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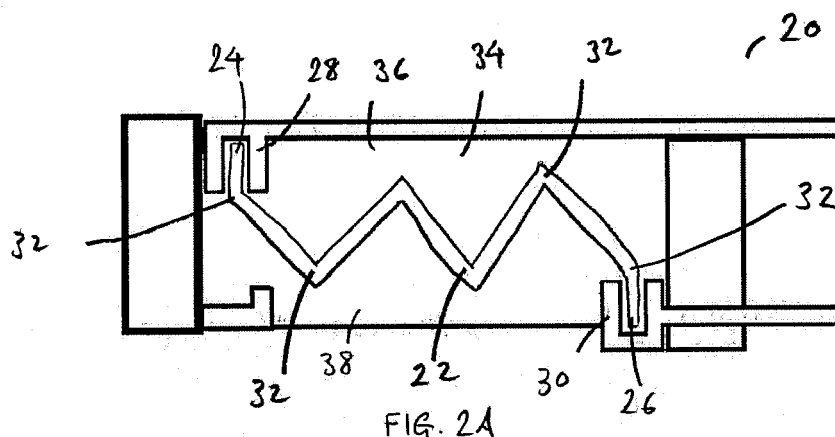
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(54) **AEROSOL GENERATION DEVICE**

(57) A heating apparatus (20) for an aerosol generation device is disclosed comprising a heating element (22) comprising one or more planar sheets of electrically

conductive material, where the planar sheet comprises at least one fold (32) and is configured to transport liquid by capillary action in use.



Description

[0001] The present invention relates to a heating element for an aerosol generation device or system, such as an electronic cigarette.

Background

[0002] Known aerosol generation devices often use a heating component, heating apparatus or heater, to heat an aerosol generating liquid in order to generate an aerosol, or vapour, for inhalation by a user. The heating component is typically made of a conductive material which allows an electric current to flow through it when electrical energy is applied across the heating component. The electrical resistance of the conductive material causes heat to be generated as the electric current passes through the material, a process commonly known as resistive heating.

[0003] Some heating elements, in particular fibre mesh array heaters, combine the heating and wicking functions, where for example an electrically conductive porous material uses capillary action to draw the aerosol generating liquid from the reservoir into the heating component, which also provides heat when electrical energy is passed through it. The electrically conductive porous material can be shaped to optimise the synergy between heating and wicking functions.

[0004] Known devices can be bulky or limited in the vapour volume they can produce due to a limited surface area of porous material. An object of the invention is to provide a more effective heating element for an aerosol generation device.

Summary

[0005] According to the present invention there is provided a heating apparatus for an aerosol generation device, the heating apparatus comprising: a heating element comprising one or more planar sheets of electrically conductive material, each comprising at least one fold, where the planar sheet is configured to transport liquid by capillary action in use.

[0006] In this way the surface area of the heating apparatus can be increased within a given size or length of an aerosol generation device or cartridge which in turn increases the heating output of the heating apparatus. A folded heating apparatus may better utilise the space in an aerosol generation device or cartridge, where the heating apparatus can be folded in different configurations according to different cartridge or aerosol generation designs. In addition cartridge sizes can also be reduced without comprising the heating apparatus area. This means that the size of the cartridge can be reduced without impairing the aerosol generating properties of the aerosol generating device. It should be understood that the design freedom is improved with regards to the shape and structure of the housing in providing a folded heating

apparatus. Moreover, the spatial efficiency of the heating apparatus may also be enhanced.

[0007] Preferably the electrically conductive material comprises fibres arranged to form a mesh. In this way the heating element also acts as a wick, thereby removing the requirement for an additional wicking element, and reducing the total number of components. This reduces the cost of manufacture and also leads to an improved efficiency of the heating operation. In one example, the mesh may be a sintered mesh with a random arrangement of fibres, preferably steel fibres. The electrically conductive material may be arranged as a woven fabric, such as a mesh, a non-woven fabric, or a bundle of electrically conductive fibres.

[0008] Preferably the at least one fold is across a length or a width of the planar sheet. In this way the space occupied by a heating apparatus within a cartridge can be specifically customised to adapt to cartridge design requirements.

[0009] Preferably the folded planar sheet comprises a concertina shape. In this way multiple folds are provided in a heating apparatus sheet such that space or volume within a cartridge can be optimally utilised. Each fold in a planar sheet may result in a local hotspot, and multiple folds in a sheet to create a concertina shape, or zig-zag shape, which in use provides multiple regions of higher temperature. It should therefore be understood that the folded sections and unfolded sections can be arranged to provide controlled temperature gradients throughout the heating apparatus. Temperature gradients across a heating apparatus provide improved transport of liquid, i.e. wicking function, via capillary action.

[0010] Preferably the planar sheet further comprises one or more slots extending inwardly from at least one of each side of the planar sheet. Preferably the slots are arranged such that the planar sheet comprises a square-wave shape, in other words the sheet has a meandering, zig-zag, periodic or serpentine shape, or that the sheet preferably follows a serpentine / meandering path. In this way a meandering current path may be provided an electrical current travels along the sheet, resulting in different concentrations of current along the length of the heating element. In use, areas of relatively high current density will become hotter than areas of relatively low current density, thus establishing a temperature gradient across the heating element. The temperature distribution of the heating element can therefore be controlled by varying the structure or pattern of the heating element such that different zones or regions of the heating element have different material densities such that the current flows along a meandering or square-wave pattern between the two contact points of an aerosol generation device.

[0011] Preferably the at least one pair of slots are arranged such that each slot in the pair extends toward the other. In this way the planar sheet can be more easily folded along a pair of slots. The current density or temperature distribution of the sheet can also be customised taking into account the pair of slots since the increased

current density due to a fold can be counter-balanced by the size of the slot in the sheet.

[0012] Preferably the planar sheet further comprises one or more holes, and wherein the at least one fold is arranged across a hole. Preferably each hole is positioned between each pair of slots. In this way the holes can also allow a sheet to be folded more easily, as well as allowing the current / temperature distribution of a heating apparatus to be better controlled by providing different material densities across the heating element, for example.

[0013] Preferably the heating apparatus further comprises a support positioned along a fold in order to provide structural stability to the planar sheet. In this way a more robust structure is provided which is less prone to damage. The planar sheet is arranged to "fold over" or drape over the support such that the two sections of the planar sheet on either side of the fold do not come into contact.

