(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 4 483 730 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
01.01.2025 Bulletin 2025/01

(21) Application number: **23182838.5**

(22) Date of filing: **30.06.2023**

(51) International Patent Classification (IPC):
A24F 40/46 *(2020.01)* ***A24F 40/70*** *(2020.01)*

(52) Cooperative Patent Classification (CPC):
A24F 40/46; A24F 40/70

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC ME MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA
Designated Validation States:
KH MA MD TN

(71) Applicant: **JT International SA**
1202 Geneva (CH)

(72) Inventor: **BEHFAR, Samrand**
Tuggen (CH)

(74) Representative: **Gill Jennings & Every LLP**
The Broadgate Tower
20 Primrose Street
London EC2A 2ES (GB)

(54) **AN AEROSOL GENERATING DEVICE COMPRISING A VACUUM CHAMBER**

(57) Disclosed herein is an aerosol generating device (200, 300, 500). The aerosol generating device comprises vacuum chamber (202, 302, 502) defined between an inner wall (204, 304, 504) and an outer wall (206, 306, 506) and a heater (208, 308, 508) disposed within the vacuum chamber. The heater is provided on the inner wall. The aerosol generating device also comprises one or more electrical connections (210a, b, 310a, b, 510a, b), wherein the one or more electrical connections are configured to be electrically connected to a power source provided external to the vacuum chamber through the outer wall of the vacuum chamber. The heater is solderlessly connected to the one or more electrical connections, thereby electrically connecting the heater to the one or more electrical connections.

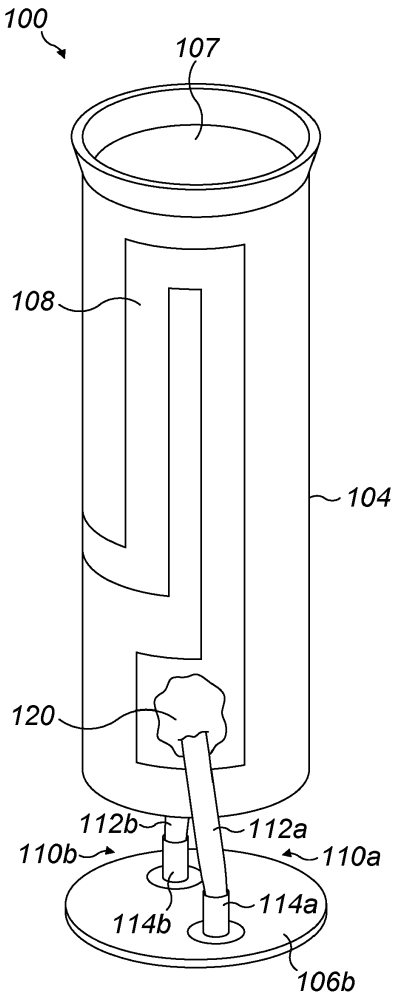

FIG. 1

EP 4 483 730 A1

Description

FIELD OF THE INVENTION

[0001] The present invention relates to an aerosol generating device comprising a vacuum chamber. More specifically, the present invention relates to an aerosol generating device comprising a vacuum chamber, wherein a heater is disposed within the vacuum chamber.

BACKGROUND

[0002] It is a developing field of interest to produce electronic cigarettes that heat, but do not burn, a solid or semi-solid aerosol forming substrate which comprises tobacco. One issue in these devices is that a heater which supplies heat to a heating chamber can also undesirably heat the remainder of the device. In compact devices this can be disadvantageous because the temperature of the outer surfaces of the device, which are held by a user, can become unacceptably high. In order to mitigate these effects some aerosol generating devices have been provided with vacuum chambers that can space the heater from the outer surfaces of such devices. This can provide thermal separation between the heating chamber and the outer surfaces which are held by a user. The heater can be disposed within the vacuum chamber along with electrical connections which connect the heater to a power source provided external to the vacuum chamber.

[0003] It is important that a vacuum state is maintained in the vacuum chamber so that heat transfer via gases in the chamber can be minimised. The term vacuum used herein may not necessarily refer to a completely evacuated space. The vacuum state within the vacuum chamber may be a low, mid, or high-grade vacuum. There may be some trace amounts of gases within the vacuum chamber, for example. Generally, the vacuum state should be held at a sufficiently low pressure such that heat transfer from the heater to the outer surfaces of the device is reduced. A small quantity of heat transfer may be tolerated.

[0004] There is a demand for producing aerosol generating devices that include vacuum chambers that have a vacuum state that will be preserved for sustained periods of time. It is an object of the present invention to provide an aerosol generating device that addresses these requirements.

SUMMARY OF INVENTION

[0005] In an aspect of the invention there is provided an aerosol generating device, comprising: a vacuum chamber defined between an inner wall and an outer wall; a heater disposed within the vacuum chamber, wherein the heater is provided on the inner wall; and one or more electrical connections, wherein the one or more electrical connections are configured to be electrically connected to a power source that is provided externally to the vacuum chamber, wherein the one or more electrical connections extend through the outer wall of the vacuum chamber, and wherein the heater is solderlessly connected to the one or more electrical connections, thereby electrically connecting the heater to the one or more electrical connections. The heater is preferably entirely disposed within the vacuum chamber.

[0006] It has been found that, during use, components of aerosol generating devices, such heating elements and electrical connections, can outgas when heated, which means that they can release gases. Organic compounds in particular can decompose when heated to cause outgassing. Heaters to be disposed within vacuum chambers can be baked prior to assembly of the device, and this can remove organic compounds in and or on the heaters.

[0007] In forming electrical connections, wires are conventionally soldered to heaters within the vacuum chamber. Solder often contains traces of flux and flux often comprises organic compounds such as naturally occurring resins. Solder and flux are not suitable for baking in the same manner as that of a heater due to their low melting and evaporation points. Organic compounds in flux therefore may cause outgassing into the vacuum chamber during operation of the device, damaging the vacuum state of the vacuum chamber.

[0008] In devices wherein the vacuum state is a low-grade vacuum state, trace amounts of gases may be present within the vacuum chamber. However, such a vacuum state may still be effective at preventing significant heat transfer. If outgassing were to occur into such a vacuum state, the amount of gas present within the vacuum chamber would increase and so would the gas pressure. In this scenario the gases outgassed into the vacuum chamber may start to transfer heat which would increase heat transfer to the exterior surfaces of the device. This would damage the vacuum state of the vacuum chamber.

[0009] By removing solder from the electrical connections disposed within the vacuum chamber, the effect of outgassing from solder and flux can be reduced. This can therefore help to preserve the vacuum state of the vacuum chamber for a sustained period of time.

[0010] In one configuration, the one or more electrical connections are biased towards the heater, thereby electrically connecting the heater to the one or more electrical connections. Preferably, the one or more electrical connections comprise a spring to bias the one or more electrical connections towards the heater. In this way, the heater can be solderlessly connected to the one or more electrical connections. The heater can make direct contact with the one or more electrical connections, thereby permitting an electrical current to flow between the heater and the one or more electrical connections. The electrical connections may be elongated pins that are provided through the outer wall of the vacuum chamber. The electrical connections may be biased towards lead pads of the heater, which may have a large surface

area to simplify the assembly of the electrical connection with the heater.

