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(54) **HEATING APPARATUS FOR AN AEROSOL GENERATING DEVICE**

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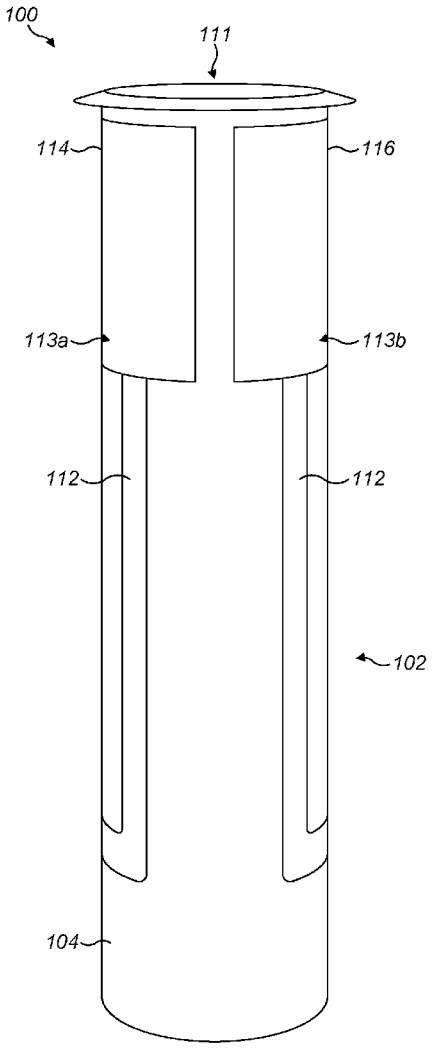
(57) **ABSTRACT**

A heating apparatus for an aerosol generating device includes an insulator including an inner wall and an outer wall that are separated from one another, a cavity in which an aerosol forming substance can be received, positioned adjacent the inner wall of the insulator, a heater provided inside the insulator on the inner wall, configured to heat an aerosol forming substance received in the cavity by thermal conduction to generate an aerosol, and a first connection pad provided on the inner wall, configured to electrically connect the heater to a power source. The first connection pad is joined to the outer wall and the inner wall to seal the insulator, and the heater is spaced apart from the outer wall. The first connection pad at least partially covers the heater to provide a protective layer over the heater.