[0014] Preferably the support comprises two contact points arranged to allow a current to be applied to the support. In this way the support can act as a heating rod which is configured to heat to the fold portion of the planar sheet in contact with the support. A solid electrically conductive rod may provide a more consistent and reliable heating operation along the length of the heating element. A temperature gradient will also be provided from the fold portion of the planar sheet in contact with the support to the edge of the planar sheet (which is preferably used as a wicking element). Providing a temperature gradient in the planar sheet may improve the wicking function of the heating element. In one example, each sheet of heating material is folded longitudinally about a respective fold line such that the fold line is parallel to the length of a housing of a cartridge, and at least one support structure is provided along each fold line and extends along the length of the housing adjacent to the fold line.

[0015] Preferably the support is u-shaped and the planar sheet is folded over the support. In this way the support generates heat by receiving electrical energy from the aerosol generation device between electrical contacts arranged at either end of the u-shaped support. The generated heat can then be conducted to the portion of the planar sheet which is in contact with the support and a temperature gradient is provided between this heated portion and the edges of the planar sheet.

[0016] In some examples the heating apparatus may comprise an induction heater, where the heating apparatus is made from a material which can generate heat by induction heating such as iron or its alloys. In another example the support may be configured to be inductively heated and the one or more planar sheets are arranged to generate heat by receiving heat from the support via conduction. This means that the portion or region of a sheet in contact with, or in close proximity to, (e.g. a central portion or a folded portion of a sheet) the inductively heated support will receive more heat, thereby creating a temperature gradient across the sheet (e.g. between

a folded / central portion of a sheet and a edge of the sheet in contact with a liquid store).

[0017] Preferably the heating apparatus further comprises a heating element housing having one or more gaps, the housing configured to accommodate the one or more planar sheets within the housing; and a liquid store arranged outside of the heating element housing, wherein at least a portion of each sheet is arranged so as to interface with the liquid store through the one or more gaps. In this way the portion of a sheet, for example an edge, can act as a wick end and draw liquid from a liquid store surrounding the housing into the heating apparatus. The size of the gap and the thickness of the one or more sheets may be controlled to such that an edge of the sheet is positioned within the gap or just outside of the gap (i.e. beyond the outer boundary of the housing). Alternatively a portion of each sheet may be pressed against a gap in the housing such that any liquid that passes through the gap from the liquid supply or store is absorbed onto the sheet and wicked through the remainder of the sheet to be heated / generate an aerosol.

[0018] According to another aspect of the invention there is provided a method for making the heating apparatus of the present disclosure, comprising: providing one or more planar sheets of electrically conductive material; and folding the one or more planar sheets. According to another aspect of the invention there is provided a cartridge for an aerosol generation device, comprising the heating apparatus according to the present disclosure. According to another aspect of the invention there is provided an aerosol generation device, comprising: the heating apparatus according to the present disclosure.

Brief description of the drawings

[0019] Embodiments of the invention are now described, by way of example, with reference to the drawings, in which:

Figure 1 is a schematic view of a known heating element for an aerosol generation device;

Figure 2A is a cross-sectional side view of a cartridge comprising a heating apparatus in a first embodiment of the invention;

Figure 2B is another cross-sectional side view of the cartridge comprising the heating apparatus in the first embodiment of the invention;

Figure 2C is a cross-sectional end view of the cartridge comprising the heating apparatus in the first embodiment of the invention;

Figure 3A is a schematic view of an unfolded heating element in a second embodiment of the invention;

Figure 3B is a schematic view of an unfolded heating

element in a third embodiment of the invention;

Figure 3C is a schematic view of an unfolded heating element in a fourth embodiment of the invention;

Figure 3D is a schematic view of an unfolded heating element in a fifth embodiment of the invention;

Figure 4A is a cross-sectional view of a cartridge comprising a heating element in a sixth embodiment of the invention;

Figure 4B is a cross-sectional view of a heating element in a seventh embodiment of the invention;

Figure 4C is a cross-sectional view of a heating element in an eighth embodiment of the invention;

Figure 4D is a cross-sectional view of a heating element in a ninth embodiment of the invention;

Figure 5A is a cross-sectional view of a cartridge comprising a heating element in a tenth embodiment of the invention; and

Figure 5B is a side view of the heating element in the tenth embodiment of the invention.

Detailed description

[0020] Figure 1 shows a heating element 2 in the art, which includes an electrically conductive mesh 4 having two contact ends 6 and 8 which are connected to a power source (not shown). The mesh 4 provides a wicking function to the heating element 2 by drawing liquid from a reservoir by capillary action such that the surface of the mesh 4 is wetted with the liquid. In use an electric current passes through the heating element 2 between the contact ends 6 and 8, which causes the mesh 4 to generate heat by resistive heating. The heating element 2 also includes a plurality of slots 10 in the mesh 4, which are arranged to cause an electric current to follow a serpentine path as it flows between the two ends 6 and 8. The liquid on the surface of the mesh 4 is subsequently heated by the mesh 4 to form an aerosol for inhalation.

[0021] Figure 2A and 2B show cross-sectional side views of a cartridge 20 comprising a heating element 22 having a first contact end 24 and a second contact end 26 in a first embodiment of the invention. The first contact end 24 and the second contact end 26 are positioned at opposite ends of the cartridge 20 and held in place by a first electrode clamp 28 and a second electrode clamp 30 respectively. The first and second electrodes or electrode clamps 28, 30 are configured to deliver electrical energy from a power source to the heating element 22 in the cartridge 20. Different arrangements of the heating element 22 in a cartridge 20 and different configurations of positioning and fastening the contact ends 24, 26 in

place would be readily apparent to a person skilled in the art. For example, the contact ends may each include a hole for a screw or plug to pass through and be held in a matching screw thread or plughole. In other examples the heating element may be inductively heated and therefore electrical contact ends would not be required. The cross-sectional view of the cartridge 20 in Figure 2B is rotated by 90° from the cross-sectional view in Figure 2A, where Figure 2B also shows the cartridge 20 placed in a liquid store 40 where an aerosol generating liquid provided within the liquid store 40 is able to interact with the edges of, and be wicked onto (in the directions depicted by the arrows), the heating element 22 for aerosol generation. The cartridge 20 is also configured to allow aerosol generated by the heating element 22 to be inhaled by a user through a mouthpiece 42 of an aerosol generation device. Figure 2C shows a further cross-sectional end view of the cartridge 20 in the first embodiment provided in the liquid store 40.