[0011] In another optional configuration, the one or more electrical connections are printed on or to the heater. Preferably, the one or more electrical connections comprise a wire and a connection pin, wherein a connection between the wire and the connection pin is within the vacuum chamber, wherein the connection pin extends through the outer wall, and wherein the wire is printed on or to the heater. In this way, the one or more electrical connections can be solderlessly connected to the heater as the one or more electrical connections can secured on or to the heater by printing over the one or more electrical connections and the heater. The electrical connections can be printed on or to the heater, or lead pads of the heater, using a screen print ink that is electrically conducting and does not outgas. The one or more electrical connections may comprise a flat, elongate wire that can be printed on or to the heater. This increases the surface area of contact between the wire and the heater. The wire can therefore be connected to the heater by means not requiring a solder.

[0012] By providing that the connection between the wire and the connection pin is within the vacuum chamber, and that the connection pin extends through the outer wall, the assembly of the device can be simplified, and the size of the device can be minimised. The electrical connections between the heater, the wire, and the connection pin can all be within the vacuum chamber and all of these connections can be made without the use of a solder.

[0013] Preferably, the wire is secured to the connection pin. In this way, the wire can be deformed around the connection pin. In configurations where the wire is a flat elongate wire, the wire can be easily and securely folded around the connection pin. In configurations where the wire is an elongate cylindrical wire, the wire can be wrapped around the connection pin.

[0014] Preferably, the wire is connected to a ferrule, and the ferrule is crimped to the connection pin. In this way, the likelihood of damaging the wire or the connection pin during the crimping process is reduced. The ferrule may be a short cylindrical tube into which the wire may be partially inserted. The ferrule may then be crimped to the connection pin and/or the wire. In embodiments where the wire is a flat elongate wire, an end of the wire may be bent into a circular cross-sectional shape prior to being inserted into the ferrule.

[0015] In another configuration, the wire is deformed towards the connection pin, thereby bringing the wire and the connection pin into contact. In this way, the wire can be guided towards the connection pin by deforming the wire towards the connection pin such that the two make contact. Preferably, a portion of the wire is provided at an angle to the longitudinal axis of the wire, such that the wire is deformed towards the connection pin. Preferably, the angled portion of the wire makes contact with the connection pin. In this way, the wire can be easily connected to the connection pin. In this arrangement, the formation of the electrical connection, and thereby the assembly of the device, is simplified. The angled portion of the wire may be provided at an angle of approximately 90 degrees to the longitudinal axis of the wire.

[0016] Preferably, the heater comprises a printed heater. In this way, the heater may be easily and securely provided on the inner wall of the vacuum chamber. The size of the aerosol generating device can be reduced and its assembly can also be simplified. Furthermore, the process of printing the one or more electrical connections to the heater can be simplified as the one or more electrical connections can be printed to the heater using the same material as the heater itself. The printed heater may comprise printed lead pads to which the one or more electrical connections can be connected.

[0017] In another aspect of the invention there is provided a method of forming an aerosol generating device, comprising: baking a heater; forming a vacuum chamber defined between an inner wall and an outer wall, wherein the baked heater is disposed within the vacuum chamber, and wherein the heater is provided on the inner wall; and forming one or more electrical connections, wherein the one or more electrical connections are configured to be electrically connected to a power source provided external to the vacuum chamber, wherein the one or more electrical connections extend through the outer wall of the vacuum chamber, and wherein the heater is solderlessly connected to the one or more electrical connections, thereby electrically connecting the heater to the one or more electrical connections.

[0018] The heater is baked to remove any organic compounds that may be present in and/or on the heater. This is to ensure that any organic compounds do not outgas into the vacuum chamber when heated by heat from the heater. The heater may be baked at a temperature of 850 degrees Celsius, for example. However, other temperatures may also be suitable. Preferably, the method further comprises baking the one or more electrical connections. The one or more electrical connections are baked to also to remove any organic compounds that may be present in and/or on the one or more electrical connections.

[0019] The above-described apparatus features may be implemented as method steps in a method of forming an aerosol generating device and vice versa. It should be understood that the steps of the methods described may be performed in a variety of different sequences.

BRIEF DESCRIPTION OF DRAWINGS

[0020] Embodiments of the invention will now be described, by way of example, by reference to the drawings, in which:

Figure 1 is a perspective view of the interior of a vacuum chamber of an aerosol generating device known in the art;

Figure 2A is a schematic cross-sectional diagram of an aerosol generating device in an embodiment of the invention;

Figure 2B is a perspective view of the interior of a vacuum chamber of an aerosol generating device in the embodiment of the invention according to Figure 2A;

Figure 3A is a schematic cross-sectional diagram of an aerosol generating device in another embodiment of the invention;

Figure 3B is a perspective view of the interior of a vacuum chamber of an aerosol generating device in the embodiment of the invention according to Figure 3A;

Figure 4 is a schematic flow diagram of a method for a method for forming an electrical connection for use with an aerosol generating device in the embodiment of the invention according to Figures 3A and 3B;

Figure 5A is a schematic cross-sectional diagram of an aerosol generating device in another embodiment of the invention; and

Figure 5B is a perspective view of the interior of a vacuum chamber of an aerosol generating device in the embodiment of the invention according to Figure 5A.

DETAILED DESCRIPTION

[0021] Figure 1 is a perspective view of the interior of a vacuum chamber of an aerosol generating device 100 known in the art. The vacuum chamber is defined between the exterior of an inner wall 104 and the interior of an outer wall. The outer wall comprises a bottom wall 106b and may also comprise a side wall (not shown) and a top wall (not shown). A heater 108 is provided on the exterior of the inner wall 104 and the heater 108 is disposed within the vacuum chamber. The heater 108 is electrically connected to a power source (not shown) provided external to the vacuum chamber using first and second electrical connections 110a, b. The first and second electrical connections 110a, b each comprise a wire 112a, b and a connection pin 114 a, b. The wires 112 a, b are soldered to lead pads (not shown) of the heater 108 and to the connection pins 114a, b using a solder 120. The connection pins 114 a, b are provided through the bottom wall 106b of the outer wall to enable the heater 108 to be electrically connected to the power source provided external to the vacuum chamber.

[0022] The heater 108, which is a printed heating element, is baked prior to the assembly of the vacuum chamber to remove any organic compounds that may be present as organic compounds may outgas when heated. The baking temperature may be approximately 850 degrees Celsius, for example.

[0023] In this known example, the wires 112 a, b are soldered to lead pads (not shown) of the heater 108 and to the connection pins 114a, b using a soft soldering process. The soft soldering process may be carried out at a temperature of 450 degrees Celsius, for example, using a flux. The solder may comprise a tin-lead solder or another type of solder. The flux may comprise resin derived from naturally occurring resins.

[0024] Baking the solder 120 prior to the assembly of the vacuum chamber would not be appropriate as the baking temperature would be much higher than the melting point of the solder 120, thereby damaging the electrical connection with the heater 108. Organic compounds present in flux within the solder 120 therefore have the potential to outgas into the vacuum chamber during operation of the heater 108 in this known example.

