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(54) AN AEROSOL GENERATING DEVICE, AND ASSOCIATED AEROSOL GENERATING SYSTEM

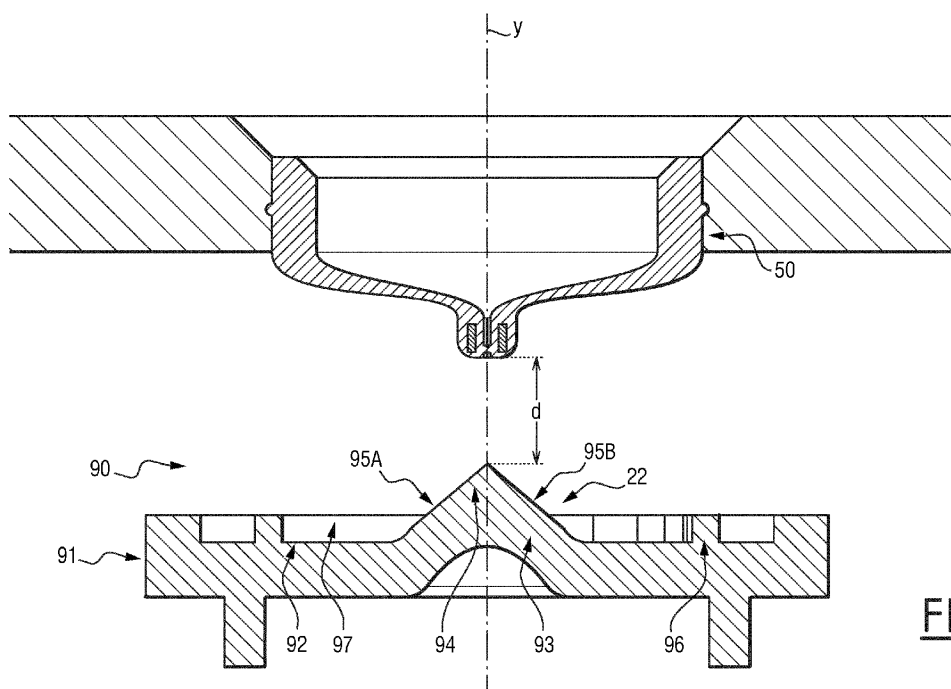
(57) The present invention concerns an aerosol generating device extending along a device axis (Y) and configured to operate with an aerosol generating cartridge comprising a cartridge body comprising a dispensing opening and a valve (50) mounted on the dispensing opening;

the aerosol generating device comprising:

- a heating cavity (90) configured to receive at least a part of the cartridge and defining a transversal wall (91);
- a heater (22) integrated in the transversal wall (91) of the

heating cavity (90);

wherein the heater (22) comprises a flat part (92) and a protruding part (93) protruding from the flat part (92) to face the valve (50) when the cartridge is received at least partially in the heating cavity (90), the protruding part (93) forming a substantially constant gap (d) with the cartridge when the cartridge is received at least partially in the heating cavity (90).

**FIG.6****EP 4 573 937 A1**

Description

FIELD OF THE INVENTION

[0001] The present invention concerns an aerosol generating device. The present invention also concerns an aerosol generating system associated to such a device.

BACKGROUND OF THE INVENTION

[0002] Aerosol generating cartridges, also known as pods or consumable articles, are used in aerosol generating devices such as electronic cigarettes and vaping devices to provide a vaporizable material that is heated to generate an aerosol or vapour for inhalation by a user.

[0003] The aerosol generating cartridge includes generally a wick that ensures liquid transmission from a reservoir to a heating element where it is vaporized and mixed with an airflow coming from the exterior of the cartridge. However, in some case, vaporization of the vaporizable material and/or its mixing with the airflow is not optimal. This can cause leakages, wick clogging, under-heating or over-heating of the vaporizable material, pressure drops, undesirable draw resistance, etc.

SUMMARY OF THE INVENTION

[0004] An aim of the present invention is to improve vaporization of the vaporizable material and/or its mixing with an airflow to avoid the above-mentioned issues.

[0005] For this purpose, the invention proposes an aerosol generating device extending along a device axis and configured to operate with an aerosol generating cartridge comprising a cartridge body comprising a dispensing opening and a valve mounted on the dispensing opening;

the aerosol generating device comprising:

- a heating cavity configured to receive at least a part of the cartridge and defining a transversal wall ;
- a heater integrated in the transversal wall of the heating cavity;

wherein the heater comprises a flat part and a protruding part protruding from the flat part to face the valve when the cartridge is received at least partially in the heating cavity, the protruding part forming a substantially constant gap with the cartridge when the cartridge is received at least partially in the heating cavity.

[0006] Provided with these features, the vaporizable material dispensed from the valve is guided directly by the heater and can be efficiently evaporated. Particularly, since the vaporizable material is in direct contact with the heater upon its dispensing from the cartridge, the surface

of the heater and the quantity of the dispensed vaporizable material can be accurately adjusted to avoid under-heating and over-heating. Moreover, provided with these features, it is possible to avoid using of a wick in the cartridge and in the aerosol generating device. Particularly, in this case, the quantity of the dispensed vaporizable material is defined by the valve. This avoids the problems of wick clogging and undesirable leakage. Additionally, since the vaporizable material is directly dispensed on the heater and guided by this heater, it is possible to predict the draw resistance and make it consistent throughout the whole vaping session and/or the whole cycle of use of the cartridge.

[0007] In some embodiments, the protruding part of the heater has a shape configured to guide a vaporizable material dispensed through the valve, until the flat part.

[0008] Thus, the protruding part can be arranged close to the valve dispensing the vaporizable material. The flow can be thus distributed homogeneously on the whole surface of the heater and notably, on the flat part of the heater. This allows homogeneous heating of the vaporizable material and avoids its over-heating and under-heating. Additionally, the dimensions of the heater can be adapted to the quantity of the vaporizable material dispensed by the valve so as to avoid the over-heating and under-heating of the vaporizable material. This also reduces leakages during the operation of the device since the total quantity of the dispensed vaporizable material is vaporized by the heater.

[0009] In some embodiments, the gap between the valve and the protruding part of the heater can be chosen based on properties of the vaporizable material such as for example its viscosity.

[0010] According to some embodiments, the protruding part of the heater has a triangular cross-section in at least one plane comprising the device axis.

[0011] The protruding part forms thus a pyramidal shape or a shape of a cylinder having a triangular base, extending parallel to the flat part and adjacent to this flat part by one of its lateral walls. In this last case, the heater defines an edge extending along an axis parallel to the flat part of the heater.

[0012] This edge can be designed to face the hole of the valve when it is open and the slit of the valve when it is closed. Advantageously, the edge is aligned with the slit and has substantially the same dimensions. This disposition is advantageous since upon opening the valve, the hole does not form a strictly circular shape but rather an oval shape extending in the direction of the edge. Thus, the vaporizable material can be dispensed directly on the edge which guides it efficiently towards the flat part.

[0013] In some embodiments, the protruding part of the heater further defines a pair of inclined surfaces extending from the edge to the flat part.

[0014] The inclined surfaces can guide efficiently the dispensed vaporizable material from either side of the edge to the flat part of the heater.

[0015] In some embodiments, the protruding part is

arranged in a center of the flat part.

[0016] In this case, the vaporizable material can be homogeneously distributed on the whole surface of the flat part. Thus, its heating can be particularly efficient.

[0017] In some embodiments, the flat part comprises a border extending on its periphery and delimiting a receiving space for the vaporizable material. Additionally, the receiving space may be configured to receive a predetermined quantity of the vaporizable material.

[0018] The receiving space delimited by the border prevents against leakages of the part of the vaporizable material which has not been vaporized yet by the heater. Advantageously, the heating capacity of the heater is chosen in accordance with the volume of the receiving space. Additionally, the dispensing of the vaporizable material by the valve can also be adapted in accordance with the volume of the receiving space. For example, the valve can dispense the vaporizable material in a toggle mode so as the heater is able to evaporate the quantity of the vaporizable material received in the receiving space before dispensing the next portion of the vaporizable material by the valve. For this purpose, the means actuating the valve can be adapted accordingly. For example, when the valve is actuated by pressure exerted by a piston, the drive unit driving the piston can be adapted accordingly.

[0019] In some embodiments, the flat part and the protruding part form one single piece.

[0020] Thanks to these features, the flat part and the protruding part can be easily formed by a known manufacturing process for example from a heat resistant and a heat conducting material such as metal. These parts can be additionally associated with one or several resistive elements transferring heat to this part when they are powered by the battery. The or each resistive element can be arranged on the surface of the flat and protruding parts opposite to the one in contact with the vaporizable material.

[0021] The invention also concerns an aerosol generating system comprising an aerosol generating device as previously defined and an aerosol generating cartridge configured to operate with the aerosol generating device.