[0022] It should be understood that, in use, the liquid will flow from the sides, or edges, of the heating element in direct communication with an e-liquid (aerosol generating liquid) in the liquid store and be wicked toward the centre of the heating element by capillary action. A temperature gradient is provided in the heating element to improve the wicking process and optimise aerosol generation. The temperature gradient occurs when there are zones or areas in the heating element with reduced material densities. The reduced material densities can be obtained by having, for example, a flat electrical conductive element with hole/slots distributed in the element, wherein the distance between two holes/slots is reduced compared to the remaining part of the element. Therefore a higher material density zone is provided at the sides or edges of the heating element and a lower material density zone is provided toward or at the central region of the heating element. This means that the edges of the heating element will be cooler than the central reduced material density zone of the heating element. A heating element may be shaped, patterned or otherwise designed in a way to provide these different material density zones in order for a temperature gradient to form during use. Different heating element patterns are shown by way of example in Figures 3A, 3B, 3C and 3D.

[0023] It should also be understood that components in the e-liquid with a lower temperature of evaporation will heat first at the edges of the heating element, followed by components in the e-liquid with higher evaporation temperatures which will be vaporised when they reach central areas or zones in the heating element which exhibit higher temperatures. In this way the temperature operation of the device can be lowered, which improves the heat distribution and optimises the vaporization, meaning that finer droplets particles are generated.

[0024] The heating element 22 in Figure 2A is depicted as a cross-sectional edge view, and is shown having six folds 32 between the first contact end 24 and the second contact end 26 to provide a zig-zag pattern or meandering

/ concertina shape across its cross-section. It should be understood that the heating element 2 of Figure 1, or the heating elements described with reference to Figures 3A, 3B, 3C and 3D may be folded to provide the heating element in Figure 2A. This means that as an electric current travels through the heating element 22, it flows along a meandering or square-wave pattern between the two contact points in two planes, where the first meandering plane is associated with the slots 10 or holes in the heating element 22 and the second meandering plane is associated with the folds 32 in the heating element 22. As the electric current travels along the sheet, different concentrations of current would be provided along the length of the heating element, which means that the temperature distribution of the heating element can also be controlled by varying the structure of the heating element. In use, areas of relatively high current density will become hotter than areas of relatively low current density, thus establishing a temperature gradient across the heating element. Therefore it should be understood that the temperature distribution of the heating element can be controlled by varying the structure of the heating element 22 and its folded arrangement in the cartridge 20 such that the current flows along a meandering or square-wave pattern between the contact points 24, 26 across two planes / axes.

[0025] The heating element 22 is mounted in the heater cradle 34, between an upper cradle part 36 and a lower cradle part 38. The cradle 34 acts as a vaporisation chamber which is configured to collect generated aerosol within the inner spaces of the two cradle parts 36, 38. One or more airflow channels (not shown) is also provided in the heater cradle 34, where the airflow channel is configured to, on user inhalation, direct air from outside the cartridge 20 through the channel and toward a mouth end of an aerosol generation device.

[0026] One or more edges of the heating element 22 is exposed to a liquid store 40 which surrounds the heater cradle 34 and the heating element 22, as shown in Figures 2B and 2C. The edges of the heating element 22 may extend beyond the outer limits of the heater cradle 34, or alternatively the upper and lower cradle parts 36, 38, when constructed, form a gap between the two cradle parts which allows aerosol generating liquid from the liquid store to come into contact with the heating element edge, whereby the liquid is drawn further across the heating element 22 via capillary action.

[0027] Figures 3A, 3B, 3C and 3D show different configurations of a heating element according to the present invention, where patterns are used to provide different zones of material densities in order to create temperature gradients across the heating element. The heating elements in Figures 3A to 3D include a mesh and holes and/or slots to control the flow path of an applied electric current.

[0028] Figures 3A and 3B show a heating element 50 having a mesh 52, a plurality of slots 54 and a plurality of holes 56 within the central portion of the 52. Similar to

the heating element 2 in the art, the mesh 52 is configured to provide a wicking function to the heating element 50. The sides or edges of the heating element 50 are configured to be in contact with aerosol generating liquid in a liquid store, and have higher material densities than the central zone or region of the heating element 50. The plurality of slots 54 are arranged as pairs of slots, where the slots in a pair are oppositely arranged along the length of the heating element 50. In Figure 3A each hole 56 is positioned in the middle portion of the mesh 52 between a pair of slots, where the distance between holes 56 is smaller at the central section of a hole to provide reduced material densities toward the central zone of the heating element 50. In Figure 3B the holes 56 and the slots 54 are provided in an alternating pattern along the length of the heating element 50. It can be seen in Figure 3B that the central region of the heating element 50 also has reduced material densities compared to the edges of the heating element 50.

The heating element 50 in Figure 3A can be folded across its width along one or more fold lines 58 such that a portion of mesh 52 is folded across a pair of slots and a corresponding hole. Each pair of slots and corresponding hole can be folded inwardly or outwardly in an alternating manner along the length of the heating element 50 such that a zig-zag pattern or concertina shape is formed by the folded heating element 50. In Figure 3A a flowing current will follow a meandering path as it flows along a heating element which is folded inwardly and outwardly along fold lines 58 in an alternating pattern.

[0029] In Figure 3B a flowing current will follow a meandering or square-wave path as it travels across the heating element 50 such that it flows around one or more holes 56 and through one or more pairs of slots 54. An additional flow direction is introduced when the heating element 50 in Figure 3B is folded across its width along one or more fold lines 58. In other words an additional longitudinal or lateral current flow direction is introduced when the heater is folded. The mesh 52 in Figure 3B can be folded across a pair of slots 54 or across a hole 56 or at both the slots and the holes. Similar to the arrangement in Figure 3A, the heating element 50 can be folded inwardly and outwardly in an alternating fashion.

[0030] Alternatively the heating element 50 in Figures 3A and 3B can also be folded lengthways along fold line 60 to form a longitudinal fold along the heating element. In this way each of the holes in the plurality of holes 56 are folded. Longitudinally folded heating elements are described in further detail below by way of reference to Figures 4A to 4D.

