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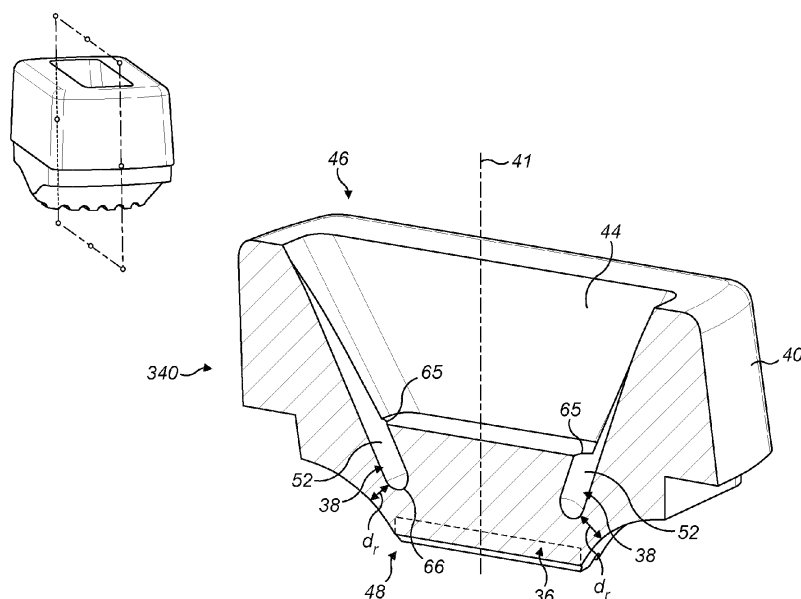
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(54) **AEROSOL GENERATING SYSTEMS AND CARTRIDGES FOR USE IN AEROSOL GENERATING SYSTEMS**

(57) A cartridge 14 for an aerosol generating system comprises a reservoir 30 having a reservoir chamber 32 for containing a liquid aerosol generating substrate, a vaporisation region 36, and a fluid transfer medium 340, 340a operable to absorb liquid from the reservoir chamber 36 and transfer the absorbed liquid to the vaporisation region 32. The fluid transfer medium 340, 340a comprises a porous ceramic, and the porous ceramic com-

prises a pressure release structure 38 in an interior surface 44 of the fluid transfer medium 340, 340a, the pressure release structure 38 comprising a recess 52 in the interior surface 44 of the fluid transfer medium defining a reduced thickness region of the porous ceramic. An aerosol generating system including the cartridge 14 is also described.

**FIG. 4****EP 4 467 016 A1**

Description

Technical Field

[0001] The present invention relates generally to aerosol generating systems. The invention relates particularly, but not exclusively, to cartridges for aerosol generating systems that comprise a base part and a separable cartridge.

Technical Background

[0002] Aerosol generating systems, also commonly termed electronic cigarettes, are an alternative to conventional cigarettes. Instead of generating a combustion smoke, they vaporise a liquid aerosol generating substrate which can be inhaled by a user. The liquid typically comprises an aerosol-forming substance, such as glycerine or propylene glycol, that creates the vapour when heated. Other common substances in the liquid are nicotine and various flavourings.

[0003] An aerosol generating system is a hand-held inhaler system, typically comprising a mouthpiece section, a reservoir configured to hold liquid aerosol generating substrate in a reservoir chamber, and a power supply unit. Vaporisation is achieved in a vaporisation region, such as a vaporisation chamber, by a vaporiser or heater unit which typically comprises a heating element in the form of a heating coil and a fluid transfer medium such as a wick. Vaporisation occurs when the heater heats the liquid in the wick until the liquid is transformed into vapour.

[0004] In general terms, a vapour is a substance in the gas phase at a temperature lower than its critical temperature, which means that the vapour can be condensed to a liquid by increasing its pressure without reducing the temperature, whereas an aerosol is a suspension of fine solid particles or liquid droplets, in air or another gas. It should, however, be noted that the terms "aerosol" and "vapour" may be used interchangeably in this specification, particularly with regard to the form of the inhalable medium that is generated for inhalation by a user.

[0005] Conventional cigarette smoke comprises nicotine as well as a multitude of other chemical compounds generated as the products of partial combustion and/or pyrolysis of the plant material. Electronic cigarettes on the other hand deliver primarily an aerosolised version of an initial starting e-liquid composition comprising nicotine and various food safe substances such as propylene glycol and glycerine, etc., but are also efficient in delivering a desired nicotine dose to the user. Electronic cigarettes need to deliver a satisfying amount of vapour for an optimum user experience whilst at the same time maximising energy efficiency.

[0006] WO 2017/179043 discloses an aerosol generating system comprising a disposable cartridge and a reusable base part. The cartridge has a simplified struc-

ture which is achieved by keeping the main heating element in the re-usable base part, while the cartridge is provided with a heat transfer unit. The heat transfer unit is configured to transfer heat from the heating element to the proximity of liquid in the cartridge to produce a vapour for inhalation by a user.

[0007] During use of an aerosol generating system, as liquid in the fluid transfer medium is vaporised, the pressure in the reservoir drops. This is because liquid is pulled into the fluid transfer medium by capillary forces in order to re-saturate the fluid transfer medium as liquid already held in the fluid transfer medium is heated and vaporised. The pressure difference between the reservoir chamber and the ambient atmosphere outside the reservoir can become very large unless air is permitted to propagate to the reservoir chamber in order to equalise the pressure. Failure to permit air ingress to the reservoir chamber can prevent the fluid transfer medium from re-saturating correctly. For this reason, aerosol generation systems sometimes include a pressure balance system that is operable to provide a pressure equalisation air path between the reservoir chamber and air at ambient pressure. Such a pressure balance system allows for gas (and in particular, air) transfer into the reservoir as liquid is consumed in the vaporisation process.

[0008] However, since such pressure balance systems permit air ingress to the reservoir chamber, they can also permit fluid to escape from the reservoir chamber. This can undesirably result in leakage from the reservoir chamber, resulting in the need to provide additional structure in the system to combat or contain the leakage.

[0009] It is desirable to provide a cartridge including an alternative pressure balance system that is less prone to leakage.

Summary

[0010] According to a first aspect of the present invention, we provide cartridge for an aerosol generating system, the cartridge comprising:

a reservoir having a reservoir chamber for containing a liquid aerosol generating substrate;
a vaporisation region; and
a fluid transfer medium operable to absorb liquid from the reservoir chamber and transfer the absorbed liquid to the vaporisation region;
wherein the fluid transfer medium comprises a porous ceramic, and the porous ceramic comprises a pressure release structure in an interior surface of the fluid transfer medium, the pressure release structure comprising a recess in the interior surface of the fluid transfer medium defining a reduced thickness region of the porous ceramic.

[0011] Conventional pressure balance systems are typically provided in a wall of the reservoir, or as an additional component in fluid communication with the

reservoir, such as a mounting fixture for the fluid transfer medium. This adds complexity to the construction of a cartridge, and so adds to the expense of production. Furthermore, leakage from the reservoir can occur via the pressure balance system, as it provides a fluid path between the reservoir chamber and the exterior of the reservoir. Again, this can result in the need for additional complexity in the form of leakage prevention systems, such as ribs external to the reservoir for collecting the leaked liquid.

