112).

13. The steaming device (100) according to any one of claims 3 to 7, 10 and 11, wherein the steam chamber (102) is fluidly closed by a steam cover, each the pair of walls (A1, A2) extending upwards compared to the steaming surface (104) up to contacting the steam cover.

14. The steaming device (100) according to any one of claims 3 to 7, 10, 11 and 13, comprising a steam exit (107) to allow steam to exit the steam chamber (102), the steam exit being proximal to the rear part (104B) of the steaming surface (104) and being arranged in-between said pair of walls (A1, A2).

15. The steaming device (100) according to claim 14, wherein the steam exit (107) is partly delimited by a dam portion (DP) protruding from the steaming surface (104).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104A
105
104
120
A2
107
128
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P2
102
130
RP
114B
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DP
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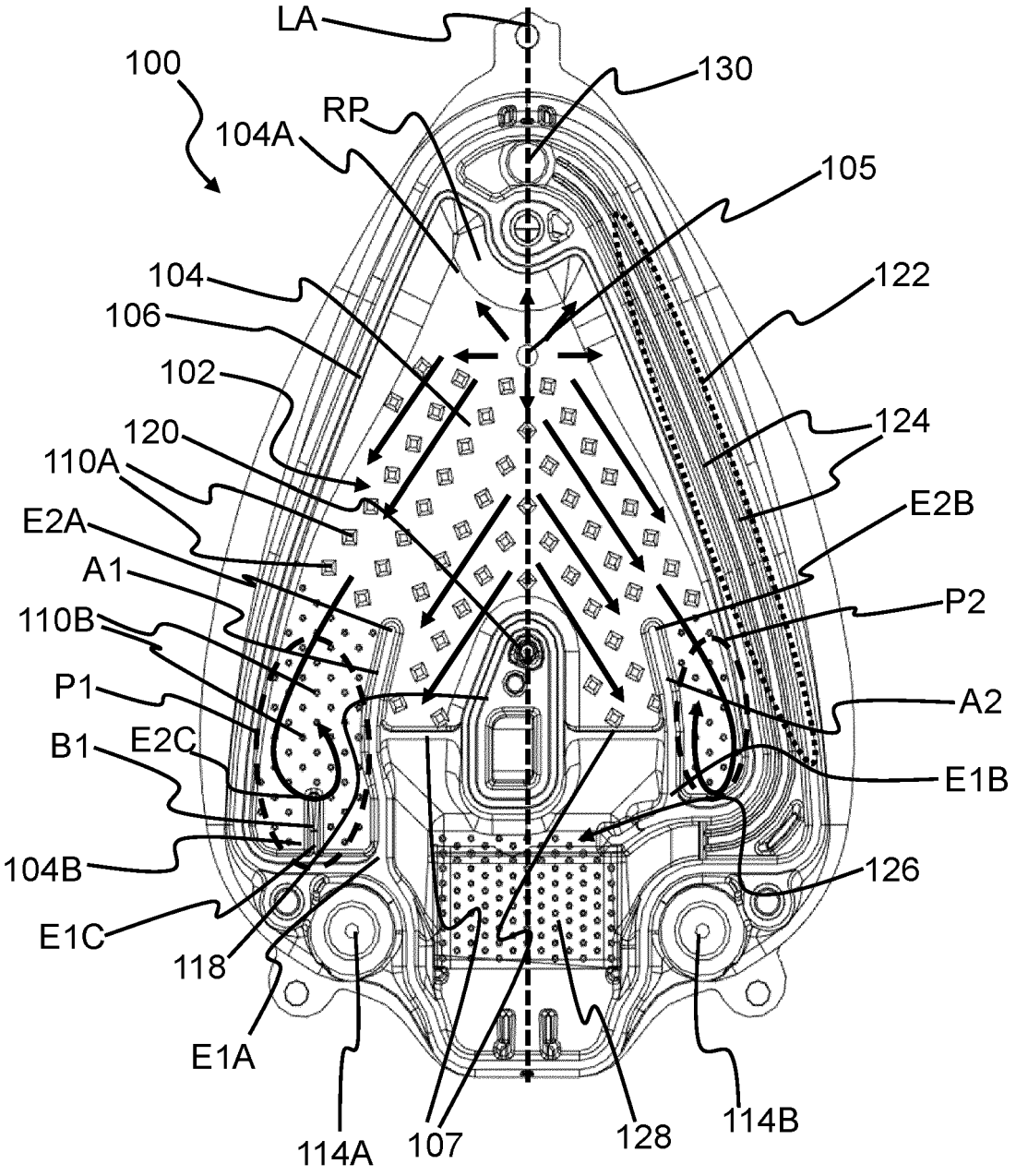
108B
114A
A1
B1