[0031] Figure 3C shows a heating element 70 that is similar to the heating element 50 in Figure 3A, except the heating element 70 in Figure 3C does not include slots and the plurality of holes 72 in the heating element 70 have different shapes and arranged differently to the example in Figures 3A and 3B. As above the heating element 70 includes a mesh 74 to provide heating and wicking functions, and the heating element 70 can also

be folded across lateral fold lines 76 inwardly or outwardly in an alternating manner to provide a concertina shape or folded across a longitudinal fold line 78. The plurality of holes are provided in the heating elements to control the electric current flow and also allow the mesh heating element to be more easily folded. The holes 72 are positioned close to each other across the heating element 70 such that a narrow portion of mesh 74 is provided between holes 72 in order to provide reduced material densities at the central region of the heating element 70 in order to create a temperature gradient from the edge of the heating element to its central zone. It should be understood that each zone (i.e. area within the heating element) with a reduced distance between holes is subject to higher current density in such a way that when current flows through the heating element, the temperature will be higher in each zone.

[0032] Figure 3D shows another heating element 90 according to the present invention. The heating element 90 includes discrete mesh portions 92. Each mesh portion 92 has a substantially hourglass shape or two opposing and partially overlapping triangles such that adjacent mesh portions form a diamond-like shaped hole 96 therebetween. The heating element 90 further comprises wires 98 configured to connect the plurality of mesh portions 92 together and to electrical contacts in a cartridge. The wires 98 are optional as it should be understood that the mesh portions may also be connected by overlapping a portion of the mesh portions (e.g. corner portions of adjacent mesh portions). Again, as above, the mesh portions 92 provide heating and wicking functions, and the heating element 90 can be folded across lateral fold lines 100 inwardly or outwardly in an alternating manner to provide a zig-zag / concertina shape or folded across a longitudinal fold line 102. In other example the wires 98 may be inductively heated and the mesh portions 92 receive heat energy from the wires via thermal conduction.

[0033] Figures 4A, 4B, 4C and 4D show cross-sectional end views of heating apparatuses according to the invention. Each heating apparatus in figures 4A to 4D show one or more folded heating elements and one or more supports provided in a heater cradle comprising multiple cradle sections.

[0034] Figure 4A shows a heating apparatus 110 having a heater cradle 112 comprising multiple cradle parts 112a, 112b, 112c and 112d that are configured to form a substantially circular arrangement with gaps 116 provided between adjacent ends of each cradle part. A first longitudinally-folded heating element 114 is arranged within the heater cradle 112 such that the outer edges of the first heating element 114 are positioned toward or between gaps 116 between cradle parts 112a and 112b, and 112d and 112a such that the outer edges are exposed to a liquid store surrounding the heater cradle 112 and can provide a wicking function to the heating element 114 via capillary action. A second longitudinally-folded heating element 118 is arranged in a similar way in the

heater cradle 112 such that the outer edges of the second heating element 118 are positioned toward or between gaps 116 between cradle parts 112b and 112c, and 112c and 112d. The heater cradle 112 acts as a vaporisation chamber in which generated aerosol is collected within the cradle 112 and travel along airflow channels 120 in the cradle 112 toward a user's mouth.

[0035] The heating apparatus 110 further comprises supports 122 where the each support 122 is arranged along at least a portion of the longitudinal fold of the first and/or second heating element 114, 118. In other words there is a support 122 provided along a portion of the inner fold line of the first heating element 114, and another support 122 provided along a portion of the inner fold line of the second heating element 118, as well as supports 122 provided along the outer fold lines of the first and second heating elements 114, 118.

[0036] The supports 122 are configured to provide structural support to a heating element 114, 118 such that the heating element maintains its position in the heater cradle 112 and does not deform or lose shape across its length. For example the support 122 provide along an inner fold line prevents a heating element from fully folding on itself. Therefore it should be understood that the supports 122 have a higher rigidity than the heating element. This can be achieved by providing a solid support structure having a greater thickness than the heating element, or the support may be made from a material with higher tensile properties than the material used for the heating element and therefore would be more rigid than the heating element.

[0037] Optionally the supports 122 can also be configured to receive electrical energy and generate heat by resistive heating. An electrically heated support can then transfer heat to the heating elements 114, 118 by conduction such that the folded sections of the heating elements are hotter than the outer edges of the heating elements 114, 118 which draw an aerosol forming liquid from the surrounding liquid store, thereby providing a temperature gradient across the heating elements. Alternatively the heating elements 114, 118 are also electrically heated and the electrically heated supports 122 are used to provide additional heat energy and temperature distribution control to the heating apparatus 110. In other examples the supports 122 can be inductively heated, such that the supports 122 respond to an alternating magnetic field by generating eddy currents and where the flow of the eddy currents through the resistance of the inductive material causes heat to be generated.

[0038] Figure 4B shows another heating apparatus 130 having a heater cradle 132, three supports 134 and a single heating element 136. The heater cradle 132 comprises six cradle parts that are configured to form a substantially circular arrangement with a gap 138 provided between adjacent cradle parts. The gaps 138 are configured to allow the heating element 136 to pass through and be exposed to a surrounding liquid store. The three supports 134 are provided within the heater cradle 132

in a triangular formation toward the centre of the heater cradle cross-section. It should be clear that alternative cross-sectional shapes can be used for the heater cradle, such as rectangular or triangular.

[0039] The heating element 136 comprises a single planar heating mesh sheet which has eight folds 140, where the heating element 136 is folded inwardly and outwardly in an alternating manner such that the heating element 136 is threaded through the gaps 138 and around one of the three supports 134 in a meandering path. The heating element 136 is also arranged such that edges of the mesh sheet are brought together at a closure line 142. Passing the heating element 136 through the gaps 138, around the supports 136, and bringing the edges of the heating element 136 together at closure line 142 mean that the heating element 136 forms a clover-shape. The supports 134 provide structural support to the heating element 136 and allow the heating element to maintain its shape. Alternative shapes and configurations would be readily available to a skilled person. Airflow channels 144 are provided in the heater cradle 132 such that generated aerosol is collected within the cradle 112 and is able to travel along airflow channels 120 in the cradle 112 toward a user's mouth.

[0040] In this embodiment, the supports 134 receive electrical energy to be resistively heated thereby providing a central region of heat in the heating apparatus 130, and the heating element 136 is configured to be conductively heated by receiving heat generated by the supports 134. In this way the temperature distribution is better controlled and local temperature gradients from the central region of the heating apparatus 130 to outer surface of the heater cradle 132 and the portions of the heating element 136 in direct exposure to a surrounding liquid store can be easily formed.