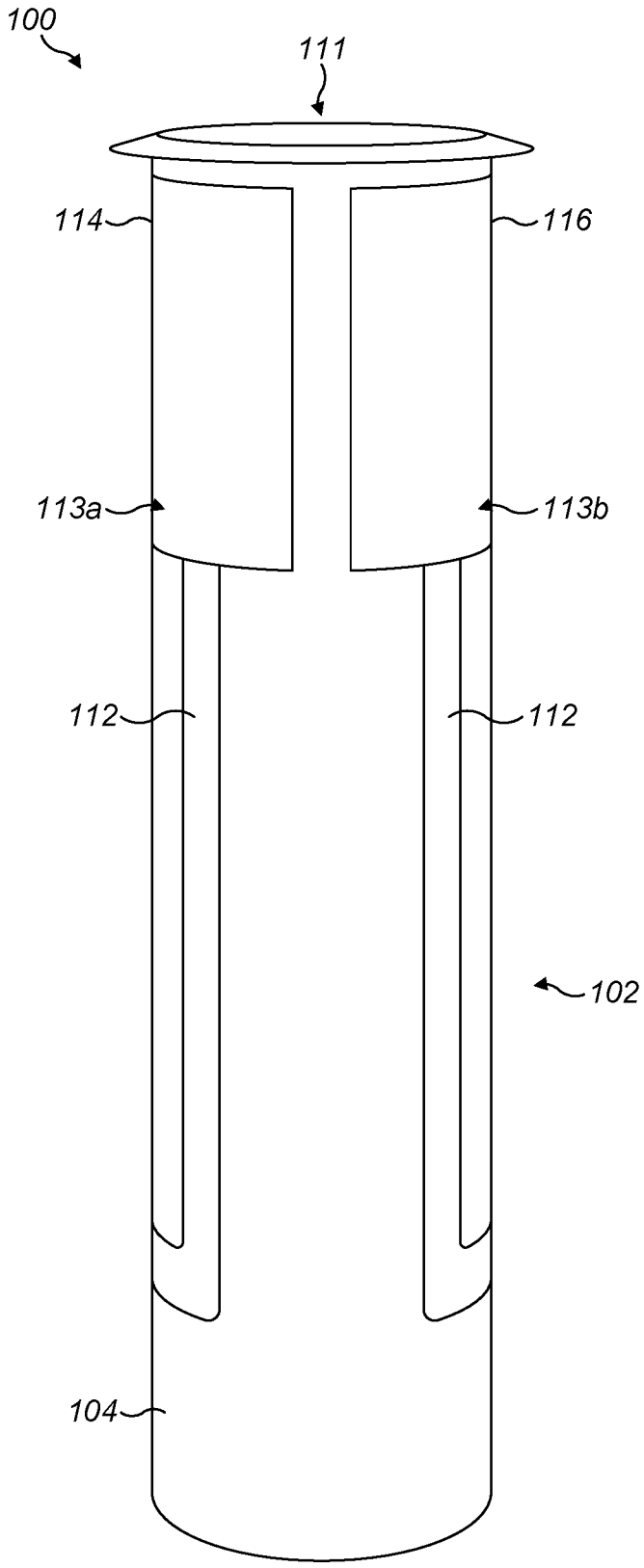


FIG. 1

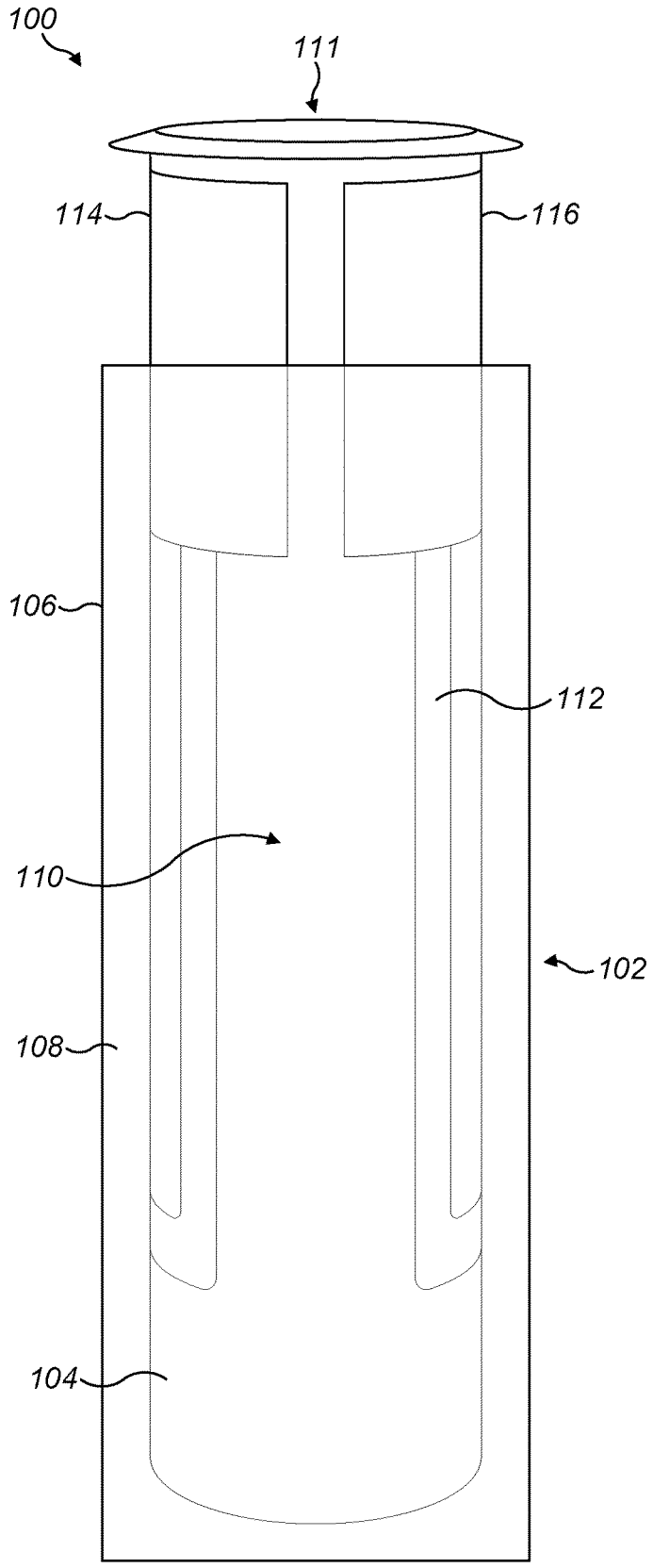


FIG. 2

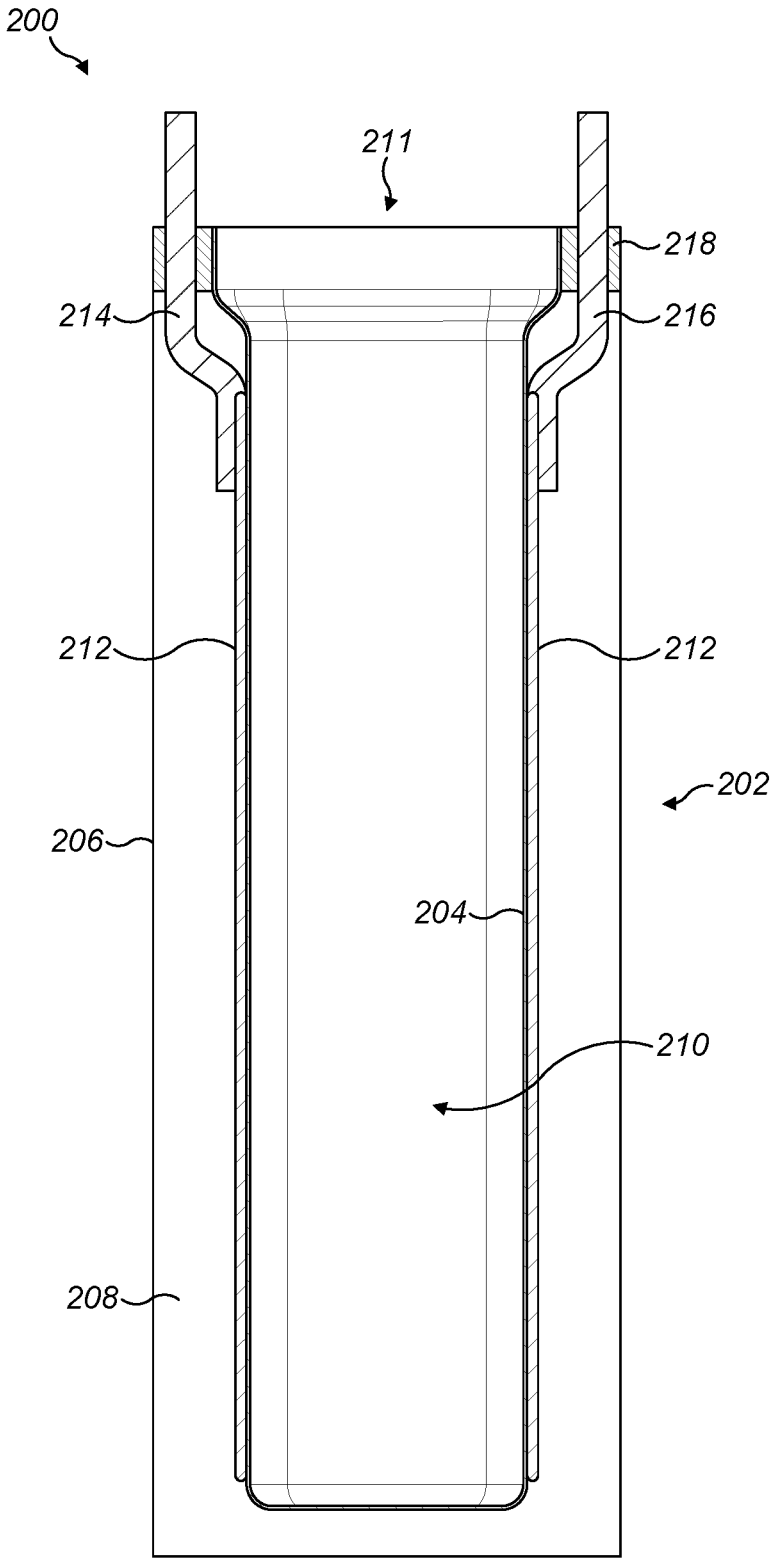


FIG. 3

HEATING APPARATUS FOR AN AEROSOL GENERATING DEVICE

FIELD OF INVENTION

[0001] The invention relates to a heating apparatus for an aerosol generating device. Specifically, the invention relates to a heating apparatus with a vacuum insulator.

BACKGROUND TO THE INVENTION

[0002] Heating apparatuses for aerosol generating devices often have heaters that can become damaged during use or manufacturing, especially when these heaters are provided together with a vacuum insulator. Accordingly, there is a demand for more robust heating apparatuses. It is also desirable that aerosol generating devices can be made as efficient as possible, so that the battery life can be extended and thus the convenience for the user can be increased. It is an object of the present invention to address these demands.

SUMMARY OF INVENTION

[0003] According to a first aspect of the invention, there is provided a heating apparatus for an aerosol generating device, comprising: an insulator, comprising an inner wall and an outer wall that are separated from one another; a cavity in which an aerosol forming substance can be received, positioned adjacent the inner wall of the insulator; a heater provided inside the insulator on the inner wall, configured to heat an aerosol forming substance received in the cavity by thermal conduction to generate an aerosol; a first connection pad provided on the inner wall, configured to electrically connect the heater to a power source; wherein the first connection pad is joined to the outer wall and the inner wall to seal the insulator, and wherein the heater is spaced apart from the outer wall; wherein the first connection pad at least partially covers the heater to provide a protective layer over the heater.

[0004] In this way, the first connection pad is "sandwiched" between the inner and outer walls. It has been found that it is preferable to sandwich the first connection pad in this way, rather than sandwiching the heater or other fragile electrical connections since the pressure and forces exerted on the heater (or other components) is avoided during use and during manufacturing. The reduction of forces on the heater can help prevent it from becoming damaged. Therefore providing a separate connection pad at the join between the inner and outer walls creates a more robust heating apparatus which minimises the likelihood of damage to important and potentially fragile components. Additionally, spacing the heater apart from the outer wall means the heater only heats the necessary parts of the inner wall. Thus, heat can be delivered more efficiently to the aerosol generating substance while minimising the heat lost via conduction through the outer wall. The first connection pad and the heater can be provided as a single integral piece or closely abutting one another to create an electrical connection. The insulator can contain any suitable insulating medium, for example gasses such as air, or powdered or fibrous insulating materials. In other embodiments, the insulator can enclose a vacuum. The inner and outer walls of the insulator may comprise a material with higher thermal conductivity than an insulating layer or material contained inside the insulator to allow heat to be transferred from the heater to the cavity.