[0025] Figure 2A is a schematic cross-sectional diagram of an aerosol generating device 200 in an embodiment of the invention. The aerosol generating device 200 comprises a vacuum chamber 202 defined between an inner wall 204 and an outer wall 206. The outer wall 206 comprises a side wall 206a, a bottom wall 206b, and may also comprise a top wall (not shown). A heater 208 is provided on the inner wall 204 and the heater 208 is disposed within the vacuum chamber 202. The heater 208 is electrically connected to a power source (not shown) provided external to the vacuum chamber 202 using first and second electrical connections 210a, b. The first and second electrical connections 210a, b are biased towards lead pads 209 of the heater 208 to form an electrical connection with the heater 208. The first and second electrical connections 210a, b are biased upwardly into the vacuum chamber 202, in the direction from the bottom wall 206b to an opening 207, and inwardly towards to the heater 208, in the direction from the side wall 106a to the inner wall 204. The first and second electrical connections 210a, b are provided through the bottom wall 206b to enable the heater 208 to be electrically connected to the power source provided external to the vacuum chamber 202.

[0026] Figure 2B is a perspective view of the interior of a vacuum chamber of an aerosol generating device 200 in the embodiment of the invention according to Figure 2A. Figure 2B depicts the opening 207 that is provided radially internally within the cup-shaped inner wall 204. The opening 207 is configured such that an aerosol generating substrate (not shown) can be received within the internal wall 204 for heating by the heater 208. The vacuum chamber may be sealed to the inner wall 204 at a section of the inner wall 204 provided between the heater 208 and the opening 207.

[0027] The vacuum in the vacuum chamber 202 surrounds the exterior surfaces of the inner wall 204 that are within the vacuum chamber 202 and the exterior surfaces of the heater 208, the heater 208 provided on the exterior of the inner wall 204 and within the vacuum chamber 202.

The exterior surfaces of the inner wall 204 and the interior surfaces of the outer wall 206 are spaced apart from each other within the vacuum chamber 202. The vacuum chamber therefore insulates the outer wall 206, and thus a user of the device, from heat produced by the heater 208. Heat from the heater 208 is transferred to the inner wall. The outer wall 206 has the shape of an elongate cylinder.

[0028] In this example, the heater 208 is a printed heating element comprising printed lead pads 209 to which the first and second electrical connections 210a, b can be connected. The heater 208 is baked prior to the assembly of the vacuum chamber 202 to remove any organic compounds that may be present. The heater 208 is printed to the exterior of the inner wall 204 that is to be within the vacuum chamber 202 with an electrically conducting screen print ink which forms the heater. In other examples, the heater 208 may be a wire heating element or another type of heater. The heater 208 is printed in a meandering pattern to provide uniform heating to the inner wall 204.

[0029] In this example, the first and second electrical connections 210a, b are biased towards the heater 208 to form an electrical connection with the heater 208. More specifically, the first and second electrical connections 210a, b are biased towards the lead pads 209 of the heater 208 to form an electrical connection with the heater 208. Ends of the first and second electrical connections 210a, b make physical contact with the heater 208 and therefore a current may flow between them. The use of a solder to connect the first and second electrical connections 210a, b to the heater 208 is not required, therefore. The risk of outgassing into the vacuum chamber 202 from a solder is eliminated.

[0030] The first and second electrical connections 210a, b are elongate pins that each comprise a spring that biases the ends of the first and second 210a, b electrical connections that are within the vacuum chamber 202 towards the heater 208 such that they make contact. The springs are provided in the bases of the pins, within the bottom wall 206b. The springs of first and second electrical connections 210a, b bias the connections upwardly into the vacuum chamber 202, in the direction from the bottom wall 106b to the opening 207, and inwardly towards to the heater 208, in the direction from the side wall 106a to the inner wall 204. In other examples, the first and second electrical connections 210a, b may comprise a wire that is deformed to bias it towards the heater 208 to make contact with the heater.

[0031] In this example, the first and second electrical connections 210a, b are provided through the bottom wall 206b of the outer wall 206. In other examples, the first and second electrical connections 210a, b may be provided through the side wall 206a or a top wall (not shown) or through a combination of walls.

[0032] Figure 3A is a schematic cross-sectional diagram of an aerosol generating device 300 in another embodiment of the invention. As with the embodiment according to Figure 2A, the aerosol generating device 300 comprises a vacuum chamber 302 defined between an inner wall and an outer wall 306. The outer wall 306 also comprises a side wall 306a, a bottom wall 306b and may also comprise a top wall (not shown). A heater 308 is similarly provided on the inner wall 304 and the heater 308 is disposed within the vacuum chamber 302. The heater 308 is also electrically connected to a power source (not shown) provided external to the vacuum chamber 302 using first and second electrical connections 310a, b.

[0033] Figure 3B is a perspective view of the interior of a vacuum chamber of an aerosol generating device 300 in the embodiment of the invention according to Figure 3A. As with the embodiment according to Figure 2B, Figure 3B depicts an opening 307 that is provided radially internally within the cup-shaped inner wall 304.

[0034] In this embodiment, the first and second electrical connections 310a, b comprise wires 312a, b and connection pins 314a, b. The first wire 312a is connected to the heater 308 and to the first connection pin 314a. The second wire is connected to the heater 308 and to the second connection pin 314b. The wires 312a, b are printed on or to the heater 308 and are connected to the connection pins 314a, b by crimping the wires 312a, b to the connections pins 314a, b. The connection pins 314a, b are provided through the bottom wall 306b of the outer wall 306b.

[0035] In this example, the wires 312a, b in the first and second electrical connections 310a, b are connected to two separate lead pads (not shown) of the heater 308 by printing over a first end of each wire 312a, b and the heater 308. A layer of the printed material 313 is provided over the first ends of each wire 312a, b and the heater 308, thereby securing the wires 312a, b to the heater. The wires 312a, b are elongate and flat copper wires, thus increasing the area of contact between the first ends of the wires 312a, b and the lead pads. The first ends of the wires 312a, b are printed on or to the lead pads of the heater 308 using the same screen print ink that the heater 308 is comprised of. The wires 312a, b are therefore connected and secured to the heater 308 without the use of a solder.

[0036] In this example, the wires 312a, b are connected to the connection pins 314a, b by crimping a second end of each wire 312a, b to respective connection pins 314a, b. More specifically, the seconds ends of each wire are folded and inserted partially into ferrules 316a, b, which are short tubes. The ferrules 316a, b are then crimped to the connection pins 314 a, b using a crimping tool or another suitable appliance. In the crimping process the ferrules 316 a, b are deformed to the exteriors of the connection pins 314a, b. The wires 312a, b are connected to the connection pins 314a, b by means forming a secure mechanical connection not requiring solder.

[0037] The wires 312a, b, the screen print ink used to print the wires 312a, b to the heater and the connection

pins 314a, b are baked prior to the assembly of the vacuum chamber to remove any organic compounds that may be present.