[0041] Figures 4C and 4D show alternative embodiments of heating apparatuses, similar to the heating apparatus 110 described with reference to Figure 4A. In Figure 4C the heating apparatus 150 comprises a single support rod 152 which is positioned along the outer fold lines of a first longitudinally-folded heating element 154 and a second longitudinally-folded heating element 156. As explained above the support rod 152 may be configured to provide heat to the portion of the heating elements 154, 156 in contact or in close proximity to the support rod, thereby allowing temperature gradients to be provided in the heating elements and optimise wicking through the heating elements. Alternatively Figure 4D shows a heating apparatus 160 having a first longitudinally-folded heating element 162 and a second longitudinally-folded heating element 164 which are configured to receive electrical energy and generate heat. A support rod 166 is positioned along the outer fold of the first and second heating elements 162, 164 and can be welded to the heating elements to provide a more robust structure.

[0042] Figures 5A and 5B show schematic views of a cartridge 200 in another embodiment of the invention.

The cartridge 200 comprises a casing 202, a cradle 204, a support rod 206, a heating element 208, a liquid store 210 and an airflow channel 212.

[0043] The cradle 204 comprises an upper cradle section 214 and a lower cradle section 216 which are arranged in the cartridge 200 to form a gap 218 therebetween. The interfacing surfaces of the cradle sections 214, 216 preferably each have a tapered portion which provides support to the portions of the heating element 208 positioned in the gap 218. The heating element 208 is therefore held between the gaps 218 such that the edges of the heating element 208 are exposed to the liquid store 210 and can wick aerosol forming liquid onto the body of the heating element 208 by capillary action.

[0044] The upper cradle section 214 provides a hollow space within which acts as a vaporisation chamber 220 that collects aerosol generated by the heating element 208. A portion of the support rod 206 is also arranged within the vaporisation chamber 220, such that the heating element 208 is folded at least once from a first gap 218 to be brought toward the support 206 and where the heating element 208 is folded or draped over the support 206 such that it is further brought toward the second gap 218 between the cradle sections 214, 216.

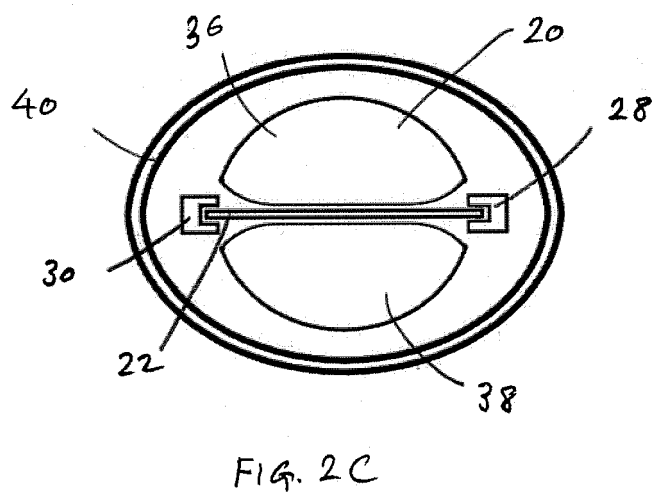
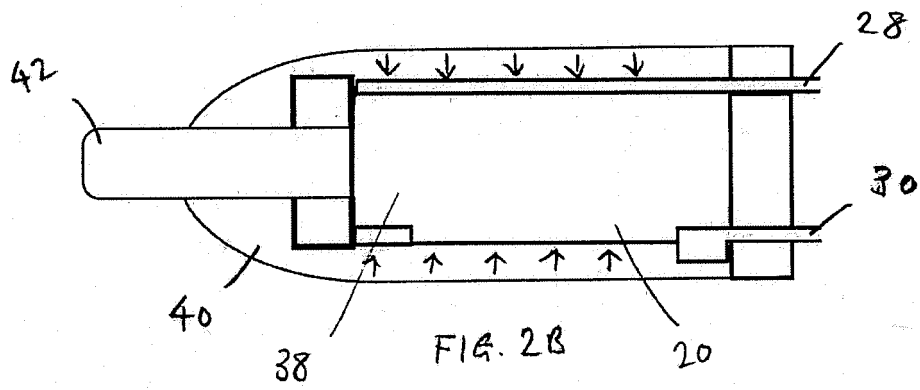
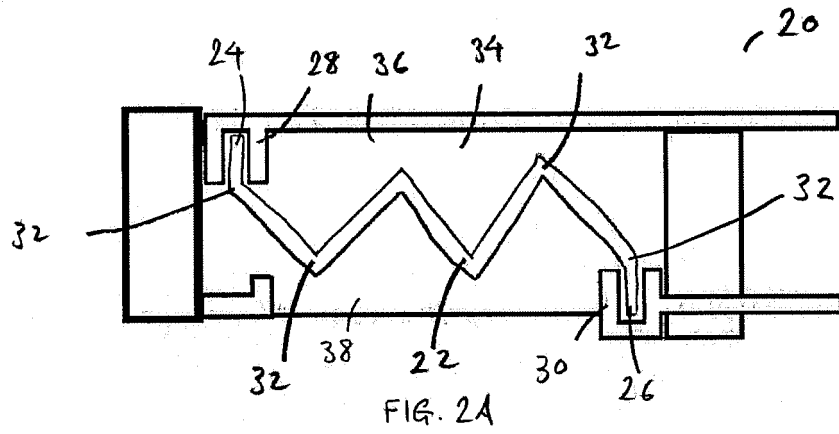
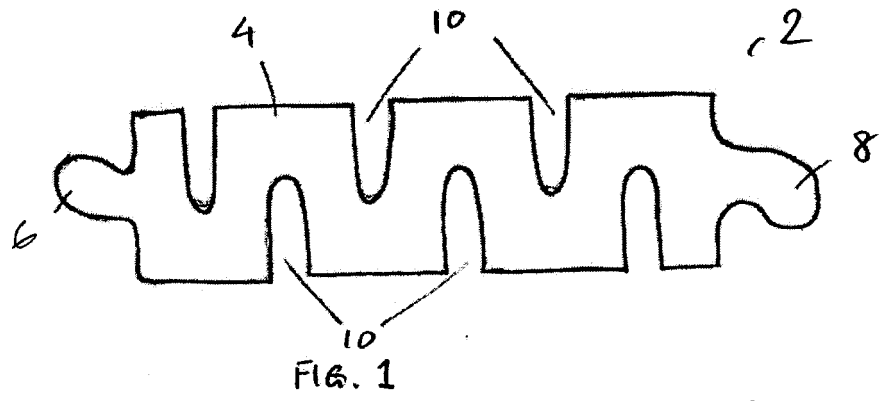
[0045] The support 206 generates heat by receiving electrical energy from electrical contacts 222 provided at the ends of the support 206, which are connected to a power source in an aerosol generation device. As can be seen in Figure 5B the support 206 can be U-shaped or horseshoe shaped such that the electrical contacts 222 can be arranged at a same side of the cartridge 200. However it should be clear that the support 206 can be another shape.