[0005] Preferably, the inner wall and the outer wall are separated by a vacuum such that the insulator is a vacuum insulator, and the first connection pad is joined to the outer wall and the inner wall to seal the vacuum inside the vacuum insulator. In this way, the connection pad is particularly effective because the forces required to create a tight join required to seal a vacuum insulator may be significantly larger than for other types of insulators. Such forces can pose a particular risk to the heater during manufacturing.

[0006] Preferably, the first connection pad is configured to have an increased mechanical robustness with respect to the heater. In this way, the first connection pad can be made resistant to damage during use or manufacturing while avoiding the need to change the properties of the heater to increase the robustness of the heater. The first connection pad can comprise a metal, such as stainless steel or copper. Other mechanically robust materials could also be used.

[0007] Preferably, the heater comprises an electrically resistive track that is printed or coated onto the inner wall. In this way, heat can be delivered efficiently to the inner wall. Coated heating elements may be particularly fragile, and therefore the providing a first connection pad at the join between the inner and outer walls significantly improves the robustness of the heating apparatus. The resistive track could be provided on particular sections of the inner wall, or the resistive track could be coated or printed onto the inner wall to cover a substantially full amount of the inner wall. The resistive track may follow a serpentine or sinuous path on the inner wall from a first end to a second end of the track. In other examples, the heater could comprise one or more resistive heating plates provided on the inner wall. The heating plate could also be provided as a sinuous or serpentine resistive track.

[0008] Preferably, the first connection pad is provided on the heater. In this way, the heater and connection pad can be electrically connected in a simple manner by attaching the connection pad to the inner wall over the heater, thus avoiding the need to electrically join or solder the first connection pad and the heater to one another.

[0009] In some embodiments, the first connection pad covers a substantially full amount of the heater. In this way, the connection pad can act as a protective layer over the heater that reduces the likelihood of damage to the heater. The first connection pad may fully cover the heater.

[0010] Preferably, the first connection pad has an electrical resistance that is less than the electrical resistance of the heater. More preferably, the first connection pad may have a resistance selected to generate a negligible amount of heat compared to the heater. In this way, the connection pad generates a substantially minimal amount of heat through conduction of electricity that could be lost from the insulator via the outer wall. Therefore, further energy loss is avoided and the device can be made more efficient.

[0011] Preferably, the heater and the first connection pad comprise different materials. In this way, the first connection pad can be optimised for mechanical robustness while the heater can be optimised for heating and efficiency.

[0012] Preferably, a second connection pad is provided on the inner wall, and the second connection pad is joined to the inner wall and the outer wall to seal the insulator. More preferably, the first connection pad and the second connection pad are connected to different parts of the heater and respectively configured to connect to opposite terminals of a power source to enable an electric current to flow through

the heater. In this way, both of the necessary electrical connections to the heater can be made using connection pads rather than using sections of the heater, and the heating apparatus can be more robust. The second connection pad may be configured to seal the vacuum inside the vacuum insulator.

[0013] According to a second aspect of the invention, there is provided an aerosol generating device comprising the heating apparatus described above.

[0014] Preferably, the aerosol generating device comprises a controller configured to control operation of the heater, and the first connection pad is electrically coupled to the controller. In this way, the first connection pad acts to increase the robustness of the heating apparatus while also enabling the controller to control the heater. The first connection pad can be directly coupled to the controller or a circuit board, or coupled to the controller via one or more wires. In one example, a wire could be soldered to the first connection pad outside the insulator.

[0015] According to a third aspect of the invention, there is provided a method of manufacturing the heating apparatus as defined above, comprising the steps of: providing the heater on the inner wall; providing the first connection pad on the inner wall in electrical connection with the heater; joining the first connection pad to the inner wall and the outer wall; and covering the heater with the first connection pad at least partially to provide a protective layer over the heater.

[0016] Preferably, in embodiments where the heater comprises an electrically resistive track that is coated onto the inner wall, the step of providing the heater on the inner wall comprises coating the inner wall with an electrically resistive material.

[0017] Preferably, the step of joining the first connection pad to the inner wall and the outer wall comprises welding the outer wall to the inner wall and the first connection pad. Welding the outer wall to the inner wall and the first connection, rather than to the heater, avoids damage to the heater during the welding process. In other embodiments, the outer and inner wall could be joined using a heat resistant seal rather than welding.

