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

(72) Inventor: **MONTICONE, Pier Paolo**
1218 LE GRAND-SACONNEX (CH)

(74) Representative: **Plasseraud IP**
104 Rue de Richelieu
CS92104
75080 Paris Cedex 02 (FR)

(54) **AEROSOL GENERATION SYSTEM**

(57) An aerosol generation system (10) comprising a power source (14) and an outer casing (12), said outer casing (12) comprising a heating chamber (16) configured to receive an aerosol substrate (28) including an aerosol precursor, and a gaseous fluid storage chamber (18) fluidically connected to the heating chamber (16), said gaseous fluid being a mix of aerosol and/or aerosol precursor from the heating chamber (16) and air, the aerosol generation system further comprising a device (40) for generating a gaseous fluid flow between the heating chamber (16) and the storage chamber (18).

[Fig. 3]

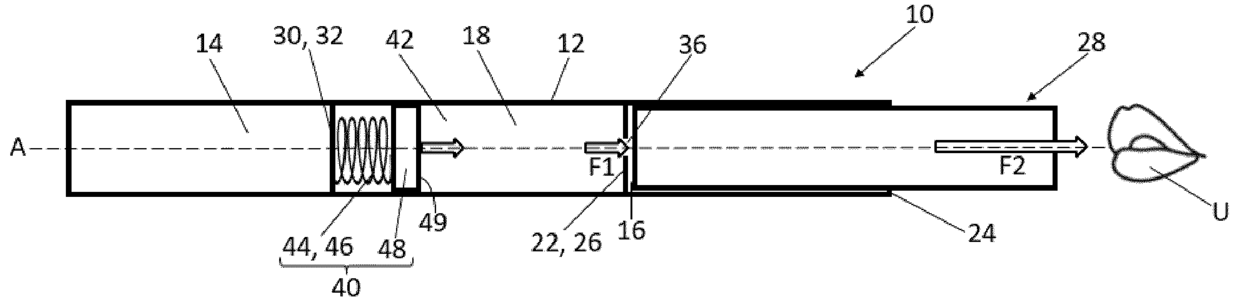

Fig. 3

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Description

Technical Field

[0001] This disclosure pertains to the field of aerosol generation systems.

Background Art

[0002] Aerosol generation systems based on aerosol-generating consumable articles have gained popularity in the recent years.

[0003] Unlike conventional tobacco products, in which the tobacco is burned so that the user can inhale the substances it contains, the aerosol generation systems merely heat aerosolisable substances, without combustion. An aerosol that can be inhaled by the user is therefore generated. This aerosol does not contain the undesired by-products that are generated during combustion.

[0004] Various systems are available that heat aerosolisable substances to generate such an aerosol for inhalation by user. These systems let air pass into or near the aerosolisable substance. This air is mixed with the generated aerosol, this mix being inhaled by the user.

[0005] It has been found, however, that these systems do not effectively extract the products contained in the aerosolisable substances. In particular, they do not provide a user's sensorial experience, especially in terms of taste, that is sufficiently intense or, for it to be intense enough, the energy consumed by the system has to be high, which requires large batteries and increases the cost of use.

[0006] There is therefore a need to develop an aerosol generation system capable of increasing the efficiency of extraction of the products from the aerosolisable substances and the taste of the inhaled aerosol-air mix.

Summary

[0007] To that end, It is proposed an aerosol generation system comprising a power source and an outer casing, said outer casing comprising a heating chamber configured to receive an aerosol substrate including an aerosol precursor, and a gaseous fluid storage chamber fluidically connected to the heating chamber, said gaseous fluid being a mix of aerosol and/or aerosol precursor from the heating chamber and air, the aerosol generation system further comprising a device for generating a gaseous fluid flow between the heating chamber and the storage chamber.

[0008] Thanks to the device generating the gaseous fluid flow between the heating chamber and the storage chamber, air passes twice through the aerosol substrate before being inhaled by the user. The air can therefore form a mix more enriched in aerosol and/or aerosol precursor. The efficiency of extraction of the aerosol and/or the aerosol precursor of the aerosol substrate is therefore increased, as well as the taste of the inhaled aerosol-air mix. The sensorial experience of the user is therefore improved. In addition, the increased efficiency of extraction allows reducing the energy consumption of the aerosol generation system, thus reducing its cost of use.

[0009] In an embodiment, the device comprises a deformable member installed in the storage chamber, the deformable member being arranged to move between a first position, in which the storage chamber stores the gaseous fluid, and a second position, in which at least part of said gaseous fluid has flowed out of the storage chamber. Thus, the above-mentioned air flow passing through the aerosol substrate in twice may be realized based on at least a partially mechanical structure. It may lead to reduce the energy consumption.

[0010] In an embodiment, the deformable member is configured to move from the first position to the second position in response to a pressure reduction of the gaseous fluid in the storage chamber, and to move from the second position to the first position when the pressure reduction of the gaseous fluid in the storage chamber ceases. Thus, the above-mentioned air flow passing through the aerosol substrate in twice may be realized based on a mainly mechanical structure. It may lead to effectively save energy consumption.