[0012] By providing a pressure release structure in the interior surface of the fluid transfer medium in the form of a recess defining a reduced thickness region of porous ceramic, air can be provided with a pressure equalisation path for ingress to the reservoir chamber through the reduced thickness region, without providing a direct fluid path opening into the reservoir chamber. In particular, the pressure release structure is preferably operable to permit air ingress to the reservoir chamber from a location external to the reservoir through the reduced thickness region, without providing an open gas inlet in an exterior surface of the reservoir. This may reduce the risk of leakage from the reservoir via the pressure release structure, while still allowing for air ingress to the reservoir chamber in a controlled manner, at a controlled location. Furthermore, providing a pressure release structure in an interior surface of a ceramic fluid transfer medium allows for a simplified construction as compared to other pressure balance systems, as such a structure can be conveniently machined or cast into the fluid transfer medium during manufacture.

[0013] Preferably, a thickness of the reduced thickness region is less than or equal to 1 mm, and most preferably less than 0.5mm. For example, the reduced thickness region may have a thickness in the range 0.1mm-1mm, 0.2mm-1mm, 0.2mm-0.7mm, or 0.2mm-0.5mm. A pressure release structure including such a reduced thickness region may reduce the magnitude of the pressure differential needed to cause air to migrate through the porous ceramic into the reservoir chamber. In a ceramic fluid transfer medium absent any pressure release structure, a minimum thickness of the porous ceramic is typically in the range 1.5mm-2mm. Such a fluid transfer medium can require a pressure difference of up to 20Pa between the reservoir chamber and the exterior before air is caused to migrate to the reservoir chamber. In contrast, a ceramic fluid transfer medium comprising a pressure release structure can require a much lower pressure difference to cause air to migrate through the reduced thickness region, for example less than 15Pa, or less than 10Pa.

[0014] As noted above, the fluid transfer medium comprises a porous ceramic fluid transfer medium, which may be positioned adjacent to an opening of the reservoir chamber and arranged to hold and transfer aerosol generating liquid from the reservoir chamber to the vaporisation region by capillary action. The porous ceramic fluid transfer medium may be substantially rigid and inflexible.

The pore size of the porous ceramic may be in the range 10-80 μm , for example in the range 20-60 μm .

[0015] The recess may comprise a non-through hole, with the reduced thickness region being defined between a wall of the non-through hole and an exterior surface of the fluid transfer medium. Such a non-through hole may be formed as a bore in the ceramic having a blind end, where the reduced thickness region is located at or adjacent the blind end. Such a non-through hole may provide a convenient guide path into the reservoir chamber for air entering the reservoir through the reduced thickness region, while maintaining a large area of the interior surface clear for liquid absorption into the fluid transfer medium.

[0016] The reduced thickness region may be defined between a wall of the non-through hole and an exterior surface of the fluid transfer medium in the vaporisation region. Thus, fluid that is wicked from the reservoir through the reduced thickness region may be deposited into the vaporisation region, from which it may be vaporised together with fluid that has been wicked through the full thickness of the fluid transfer medium.

[0017] The pressure release structure may comprise a non-through hole offset from a longitudinal axis of the fluid transfer medium. This may promote air ingress to the reservoir at a location which is offset from the vaporisation region. Air which enters the reservoir chamber through the reduced thickness region may aggregate on the interior surface of the fluid transfer medium in the form of one or more bubbles, which may inhibit the absorption of fluid into the portion of the porous ceramic holding the one or more bubbles until the bubbles eventually detach. Thus, controlling the location of the air ingress may assist in promoting liquid absorption into the fluid transfer medium by providing separation between the reduced thickness region and a main fluid absorption region of the fluid transfer medium, e.g. above the vaporisation region. Furthermore, a clear fluid path is maintained through the porous ceramic between the reservoir chamber and the vaporisation region.

[0018] Alternatively, the pressure release structure may comprise a non-through hole aligned with a longitudinal axis of the fluid transfer medium.

[0019] The pressure release structure may further comprise a bubble release feature on the interior surface of the fluid transfer medium. As noted above, air which enters the reservoir chamber through the reduced thickness region may aggregate on the interior surface of the fluid transfer medium in the form of one or more bubbles. This may adversely affect the ability of the fluid transfer medium to absorb liquid by blocking liquid access to the porous ceramic until the bubbles detach. By providing a bubble release feature on the interior surface of the fluid transfer medium, bubbles which form may be encouraged to separate from the interior surface and propagate upward and out of the liquid held in the reservoir chamber. This may further assist in promoting liquid absorption into the fluid transfer medium.

[0020] The bubble release feature may comprise a protrusion defining a raised portion of the interior surface. For example, the pressure release structure may comprise a non-through hole, which may be aligned with a longitudinal axis of the fluid transfer medium. A protrusion may be formed adjacent or surrounding a mouth of the non-through hole. In this way a bubble release region may be raised above the main fluid absorption region of the fluid transfer medium, further reducing the impact of bubble formation on the liquid absorption.

[0021] The fluid transfer medium may comprise a plurality of pressure release structures. For example, the fluid transfer medium may comprise a plurality of pressure release structures, each of which may comprise a non-through hole offset from a longitudinal axis of the fluid transfer medium. The fluid transfer medium may comprise a pair of pressure release structures on opposing sides of the longitudinal axis of the fluid transfer medium. This arrangement may provide for increased air ingress to the reservoir chamber while still maintaining a clear fluid path between the reservoir chamber and the vaporisation region.

[0022] The fluid transfer medium may be operable to close an opening in the reservoir such that at least a portion of the interior surface of the fluid transfer medium is in direct contact with a liquid held within the reservoir chamber.

[0023] The cartridge may further comprise a seal surrounding at least a portion of the exterior surface of the fluid transfer medium. The seal may further assist in preventing leakage from the reservoir.

[0024] According to a second aspect of the invention, we provide an aerosol generating system comprising: a cartridge for an aerosol generating system, the cartridge comprising:

- a reservoir having a reservoir chamber for containing a liquid aerosol generating substrate;
 - a vaporisation region; and
 - a fluid transfer medium operable to absorb liquid from the reservoir chamber and transfer the absorbed liquid to the vaporisation region;
- wherein the fluid transfer medium comprises a porous ceramic, and the porous ceramic comprises a pressure release structure in an interior surface of the fluid transfer medium, the pressure release structure comprising a recess in the interior surface of the fluid transfer medium defining a reduced thickness region of the porous ceramic;
- the aerosol generating system further comprising a base part configured to removably connect to the cartridge.

[0025] The cartridge may comprise any of the features set out above in relation to the first aspect of the invention, in any combination.

[0026] The base part may comprise a heater operable to supply heat to the vaporisation region when the car-

tridge is thermally connected to the cartridge. Such an arrangement simplifies the structure of the cartridge and allows reuse of the heater with multiple cartridges.

[0027] The cartridge may further comprise a thermal interface membrane operable to transfer heat from the heater in the base part to the vaporisation region when the cartridge is thermally connected to the base part. Such a thermal interface membrane provides a cartridge having a sealed construction which reduces the risk of leakage.

[0028] It is to be appreciated that the cartridge and the base part may further include any one or more components conventionally included in an aerosol generating system, such as the system described below in connection with Figure 1.

[0029] For example, the cartridge may further comprise a vapour transfer channel operable to fluidly connect an inlet with an outlet, with the vaporisation region being in communication with, and preferably located in, the vapour transfer channel between the inlet and the outlet.

[0030] Furthermore, the cartridge may further comprise a cartridge housing having a proximal end configured as a mouthpiece end, which is in fluid communication with the vaporisation region via the vapour transfer channel, and a distal end operable to removably connect with the base part. The mouthpiece end may be configured for providing the vaporised liquid to the user.