[0038] In other examples, the wires may not be elongate and flat and may comprise a different shape. In these other examples, such wires may be wrapped around the connection pins to form an electrical connection. A ferrule may or may not be used in forming the electrical connections. The wires may comprise other materials than copper. The wires may instead be printed on or to the lead pads of the heater 308 using any material other than the same screen print ink that the heater 308 is comprised of.

[0039] Figure 4 is a schematic flow diagram of a method for a method for forming an electrical connection 410 for use with an aerosol generating device 300 in an embodiment of the invention. This method may be performed prior to the formation of a vacuum chamber. The method includes the steps 1, 2 and 3. Step 1 of the method comprises folding an end of a flat elongate wire 412 such that the end of the wire has a circular cross-sectional shape. The folded end of the wire 412 is then able to be inserted into a ferrule 416. Step 2 comprises inserting the folded end of the wire 412 into the ferrule 416. Step 3 comprises inserting a connection pin 414 into a bottom wall 406b, inserting the connection pin 414 into the ferrule 416, and then crimping the ferrule 416 to the connection pin 414.

[0040] In step 1, a flat elongate wire 412 is folded to form a generally cylindrical curled end at an end of the wire 412. The ferrule 416 is a short cylindrical tube and thus the folded end of the wire 412 is able to be received by the ferrule 416. In embodiments where the wire 412 is not a flat elongate wire, the wire may not need to be folded.

[0041] In step 2, the folded end of the wire 412 is inserted into one end of the ferrule 416 such that the ferrule partially receives the folded end of the wire 412 in a portion of its interior. The crimped portion 412 is not received fully by the ferrule 416 as a connection pin 414 must also be inserted into the ferrule 416 at its opposite end.

[0042] In step 3, a connection pin 414 is inserted into an opening in a bottom wall 406b such that an end of the connection pin 414 protrudes through and out of the bottom wall 406b. The end of the connection pin 414 that protrudes through and out of the bottom wall 406b is then inserted into the opposite end of the ferrule 416 to which the crimped end of the wire 412 is inserted into. The ferrule 416 is then crimped to the connection pin 414 and/or the folded end of the wire 412 to form a secure electrical connection not requiring solder.

[0043] Figure 5A is a schematic cross-sectional diagram of an aerosol generating device 500 in another embodiment of the invention. As with the embodiment according to Figure 3A, the aerosol generating device 500 comprises a vacuum chamber 502 defined between an inner wall and an outer wall 506. The outer wall 506 also comprises a side wall 506a, a bottom wall 506b and may also comprise a top wall (not shown). A heater 508 is similarly provided on the inner wall 504 and the heater 508 is disposed within the vacuum chamber 502. The heater 508 is also electrically connected to a power source (not shown) provided external to the vacuum chamber 502 using first and second electrical connections 510a, b.

[0044] Figure 5B is a perspective view of the interior of a vacuum chamber of an aerosol generating device 500 in the embodiment of the invention according to Figure 5A. As with the embodiment according to Figure 3B, Figure 5B depicts an opening 507 that is provided radially internally within the cup-shaped inner wall 504.

[0045] The first and second electrical connections 510a, b comprise wires 512a, b and connection pins 514a, b. The wires 512a, b are printed on or to the heater 508 and are connected to the connection pins 514a, b by deforming the wires 512a, b towards the connection pins 514a, b and bringing the respective wires 512a, b and connection pins 514a, b into contact. The connections pins 514a, b extend through the bottom wall 506b of the outer wall 506b.

[0046] The wires 512a, b in the first and second electrical connections 510a, b are connected to two separate lead pads (not shown) of the heater 508 by printing over a first end of each wire 512a, b and the heater 508. In this example, the wires 512a, b are connected to the connection pins 514a, b by deforming a second end of each wire 512a, b to form an angled portion. The respective angled portions of the wires 512a, b are angled towards the connection pins 514a, b such that the surfaces of the angled portions of the wires 512a, b make contact with the connection pins 514a, b. The angled portions of the elongate and flat wires 512a, b form a mechanical connection not requiring a solder that is simple to assemble.

[0047] The angled portions of the wires 512a, b are angled at approximately a right angle to the longitudinal axes of each of the wires 512a, b. More specifically, the angled portions of the wires 512a, b are angled between 87 degrees and 90 degrees to the longitudinal axes of each of the wires 512a, b. In other examples, the angled portions of the wires 512a, b may be angled at any other angle to the longitudinal axes of each of the wires 512a, b. The wires 512a, b, the screen print ink used to print the wires 512a, b to the heater and the connection pins 514a, b are baked prior to the assembly of the vacuum chamber to remove any organic compounds that may be present.

Claims

1. An aerosol generating device, comprising:

a vacuum chamber defined between an inner wall and an outer wall;
a heater disposed within the vacuum chamber, wherein the heater is provided on the inner wall; and

one or more electrical connections, wherein the one or more electrical connections are configured to be electrically connected to a power source that is provided externally to the vacuum chamber, wherein the one or more electrical connections extend through the outer wall of the vacuum chamber, and wherein the heater is solderlessly connected to the one or more electrical connections, thereby electrically connecting the heater to the one or more electrical connections.

2. An aerosol generating device according to claim 1, wherein the one or more electrical connections are biased towards the heater, thereby electrically connecting the heater to the one or more electrical connections.

3. An aerosol generating device according to claim 2, wherein the one or more electrical connections comprise a spring to bias the one or more electrical connections towards the heater.

4. An aerosol generating device according to claim 1, wherein the one or more electrical connections are printed on or to the heater.

5. An aerosol generating device according to claim 4, wherein the one or more electrical connections comprise a wire and a connection pin, wherein a connection between the wire and the connection pin is within the vacuum chamber, wherein the connection pin extends through the outer wall, and wherein the wire is printed on or to the heater.

6. An aerosol generating device according to claim 5, wherein the wire is secured to the connection pin.

7. An aerosol generating device according to claim, 6, wherein the wire is connected to a ferrule, and wherein the ferrule is crimped to the connection pin.

8. An aerosol generating device according to claim 5, wherein the wire is deformed towards the connection pin, thereby bringing the wire and the connection pin into contact.

9. An aerosol generating device according to claim 8, wherein a portion of the wire is provided at an angle to the longitudinal axis of wire, such that the wire is deformed towards the connection pin.

10. An aerosol generating device according to claim 9, wherein the angled portion of the wire makes contact with the connection pin.

11. An aerosol generating device according to any preceding claim, wherein the heater comprises a printed heater.

12. A method of forming an aerosol generating device, comprising:

baking a heater;
forming a vacuum chamber defined between an inner wall and an outer wall, wherein the baked heater is disposed within the vacuum chamber, and wherein the heater is provided on the inner wall; and
forming one or more electrical connections, wherein the one or more electrical connections are configured to be electrically connected to a power source provided external to the vacuum chamber, wherein the one or more electrical connections extend through the outer wall of the vacuum chamber, and wherein the heater is solderlessly connected to the one or more electrical connections, thereby electrically connecting the heater to the one or more electrical connections.