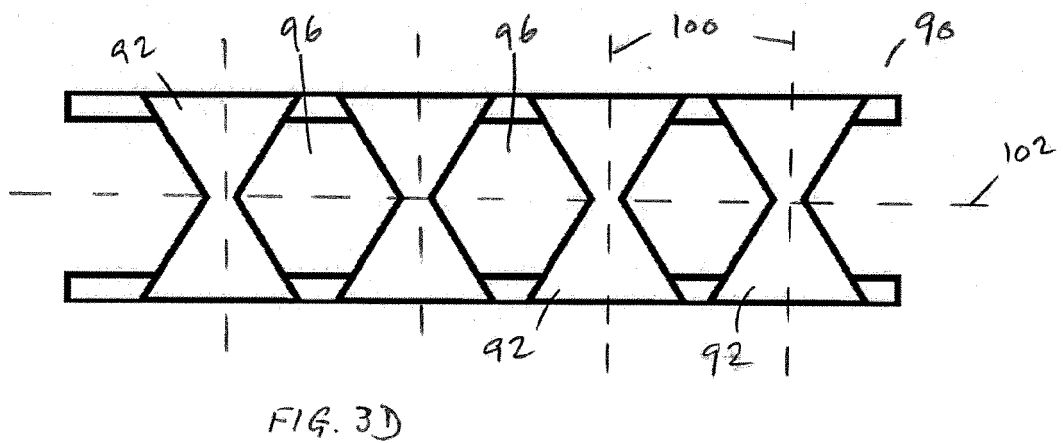
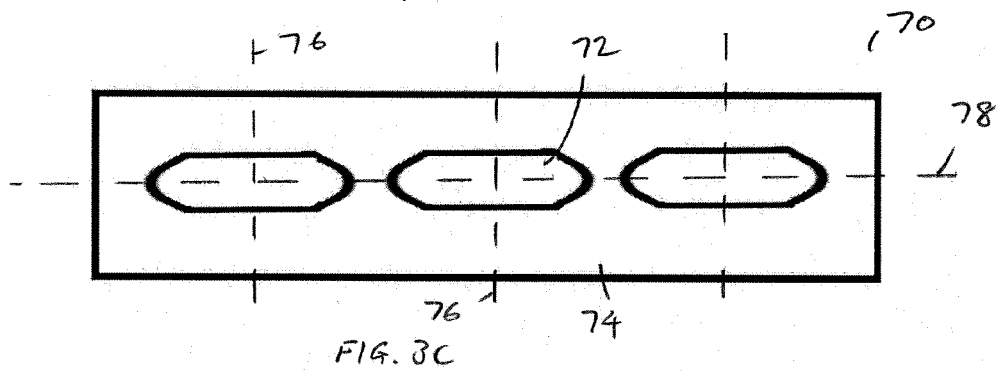
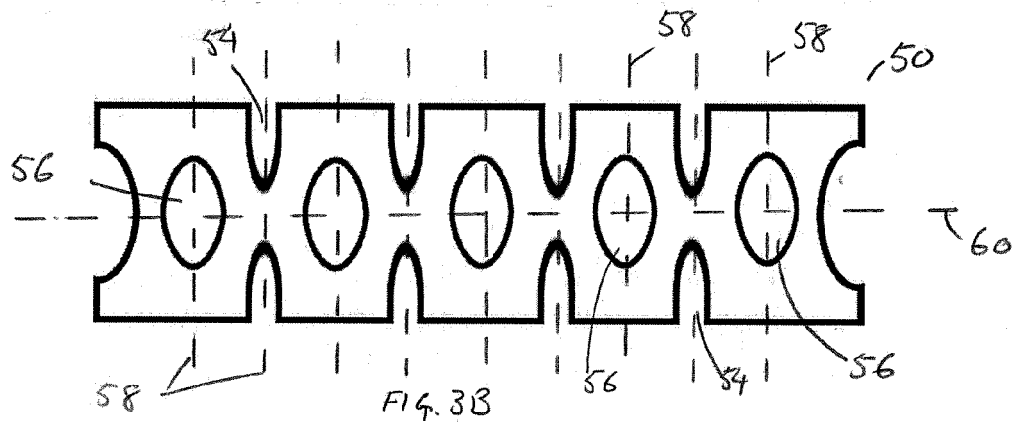
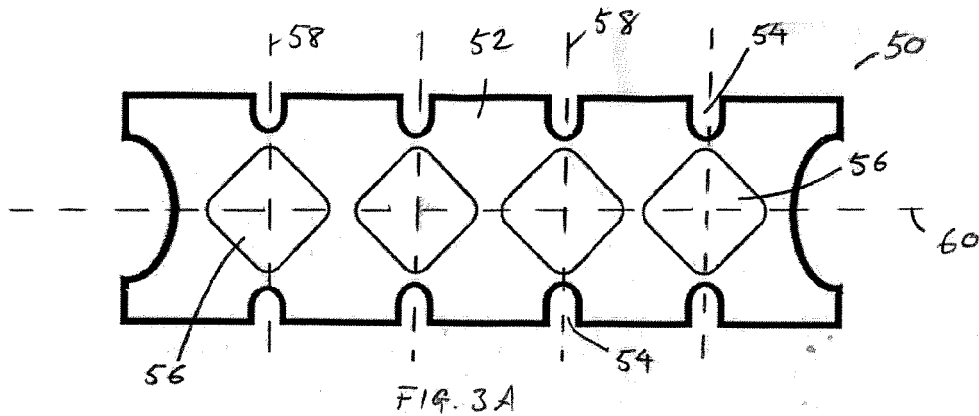
[0046] The portion of the heating element 208 in contact, or draped over, the support 206 is configured to be heated by the support 206 by conduction. Therefore a temperature gradient is provided across the heating element 208 where the edges of the heating element 208 (in contact with the liquid store 210) are cooler than the central portion of the heating element 208 in contact with the support 206. This optimises the wicking function of the heating element 208 and also ensures that most of the aerosol is generated within the vaporisation chamber 220, where in use, air travels along the airflow channel 212 and carries generated aerosol out of the cartridge 200 and toward a user's mouth.