[0022] In some embodiments, the aerosol generating cartridge comprises a valve comprising a movable part configured to be in an open configuration under pressure of the vaporizable material exerted and in a closed configuration otherwise.

[0023] Additionally, in some embodiments, the aerosol generating cartridge extends along a cartridge axis and comprising a cartridge body;

the cartridge body being deformable under pressure exerted according to the cartridge axis to cause opening of the valve and dispensing of a vaporizable material through the valve.

[0024] In other words, the cartridge body can be deformable by a pressure exerted externally for example by a piston. This creates a pressure of the vaporizable material inside the cartridge which is exerted then on

the valve. The valve is closed until this pressure achieves a certain threshold pressure and is open otherwise.

[0025] In some embodiments, the valve comprises a pair of lips arranged to face each other and forming between them a slit in the closed configuration of the moveable part and a hole in the open configuration of the moveable part.

[0026] Provided with these features, the hole formed by the valve in the open configuration can form an oval shape. This oval shape can be adapted to a particular shape of the protruding part of the heater so as to guide efficiently the dispensed vaporizable material. For example, the protruding part may comprise an edge which is aligned with the slit and as a consequence with the oval shape of the hole.

[0027] The invention also proposes an aerosol generating cartridge for an aerosol generating device, the cartridge extending along a cartridge axis and comprising a cartridge body;

the cartridge body comprising a container for containing a vaporizable material, the container having a dispensing opening and a valve mounted on the dispensing opening;

wherein the cartridge body is deformable under pressure exerted according to the cartridge axis to cause opening of the valve and dispensing of the vaporizable material through the dispensing opening and the valve.

[0028] Thus, according to the invention, there is no need to use a wick coupled with a heater to vaporize the vaporizable material. Particularly, deformation of the cartridge body allows dispensing of the vaporizable material directly to the heater, according to a desired quantity. The deformation can be determined according to this quantity so as to dispense only the necessary quantity of the vaporizable material that the heater is able to evaporate. Thus, it is possible to avoid under-heating or over-heating.

[0029] Additionally, since no wick is necessary for dispensing the vaporizable material, the invention solves the problem of wick clogging and can ensure a predetermined draw resistance throughout the whole cycle of use of the cartridge. Additionally, since the valve ensures the dispensing of the vaporizable material, it can be accurately and easily configured to dispense the vaporizable material only at the right moment in comparison with a wick. Thus, it is possible to minimize leakages from the cartridge, especially when it is not used to generate aerosol.

[0030] The pressure on the cartridge body can be exerted by a piston integrated for example in the aerosol generating device. The piston can be driven electrically by a dedicated drive unit and/or mechanically and/or manually, for example by the user.

[0031] In some embodiments, the cartridge body can be configured to be fully deformed by the piston so as to

dispense substantially the whole quantity of the vaporizable material contained in the container. Thus, it is possible to avoid wasting of the vaporizable material.

[0032] According to some embodiments, the valve comprises a movable part configured to be in an open configuration under pressure of the vaporizable material exerted upon deformation of the cartridge body and in a closed configuration otherwise.

[0033] The moveable part can be configured to open under a certain threshold pressure exerted by the vaporizable material from the container and then elastically return to the closed configuration then the pressure exerted by the vaporizable material is under this threshold pressure. Thus, it is possible to seal the container of the cartridge when it is not used.

[0034] According to some embodiments, the moveable part comprises a pair of lips, each lip comprising an elastic element elastically deformable under said pressure between a rest position in which the moveable part is in the closed configuration and a deformed position in which the moveable part is in the open configuration.

[0035] The lips can be arranged to face each other. They can be adjacent at their ends and form a hole between them when the elastic elements are in their deformed position. On the contrary, when the elastic elements are in their rest position, the lips can be in contact with each other to seal the container. In some examples, the elastic elements can be integrated in the corresponding lips so as a light slit is formed between the lips. The slit extends transversally and does not cross axially the valve so as the valve can completely seal the dispensing opening.

[0036] In some embodiments, each elastic element is integrated inside the corresponding lip, preferably by over-molding.

[0037] Thanks to these features, each elastic element can be entirely covered by the correspond lip and its contact with the vaporizable material can be avoided. Thus, the taste of the vaporizable material is not affected by the elastic elements which can be made for example from metal, for example an oxidisable metal. Additionally, when the lips are done from a material having good sealing properties, the lips can better seal the container in comparison with the elastic elements operating solely.

[0038] The over-molding process is particularly suitable for integrating the elastic elements inside the lips. Thus, the valve can be produced easily and inexpensively.

[0039] In some embodiments, each elastic element is formed by a bar extending according to substantially the whole length of the corresponding lip.

[0040] The bar can have any suitable cross-sectional shape. It can notably form a rectangular, circular or oval cross-sectional shape. The rectangular cross-sectional shape is preferred since it allows sealing of the valve along the whole width of bar while keeping good elastic properties.

[0041] In the rest position, each bar is non-deformed

and have a flat shape. Thus, when the bars are arranged to face each other, the contact between the lips can be maximized that ensures good sealing properties of the lips. In the deformed position, each bar can be at least slightly bended outwardly from the other bar. In this way, a hole can be formed between the lips. From the bended position, the bars can elastically return to the rest position and seal the valve.

[0042] Each elastic element is formed from a heat resistant material, preferably from metal, heat resistant plastic or graphene. Advantageously, the elastic properties of the elastic elements remain unchanged with temperature changing.

[0043] Particularly, each elastic element can resist a temperature comprised between 200°C and 400°C, advantageously between 250°C and 350°C. This temperature corresponds to the operational temperature of the heater. Thus, the elastic elements remain unaffected by increasing the temperature of the heater.

[0044] In some embodiments, the valve further comprises a support part arranged to seal the dispensing opening of the container.

[0045] The support part can be provided with a skirt which is fixed to an internal wall delimiting the dispensing opening. The fixation can be done mechanically and/or using a glue. According to a particular example, the skirt is provided with a rib extending for example circumferentially. This rib is designed to cooperate with a slot formed in the dispensing opening and fix thus the support part in a sealing way.

[0046] The support part can have the same shape as the dispensing opening. For example, both support part and dispensing opening can have a circular shape.

[0047] The movable part can protrude outwardly from the support part. Additionally, both parts can form one single piece made of a heat resistive material and having good sealing properties, like for example silicon.

[0048] In some embodiments, the cartridge body is made of low density polyethylene (LDPE).

[0049] Thus, the cartridge body can be easily deformed without be broken. Additionally, the cartridge body can be formed by one single piece, using for example a molding process. Thus, the cartridge body can be easily and inexpensively manufactured. This can considerably reduce the total cost of the cartridge.

[0050] The container containing the vaporizable material can be formed by the internal space delimited by the cartridge body. Thus, the container can be deformable in a similar way that the cartridge body.

[0051] In some embodiments, the cartridge body defines a lateral wall with a thickness comprised between 0,1 mm and 0,8 mm, advantageously between 0,2 mm and 0,6 mm.

[0052] Thanks to these features, it is possible to ensure the deformation of the cartridge body in the desired way.

[0053] Additionally, in some embodiments, the cartridge body defines a rigidity decreasing from a top wall to a bottom wall, the bottom wall comprising the dispen-

sing opening and being opposite to the top wall.

[0054] Thanks to these features, a substantially homogenous deformation of the cartridge body can be achieved by substantially a same pressure effort. Thus, it is possible to achieve a homogenous dispensing of the vaporizable material through the valve.

[0055] In some embodiments, the vaporizable material is a gel or a liquid with viscosity comprised between 5,000 cps and 50,000 cps. The smoking gel could be achieved by increasing its viscosity and a propylene glycol to vegetable glycerin ratio (or "PG/VG ratio") or adding food-grade thickener to the liquid. The food-grade thickener can be Xanthan gum.

[0056] The invention also concerns an aerosol generating device configured to operate with an aerosol generating cartridge as defined above and comprising a piston moveable along the cartridge axis and configured to exert pressure on the cartridge body to deform it.

[0057] The piston can exert pressure externally on the cartridge body, for example on an external surface of the top wall. The piston can be configured to exert a homogenous pressure on the cartridge body during each vaping session. According to another example, the pressure can be exerted by alternating efforts spaced by a predetermined time interval. In some other examples, the efforts can be determined dynamically for example by a control unit, based on parameters of the vaping session. These parameters can for example include time, puffing effort, number of puffs, temperature of the heater or of a neighboring of the heater, heater resistivity, etc. This piston can be actuated using a drive unit.

[0058] According to some embodiments, the aerosol generating device comprises a cartridge housing configured to receive the cartridge and guide its deformation along the cartridge axis.