[0011] In an embodiment, the storage chamber comprises a storage portion in which said gaseous fluid is stored, a volume of said storage portion being smaller in the second position of the deformable member than in the first position. Thus, when the deformable member is in the second position, all or part of the gaseous fluid stored in the storage chamber can flow out from said storage chamber.

[0012] In an embodiment, the volume of said storage portion when the deformable member is in the first position is comprised in a range from 30 ml to 60 ml, preferably in a range from 35 ml to 55 ml. It may lead to realize the aerosol generation system without significant increment of its size.

[0013] In an embodiment, the deformable member comprises a spring having a first end fixed to a wall of the storage chamber and a second end attached to a plunger, the plunger forming a wall of said storage portion. It may lead to realize the aerosol generation system without a complex and heavy mechanical structure.

[0014] In an embodiment, the deformable member comprises an elastic diaphragm fixed to a wall of the storage chamber.

[0015] In an embodiment, the elastic diaphragm is made of silicone or polyurethane.

[0016] In an embodiment, a gaseous fluid hole is provided between the heating chamber and the storage chamber.

[0017] In an embodiment, the heating chamber is separated from the storage chamber by an interface wall, the gaseous fluid hole being provided through said interface wall. It may lead to protect the storage chamber and the deformable member when the aerosol substrate is inserted into the heating chamber and extracted from the heating chamber.

[0018] In an embodiment, the heating chamber comprises a cavity provided with an opening to receive the aerosol substrate, the heating chamber further comprising an air inlet such that air can flow from the outside of the aerosol generation system to said cavity.

[0019] In an embodiment, the heating chamber extends along a longitudinal axis between a first end and a second end, the heating chamber further comprising a lateral wall connecting said first and second ends, wherein the storage chamber at least partially surrounds said lateral wall.

[0020] In an embodiment, the aerosol generation system extends along a longitudinal axis, wherein the heating chamber and the storage chamber are arranged one after the other along said longitudinal axis.

[0021] In an embodiment, the heating chamber extends longitudinally between a first end and a second end, the heating chamber further comprising a lateral wall connecting said first and second ends, wherein the storage chamber at least partially surrounds said lateral wall.

[0022] In an embodiment, the storage chamber is configured to heat said gaseous fluid stored in the storage chamber.

Brief Description of Drawings

[0023] Other features, details and advantages will be shown in the following detailed description and on the figures, on which:

Fig. 1

[Fig. 1] shows a schematic longitudinal sectional view of an aerosol generation system comprising a deformable member in a first position according to a first embodiment.

Fig. 2

[Fig. 2] shows a schematic longitudinal sectional view of the aerosol generation system of figure 1 provided with an aerosol substrate.

Fig. 3

[Fig. 3] shows a schematic longitudinal sectional view of the aerosol generation system and the aerosol substrate of figure 2, the deformable member being in another position, called intermediate position.

Fig. 4

[Fig. 4] shows a schematic longitudinal sectional view of the aerosol generation system and the aerosol substrate of figure 2, the deformable member being in a second position.

Fig. 5

[Fig. 5] shows a schematic longitudinal sectional view of the aerosol generation system and the aerosol substrate of figure 2, the deformable member being in another intermediate position.

Fig. 6

[Fig. 6] shows a schematic longitudinal sectional view of an aerosol generation system comprising a deformable member in a second position according to a second embodiment.

Fig. 7

[Fig. 7] shows a schematic longitudinal sectional view of an aerosol generation system comprising a deformable member in a second position according to a third embodiment.

Description of Embodiments

[0024] It is now referred to figures 1 to 5, which show a first example of an aerosol generation system 10, and to figure 6 which shows a second example of the aerosol generation system 10.

[0025] The aerosol generation system 10 extends along a longitudinal axis A. In the present text, the terms "longitudinal" or "axial" are to be understood as "substantially parallel to the longitudinal axis A", and the terms "transversal" or "radial" are to be understood as "substantially perpendicular to the longitudinal axis A"

[0026] The aerosol generation system 10 comprises an outer casing 12. The outer casing 12 has for example a substantially cylindrical shape or a substantially prismatic shape.

[0027] The aerosol generation system 10 further comprises a power source 14, a heating chamber 16 and a gaseous fluid storage chamber 18. In the non-limiting examples of figures 1 to 5 and figure 6, the power source 14, the storage chamber 18 and the heating chamber 16 are arranged longitudinally one after another.

[0028] The power source 14 is preferably an electronic power source. The power source 14 may comprise one or more batteries (not shown), such as a removable battery, a rechargeable battery or the like. The power source 14 may be or comprise a lithium-ion secondary battery. A controller (not shown) comprising an electrical circuitry may be provided to control the power source 14. Such an electrical circuitry is known to the skilled person and is therefore not discussed here. The controller may be or comprise a microcontroller unit (MCU) and/or a micro processing unit (MPU).