[0031] The reservoir may be provided in the cartridge housing with the vapour transfer channel extending from an inlet at the base and one side of the cartridge, along the distal end of the cartridge to the vaporisation region and up one side of the cartridge to an outlet located centrally at the mouthpiece end. Alternatively, the reservoir may be disposed around the vapour transfer channel.

[0032] The cartridge housing may be made of one or more of the following materials: aluminium, polyether ether ketone (PEEK), polyimides, such as Kapton®, polyethylene terephthalate (PET), polyethylene (PE), high-density polyethylene (HDPE), polypropylene (PP), polystyrene (PS), fluorinated ethylene propylene (FEP), polytetrafluoroethylene (PTFE), polyoxymethylene (POM), polybutylene terephthalate (PBT), Acrylonitrile butadiene styrene (ABS), Polycarbonates (PC), epoxy resins, polyurethane resins and vinyl resins.

[0033] The base part of the system may include a power supply unit, e.g. a battery, which may be connected to the heater. In operation, upon activating the aerosol generating system, the power supply unit electrically heats the heater of the base part, which then provides its heat by conduction to the fluid transfer medium in the cartridge (optionally via a thermal interface membrane) resulting in vaporisation of the liquid absorbed therein. As this process is continuous, liquid from the reservoir chamber is continuously absorbed by the fluid transfer medium. Vapour created during the above process is transferred from the vaporisation region via

the vapour transfer channel so that it can be inhaled via the outlet by a user. Once the liquid in the reservoir chamber is used up, the cartridge may be disconnected from the base part and a new cartridge fitted, enabling the reuse of the base part.

[0034] The heater of the base part may comprise a protruding heater extending from the base part so that, in use, the heater extends into a recess of the cartridge.

[0035] The power supply unit, e.g. battery, may be a DC voltage source. For example, the power supply unit may be a Nickel-metal hydride battery, a Nickel cadmium battery, or a Lithium based battery, for example a Lithium-Cobalt, a Lithium-Iron-Phosphate, a Lithium-Ion or a Lithium-Polymer battery.

[0036] The base part may further comprise a controller associated with electrical components of the aerosol generating system, including the battery and heater.

[0037] The aerosol generating system may comprise an electronic cigarette. As used herein, the term "electronic cigarette" may include an electronic cigarette configured to deliver an aerosol to a user, including an aerosol for inhalation/vaping. An aerosol for inhalation/-vaping may refer to an aerosol with particle sizes of 0.01 to 20 μm . The particle size may be between approximately 0.015 μm and 20 μm . The electronic cigarette may be portable.

Brief Description of the Drawings

[0038] The invention will now be described, by way of example only, with reference to the accompanying drawings, in which like features are denoted with the same reference numerals.

Figure 1 is a partial cross-sectional view of an aerosol generating system comprising a base part (only partly visible) and a cartridge;

Figure 2 shows a perspective view of a porous ceramic fluid transfer medium that is not in accordance with the invention;

Figure 3 shows a cross-sectional view of the porous ceramic fluid transfer medium of Figure 2;

Figure 4 shows a cross-sectional view of a porous ceramic fluid transfer medium including a pressure release structure;

Figure 5 illustrates the functioning of the pressure release structure of the porous ceramic fluid transfer medium of Figure 4;

Figure 6 illustrates the functioning of a porous ceramic fluid transfer medium including an alternative pressure release structure.

Detailed Description

[0039] Figure 1 shows one example of an aerosol generating system 10, which can be used as a substitute for a conventional cigarette. The aerosol generating system 10 comprises a base part 12 and a cartridge 14 (also

referred to in the art as a "capsule" or "pod") thermically connectable to the base part 12. The base part 12 is thus the main body part of the aerosol generating system and is preferably re-usable.

[0040] The base part 12 comprises a housing 16 accommodating therein a power supply unit (not shown) in the form of a battery connected to a heating element located at a first end of the housing 16. The heating element is in the form of a rigid protruding heater 20 that protrudes out of the base part for partial receipt within the cartridge 14. The first end of the housing 16 has an interface configured for matching a corresponding interface of the cartridge 14 and comprises a connector for mechanically coupling the cartridge 14 to the base part. The battery is configured for providing the heater 20 with the necessary power for its operation, via suitable electrical contacts, allowing it to become heated to a required temperature. The heater 20, in the example shown, comprises a ceramic heater. However, it will be appreciated that any suitable type of heater may be selected as required by the implementation.

[0041] The heater and battery are also connected to a controller (not shown), that is operable to control the operations of the aerosol generation system using power supplied by the battery.

[0042] Referring still to Figure 1, the cartridge 14 comprises a cartridge housing 22 having a proximal end 24 and a distal end 26. The proximal end 24 may constitute a mouthpiece end configured for being introduced directly into a user's mouth. In some examples, a mouthpiece may be fitted to the proximal end 24. The distal end 26 of the housing 22 comprises a base 28 into which the heater 20 protrudes when the cartridge 14 is connected to the base unit 12. In particular, an aperture 29 in the base 28 defines a recess into which at least a portion of the heater 20 protrudes when connected.

[0043] The cartridge 14 further comprises a reservoir 30 defining a reservoir chamber 32 configured for containing therein a liquid to be vaporised. The liquid may comprise an aerosol-forming substance such as propylene glycol and/or glycerol and may contain other substances such as nicotine and acids. The liquid may also comprise flavourings such as e.g. tobacco, menthol or fruit flavour. The reservoir 30 extends between the proximal end 24 towards the distal end 26 and is spaced from the distal end 26. A vapour transfer channel 31 extends from one or more inlets 33 across the distal end 26 of the cartridge and up the side of the cartridge to an outlet 35 located centrally in the proximal end 24 of the cartridge. Many configurations for the vapour transfer channel are possible. In the example shown, the inlet 33 is located in the base part 12, and fluidly connected to the remainder of the vapour transfer channel 31 in the cartridge 14 at a fluidly sealable joint 37. Alternatively, the reservoir may surround, and coextend with, the vapour transfer channel. The inlet(s) may be provided in the cartridge 14 or in the base part 12, as required.

[0044] The cartridge 14 is further provided with a fluid

transfer medium in the form of a porous ceramic fluid transfer medium 34, also referred to herein as a porous ceramic wick, in fluid communication with the reservoir chamber 32. The porous ceramic fluid transfer medium 34 is operable to absorb liquid aerosol generating substrate from the reservoir and deliver said liquid aerosol generating substrate to a vaporisation region 36. As used herein, the term "vaporisation region" 36 refers to the region in which liquid is vaporised, and may alternatively be termed a vaporisation chamber or area. Typically, the vaporisation region is an area within and/or adjacent to the porous ceramic wick 34 in which liquid is heated to a sufficiently high temperature to achieve vaporisation / aerosolization. Vaporised liquid may then be entrained in air within the vapour transfer channel 31 as said air flows past the wick, for example during a user's inhalation.

[0045] Upon connection of the interfaces between the cartridge 14 and the base part 12 of the device, the heater 20 protrudes into the vapour transfer channel 31 immediately below the porous wick 34, thereby enabling heating of liquid in the wick until the liquid is transformed into vapour when the heater is activated.

[0046] A thermal interface membrane 50 is provided between the heater 20 and the porous wick 34. The membrane 50 is a thin membrane such as a metal foil that is configured to ensure rapid and even heating of the vaporisation region 36 in an accurate and defined geometry, reducing the amount of lateral thermal spreading (i.e. thermal losses). The thermal interface membrane 50 is flexible, and so is able to deform, and so at least partially conform, to the shape of the heater 20 when a connection is made between the cartridge 14 and the base part 12. Heat from the heater 20 in the base part is thus transferred to the fluid transfer medium 34 through the thermal interface membrane 50 by conduction, convection and/or radiation (but primarily via conduction) when the cartridge is thermically connected to the base part 12 in order to effect vaporisation of the aerosol generating liquid held in the fluid transfer medium.