[0059] For example, the wall delimiting the cartridge housing can be arranged with a predetermined distance from the lateral wall of the cartridge body. In this case, the cartridge body can form a plurality of folds stacked according to the cartridge axis X. In some other examples, the wall delimiting the cartridge housing fits the lateral wall of the cartridge body. In this case, the cartridge body can be deformed by forming folds inwardly. According to still another example, the cartridge housing can be provided with guiding means guiding the deformation of the cartridge body in a desired way.

BRIEF DESCRIPTION OF THE DRAWINGS

[0060] The invention and its advantages will be better understood upon reading the following description, which is given solely by way of non-limiting example and which is made with reference to the appended drawings, in which:

- Figure 1 is a cross-sectional view of an aerosol generating device and an aerosol generating cartridge received in the aerosol generating device;

- Figure 2 is a side view of the aerosol generating cartridge of Figure 1 in two different states: (A) non-deformed and (B) deformed;

- Figure 3 is a cross-sectional view of the aerosol generating cartridge of Figure 1;

- Figures 4 and 5 are different views of a valve integrated into the aerosol generating cartridge of Figure 1; and

- Figures 6 and 7 are different views of a heater integrated into the aerosol generating device of Figure 1.

DETAILED DESCRIPTION OF THE INVENTION

[0061] Before describing the invention, it is to be understood that it is not limited to the details of construction set forth in the following description. It will be apparent to those skilled in the art having the benefit of the present disclosure that the invention is capable of other embodiments and of being practiced or being carried out in various ways.

[0062] As used herein, the term "**aerosol generating device**" or "**device**" may include a vaping device to deliver an aerosol to a user, including an aerosol for vaping, by means of a heater element explained in further detail below. The device may be designed and configured to be hand held by a user, i.e. held and used within one hand of the user. The device may be adapted to generate a variable amount of aerosol, e.g. by activating the heater element for a variable amount of time (as opposed to a metered dose of aerosol), which can be controlled by a trigger. The trigger may be user activated, such as by a manual actuator located on an outer surface of the device (button or switch) and/or by means of an airflow or inhalation sensor arranged in the airflow path of the device. The inhalation sensor may be sensitive to the velocity of an airflow passing across the sensor during an inhalation by a user as well as the duration of inhalation to enable a variable amount of vapour to be provided (so as to mimic the effect of smoking a conventional combustible smoking article such as a cigarette, cigar or pipe, etc.). The device may include a temperature regulation control to adjust the temperature of the heater and/or of the heated aerosol generating substance (aerosol precursor) to a specified target temperature and thereafter to maintain the temperature at the target temperature that enables efficient generation of aerosol.

[0063] As used herein, the term "**aerosol**" may include a suspension of vaporizable material as one or more of: solid particles; liquid droplets; gas. Said suspension may be in a gas including air. Aerosol herein may generally refer to/include a vapour. Aerosol may include one or more components of the vaporizable material.

[0064] As used herein, the term "**vaporizable material**" or "**precursor**" may refer to a material which may

comprise nicotine or tobacco and an aerosol former. Tobacco may take the form of various materials such as shredded tobacco, granulated tobacco, tobacco leaf and/or reconstituted tobacco or a liquid tobacco extract or solution. Suitable aerosol formers include: a polyol such as sorbitol, glycerol, and glycols like propylene glycol or triethylene glycol; a non-polyol such as monohydric alcohols, acids such as lactic acid, glycerol derivatives, esters such as triacetin, triethylene glycol diacetate, triethyl citrate, glycerin or vegetable glycerin. In some embodiments, the aerosol generating agent may be glycerol, propylene glycol, or a mixture of glycerol and propylene glycol. The substrate may also comprise at least one of a gelling agent, a binding agent, a stabilizing agent, and a humectant.

DETAILED DESCRIPTION OF THE INVENTION

[0065] As shown in Figure 1, an aerosol generating system 10 comprises an aerosol generating cartridge 12 containing a vaporizable material 16 and an aerosol generating device 18 configured to operate with said cartridge 12 for producing an aerosol to be inhaled by a user.

[0066] The aerosol generating device 18 comprises a cartridge housing 20 configured for receiving the cartridge 12 and a heater 22 arranged for heating the vaporizable material 16 delivered by the cartridge 12 to the heater 22. The aerosol generating device 18 further comprises for example a battery 24 for powering the heater 22 and preferably, an electric controller 26 configured for controlling the operation of the battery 24 and the heater 22.

[0067] The aerosol generating device 18 comprises for example at least one air inlet 28 for feeding an airflow to the heater 22 and an aerosol outlet 30 for delivering the airflow containing the aerosol generated at the heater 22 to the user. The aerosol outlet 30 is for example provided in a mouthpiece 32. In the example shown in Figure 1, the mouthpiece 32 is a part of the aerosol generating device 18. According to other examples, the mouthpiece 32 can be provided separately from the aerosol generating device 18 or together with the cartridge 12. The aerosol generating device 18 is configured for the circulation of an airflow from the or each air inlet 28 to the aerosol outlet 30 with passing via the heater 22 for collecting the heated vaporizable material 16 in the airflow.

[0068] As shown in Figures 2 and 3, the cartridge 12 comprises a cartridge body 34 extending along a cartridge axis X and comprising a container 36 for storing the vaporizable material 16. Advantageously, the vaporizable material 16 is a gel or a liquid with viscosity comprised between 5,000 cps and 50,000 cps. The smoking gel could be achieved by increasing its viscosity and a propylene glycol to vegetable glycerin ratio (or "PG/VG ratio") or adding food-grade thickener to the liquid. The food-grade thickener can be Xanthan gum.

[0069] As it will be explained below, the cartridge body

34 may present a non-deformed state (shown in part A of Figure 2) and a deformed state (shown in part B of Figure 2). At least at the non-deformed state, the cartridge body 34 has for example a cylindrical shape extending along the cartridge axis X, and preferably having a circular cross-section centered on the cartridge axis X. According to other examples, the cartridge body 34 can have a rectangular cross-section or any other cross-sectional shape.

[0070] The cartridge body 36 is delimited by a lateral wall 38 extending substantially along the cartridge axis X, and a bottom wall 42 and a top wall 44 extending substantially perpendicularly to the cartridge axis X. The bottom wall 42 is provided with a dispensing opening 45 arranged for example at the center of this wall 42, in fluid communication with the container 36. The cartridge 12 further comprises a valve 50 mounted on the dispensing opening 45.

[0071] The cartridge body 34 is deformable under pressure exerted according to the cartridge axis X to cause opening of the valve 50 and dispensing of the vaporizable material 16 through the dispensing opening 45 and the valve 55. Deformation of the cartridge body 34 causes deformation of the container 36. The container 36 is for example deformable in the same way as the cartridge body 34.

[0072] Figure 2 shows in part A the cartridge body 34 at its non-deformed state and in part B the cartridge body 34 at its deformed state. As it can be seen in this Figure, at the non-deformed state, the lateral wall 38 presents a cylindrical shape extending along the cartridge axis X. In other words, in this case, in each cross-sectional plane extending along the cartridge axis X and crossing the cartridge body 34, the lateral wall 38 presents one or two rectilinear portions. At the deformed state, the lateral wall 38 presents a plurality of folds stacked according to the cartridge axis X. In other words, in this case, in each cross-sectional plane extending along the cartridge axis X and crossing the cartridge body 34, the lateral wall 38 presents one or two zigzag portions. The cartridge body 34 can also present a fully-deformed state in which it cannot be further deformed by pressure exerting according to the cartridge axis X. In this state, advantageously, the internal volume of the container 36 is minimal and substantially the whole quantity of the vaporizable material 16 is expelled from the container 36.

[0073] Advantageously, the deformation of the cartridge body 34 from its non-deformed state is irreversible.

[0074] In some embodiments, the deformation of the cartridge body 34 can be guided by the cartridge housing 20. For example, the distance between an internal surface of the cartridge housing 20 and an external surface of the cartridge body 34 can be adapted so as to ensure a predetermined shape of the cartridge body 34 at the deformed and fully-deformed states. In some embodiments, said surfaces are in contact when the cartridge 34 is at the non-deformed state. In this case, its deformation is made inwardly, i.e. toward its internal part.

[0075] To make the deformation possible, the cartridge body 34 can be made of or contain low density polyethylene (LDPE). The LDPE can be soft blow molded. Additionally, the lateral wall 38 defines a thickness suitable for deformation as explained above. This thickness may for example be comprised between 0,1 mm and 0,8 mm, advantageously between 0,2 mm and 0,6 mm. Moreover, the cartridge body 34 can present a rigidity decreasing according to the cartridge axis X from the top wall 44 to the bottom wall 42. For this purpose, the thickness of the lateral wall 38 can for example be gradually decreasing according to the cartridge axis X from the top wall 44 to the bottom wall 42.