FIG.1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104
122
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102
124
120
110A
E2B
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A1
P2
110B
P1
A2
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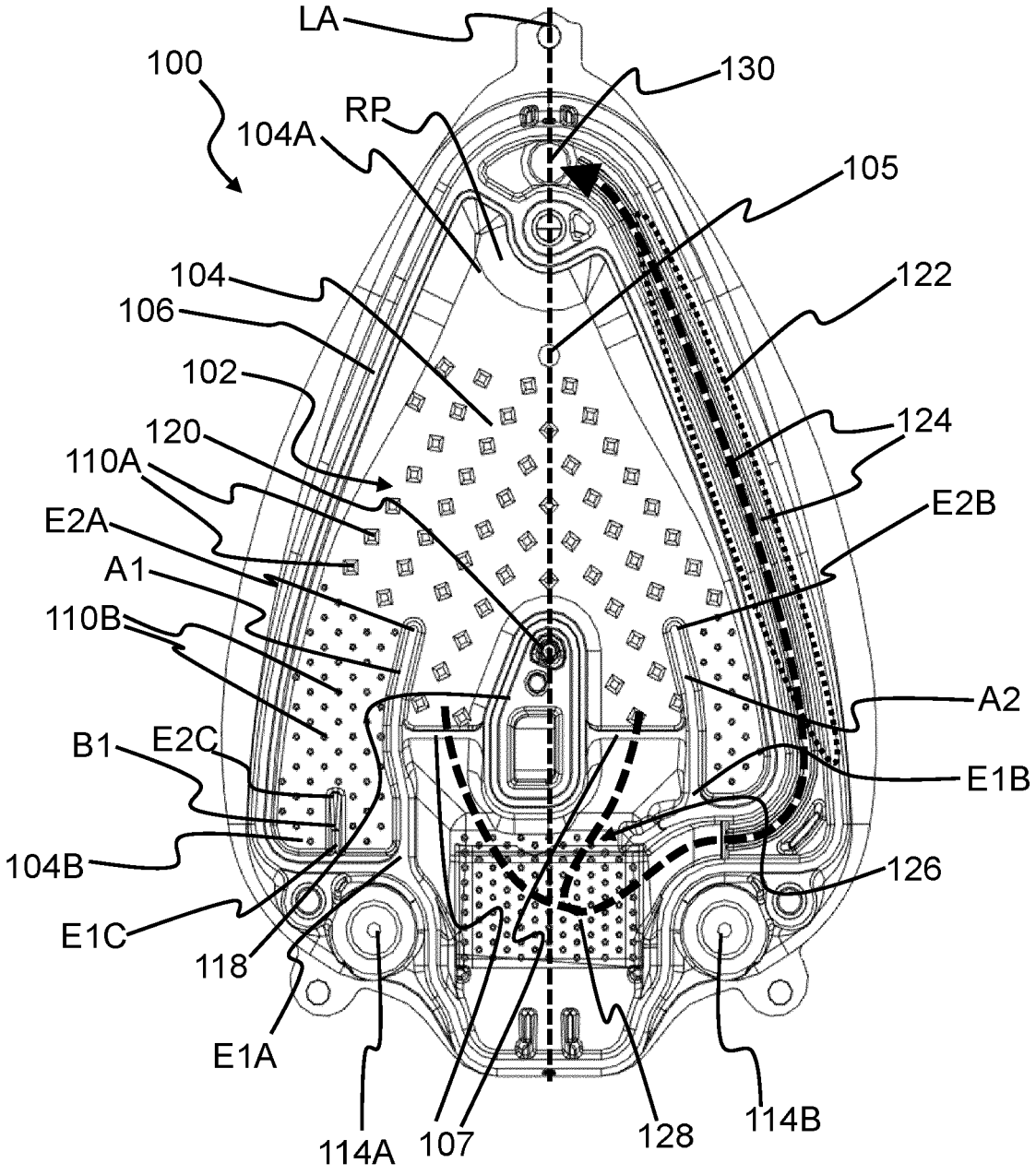
104B
126
E1C
118
E1A
114A
107
128
114B