[0047] Referring now to Figures 2 and 3, a porous ceramic fluid transfer medium 34 is shown which is not in accordance with the present invention. The porous ceramic fluid transfer medium 34 is shown separately from a cartridge 14 for clarity, but it will be appreciated that the porous ceramic fluid transfer medium 34 may be used in a cartridge 14, such as the cartridge shown in Figure 1, which comprises a reservoir having a reservoir chamber for containing a liquid aerosol generating substrate, and a vaporisation region. In use, the fluid transfer medium 34 is operable to absorb liquid from the reservoir chamber 32 and transfer the absorbed liquid to the vaporisation region.

[0048] The porous ceramic fluid transfer medium 34 illustrated in Figure 2 has a generally rectangular cross-section defining four exterior faces at an exterior surface 40 and a longitudinal axis 41. When installed in a cartridge, such as the cartridge shown in Figure 1, the fluid

transfer medium 34 is operable to close an opening 42 in the reservoir, and in particular at a distal end of the reservoir. Thus at least a portion of an interior surface 44 of the fluid transfer medium 34 is in direct contact with a liquid held within the reservoir chamber. Liquid from the reservoir may thus be absorbed into the fluid transfer medium through the inner surface 44, and wicked towards the vaporisation region.

[0049] A first end of the fluid transfer medium 34, which is located closest to the opening 42 in the reservoir, may be thought of as a reservoir end 46. A second end of the fluid transfer medium, which is remote from the reservoir end 46 and adjacent and/or including the vaporisation region 36, may be thought of as a vaporisation end 48.

[0050] When viewed in cross section (Figure 3) it can be seen that the porous ceramic of the fluid transfer medium has a minimum thickness d between the interior surface 44 and the exterior surface 40, the minimum thickness being the shortest straight path through the ceramic between those two surfaces. During use of an aerosol generating system including a porous ceramic fluid transfer medium 34 of the type shown in Figures 2 and 3, liquid in the fluid transfer medium 34 is heated, for example by the heater 20 in the base part shown in Figure 1. That heated liquid is vaporised in the vaporisation region 36, and the resulting vapour is removed from the vaporisation region by air drawn through the vapor transfer channel by a user of the system. The vaporisation of liquid within the porous ceramic causes pressure in the reservoir chamber 32 to drop. This is because new liquid is pulled into the fluid transfer medium 34 due to capillary forces in order to re-saturate the fluid transfer medium 34 as the liquid already held in the fluid transfer medium is heated and vaporised.

[0051] The pressure difference between the reservoir chamber 32 and the ambient atmosphere outside the reservoir chamber 32 can become very large unless air is permitted to propagate to the reservoir chamber 32 in order to equalise the pressure. In a ceramic fluid transfer medium of the type shown in Figures 2 and 3 (i.e. absent any pressure release structure in the ceramic fluid transfer medium), the minimum thickness d of the porous ceramic is typically in the range 1.5mm-2mm, for example 1.5mm, and the pore size is typically in the range 10-80 μm , for example in the range 20-60 μm . Such a fluid transfer medium can require a pressure difference of up to 20Pa between the reservoir chamber and the exterior before air is caused to migrate to the reservoir chamber.

[0052] Failure to permit air ingress to the reservoir chamber 32 can prevent the fluid transfer medium 34 from re-saturating correctly. In aerosol generating systems having flexible fluid transfer media, such as cotton wicks, the wick itself is typically a soft fibrous structure which can deform, and hence can create gaps that enable air to travel to the reservoir and thereby equalise the pressure. This is not possible in aerosol generating systems that utilise ceramic wicks however, such as that

shown in Figures 2 and 3, since such wicks are hard inflexible structures which do not deform during operation. In such wicks, air ingress to the reservoir chamber may only occur by air propagating through the porous ceramic itself. The lowest resistance to such air ingress may be found at the thinnest part of the ceramic, i.e. the part having the minimum thickness d , typically 1.5mm or greater. Depending on the pore size and structure of the porosity inside the ceramic wick, the pressure difference between the reservoir and the outside may need to become very large (e.g. up to or even exceeding 20Pa) before it is strong enough to cause air to propagate to the reservoir through the thickness d of ceramic in order to equalize the pressure and re-saturate the wick. This can lead to dry puffing and inconsistent delivery, which is why most commercial products with a ceramic wick include a pressure balance system in the form of a small channel in the reservoir or wick fixture that acts to permit pressure equalisation. However, such channels also lead to leakage, meaning such cartridges are typically also provided with additional features to address the problem of leakage, such as numerous ribs in a "dead" space outside the reservoir, intended to hold the leaked liquid.

[0053] An alternative fluid transfer medium 340 is shown in Figures 4 and 5. Unlike the fluid transfer medium 34 shown in Figures 2 and 3, the alternative fluid transfer medium 340 includes at least one pressure release structure 38 in an interior surface of the fluid transfer medium. In the example shown, the fluid transfer medium includes two pressure release structures 38. Each pressure release structure 38 includes a recess 52 in the interior surface 44 of the fluid transfer medium defining a reduced thickness region d_r of the porous ceramic. The thickness of the reduced thickness region d_r is substantially less than the minimum thickness d of the fluid transfer medium 34 shown in Figures 2 and 3. For example d_r may be 50% or less of the minimum thickness d , for example 40% or less, or 30% or less. The thickness of the reduced thickness region d_r is, in the example shown, approximately 1mm, but in other examples the reduced thickness region d_r may have a thickness in the range 0.1mm-1mm, 0.2mm-1mm, 0.2mm-0.7mm, or 0.2mm-0.5mm.

[0054] Pressure within the reservoir may be equalised more easily in the alternative fluid transfer medium 340 than in the fluid transfer medium 34, because the resistance to air ingress to the reservoir chamber 32 is reduced by the pressure release structure 38. In particular, a smaller pressure differential (e.g. 15Pa or less, or even 10Pa or less) is needed before air ingress becomes possible through the porous ceramic, where the porous ceramic has the same pore size and structure as a fluid transfer medium absent any pressure release structure, e.g. in the range 10-80 μm , or 20-60 μm . In turn, this makes it easier for the fluid transfer medium to re-saturate, reducing the risk of dry puffing.

[0055] By providing a pressure release structure 38 in

the interior surface 44 of the fluid transfer medium 340 in the form of a recess 52 defining a reduced thickness region d_r of porous ceramic, air can be provided with a pressure equalisation path for ingress to the reservoir chamber through the reduced thickness region d_r , without providing a direct fluid path opening into the reservoir chamber. In particular, each pressure release structure is operable to permit air ingress to the reservoir chamber 32 from a location external to the reservoir through a respective reduced thickness region d_r , without providing an open gas inlet in an exterior surface of the reservoir. Thus, the portion of ceramic forming the reduced thickness region d_r provides a resistive force to fluid leaking from the reservoir, whilst reducing the barrier to air ingress. This can reduce the risk of liquid leakage from the reservoir via the pressure release structure, while still allowing for air ingress to the reservoir chamber in a controlled manner, at a controlled location.