[0076] Advantageously, the lateral wall 38, the top wall 44 and preferably the bottom wall 42 are made of one single piece for example by molding. More advantageously, the cartridge body 34 is made of one single piece. In this case, the container 36 can correspond to an internal part of the cartridge body 34 delimited by the walls 42, 44 and 38.

[0077] The valve 50 is shown in more detail in Figures 4 and 5. This valve 50 is advantageously operated by pressure (or "pressure-operated"). The pressure-operated valve 50 is configured for staying closed when the pressure inside the container 36 is lower than a threshold pressure and for opening when the pressure inside the container 36 is higher than said threshold pressure. Particularly, this threshold pressure is achieved when the cartridge body 34 is being deformed by the pressure exerted according to the cartridge axis X. In other words, the valve 50 is open when the cartridge body 34 is being deformed and closed otherwise.

[0078] As it shown in Figure 4 and 5, the valve 50 comprises a movable part 61 and a support part 62. The movable part 61 is configured to be in an open configuration when the cartridge body 34 is being deformed and closed otherwise. The support part 62 is arranged to seal the dispensing opening 45 of the bottom wall 42. The support part 62 can have any appropriate shape adapted to seal the dispensing opening 45. For example, the support part 62 can have a circular shape fitting with a circular shape of the dispensing opening 45.

[0079] In some examples, the support part 62 can define a skirt 63 configured to be inserted in the dispensing opening 45 and be in contact in a sealing way with walls delimiting the dispensing opening 45. For example, the skirt 63 can be glued and/or fixed using any appropriate mean. For example, the skirt 63 can define a rib 64 extending circumferentially around the cartridge axis X and adapted to be received into a corresponding slot formed on the walls delimiting the dispensing opening 45. The rib 64 can thus ensure a snap-fit feature or compression-fit feature to hold the valve 50 in the dispensing opening 45.

[0080] The moveable part 61 comprises a pair of lips 70A, 70B. Each lip 70A, 70B is elastically deformable under pressure exerted from the container 36 between a rest position in which the moveable part 61 is in the closed

configuration (shown in part A of Figure 5) and a deformed position in which the moveable part 61 is in the open configuration (shown in part B of Figure 5). The lips 70A, 70B protrude from the support part 62 toward the exterior of the cartridge 12. Additionally, the lips 70A, 70B are arranged to face each other and form between them a slit 71 (shown in part A of Figure 5) in the closed configuration of the moveable part 61 and a hole 72 (shown in part B of Figure 5) in the open configuration of the moveable part 61. Particularly, in the closed configuration of the moveable part 61, the lips 70A, 70B are in contact one with the other and the slit 71 is formed by their external surfaces, without crossing the valve 50. In the open configuration of the moveable part 61, the hole 72 conducts the vaporizable material 16 out from the container 36 through the dispensing opening 45.

[0081] To be elastically deformable, each lip 70A, 70B comprises an elastic element 74A, 74B elastically deformable under said pressure between a rest position in which the moveable part 61 is in the closed configuration and a deformed position in which the moveable part 61 is in the open configuration. Particularly, each elastic element 74A, 74B may comprise a bar. Each bar is integrated into the corresponding lip 70A, 70B and may define any suitable cross-section, such for example a circular, rectangular or oval cross-section. Advantageously, in the rest position, each bar is flat and in the deformed position, each bar is at least slightly bended outwardly from the other bar. Thus, in the deformed position of the bars, at least the centers of the lips 70A, 70B are separated whereas their ends remain adjacent one to the other. In the rest position of the bars, the centers of the lips 70A, 70B are in contact one with the other.

[0082] Each bar is made from a material presenting good elastic properties but still rigid enough to return to a straight position after each opening. This material also presents heat resistive properties. For example, the material resists the temperature that can achieve a value comprised between 200°C and 400°C, advantageously between 250°C and 350°C. Such a material can for example be metal, plastic or graphene. A plastic bar can be manufactured from polycarbonate or 100% virgin MMA (Methyl Methacrylate) for heat resistance. Among metals, stainless steel or nickel-titanium (Ni-Ti) can be considered. A graphene bar may be low cost and presents high-temperature resistance properties.

[0083] Advantageously, the moveable part 61 and the support part 62 of the valve 50 form one single piece. This piece can for example be made by molding, for example from a heat resistive material, such as a heat resistant silicon. This material can present a Shore hardness comprised for example between 50 to 70, advantageously between 55 to 65. The mold used to manufacture the parts 61, 62 can be equipped with one or two dents for easier pouring. The elastic elements 74A, 74B can be integrated into the corresponding lips 70A, 70B by an over-molding process.

[0084] To deform the cartridge body 34, the aerosol generating device 18 comprises a piston 80 (shown in Figure 1) moveable along a device axis Y which coincides with the cartridge axis X when the cartridge 12 is inserted in the cartridge housing 20 of the aerosol generating device 18. Particularly, the piston 80 is adapted to exert pressure on the top wall 44 of the cartridge body 34 to deform it according to the cartridge axis X.

[0085] The piston 80 is movable or operable by an actuator 82. The actuator 82 comprises for example an axially movable pushing member 84 configured for pushing the piston 80 axially along the cartridge axis X and a drive unit 86 configured for driving the pushing member 84 axially. The actuator 82 is preferably powered by the battery 24 and controlled by the controller 26. For example, the controller 26 can control the drive unit 86 so as to drive the pushing member 84 during a vaping session. The drive unit 86 can for example drive the pushing member 84 so as to move it along the cartridge axis X. This movement can be homogenous or be defined based on various parameters of the vaping session. These parameters can for example include time, puffing effort, number of puffs, temperature of the heater or of a neighboring of the heater, heater resistivity, etc.

[0086] The pushing member 84 and the drive unit 86 cooperate for example via a screw/nut assembly. In such case, the pushing member 84 comprises for example a threaded rod and the drive unit 86 comprises a nut engaged into the threaded rod and a motor for driving the nut in rotation and thus driving the threaded rod axially to push the piston 80 towards the top wall 44 of the cartridge body 34.

[0087] In some embodiments, the pushing member 84 can be actuated manually by the user before and/or during a vaping session. In some other embodiments, the pushing member 84 is actuated mechanically by any other suitable mean, for example by a shape changing material upon heating and/or a spring.

[0088] The heater 22 is preferably separate from the cartridge 12, i.e. not integrated in the cartridge 12. The heater 22 is either fixed in the aerosol generating device 18 or preferably replaceable. In the last case, the heater 22 can be mounted on a support tray configured to be inserted for example laterally into the aerosol generating device 18.

[0089] The heater 22 is received in a heating cavity 90 arranged in the aerosol generating device 18 to collect the vaporizable material 16 released from the cartridge 12 via the dispensing opening 45. In particular, the dispensing opening 45 with the mounted valve 50 open into the heating cavity 90 when the cartridge 12 is received in the cartridge housing 20. The heating cavity 90 is in fluid communication with the or each air inlet 28 and the air outlet 29. The heating cavity 90 is further designed to receive at least a part (for example the part comprising the bottom wall 42) of the cartridge body 34 and is formed for example by the cartridge housing 20. At its bottom part, the heating cavity 90 is axially delimited by a trans-

versal wall 91 extending substantially perpendicularly to the device axis Y and integrating the heater 22.

[0090] The heater 22 comprises a flat part 92 and a protruding part 93 arranged in a center of the flat part 92 and protruding from this flat part 92 to face the valve 50 when the cartridge 12 is received at least partially in the heating cavity 90. The flat part 92 extends for example around the protruding part 93 substantially perpendicularly to the device axis Y. The flat part 92 can have a circular shape. The protruding part 93 forms a substantially constant axial gap d with the cartridge 12 and notably with the valve 50, when the cartridge 12 is received at least partially in the heating cavity 90. The axial gap d is for example chosen based on the nature of the vaporizable material 16, notably based on its viscosity, to allow its flow from the valve 50 first to the protruding part 93 and when to the flat part 92. This axial gap d is for example comprised between 0,2 mm and 1,2 mm, advantageously between 0,4 and 0,8 mm.

[0091] Particularly, the protruding part 93 of the heater 22 has a shape configured to guide the vaporizable material 16 dispensed through the valve 50 until the flat part 92. The protruding part 93 defines an edge 94 extending along an axis parallel to the flat part 92 and perpendicular to the device axis Y. For example, the protruding part 93 has a triangular cross-section so as the edge 94 is formed by one of the vertices of this triangle and a pair of inclined surfaces 95A, 95B is formed by the sides of the triangle extending from this vertex. In other words, the inclined surfaces 95A, 95B extend on either side of the edge 94 until the flat part 92 of the heater 22. In the examples of Figures 6 and 7, the edge 94 extends perpendicularly to the plane of the corresponding Figure. The axial gap d is measured between this edge 94 and the lips 70A, 70B of the valve 50.