FIG.2A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130
RP
104A
105
104
122
106
102
124
120
110A
E2B
E2A
A1
110B
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E1C
118
E1A
114A
107
128
114B

FIG.2B

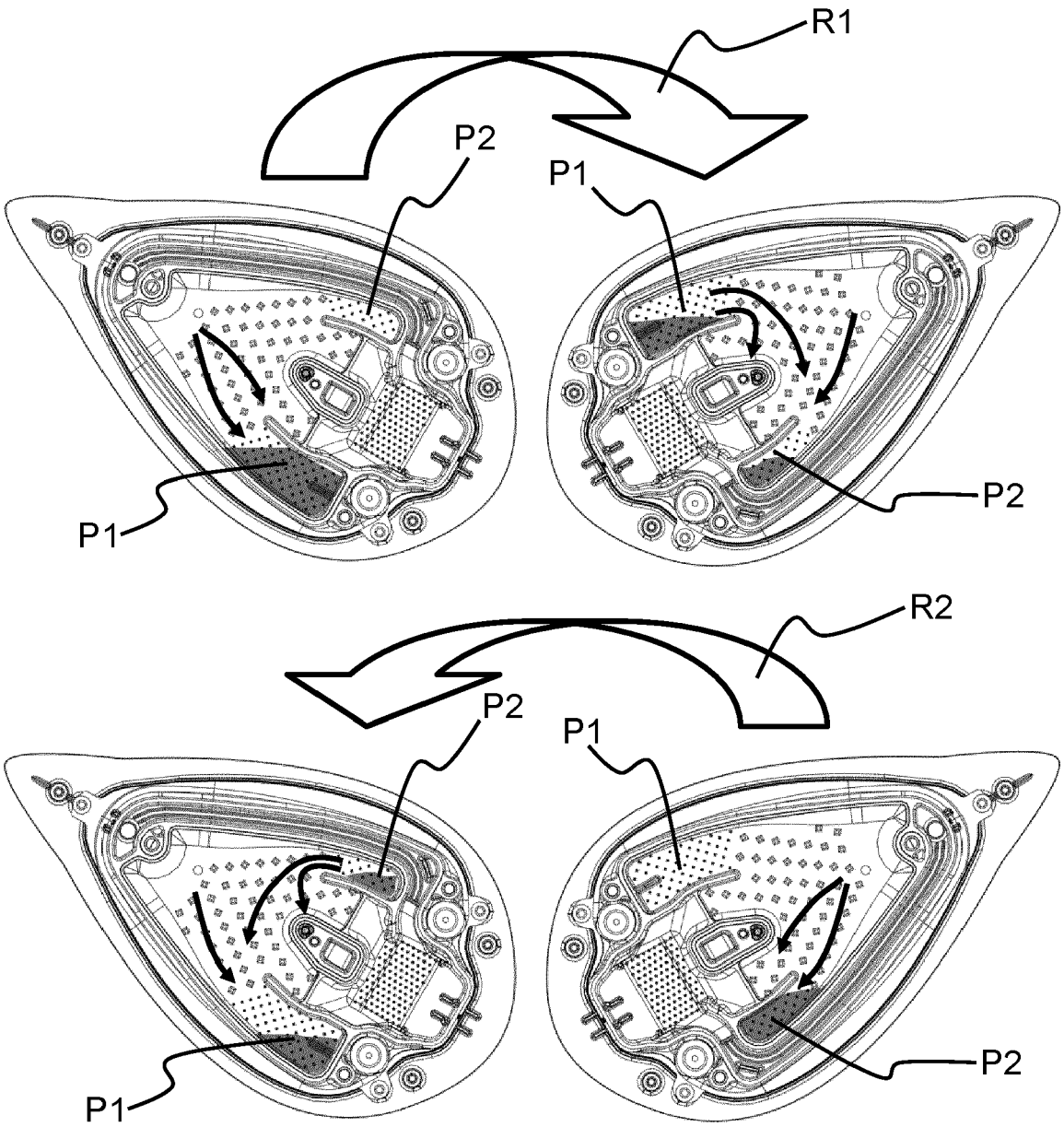


FIG.3