[0056] Controlling the location of air ingress to the reservoir chamber 32 can be advantageous, because air that enters the reservoir chamber 32 through the reduced thickness region may aggregate on the interior surface 44 of the fluid transfer medium in the form of one or more bubbles. Such bubbles can undesirably inhibit the absorption of liquid into the porous ceramic, by blocking liquid access to the portion of the porous ceramic holding the one or more bubbles until the bubbles eventually detach. Thus, controlling the location of the air ingress may assist in promoting liquid absorption into the fluid transfer medium by ensuring bubbles form primarily only at a selected location, rather than at any random location on the interior surface of the fluid transfer medium.

[0057] In the example fluid transfer medium shown in Figures 4 and 5, the pressure release structures 38 each comprise a non-through hole offset from the longitudinal axis 41 of the fluid transfer medium 340. By "non-through hole", it is meant a hole or bore comprising a mouth or opening 65 in the interior surface and a blind end 66 within the body of the porous ceramic, i.e. the hole does not extend all the way through the ceramic material to the exterior surface. The non-through hole may comprise any cross-section, such as circular, rectangular, square or oval with possibly a tapered opening. A minimum dimension of the cross-section may be at least 0.1mm, for example 0.5mm-1mm. Where the cross-section is circular the minimum dimension may be the diameter.

[0058] In use, liquid absorbed in the fluid transfer medium 340 is heated 57, for example by a heater 20 comprised in a base part 12 of the type shown in Figure 1. The heated liquid is vaporised in the vaporisation region 36, and the resulting vapour 58 is removed from the vaporisation region by air drawn through the vapor transfer channel 31 by a user of the system. New liquid 62 is then pulled into the fluid transfer medium 340 due to capillary forces in order to re-saturate the fluid transfer medium 340, and pressure within the reservoir is equalised by air ingress 64 to the reservoir chamber 32 via the pressure

release structures 38.

[0059] In the example shown, the fluid transfer medium 340 and heater 20 (and thermal interface membrane 50, if present) all share a common longitudinal axis 41. It will be appreciated that in this arrangement the main fluid path between the reservoir chamber 32 and the vaporisation region 36 coincides with the longitudinal axis. Thus, offsetting the pressure release structures 38 from the longitudinal axis 41 provides separation between the reduced thickness region d_r and a main fluid absorption region 68 of the fluid transfer medium 340, above the vaporisation region 36, so maintaining a fluid path between the reservoir chamber 32 and the vaporisation region 36 that is substantially clear of bubbles on the interior surface 44 of the fluid transfer medium 340.

[0060] Figure 6 shows a further alternative fluid transfer medium 340a. Where appropriate, like reference numerals are used to refer to like features, and so for brevity features common to the fluid transfer mediums 34, 340 shown in Figures 2-5 will not be described again in detail.

[0061] The ceramic fluid transfer medium 340a shown in Figure 6 includes an alternative pressure release structure 38a in the form of a non-through hole that is substantially aligned with the longitudinal axis 41 of the fluid transfer medium 340a. The alternative fluid transfer medium 340a additionally includes a bubble release feature 70 on the interior surface 44 of the fluid transfer medium 340a. As noted above, air which enters the reservoir chamber through the reduced thickness region may aggregate on the interior surface 44 of the fluid transfer medium in the form of one or more bubbles. This may adversely affect the ability of the fluid transfer medium to absorb liquid by blocking liquid access to the porous ceramic until the bubbles detach. In the example shown, the bubble release feature 70 takes the form of a protrusion 72 defining a raised portion of the interior surface. The protrusion is generally conical in shape, and is formed on the longitudinal axis 41, such that the non-through hole extends through the protrusion, with the protrusion 72 surrounding a mouth 65 of the non-through hole. In this way, the region of air ingress and/or bubble release is raised above the main fluid absorption region 68 of the fluid transfer medium, further reducing the impact of bubble formation on the liquid absorption. The bubble release feature includes a lip or widened region adjacent the mouth 65 of the non-through hole. For easier bubble release, it can be preferable to provide as little material as possible for the gas bubble to hold onto. To achieve this, there is a fillet at the outer edge of the protrusion 72.

[0062] Although exemplary embodiments have been described in the preceding paragraphs, it should be understood that various modifications may be made to the examples described herein without departing from the scope of the appended claims. Thus, the breadth and scope of the claims should not be limited to the above-described exemplary embodiments. For example, more

or fewer pressure release structures could be provided if required, and/or pressure release structures could be provided at different locations to those shown. Similarly, more or fewer bubble release features could be provided if required, and/or bubble release features could be provided at different locations to those shown. The pressure release structures and/or bubble release features could have different shapes to those shown.

[0063] Any combination of the above-described features in all possible variations thereof is encompassed by the present disclosure unless otherwise indicated herein or otherwise clearly contradicted by context.

15 Claims

1. A cartridge (14) for an aerosol generating system, the cartridge (14) comprising:
 - a reservoir (30) having a reservoir chamber (32) for containing a liquid aerosol generating substrate;
 - a vaporisation region (36); and
 - a fluid transfer medium (340, 340a) operable to absorb liquid from the reservoir chamber (32) and transfer the absorbed liquid to the vaporisation region (36);
 - wherein the fluid transfer medium (340, 340a) comprises a porous ceramic, and the porous ceramic comprises a pressure release structure (38) in an interior surface (44) of the fluid transfer medium, the pressure release structure (38) comprising a recess (52) in the interior surface (44) of the fluid transfer medium defining a reduced thickness region of the porous ceramic.
2. The cartridge of claim 1, wherein the pressure release structure (38) is operable to permit air ingress to the reservoir chamber (32) from a location external to the reservoir through the reduced thickness region.
3. The cartridge of claim 1 or claim 2, wherein a thickness (d_r) of the reduced thickness region is less than or equal to 1mm, and preferably less than 0.5mm.
4. The cartridge of any preceding claim, wherein the recess (52) comprises a non-through hole, with the reduced thickness region being defined between a wall of the non-through hole and an exterior surface (40) of the fluid transfer medium.
5. The cartridge of claim 4, wherein the reduced thickness region is defined between a wall of the non-through hole and an exterior surface (40) of the fluid transfer medium in the vaporisation region (36).
6. The cartridge of any preceding claim, wherein the

pressure release structure (38) further comprises a bubble release feature (70) on the interior surface (44) of the fluid transfer medium.

7. The cartridge of claim 6, wherein the bubble release feature (70) comprises a protrusion (72) defining a raised portion of the interior surface (44). 5
8. The cartridge of claim 7, wherein the pressure release structure comprises a non-through hole, and a protrusion (72) is formed adjacent or surrounding a mouth (65) of the non-through hole. 10
9. The cartridge of any preceding claim, wherein the pressure release structure (38) comprises a non-through hole aligned with a longitudinal axis (41) of the fluid transfer medium. 15
10. The cartridge of any one of claims 1-8, wherein the pressure release structure (38) comprises a non-through hole offset from a longitudinal axis (41) of the fluid transfer medium. 20
11. The cartridge of any preceding claim, wherein the fluid transfer medium 340, 340a comprises a plurality of pressure release structures (38). 25
12. The cartridge of any preceding claim, wherein the fluid transfer medium 340, 340a is operable to close an opening (42) in the reservoir (30) such that at least a portion of the interior surface (44) of the fluid transfer medium is in direct contact with a liquid held within the reservoir chamber (32). 30
13. An aerosol generating system comprising the cartridge (14) of any one of claims 1-12 and a base part (16) configured to removably connect to the cartridge (14). 35