[0092] Advantageously, when the valve 50 is closed (as it is shown in Figure 6), the edge 94 is aligned with the slit 70 formed by the valve 50. For example, the edge 94 can face the slit 70 and be parallel to this slit 70. Preferably, the edge 94 extends according to substantially the same length as the slit 70. In this way, when the valve 50 is open (as it is shown in Figure 7), the edge 94 faces the hole 72 so as the vaporizable material 16 can be dispensed directly on the edge 94. The edge 94 separates then the flow of the vaporizable material 16 between the inclined surfaces 95A, 95B that guide these flows until the flat part 92.

[0093] The flat part 92 can be advantageously delimited by a border 96 extending along the periphery of the flat part 92. For example, both flat part 92 and border 96 can have a circular shape. The border 96 protrudes from the flat part 92 to form a receiving space 97 between this border 96 and the inclined surfaces 95A, 95B. The axial extension of the border 96 is adapted so as the receiving space 97 receives a predetermined quantity of the vaporizable material 16. This predetermined quantity is for example chosen based on the capacity of the heater 22 to vaporize a quantity of the vaporizable material 16 per unit

of time and/or per predetermined number of puffs. Advantageously, the drive unit 86 of the piston 80 is configured to drive the pushing element 84 based on said predetermined quantity of the vaporizable material 16 that the receiving space 97 is able to receive. Preferably, the drive unit 86 of the piston 80 is also configured to drive the pushing element 84 based on the capacity of the heater 22 to vaporize this quantity of the vaporizable material.

[0094] In some embodiments, the flat and protruding parts 92, 93 form one single piece made of a heat resistant and heat conductive material, like a metal. These parts 92, 93 can be in contact with one or several heating elements resistively generating heat. Preferably, the or each heating element is arranged on the side of the flat and protruding parts 92, 93 opposite to the side in contact with the vaporizable material 16.

Claims

1. An aerosol generating device (18) extending along a device axis (Y) and configured to operate with an aerosol generating cartridge (12) comprising a cartridge body (34) comprising a dispensing opening (45) and a valve (50) mounted on the dispensing opening (45);

the aerosol generating device (18) comprising:

- a heating cavity (90) configured to receive at least a part of the cartridge (12) and defining a transversal wall (91) ;
- a heater (22) integrated in the transversal wall (91) of the heating cavity (90);

wherein the heater (22) comprises a flat part (92) and a protruding part (93) protruding from the flat part (92) to face the valve (50) when the cartridge is received at least partially in the heating cavity (90), the protruding part (93) forming a substantially constant gap (d) with the cartridge (12) when the cartridge is received at least partially in the heating cavity (90).

2. The aerosol generating device (18) according to claim 1, wherein the protruding part (93) of the heater has a shape configured to guide a vaporizable material (16) dispensed through the valve (50), until the flat part (92).
3. The aerosol generating device (18) according to claim 1 or 2, wherein the protruding part (93) of the heater (22) has a triangular cross-section in at least one plane comprising the device axis (Y).
4. The aerosol generating device (18) according to any one of the preceding claims, wherein the protruding

part (93) of the heater (22) defines an edge (94) extending along an axis parallel to the flat part (92) of the heater.

5. The aerosol generating device (18) according to claim 4, wherein the protruding part (93) of the heater (22) further defines a pair of inclined surfaces (95A, 95B) extending from the edge (94) to the flat part (92).
6. The aerosol generating device (18) according to claim 4 or 5, wherein the edge (94) is designed to face a hole (72) or a slit (71) formed by the valve (50).
7. The aerosol generating device (18) according to any one of the preceding claims, wherein the protruding part (93) is arranged in a center of the flat part (92).
8. The aerosol generating device (18) according to any one of the preceding claims, wherein the flat part (92) has a substantially circular shape.
9. The aerosol generating device (18) according to any one of the preceding claims, wherein the flat part (92) comprises a border (96) extending on its periphery and delimiting a receiving space (97) for the vaporizable material (16).
10. The aerosol generating device (18) according to claim 9, wherein the receiving space (97) is configured to receive a predetermined quantity of the vaporizable material (16).
11. The aerosol generating device (18) according to any one of the preceding claims, wherein the flat part (92) and the protruding part (93) form one single piece.
12. An aerosol generating system (10) comprising an aerosol generating device (18) according to any one of the preceding claims and an aerosol generating cartridge (12) configured to operate with the aerosol generating device (18).
13. The aerosol generating system (10) according to claim 12, wherein the aerosol generating cartridge (12) comprises a valve (50) comprising a movable part (61) configured to be in an open configuration under pressure of the vaporizable material (16) and in a closed configuration otherwise.
14. The aerosol generating system (10) according to claim 12 or 13, wherein the valve (50) comprises a pair of lips (70A, 70B) arranged to face each other and forming between them a slit (71) in the closed configuration of the moveable part (61) and a hole (72) in the open configuration of the moveable part (61).

15. The aerosol generating system (10) according to any one of claims 12 to 14, wherein the aerosol generating cartridge (12) extends along a cartridge axis (X) and comprising a cartridge body (34);
the cartridge body (34) being deformable under pressure exerted according to the cartridge axis (X) to cause opening of the valve (50) and dispensing of a vaporizable material (16) through the valve (50).

Amended claims in accordance with Rule 137(2) EPC.

1. An aerosol generating device (18) extending along a device axis (Y) and configured to operate with an aerosol generating cartridge (12) comprising a cartridge body (34) comprising a dispensing opening (45) and a valve (50) mounted on the dispensing opening (45);

the aerosol generating device (18) comprising:

- a heating cavity (90) configured to receive at least a part of the cartridge (12) and defining a transversal wall (91) ;
- a heater (22) integrated in the transversal wall (91) of the heating cavity (90);

wherein the heater (22) comprises a flat part (92) and a protruding part (93) protruding from the flat part (92) to face the valve (50) when the cartridge is received at least partially in the heating cavity (90), the protruding part (93) forming a substantially constant gap (d) with the cartridge (12) when the cartridge is received at least partially in the heating cavity (90),

characterized in that the flat part (92) comprises a border (96) extending on its periphery and delimiting a receiving space (97) for the vaporizable material (16).

2. The aerosol generating device (18) according to claim 1, wherein the protruding part (93) of the heater has a shape configured to guide a vaporizable material (16) dispensed through the valve (50), until the flat part (92).
3. The aerosol generating device (18) according to claim 1 or 2, wherein the protruding part (93) of the heater (22) has a triangular cross-section in at least one plane comprising the device axis (Y).
4. The aerosol generating device (18) according to any one of the preceding claims, wherein the protruding part (93) of the heater (22) defines an edge (94) extending along an axis parallel to the flat part (92) of the heater.
5. The aerosol generating device (18) according to

claim 4, wherein the protruding part (93) of the heater (22) further defines a pair of inclined surfaces (95A, 95B) extending from the edge (94) to the flat part (92).

6. The aerosol generating device (18) according to claim 4 or 5, wherein the edge (94) is designed to face a hole (72) or a slit (71) formed by the valve (50).
7. The aerosol generating device (18) according to any one of the preceding claims, wherein the protruding part (93) is arranged in a center of the flat part (92).
8. The aerosol generating device (18) according to any one of the preceding claims, wherein the flat part (92) has a substantially circular shape.
9. The aerosol generating device (18) according to any one of the preceding claims, wherein the receiving space (97) is configured to receive a predetermined quantity of the vaporizable material (16).
10. The aerosol generating device (18) according to any one of the preceding claims, wherein the flat part (92) and the protruding part (93) form one single piece.
11. An aerosol generating system (10) comprising an aerosol generating device (18) according to any one of the preceding claims and an aerosol generating cartridge (12) configured to operate with the aerosol generating device (18).
12. The aerosol generating system (10) according to claim 11, wherein the aerosol generating cartridge (12) comprises a valve (50) comprising a movable part (61) configured to be in an open configuration under pressure of the vaporizable material (16) and in a closed configuration otherwise.
13. The aerosol generating system (10) according to claim 12, wherein the valve (50) comprises a pair of lips (70A, 70B) arranged to face each other and forming between them a slit (71) in the closed configuration of the moveable part (61) and a hole (72) in the open configuration of the moveable part (61).
14. The aerosol generating system (10) according to claim 12 or 13, wherein the aerosol generating cartridge (12) extends along a cartridge axis (X) and comprising a cartridge body (34);
the cartridge body (34) being deformable under pressure exerted according to the cartridge axis (X) to cause opening of the valve (50) and dispensing of a vaporizable material (16) through the valve (50).