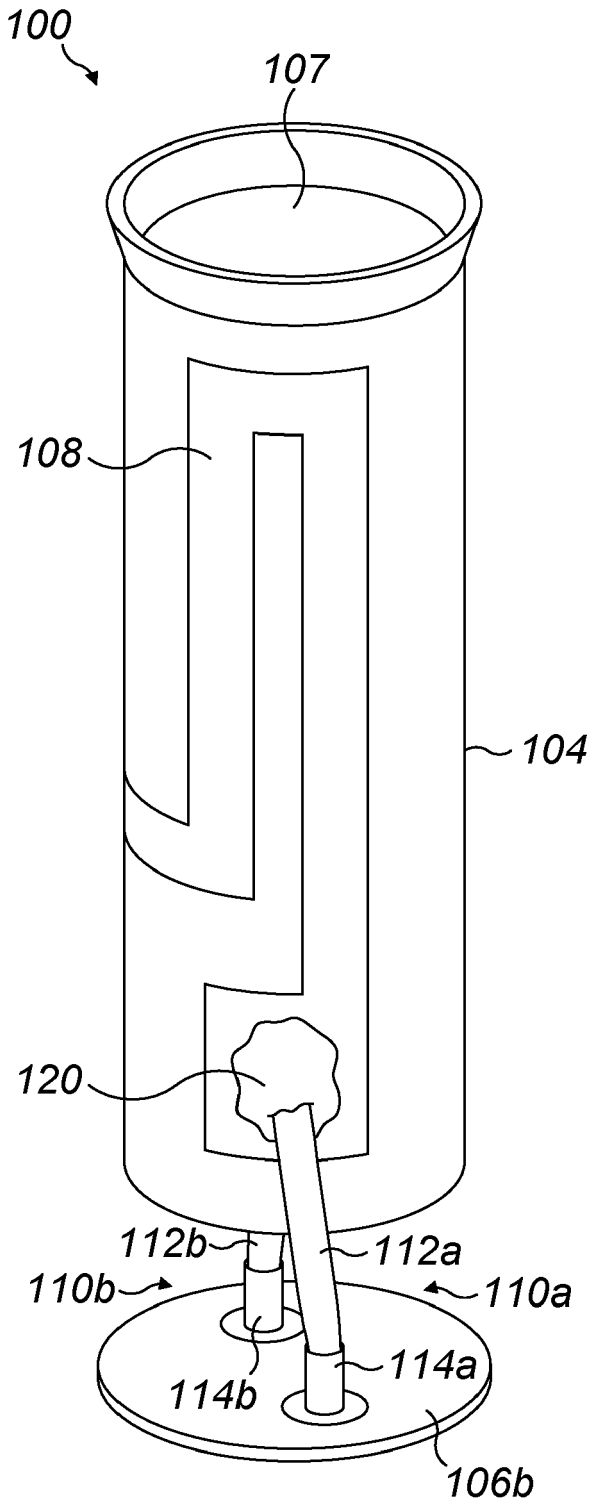

FIG. 1

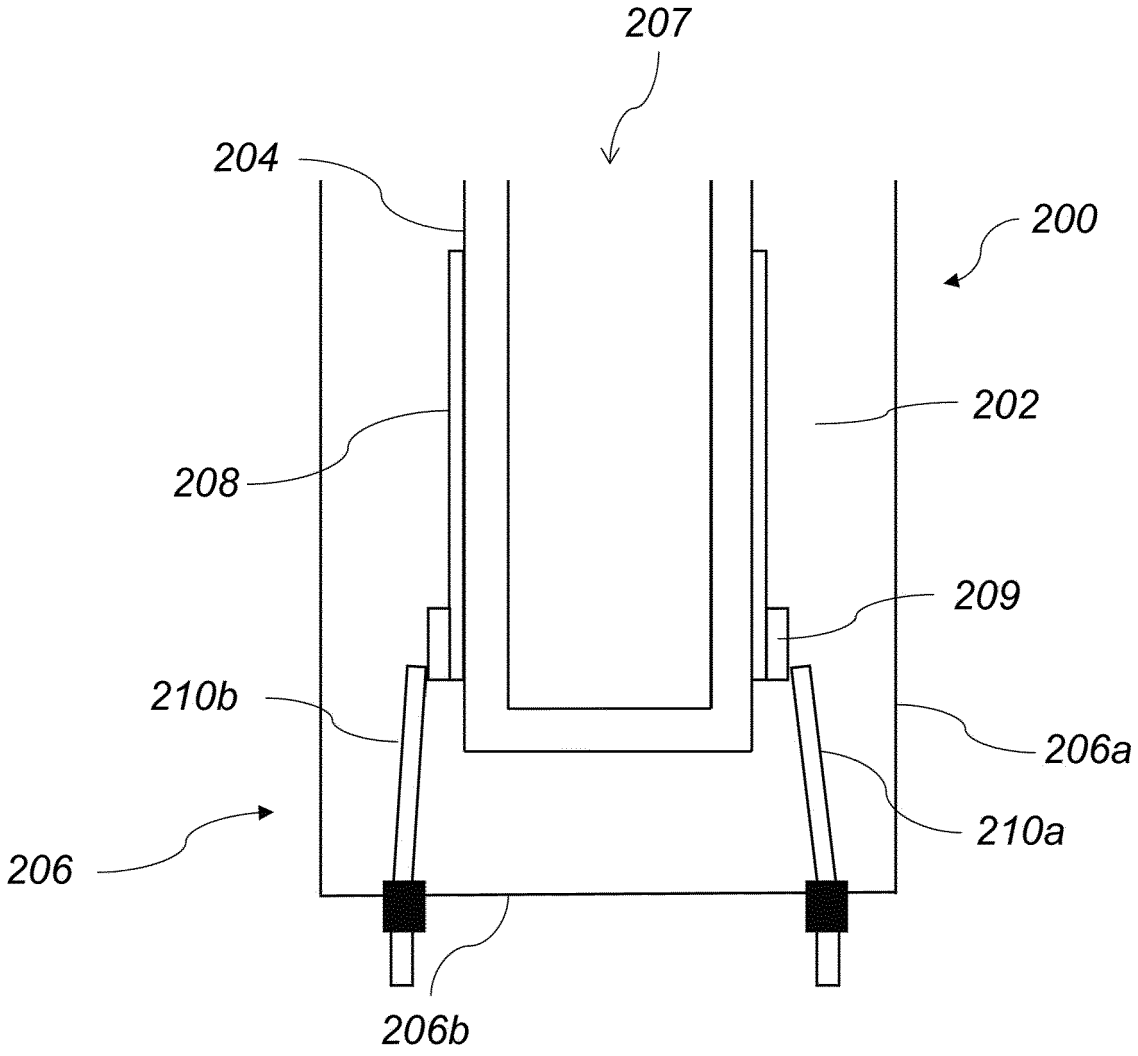

FIG. 2A

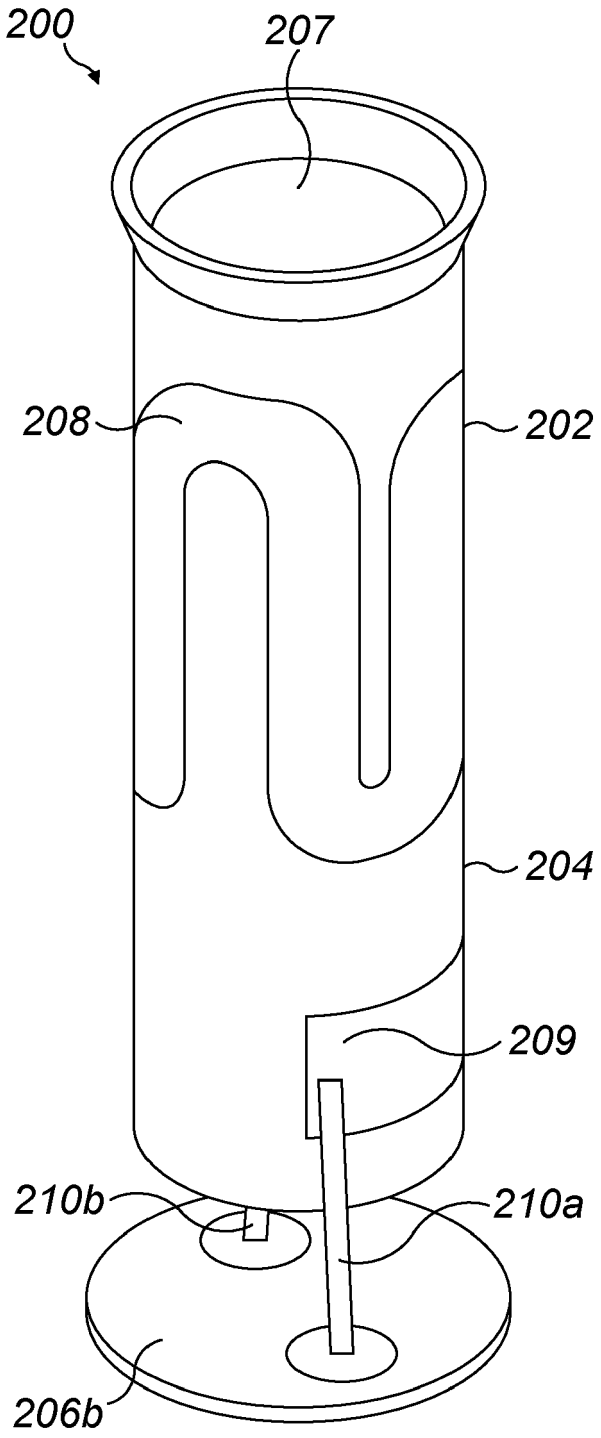