[0018] Preferably, the welding comprises laser welding performed at least partially in a vacuum. In this way, a vacuum can be sealed inside the insulator during welding of the outer wall to the inner wall.

BRIEF DESCRIPTION OF THE DRAWINGS

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

[0020] FIG. **1** shows a schematic perspective view of a portion of a heating apparatus according to an embodiment of the invention;

[0021] FIG. **2** shows a schematic perspective view of a portion of a heating apparatus according to an embodiment of the invention; and

[0022] FIG. **3** shows a schematic cross-sectional diagram of a heating apparatus according to an embodiment of the invention.

DETAILED DESCRIPTION OF THE DRAWINGS

[0023] FIG. **1** shows a perspective view of a portion of a heating apparatus for an aerosol generating device according to an embodiment of the invention. A heating apparatus **100** is provided and comprises a vacuum insulator **102** comprising an inner wall **104** and an outer wall **106**, spaced radially apart from one another so that a vacuum **108** is enclosed between them. FIG. **1** shows the heating apparatus **100** with the outer wall **106** removed so that the interior of the vacuum insulator **102** and the inner wall **104** can be viewed. FIG. **2** shows a schematic perspective view of a portion of the heating apparatus **100** and shows a schematic cross-sectional view of the outer wall **106** so that the inner wall **104** can be viewed.

[0024] The heating apparatus **100** comprises a cavity **110** that is provided adjacent the inner wall **104** and is configured to receive a consumable comprising a tobacco rod and a filter held together by a tipping wrapper.

[0025] The consumable can be inserted into the cavity **110** by a user via an opening **111** to the cavity **110** to be held in place by friction with the inner wall **104**. A heater **112** is provided within the vacuum **108** and on an outer surface of the inner wall **104**. The heater **112** is configured to be heated when an electrical current passes through it, and to pass this heat on to the inner wall **104** by conduction. Heat is then transferred through the inner wall **104** by conduction so that the inner surface of the inner wall **104** heats the consumable and the air inside the cavity **110**. The heater **112** can be powered by a battery or any other power source provided on an aerosol generating device. The heater **112** comprises a first end **113***a* in electrical connection a first connection pad **114** and a second end **113***b* in electrical connection with a second connection pad **116**. In the arrangement shown in FIG. **1** the first end **113***a* of the heater **112** is provided underneath the first connection pad **114** so that an electrical connection is established. Likewise the second end **113***b* of the heater **112** is provided underneath the second connection pad **116**. Each of the first connection pad **114** and the second connection pad **116** are configured to connect to opposite terminals of a battery provided on an aerosol generating device to enable current flow through the heater **112**. Each of the first connection pad **114** and the second connection pad **116** are joined to both the inner wall **104** and the outer wall **106** to seal the vacuum **108** inside the vacuum insulator **102**. In use, the user can draw air from the cavity **110** through the filter to carry aerosol generated in the cavity **110** to the user.

[0026] The vacuum insulator **102** is hollow and encloses a vacuum **108** between its curved inner wall **104** and its curved outer wall **106**. The vacuum insulator **102** has a substantially cylindrical shape that enables the vacuum insulator **102** to surround the consumable fully. The vacuum insulator **102** provides thermal insulation so that the heater can heat an aerosol generating substrate effectively while not heating other portions of the aerosol generating device, especially portions of the aerosol generating device that are held by a user. The vacuum insulator **102** is elongate along its longitudinal axis, which enables it to receive a consumable in the form of an elongate rod comprising tobacco. The vacuum insulator **102** has an approximately elliptical or circular cross-sectional shape when viewed along one of its ends, parallel to its longitudinal axis; however in other embodiments the vacuum insulator **102** may have other types of cross sectional shape, for example shapes that are approximately square or polygonal.

[0027] The vacuum insulator **102** comprises an opening **111** for receiving the consumable at one longitudinal end and

is closed at the opposite end. Thus, when viewed perpendicularly to its longitudinal axis as shown in FIGS. **1** and **2**, the vacuum insulator **102** has a cross-section that is cup-shaped. In other embodiments, the vacuum insulator **102** may be open at both longitudinal ends such that it has a tube-shaped cross-section when viewed perpendicularly to its longitudinal axis.

[0028] In other embodiments, the vacuum insulator **102** may instead be a non-vacuum insulator, i.e., an insulator containing an insulating medium such as air, fibrous or powdered insulators. The inner wall **104** and the outer wall **106** may be joined by the first connection pad **114** and the second connection pad **116** to seal the insulating medium between the inner and outer walls **104**, **106**.

[0029] The opening **111** is flared outwardly to enable a user to insert easily the consumable into the cavity **110**. In other embodiments, the opening **111** may not be flared and the inner wall **104** may have a cross-section that is the same across the full longitudinal extent of the inner wall **104**.

[0030] In the embodiment of FIGS. **1** and **2**, the inner wall **104** comprises stainless steel. However, in other embodiments the inner wall **104** may comprise other suitable materials that have properties suitable for transmitting heat from the heater **112** into the cavity **110**, such as other metals, metal alloys, or ceramics.