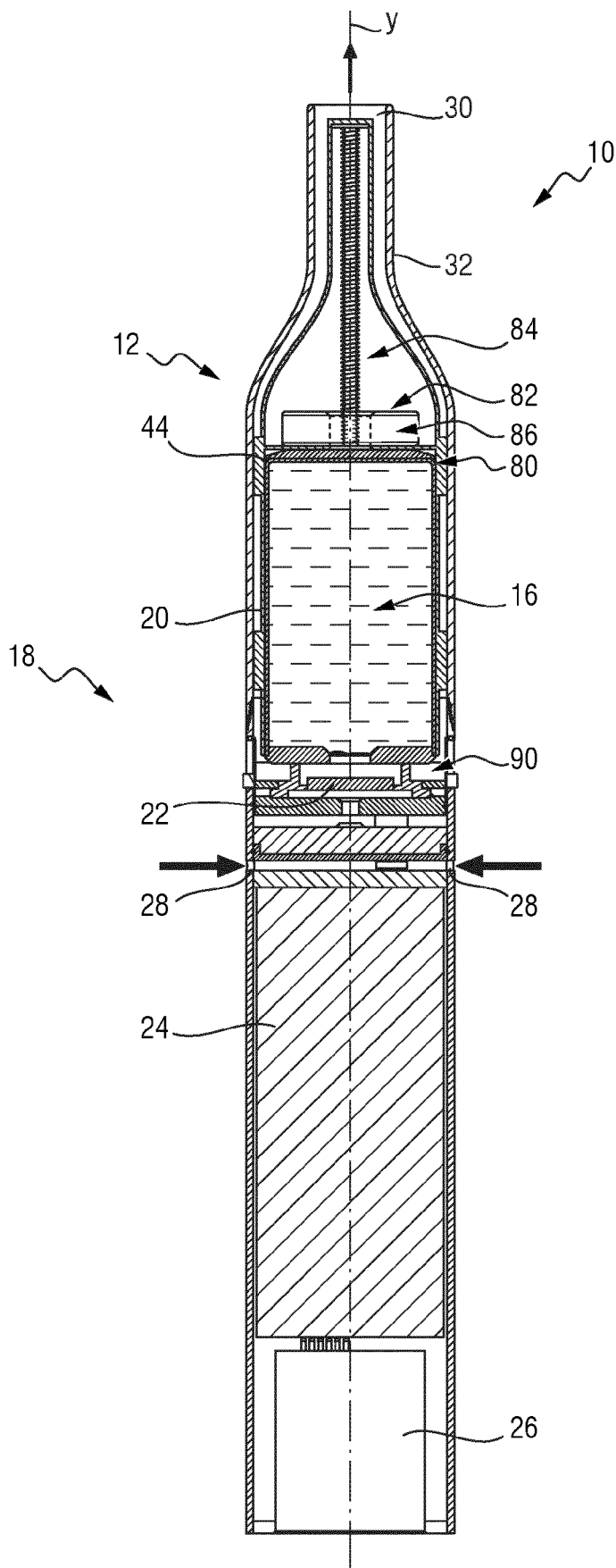
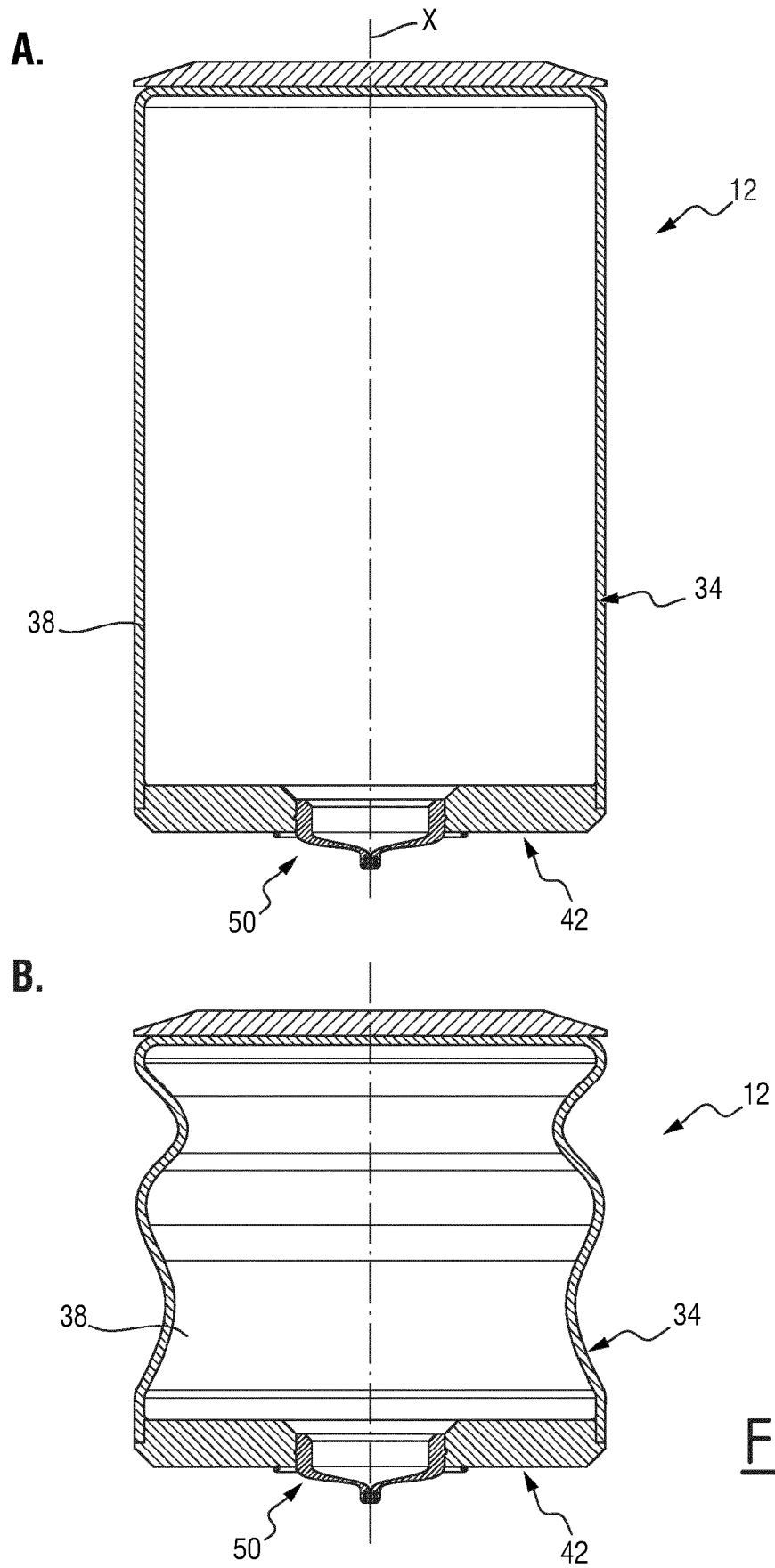