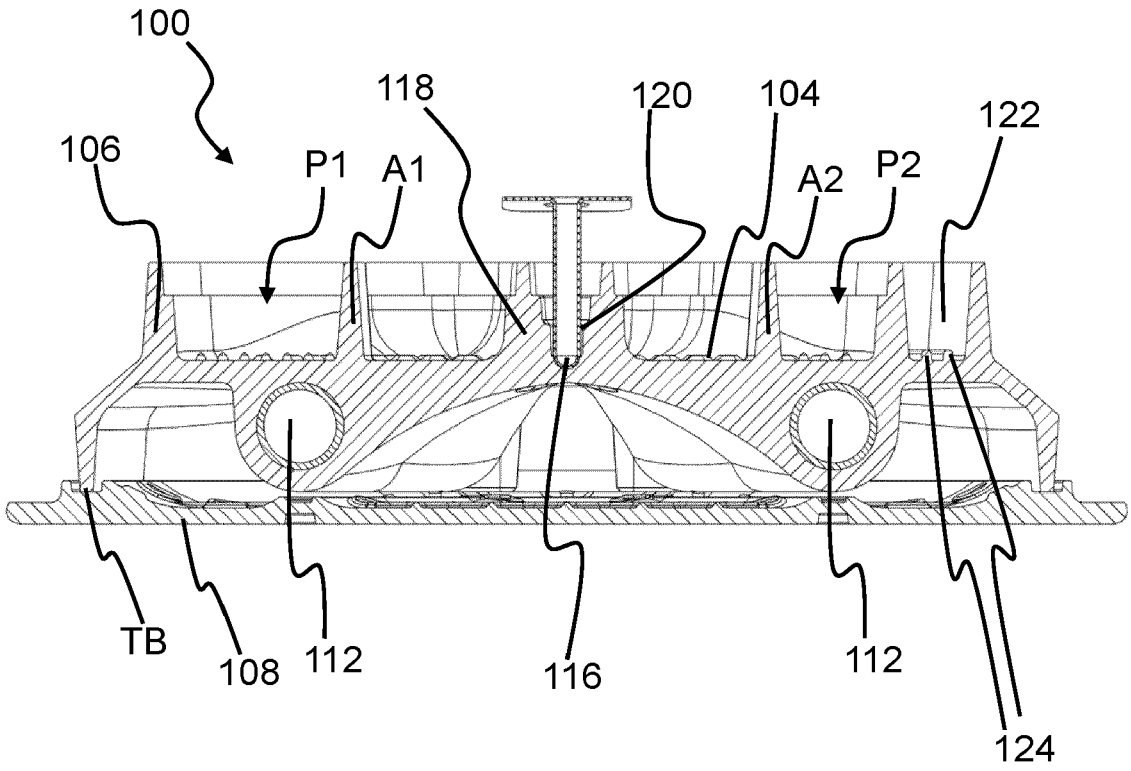
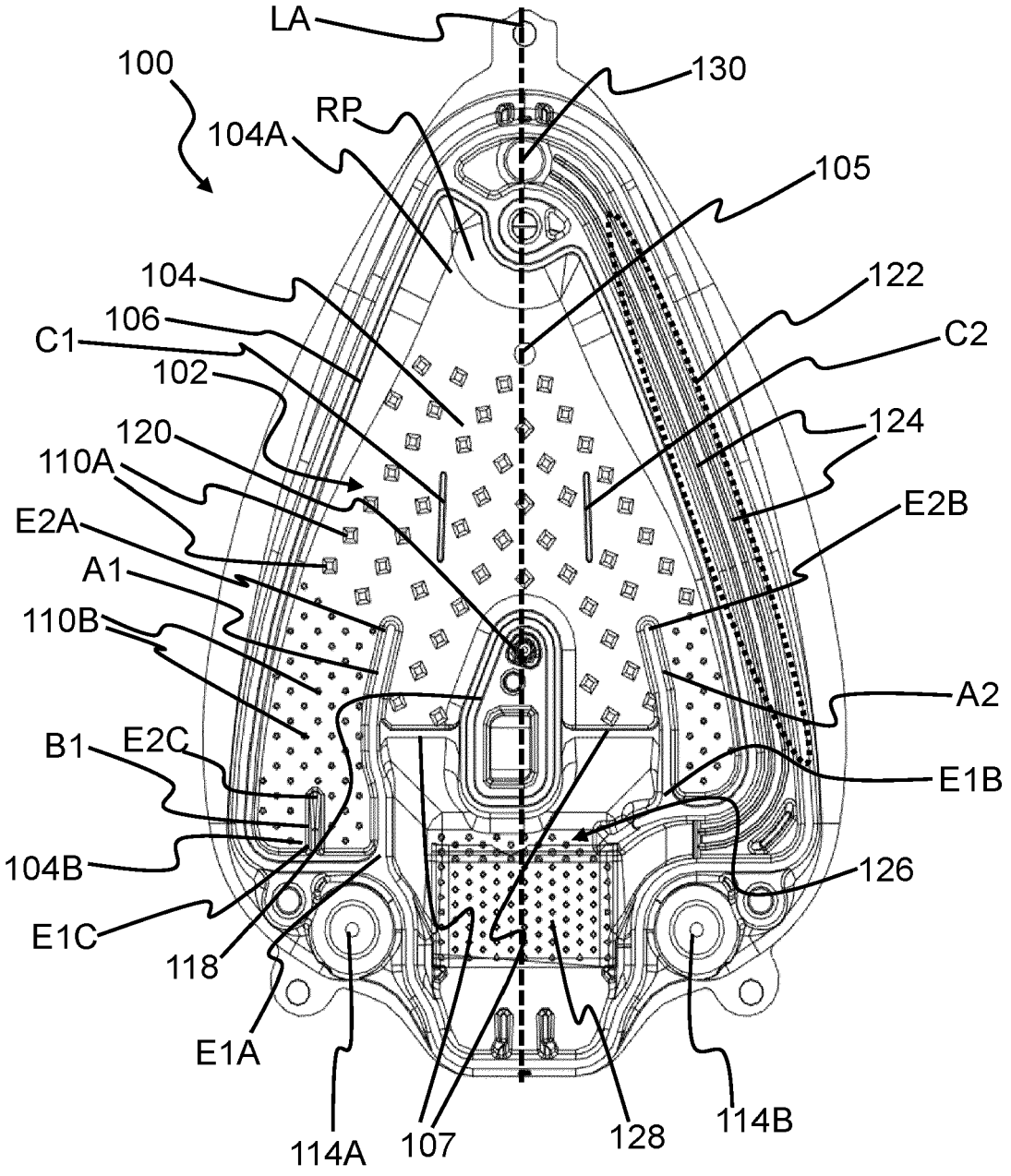


FIG.4


LA
100
130
RP
104A
105
104
122
106
C1
C2
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120
124
110A
E2A
E2B
A1
110B
A2
B1
E2C
E1B
104B
126
E1C
118
E1A
114A
107
128
114B

FIG.5

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EUROPEAN SEARCH REPORT

Application Number
EP 22 19 4411

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	26 January 2023	Röberg, Andreas

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