[0031] The outer wall **106** comprises stainless steel. In other embodiments, the outer wall **106** could comprise other suitable materials, such as other metals or plastics. The outer wall **106** comprises a single curved face that is substantially or wholly cylindrical. Other shapes of outer wall **106** could be implemented in accordance with alternatively shaped vacuum insulators.

[0032] The inner wall **104** has a thickness of about 0.1 millimetres (mm) or less. Having a relatively low thickness reduces the thermal mass of the vacuum insulator **102**, and increases the rate of heat conduction through the inner wall **104** to the cavity **110** and the consumable. In particular, less heat is conducted away from the cavity **110** by the outer face of the inner wall **104**. The threshold of 0.1 mm or less has been found to be significant in terms of improving the energy efficiency of the heating apparatus **100** by these mechanisms. In particular, an inner wall thickness of 0.1 mm has been found to have significantly improved thermal efficiency compared to an inner wall thickness of 0.25 mm.

[0033] The outer wall **106** has a thickness of about 0.25 mm, which may be preferable to a thickness of 0.1 mm to give the vacuum insulator **102** increased mechanical sturdiness and thermal insulation properties.

[0034] The cavity **110** is substantially cylindrical and is positioned immediately adjacent the inner wall **104**. Preferably, the side of the inner wall **104** facing the cavity **110**, i.e., the "inner surface" of the inner wall **104**, is substantially or completely free of additional components so that the consumable can be in direct contact with the inner face when it is received in the cavity **110**. This can maximise the efficiency of heat transfer from the inner wall **104** to the consumable. Further, the lack of additional components keeps the thermal mass of the heating apparatus low, which can improve the amount of time required to heat the tobacco to aerosol generating temperatures.

[0035] In the embodiment of FIGS. **1** and **2**, the heater **112** is a resistance heater configured to generate heat when applied with an electric current. The heater **112** comprises a winding resistive heating track that extends from a first end **113***a* of the heater **112** to a second end **113***b*. The track follows a sinuous path along the length of the inner wall **104**, as shown in FIGS. **1** and **2**. The first end **113***a* and the second end **113***b* of the heater **112** are each configured to make electric connection with the first and second connection pads **114**, **116**. The heater **112** is longitudinally offset from the join or seal between the inner wall **104** and the outer wall **106** to avoid damage to the heater **112** during assembly and use of the heating apparatus **100**.

[0036] The heater **112** is printed or coated onto the outer face of the inner wall **104**. In other embodiments, the heater **112** can comprise a heating element or plate provided on and attached to the inner wall **104**. Thus, the heater **112** may provide "trace heating" to the cavity **110**. The heater **112** may have a sinuous shape on the surface of the inner wall **104** so that a substantially full length of the inner wall **104** receives heating, as shown in FIGS. **1** and **2**. In other embodiments, the heater **112** may cover a substantially full circumference and/or area of the inner wall **104**.

[0037] The heater **112** may comprise a material susceptible to an oxidation reaction in the presence of oxygen, and also may be provided without an anti-oxidation coating. Exposing the heater **112** to the vacuum **108** in this way takes advantage of the lack of oxygen in the vacuum insulator **102** to make the heater **112** cheaper and/or easier to manufacture.

[0038] The first connection pad **114** and the second connection pad **116** are provided as plates on the inner wall **104** and positioned on top of the heater **112** to enable an electrical connection between each of the connection pads and the heater **112**. The first and second connection pads **114**, **116** are spaced apart to prevent short circuiting and are provided at opposite ends of the track that forms the heater **112**. The first and second connection pads **114**, **116** are each sandwiched between, and joined to both of, the inner wall **104** and the outer wall **106**. The first and second connection pads **114**, **116** are curved to match the circumferential curvature of the inner wall **104**.

[0039] In the embodiment of FIGS. **1** and **2**, the first and second connection pads **114**, **116** comprise stainless steel. The first and second connection pads **114**, **116** are configured to conduct electricity so that they can be used to power the heater **112** while increasing the mechanical robustness of the device. In other embodiments, the first and second connection pads **114**, **116** could comprise copper or other mechanically robust materials configured to conduct electricity.

[0040] Each of the first and second connection pads **114**, **116** may extend through the join or seal between the inner and outer walls **104**, **106** to enable an electrical connection to be made with the first and second connection pads **114**, **116** outside of the vacuum insulator **102**. The electrical connection could be made by wires soldered to the first and second connection pads **114**, **116** that are configured to connect the heater **112** via the connection pads **114**, **116** to a controller or battery provided in an aerosol generating device. In other embodiments, the connection pads **114**, **116** may extend directly to the battery or controller when the heating apparatus **100** is provided within an aerosol generating device.

[0041] In the embodiment of FIGS. **1** and **2**, a seal (not shown) is provided at the join between the inner wall **104** and the outer wall **106** to prevent air from entering the vacuum insulator **102**. The seal could comprise any suitable material, such as rubber, polyether ether ketone (PEEK), or

metal. The inner wall **104** and outer wall **106** may be welded together, in which case the seal could comprise welded material.