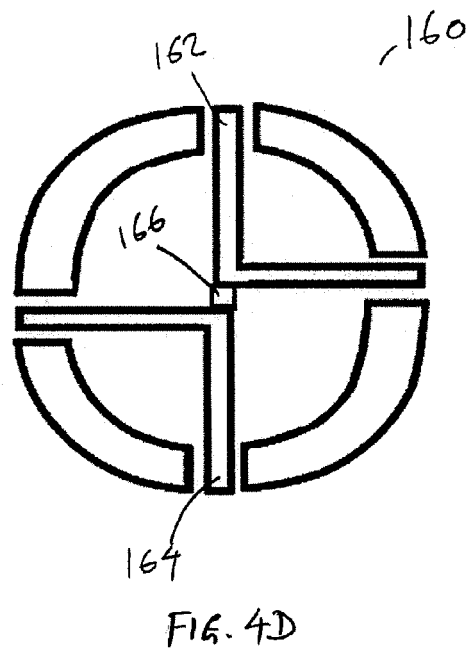
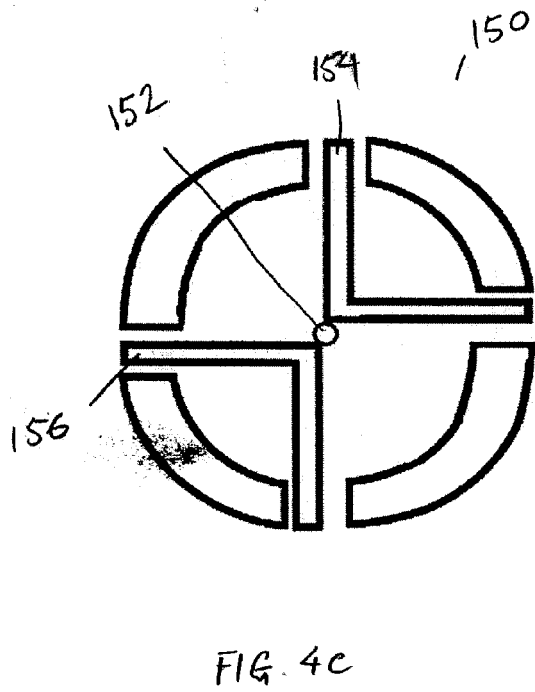
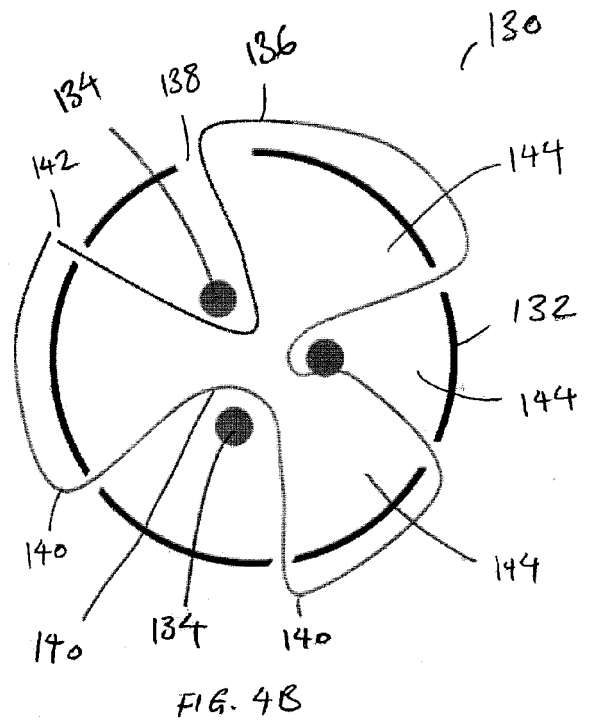
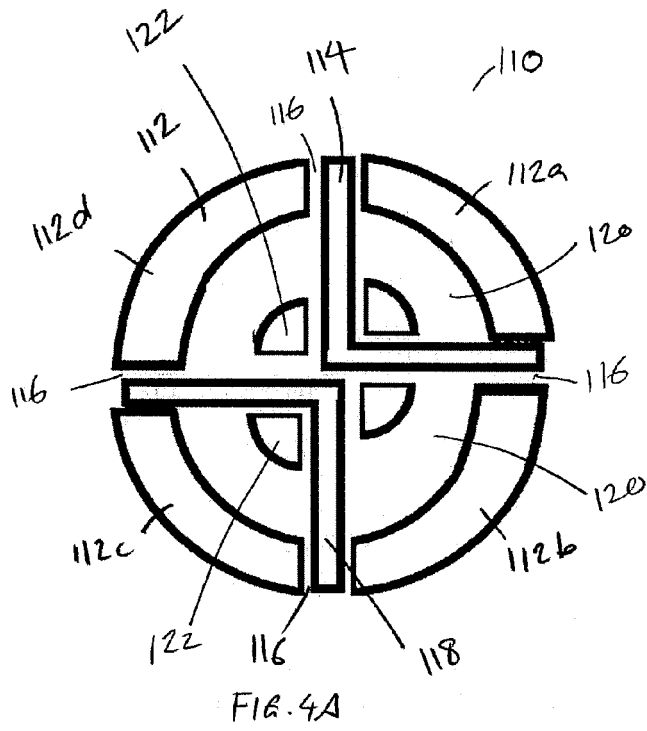
Claims