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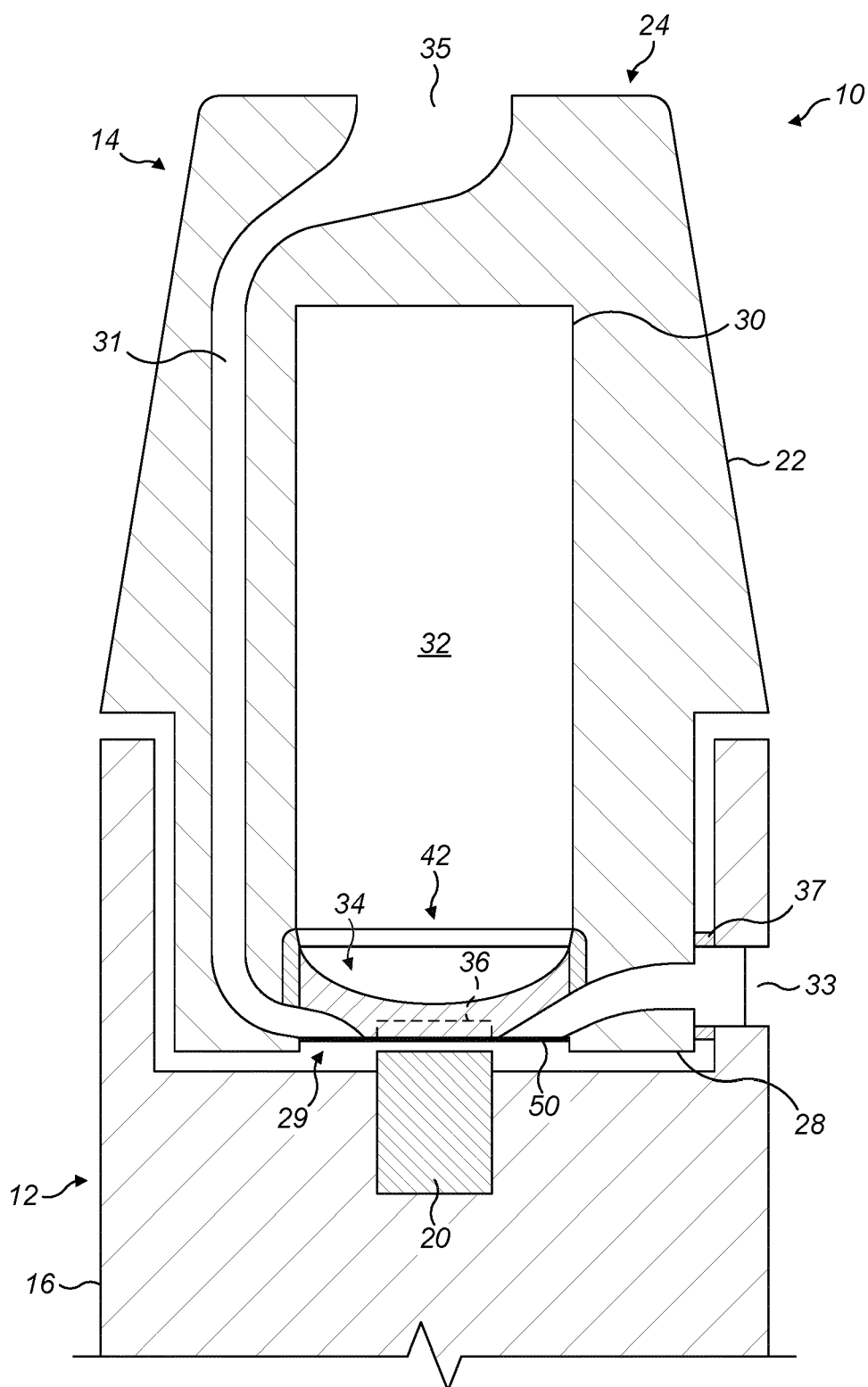