[0042] The heating apparatus **100** can be used with or provided in an aerosol generating device. The aerosol generating device would typically comprise a battery for powering the heater **112**, a button or other input mechanism to enable a user to initiate the heater **112**, and a controller to control the electronic components of the device, such as the heater **112**. The heating apparatus **100** may be provided within a housing of the aerosol generating device, wherein the housing comprises an opening aligned with the opening **111** of the heating apparatus **100**. The aerosol generating device may be configured as an electronic smoking device.

[0043] The heating apparatus **100** is configured to be used with a consumable comprising tobacco and a filter, which may be held together by a tipping wrapper. The consumable may be a cylindrical rod; however, other shapes of consumable designed to be received within the cavity **110** could also be used. Other forms of aerosol forming substance may be used alternatively or addition to tobacco.

[0044] Now, an example use of the heating apparatus **100**, as used within an aerosol generating device, will now be described with reference to FIGS. **1** and **2**.

[0045] In use, a user can insert the consumable through the opening **111** into the cavity **110**. The consumable may have a diameter slightly less than the opening **111** to allow the consumable to be initially received in the cavity **110**.

[0046] When the user is ready to initiate vaporisation, the user may press a button provided on the aerosol generating device, after which the controller may allow a current to flow from the battery to the heater **112** via the first connection pad **114** and the second connection pad **116**. The heater **112** generates heat, due to its electrical resistance, that is transmitted to the inner wall **104** by conduction and radiation. The first connection pad **114** and the second connection pad **116** have low resistances and produce a negligible amount of heat due to the current flowing within. This minimises the amount of undesirable heating of the outer wall **106** to improve the efficiency of the heating apparatus **100**.

[0047] While the heater **112** is operating, the vacuum **108** within the vacuum insulator **102** inhibits the conductive escape of heat from the cavity **110**. The vacuum insulator **102** also prevents heat from escaping via convection, except from via the opening **111**. In this way, the cavity **110**, the heater **112**, and the vacuum insulator **102** form a highly efficient heating oven in which the tobacco within the consumable can be heated to a desired aerosol generating temperature. The controller may be configured to instruct the heater **112** to heat the tobacco to temperatures below the combustion temperature of tobacco. It may take several seconds for the cavity **110** to reach aerosol generating temperatures.

[0048] The heater **112** is spaced apart from the outer wall **106** so that the heater **112** and the outer wall **106** are not in contact. This minimises the amount of heat transmitted to the outer wall **106** that is subsequently lost from the heating apparatus **100**.

[0049] As the tobacco is heated, an aerosol is produced inside the cavity **110**. The user can then inhale the aerosol by drawing air from the cavity **110** via the filter. This may draw air into the cavity **110** through a periphery of the opening **111** so that the user can continuously inhale aerosol from the cavity **110**.

[0050] The heater **112** is difficult to repair due to its placement inside the vacuum insulator **102**. Therefore, to avoid damage to the potentially fragile heater **112** during assembly or manufacture of the heating apparatus **100**, the first connection pad **114** and the second connection pad are joined to the inner wall **104** and the outer wall **106** to seal the vacuum **108** inside the vacuum insulator **102**. This avoids the need to join the outer wall **106** to the inner wall **104** over the heater **112**, which can damage the heater **112**. This arrangement may be especially effective when using a coated heating track, which can be particularly fragile.

[0051] The inner and outer walls **104**, **106** can be welded to the first and second connection pads **114**, **116**. In one example, the inner and outer walls **104**, **106** can be laser welded in a vacuum in order to create a vacuum inside the vacuum insulator **102**. It is envisaged that other methods of joining the inner and outer walls **104**, **106** to the first and second connection pads **114**, **116** may be implemented.

[0052] Alternatively, a seal such as a rubber seal, may be provided to join the inner wall **104**, the outer wall **106** and the first and second connection pads **114**, **116**.

[0053] In other embodiments, not shown in the Figures, the first connection pad **114** and the second connection pad **116** could be provided to cover a full or substantially full proportion of the heater **112**. This can provide a protective layer for the whole heater **112** to prevent damage during use. In this case, parts of the heater **112** may be electrically insulated from the connection pads **114**, **116** to avoid short circuiting.

[0054] FIG. **3** shows a cross-sectional schematic diagram of a heating apparatus **200** according to an alternative embodiment of the invention. The heating apparatus **200** comprises a vacuum insulator **202** with an inner wall **204** and an outer wall **206** configured in substantially the same way as the inner wall **104** and the outer wall **106** of the vacuum insulator **102**. However, the vacuum insulator **202** differs from the vacuum insulator **102** in that the inner wall **204** comprises a flared opening **211**. The opening **211** is flared radially outwardly from the centre of an adjacent cavity **210** to enable easier insertion of a rod-shaped consumable into the cavity **210**. The inner wall **204** and the outer wall **206** are joined at the flared region of the inner wall **204**, as shown in FIG. **3**.