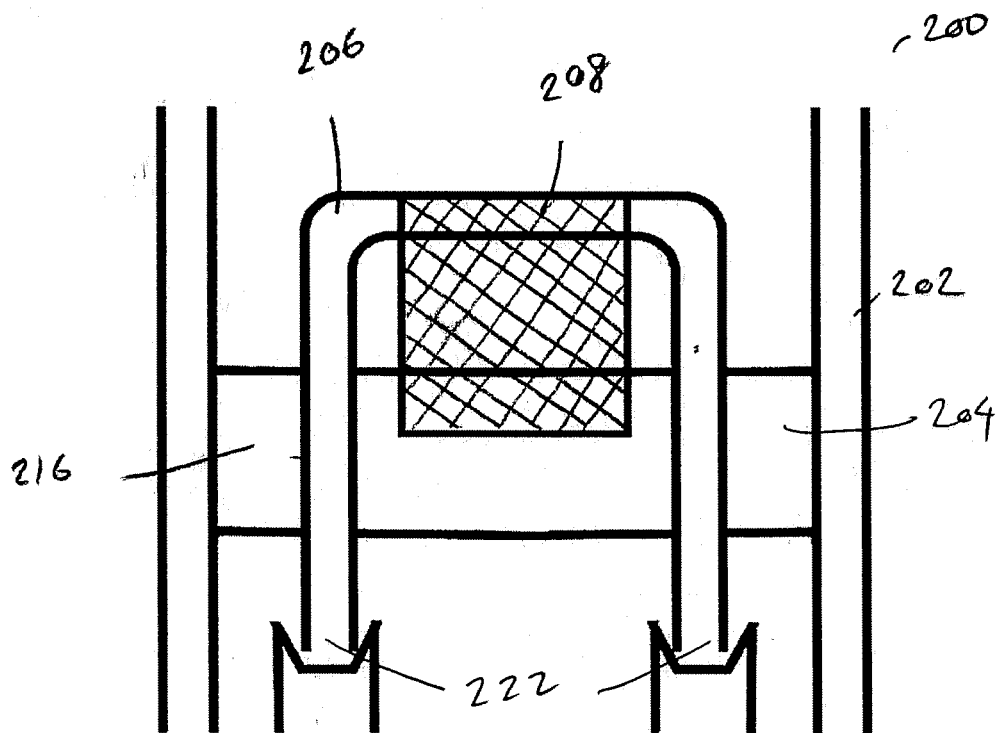
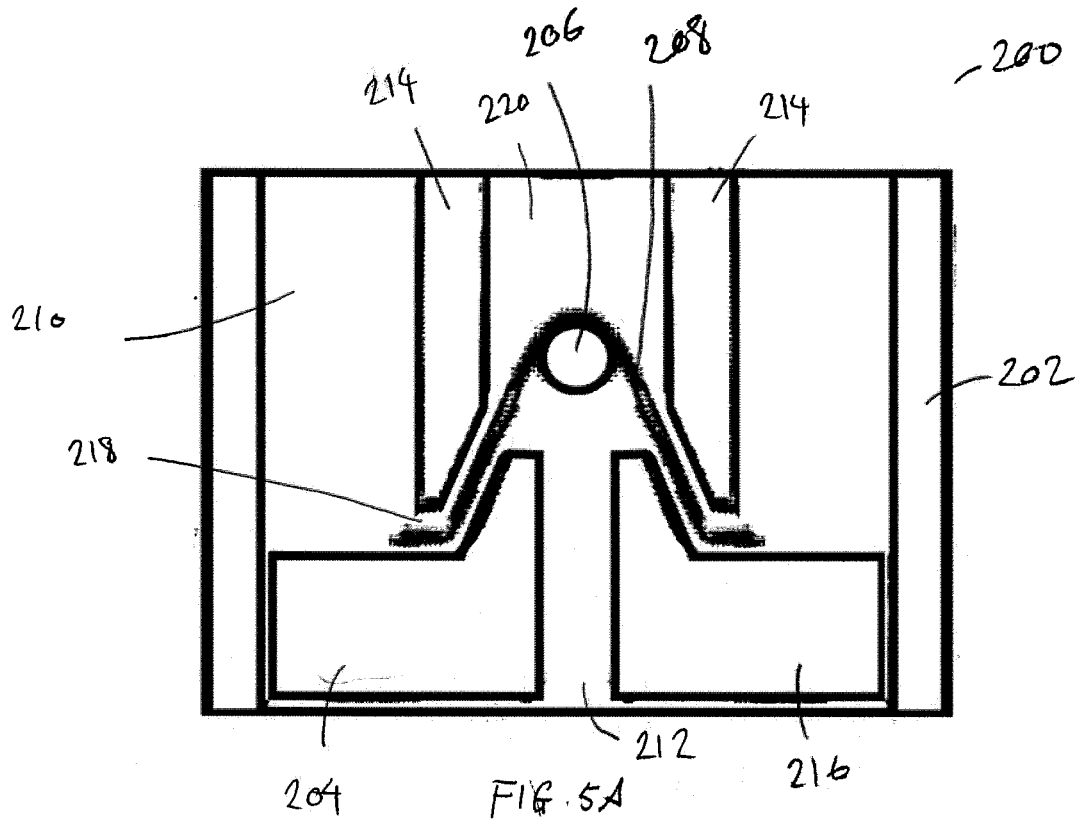
1. A heating apparatus for an aerosol generation device, the heating apparatus comprising: a heating element comprising one or more planar sheets of electrically conductive material, each comprising at least one fold, where the planar sheet is configured to transport liquid by capillary action in use.

2. The heating apparatus according to claim 1 wherein the electrically conductive material comprises fibres arranged to form a mesh.
3. The heating apparatus according to claims 1 or 2 wherein the at least one fold is across a length or a width of the planar sheet.
4. The heating apparatus according to claims 1, 2 or 3 wherein the folded planar sheet comprises a concertina shape.
5. The heating apparatus according to any of claims 1 to 4 wherein the planar sheet further comprises one or more slots extending inwardly from at least one of each side of the planar sheet.
6. The heating apparatus according to claim 5 wherein the slots are arranged such that the planar sheet comprises a square-wave shape.
7. The heating apparatus according to claim 5 wherein the at least one pair of slots are arranged such that each slot in the pair extends toward the other.
8. The heating apparatus according to any of the preceding claims wherein the planar sheet further comprises one or more holes, and wherein the at least one fold is arranged across a hole.
9. The heating apparatus according to claims 7 and 8 wherein each hole is positioned between each pair of slots.
10. The heating apparatus according to any of the preceding claims further comprising a support positioned along a fold in order to provide structural stability to the planar sheet.
11. The heating apparatus according to claim 10 wherein the support comprises two contact points arranged to allow a current to be applied to the support.
12. The heating apparatus according to claim 10 wherein the support is u-shaped and the planar sheet is folded over the support.
13. The heating apparatus according to any of the preceding claims further comprising:
 - a heating element housing having one or more gaps, the housing configured to accommodate the one or more planar sheets within the housing; and
 - a liquid store arranged outside of the heating element housing, wherein at least a portion of each sheet is arranged so as to interface with the liquid store through the one or more gaps.
14. A cartridge for an aerosol generation device comprising the heating apparatus according to any of the claims 1 to 13.
15. An aerosol generation device comprising the heating apparatus according to any of claims 1 to 13.











EUROPEAN SEARCH REPORT

Application Number
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