FIG.1



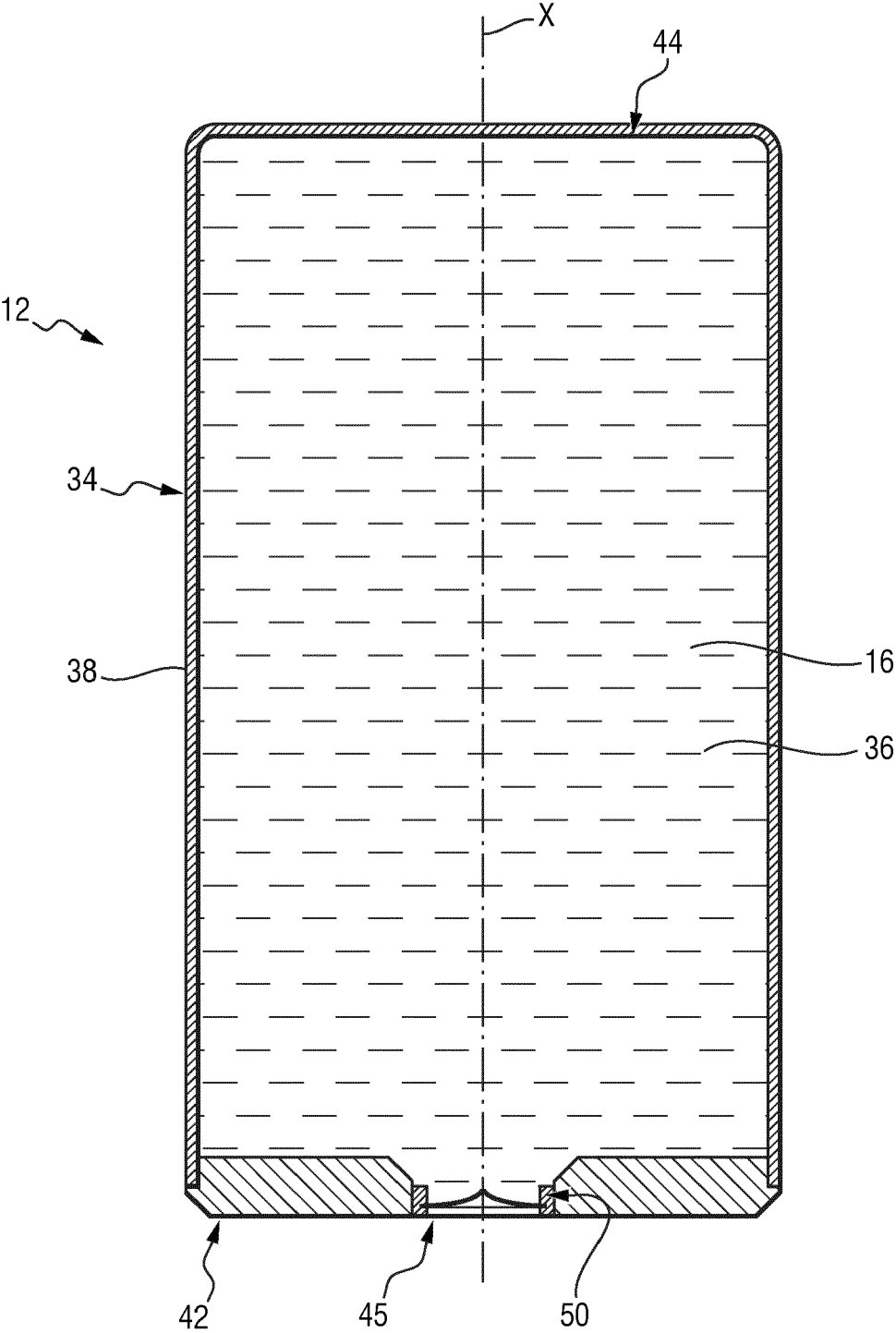


FIG.3

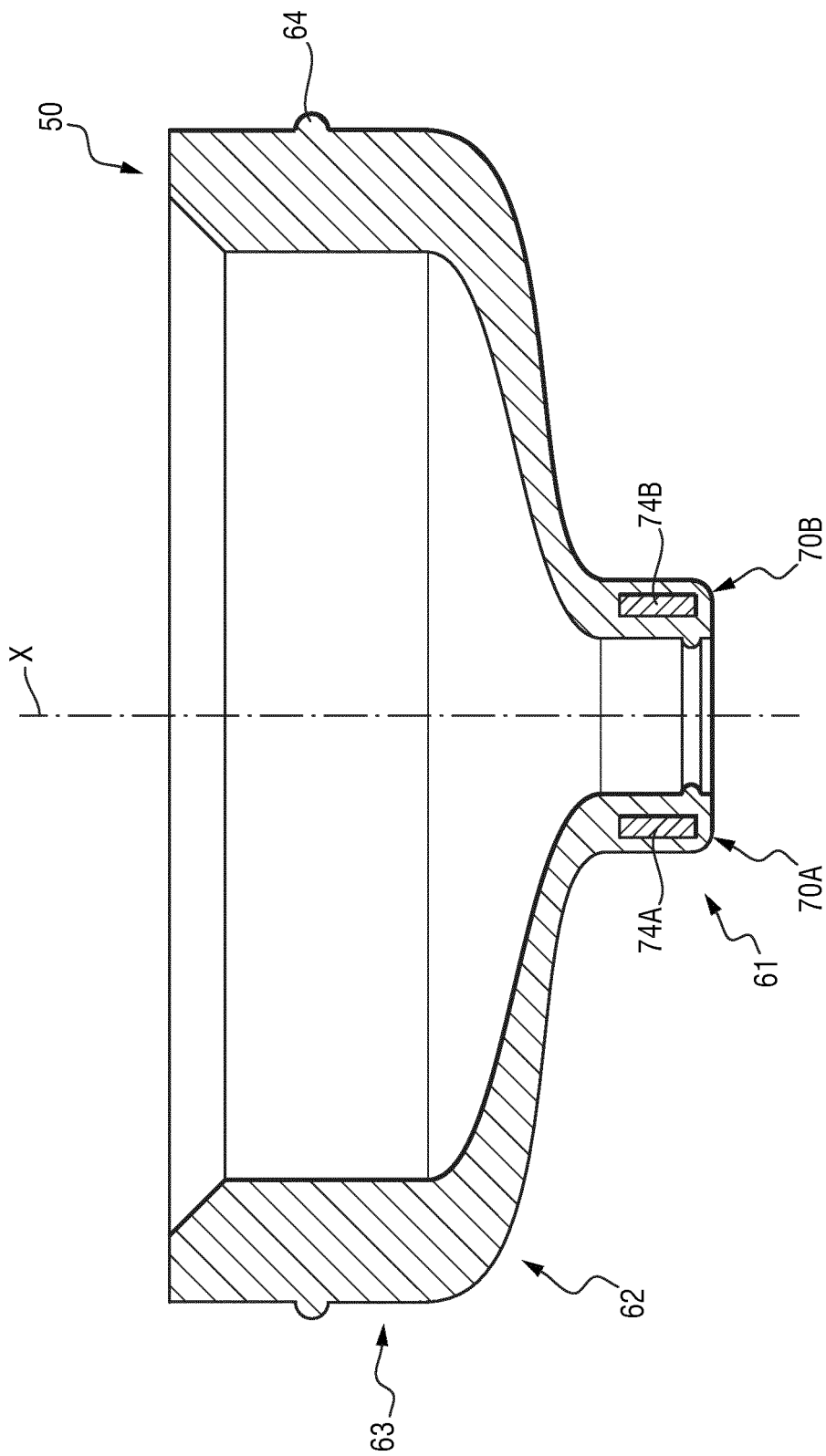


FIG.4

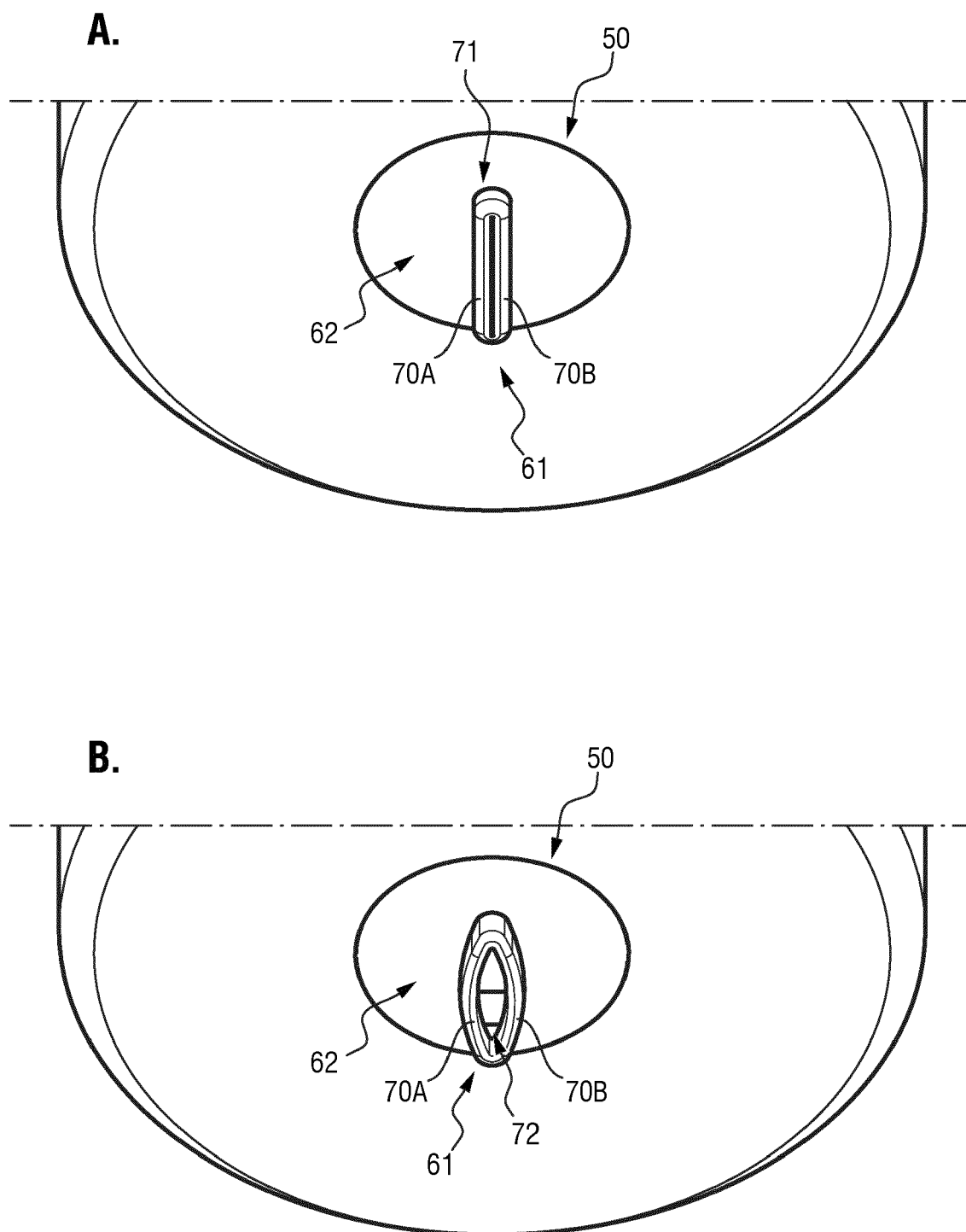


FIG.5

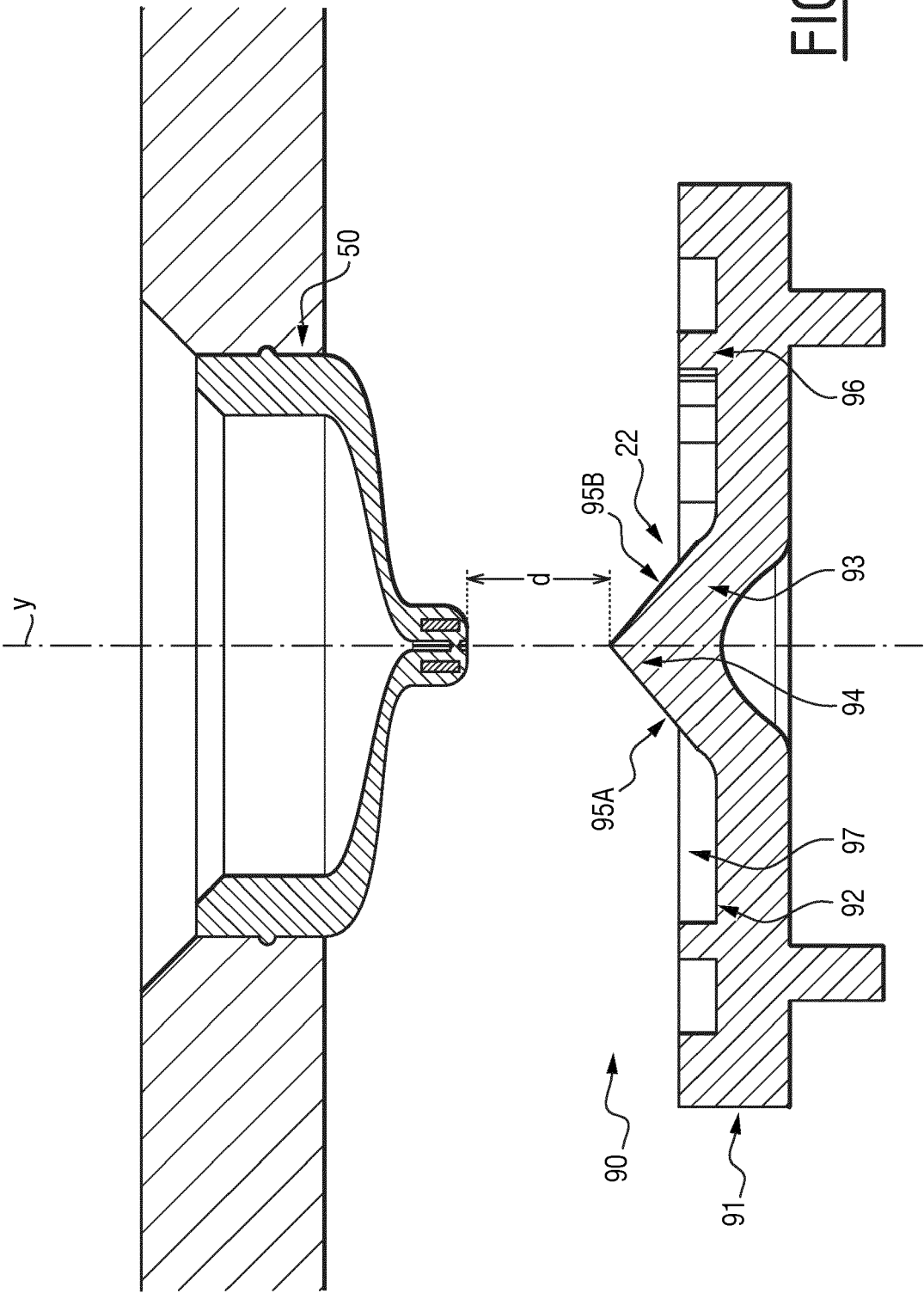


FIG.6

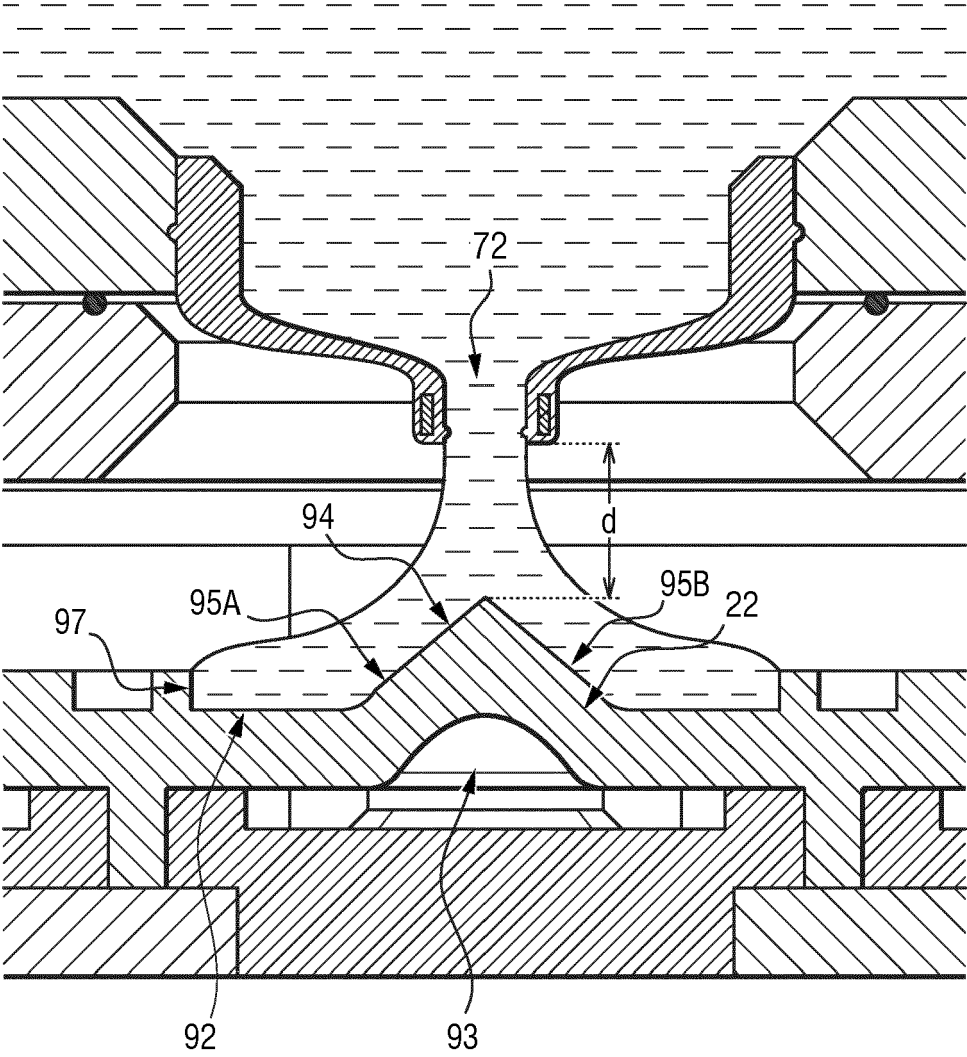


FIG.7



EUROPEAN SEARCH REPORT

Application Number

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X	WO 2022/263672 A1 (NICOVENTURES TRADING LTD [GB]) 22 December 2022 (2022-12-22) * title; figures 6, 9b, 9e, 9f, 9g * * page 1, line 4 - line 7 * * page 13, line 22 - line 24 * * page 26, line 21 - line 23 * * page 6, line 8 - line 11 * * page 22, line 11 - line 14 * * page 30, line 20 - line 23 *	1, 2, 4, 6-12	TECHNICAL FIELDS SEARCHED (IPC) A24F
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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 13 May 2024	Examiner Schäfer, Lucas
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