[0055] A vacuum **208** is enclosed between the inner wall **204** and the outer wall **206**, the cavity **210** is provided adjacent the inner wall **204**, and a heater **212** is provided on the inner wall **204**. A seal **118** is provided at the join between the inner wall **204** and the outer wall **206**. Each of these components or aspects are configured in, and operate in, the same way as the corresponding features of the heating apparatus **100**.

[0056] A first connection pad **214** and a second connection pad **216** are provided on the heater **212** at different ends of the heater track to facilitate a current flow through the heater **212**, as described previously. The first connection pad **214** and the second connection pad **216** are curved at one end to match the circumferential curvature of the inner wall **204**. These same ends are provided on the inner wall **204** in contact with the heater **212** to make an electrical connection with the heater **212**, as shown in FIG. **3**. The first connection pad **214** and the second connection pad **216** differ from those

of the heating apparatus **100** in that they are flared outwardly to match the outwardly flared inner wall **204**. This enables the first and second connection pads **214**, **216** to be joined to the inner and outer walls **204**, **206** at the outwardly flared portion where the inner and outer walls **204**, **206** are joined together. As can also be seen in FIG. **3**, the outwardly flared ends of the first and second connection pads **214**, **216** are joined to and sandwiched between the inner wall **204**, the outer wall **206**, and the seal **118** that prevents entry of air into the vacuum insulator **202**.

[0057] FIG. **3** shows a gap between the first and second connection pads **214**, **216** and the inner wall **204**. In other embodiments, the first and second connection pads **214**, **216** may be provided with a flared shape more precisely matching the flared shape of the inner wall **204**. This can allow the first and second connection pads **214**, **216** to be in contact with the inner wall **204** along the full length of the first and second connection pads **214**, **216**.

[0058] In other respects, the first and second connection pads **214**, **216** are configured in, and operate in, the same manner as the first and second connection pads **114**, **116** as described above with reference to FIGS. **1** and **2**.

1. A heating apparatus for an aerosol generating device, comprising:

an insulator, comprising an inner wall and an outer wall that are separated from one another;

a cavity configured to receive an aerosol forming substance, positioned adjacent the inner wall of the insulator;

a heater provided inside the insulator on the inner wall, configured to heat an aerosol forming substance received in the cavity by thermal conduction to generate an aerosol; and

a first connection pad provided on the inner wall, configured to electrically connect the heater to a power source;

wherein the first connection pad is joined to the outer wall and the inner wall to seal the insulator, and wherein the heater is spaced apart from the outer wall; and

wherein the first connection pad at least partially covers the heater to provide a protective layer over the heater.

2. The heating apparatus of claim **1**, wherein the inner wall and the outer wall are separated by a vacuum such that the insulator is a vacuum insulator, and wherein the first connection pad is joined to the outer wall and the inner wall to seal the vacuum inside the vacuum insulator.

3. The heating apparatus of claim **1**, wherein the first connection pad is configured to have an increased mechanical robustness with respect to the heater.

4. The heating apparatus of claim **1**, wherein the heater comprises an electrically resistive track that is printed or coated on the inner wall.

5. The heating apparatus of claim **1**, wherein the first connection pad covers a substantially full amount of the heater.

6. The heating apparatus of claim **1**, wherein the first connection pad has an electrical resistance that is less than an electrical resistance of the heater.

7. The heating apparatus of claim **1**, wherein the heater and the first connection pad comprise different materials.

8. The heating apparatus of claim **1**, further comprising a second connection pad provided on the inner wall, wherein the second connection pad is joined to the inner wall and the outer wall to seal the insulator.

9. The heating apparatus of claim **8**, wherein the first connection pad and the second connection pad are connected to different parts of the heater and respectively configured to connect to opposite terminals of a power source to enable an electric current to flow through the heater.

10. An aerosol generating device comprising the heating apparatus of claim **1**.

11. The aerosol generating device of claim **10**, further comprising a controller configured to control operation of the heater, wherein the first connection pad is electrically coupled to the controller.

12. A method of manufacturing the heating apparatus of claim **1**, comprising the steps of:

providing the heater on the inner wall;

providing the first connection pad on the inner wall in electrical connection with the heater;

joining the first connection pad to the inner wall and the outer wall; and

covering the heater with the first connection pad at least partially to provide a protective layer over the heater.

13. The method of manufacturing of claim **12**, wherein the heater comprises an electrically resistive track that is coated onto the inner wall, and wherein the step of providing the heater on the inner wall comprises coating the inner wall with an electrically resistive material.

14. The method of manufacturing of claim **12**, wherein the step of joining the first connection pad to the inner wall and the outer wall comprises welding the outer wall to the inner wall and the first connection pad.

15. The method of manufacturing of claim **14**, wherein the welding comprises laser welding performed at least partially in a vacuum.

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