FIG. 2B

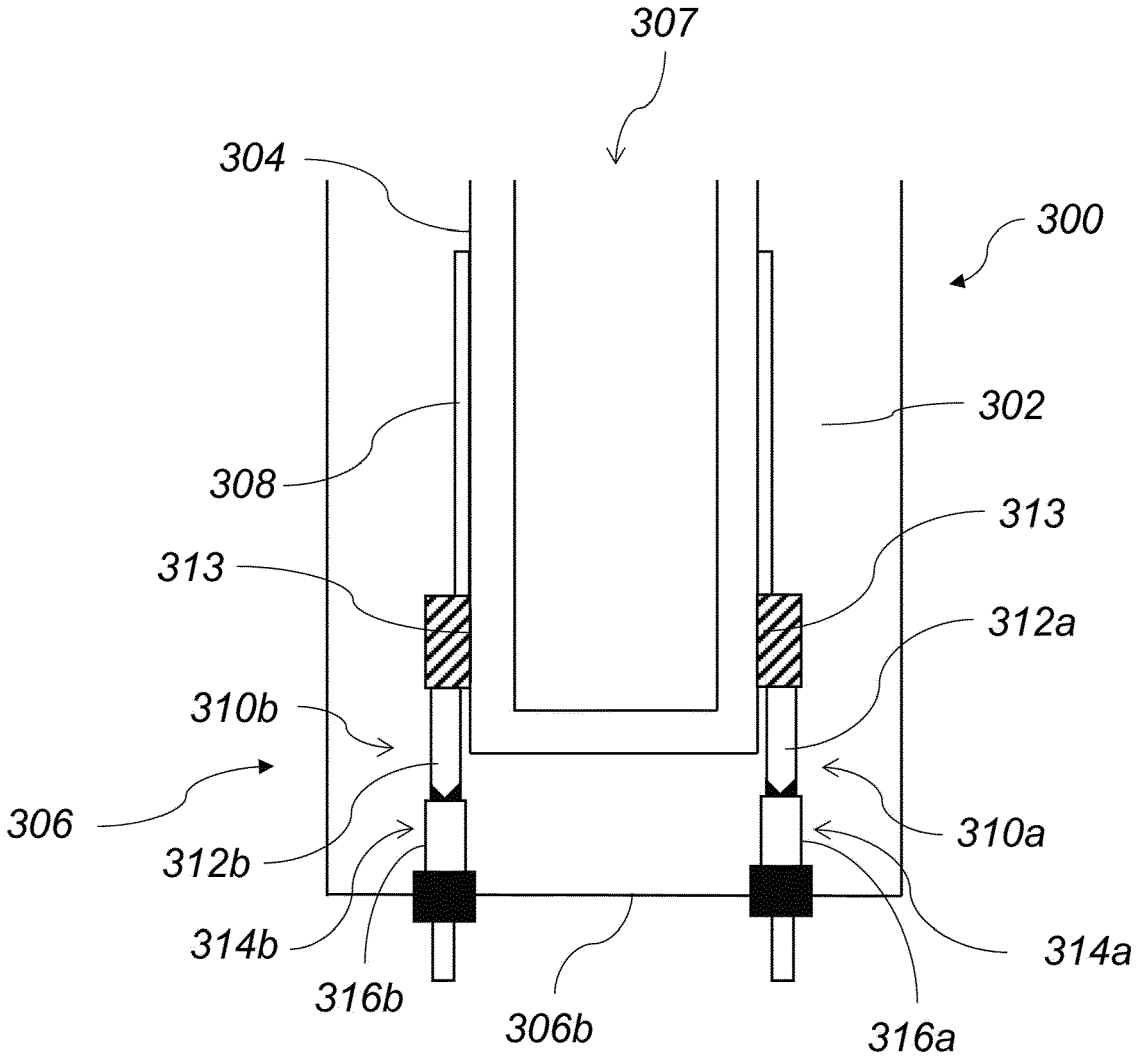
307
304
300
302
308
313
313
312a
310b
306
310a
312b
314b
314a
316b
306b
316a