FIG. 1

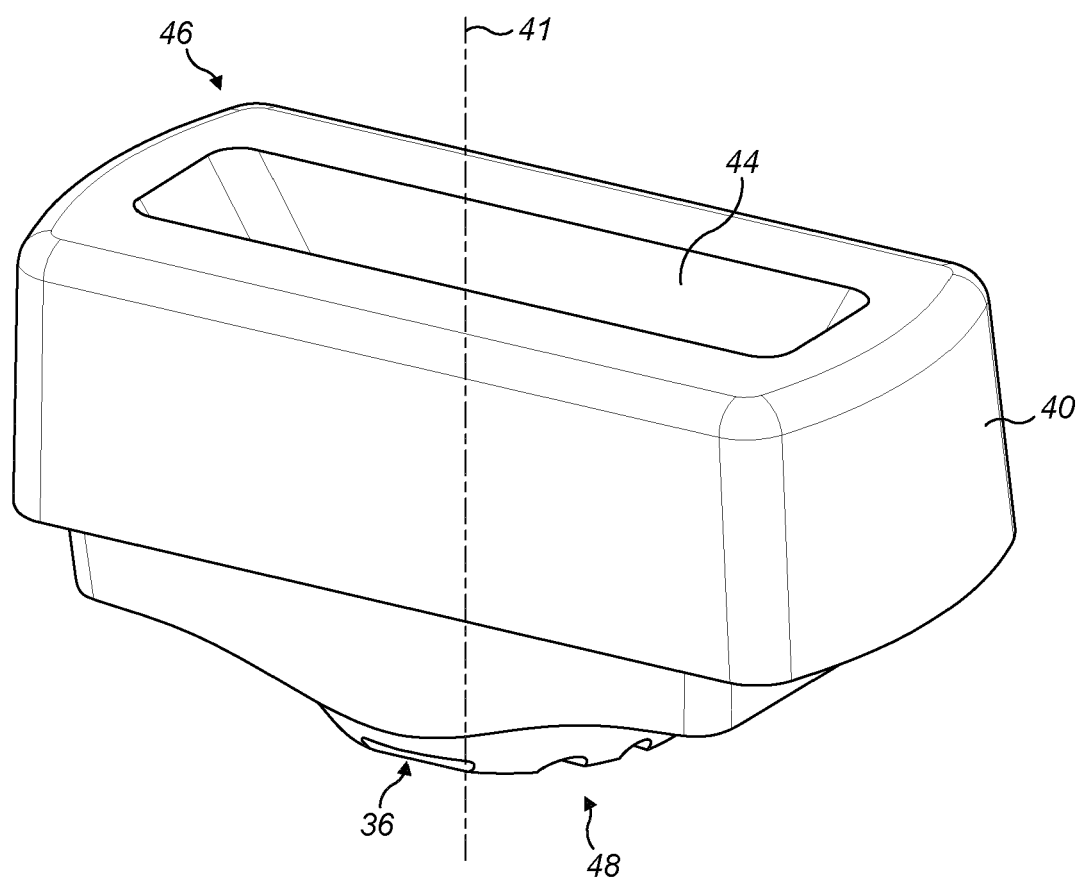


FIG. 2

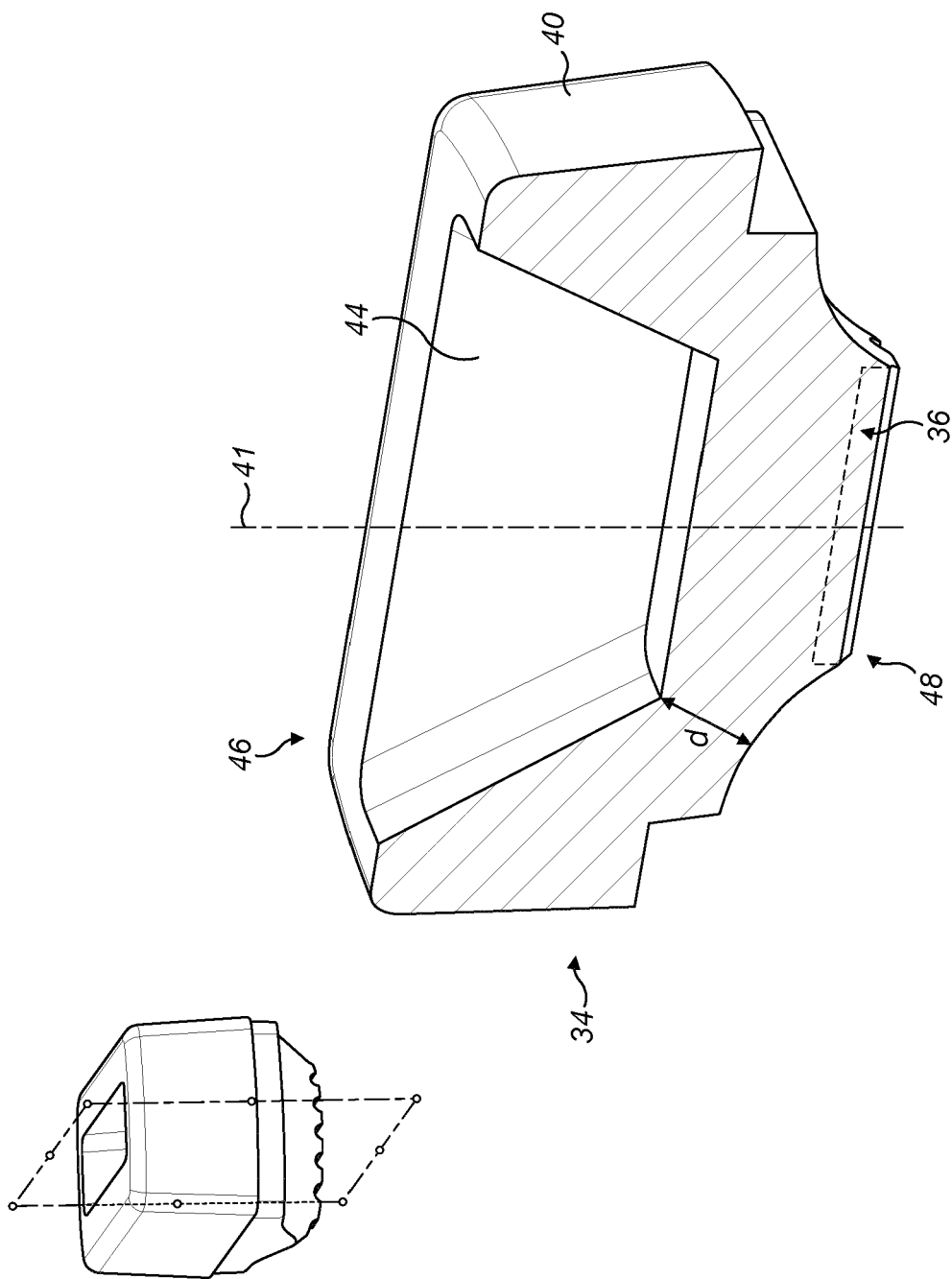


FIG. 3

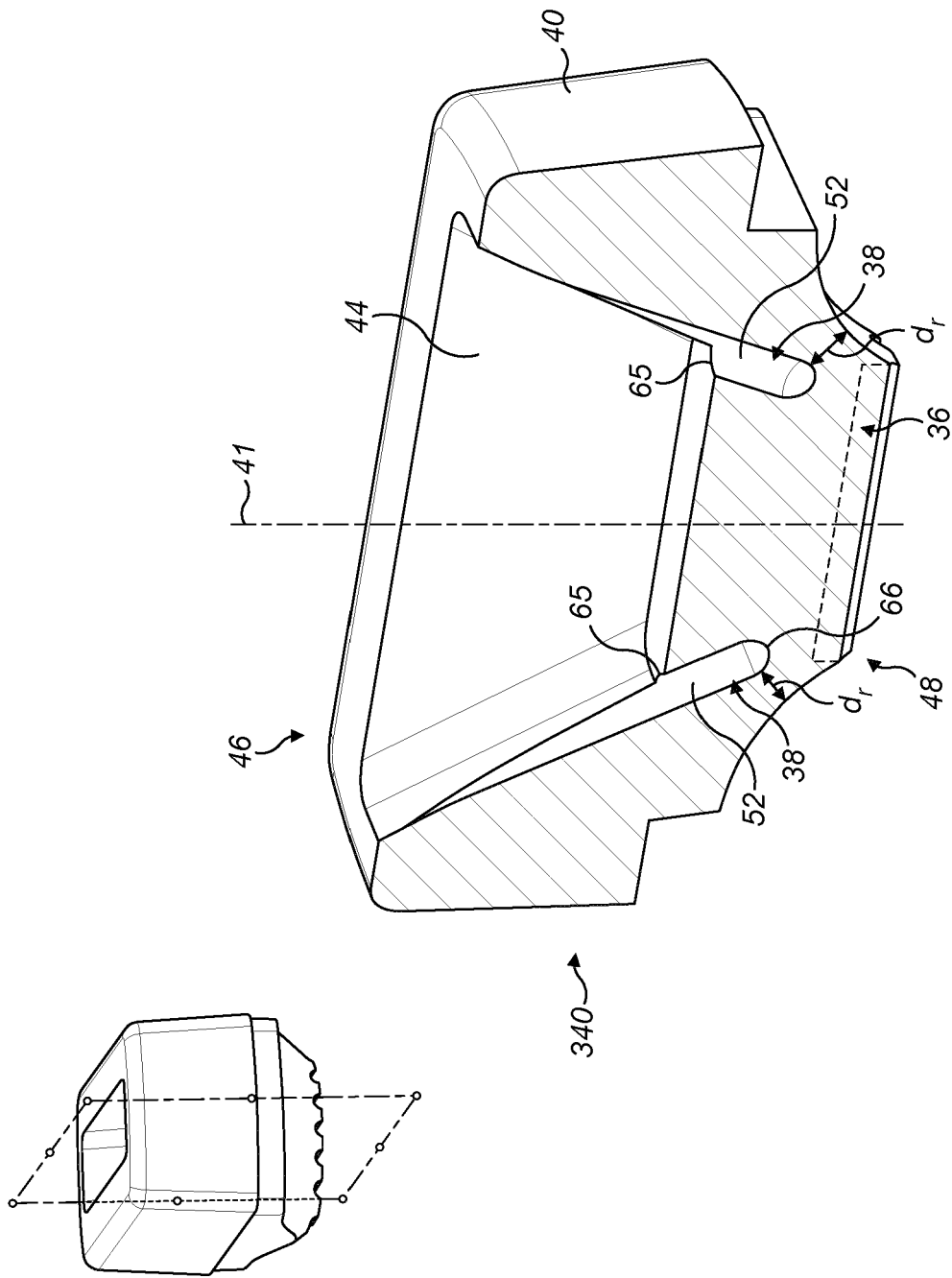


FIG. 4

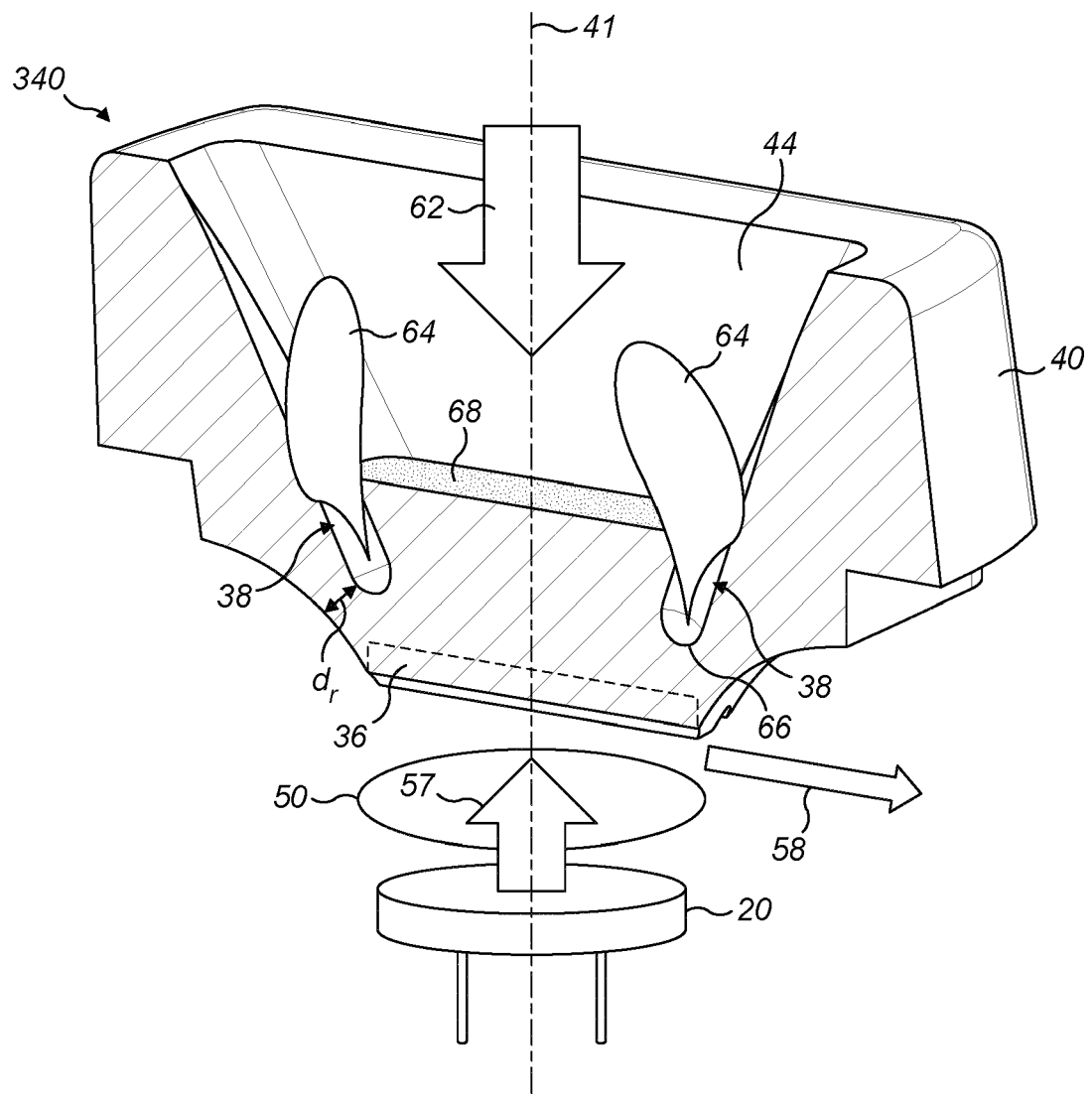


FIG. 5

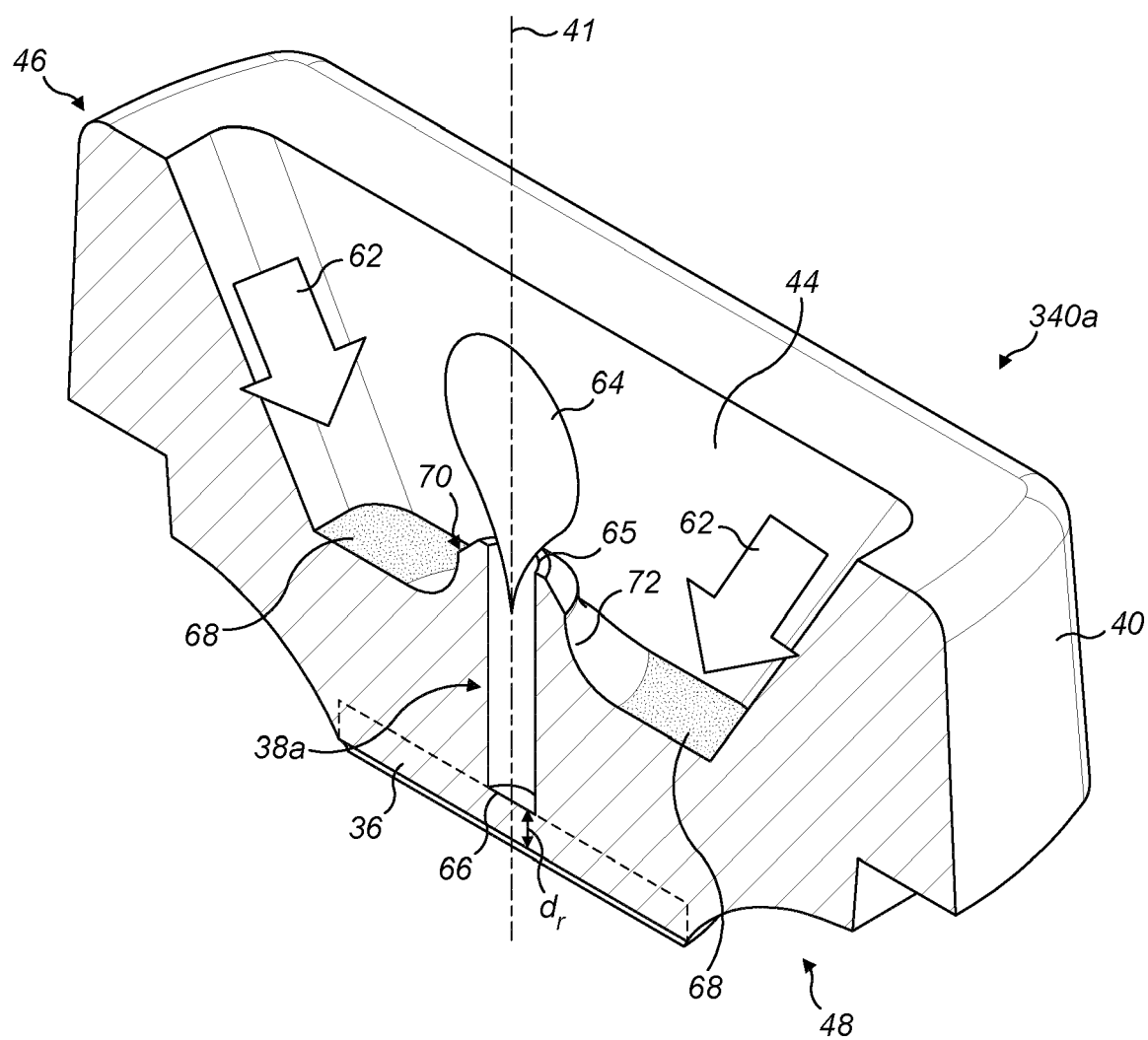


FIG. 6



EUROPEAN SEARCH REPORT

Application Number

EP 23 17 4799

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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 9 October 2023	Examiner Cardan, Cosmin
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