FIG. 3A

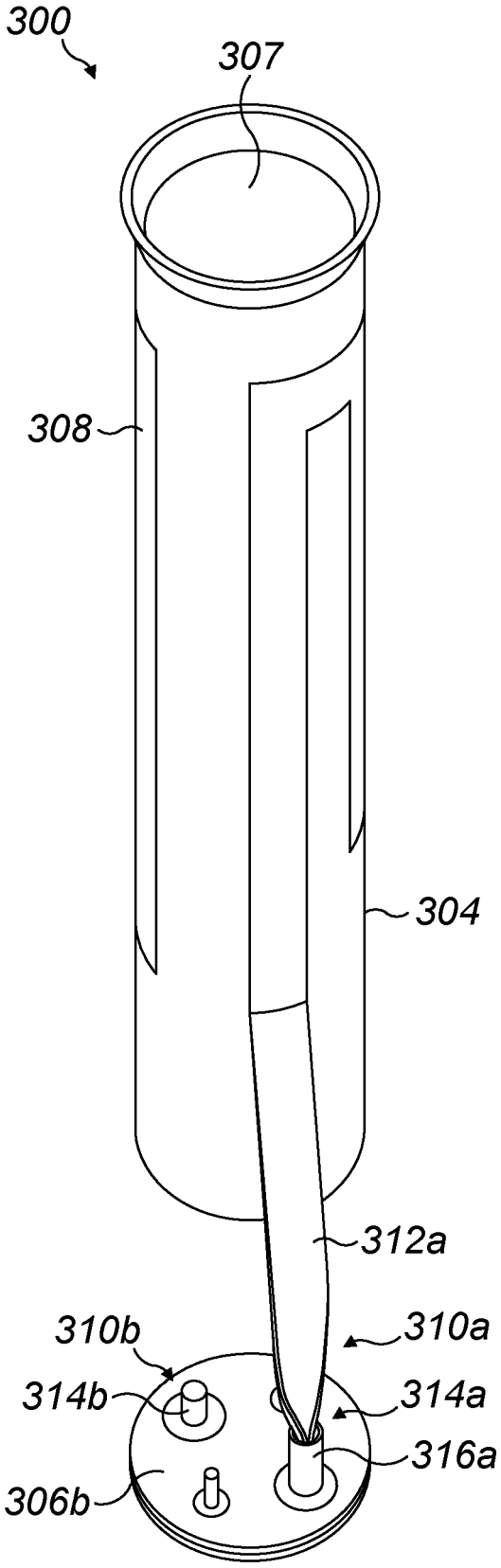

FIG. 3B

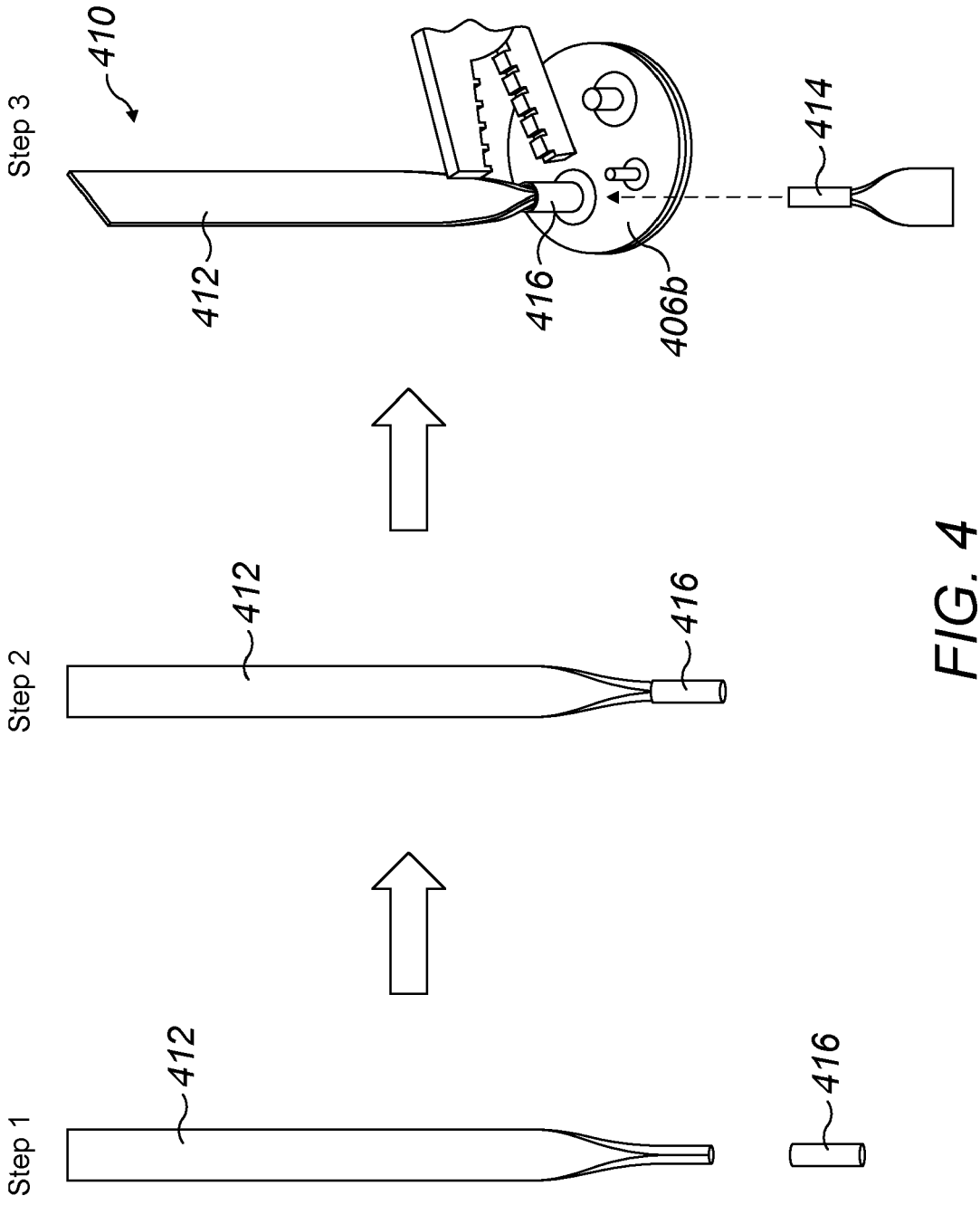

FIG. 4

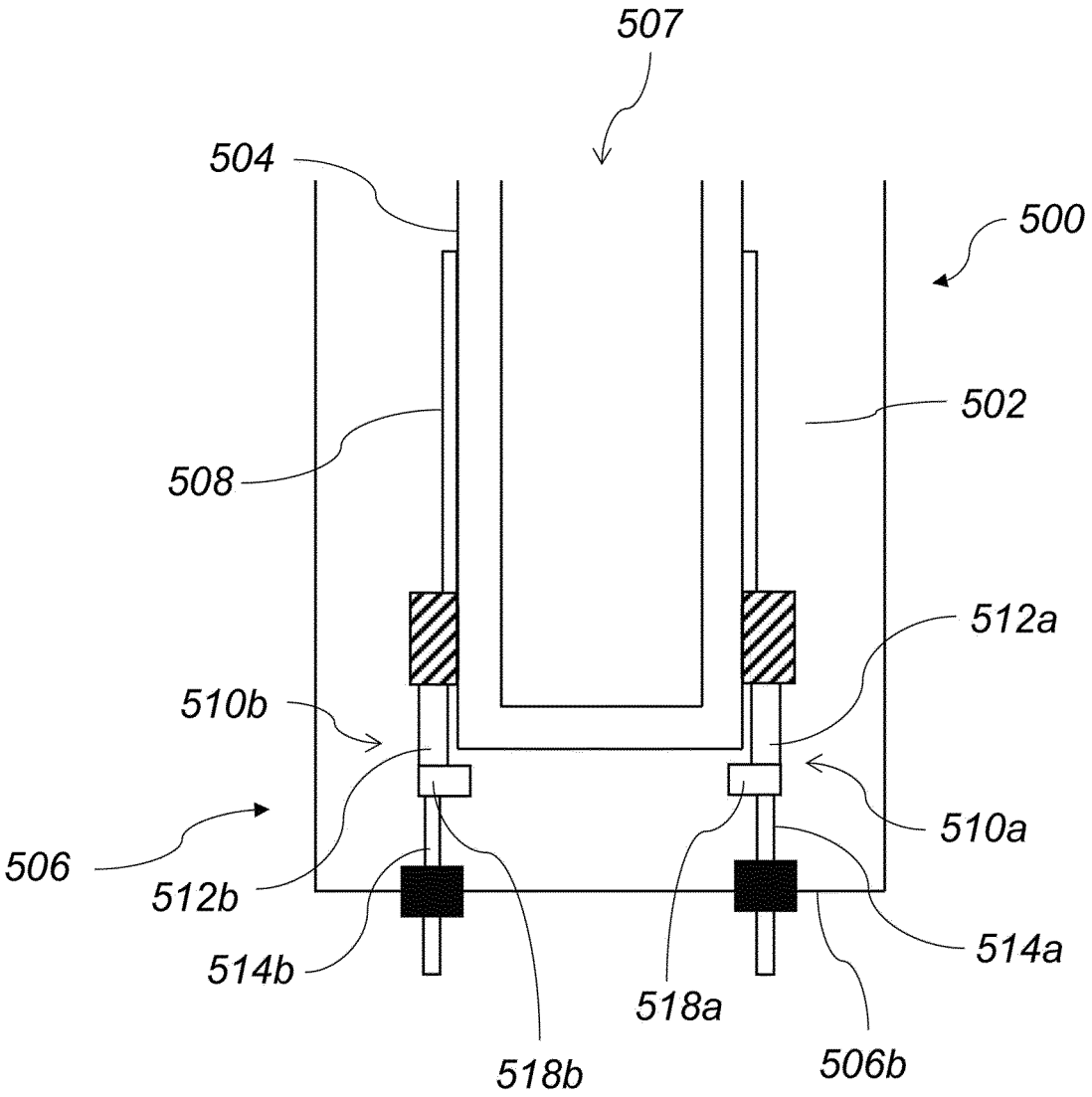
507
504
500
502
508
512a
510b
510a
506
512b
514a
514b
518a
518b
506b

FIG. 5A

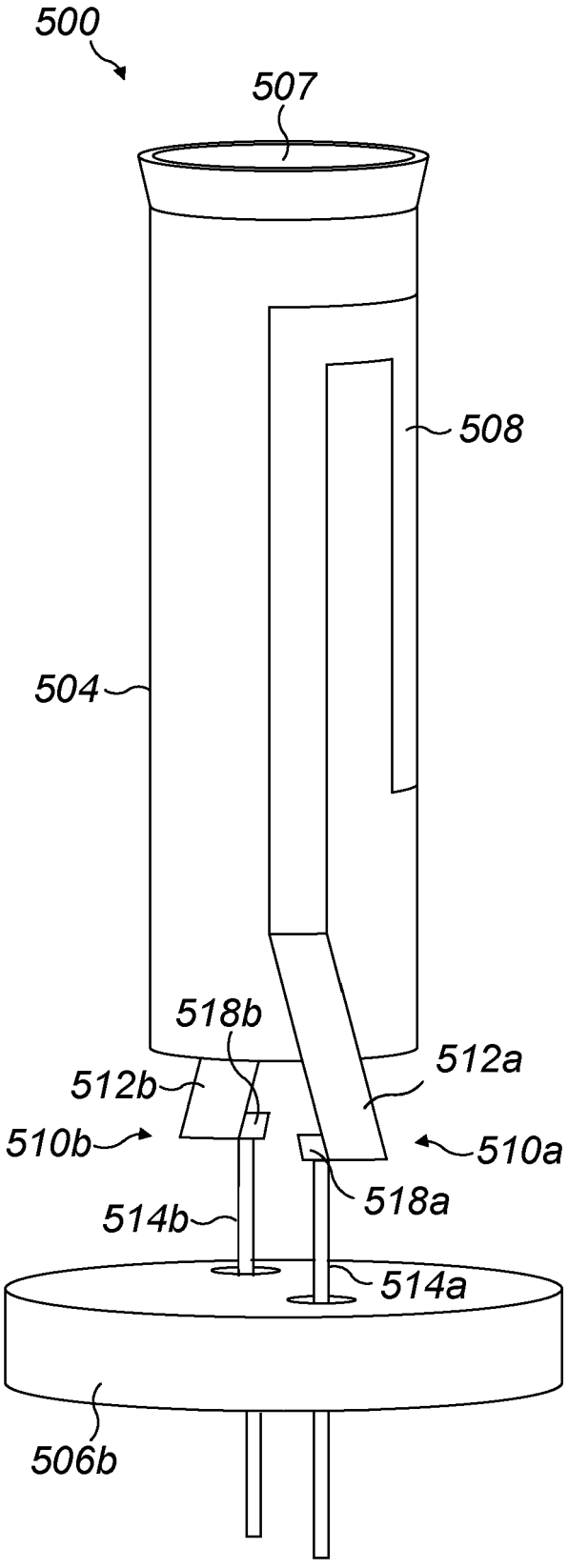

FIG. 5B

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 23 18 2838

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 2022/354184 A1 (KT & G CORP [KR]) 10 November 2022 (2022-11-10) * paragraphs [0023] - [0034], [0067] - [0091]; figures 1,14,15,19 *	1-12	INV. A24F40/46 A24F40/70
A	EP 3 598 905 A1 (SHENZHEN SMOORE TECHNOLOGY LTD [CN]) 29 January 2020 (2020-01-29) * paragraphs [0001], [0005], [0021] - [0024], [0026] - [0028], [0033] - [0034]; figures *	1-12	
A	WO 2023/274857 A1 (JT INT SA [CH]) 5 January 2023 (2023-01-05) * page 3, line 26 - page 5, line 6; figure *	1	

TECHNICAL FIELDS SEARCHED (IPC)

A24F

The present search report has been drawn up for all claims

1

Place of search	Date of completion of the search	Examiner
Munich	21 November 2023	Kock, Søren

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 23 18 2838

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

21-11-2023

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2022354184 A1	10-11-2022	CN 114080264 A	22-02-2022
		EP 3945886 A1	09-02-2022
		JP 7187103 B2	12-12-2022
		JP 2022540282 A	15-09-2022
		KR 20210150157 A	10-12-2021
		US 2022354184 A1	10-11-2022
		WO 2021246621 A1	09-12-2021
EP 3598905 A1	29-01-2020	CN 108851244 A	23-11-2018
		EP 3598905 A1	29-01-2020
		JP 6998343 B2	10-02-2022
		JP 2020014463 A	30-01-2020
		KR 20200011375 A	03-02-2020
WO 2023274857 A1	05-01-2023	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82