[0029] The power source 14 may be included in the outer casing 12 or may be external to the outer casing 12. When the power source 14 is external to the outer casing 12, it can be installed inside a housing that is connectable to the outer casing 12.

[0030] The heating chamber 16 and the gaseous fluid storage chamber 18 are formed inside the outer casing 12. In figures 1 to 6, the heating chamber 16 and the storage chamber 18 are in particular arranged longitudinally one after the other within the outer casing 12.

[0031] In some cases, the outer casing 12 can be detachable at the boundary between the heating chamber 16 and the storage chamber 18, so that the heating chamber 16 and the storage chamber 18 can be separated from each other.

[0032] The heating chamber 16 comprises a cavity 20. The cavity 20 extends longitudinally between a first end 22, said distal end, and a second end 24, said proximal end.

[0033] The first end 22 of the cavity 20 comprises a wall 26, called interface wall 26. The interface wall 26 separates the heating chamber 16 from the storage chamber 18. The interface wall 26 extends substantially transversally, but it could take any other orientation that allows the heating chamber 16 to be separated from the storage chamber 18.

[0034] The second end 24 of the cavity 20 comprises an opening 27. The cavity 20 and the opening 27 are in particular shaped to receive an aerosol substrate 28, shown in figures 2 to 5. Advantageously, at least the opening 27 is shaped such that the aerosol substrate 28 can be tightly disposed in the opening 27. The above-mentioned interface wall 26 may work as a protection member which protects the storage chamber 18 when the aerosol substrate 28 is inserted into the heating chamber 16 (in particular in the cavity 20) and extracted from the heating chamber 16 (in particular from the cavity 20).

[0035] The heating chamber 16 further comprises a heater (not shown) that is configured to generate heat inside the heating chamber 16 so that the aerosol substrate 28 can be heated. The heater may be powered by the power source 14. In order to limit heat loss, and to prevent a user U from being burned if they touch the outer casing 12 at the level of the heating chamber 16, an insulator (not shown) may surround the heating chamber 16.

[0036] The aerosol substrate 28 is a consumable, for example in the form of a stick. The aerosol substrate 28 can include tobacco, for example in dried or cured form. In some cases, the aerosol substrate 28 includes, in addition to or alternatively to tobacco, ingredients for flavoring or producing a smoother or more pleasurable experience. Flavors may include ethyl vanillin (vanilla), menthol, isoamyl acetate (banana oil), etc.

[0037] The aerosol substrate 28 further comprises an aerosol precursor (not shown). The aerosol precursor includes for example glycerin and/or propylene glycol.

[0038] When the heater generates heat inside the heating chamber 16, the aerosol precursor vaporizes and/or the aerosol substrate 28 vaporizes. The vaporization of the aerosol substrate 28 creates an aerosol that extracts nicotine, flavors and/or other components from the aerosol substrate 28. The heater is in particular configured to heat the aerosol substrate 28 to a temperature that is sufficiently high to generate the aerosol from the aerosol substrate 28 but not so high as to cause combustion of the aerosol substrate's components. Consequently, the aerosol generation system 10 could equally be referred to as a "heated tobacco system", a "heat-not-burn tobacco system", a "system for vaporizing tobacco products", and the like, with this being interpreted as a system suitable for achieving these effects.

[0039] As shown in the figures when the aerosol substrate 28 is installed in the heating chamber 16, an end portion of the aerosol substrate 28 remains outside the heating chamber 16. The user U of the aerosol generation system 10 can therefore puff on the aerosol substrate 28, so that the vaporized aerosol precursor and/or the aerosol created by heating the aerosol substrate 28 in the heating chamber 16 can reach the user's mouth to be inhaled. That is, the end portion of the aerosol substrate 28 may work as a mouthpiece.

[0040] In some cases, as shown in figure 6, an air inlet 29 can be provided in the heating chamber 16. Advantageously, the air inlet 29 is placed close to a filter portion (not shown) of the aerosol substrate 28.

[0041] In the example of figure 6, the air inlet 29 comprises a cavity through the outer casing 12. The air inlet's cavity fluidically connects the cavity 20 of the heating chamber 16 to the outside. Air, in particular ambient air, can therefore flow from the outside of the aerosol generation system 10 to the cavity 20 of the heating chamber 16.

[0042] The vapor of the aerosol precursor and/or the aerosol generated in the heating chamber 16 can be diluted with the ambient air introduced in the cavity 20 via the air inlet 29 before user's inhalation. This allows to reduce the volume of the storage chamber 18 and to increase the battery duration of the aerosol generation system 10, as it will be explained.

[0043] Of course, although this air inlet 29 is only represented in the example of figure 6, it could equally be provided in the example of figures 1 to 5, as well as in the example of figure 7 that is described below.

[0044] Additionally or alternatively, the air inlet 29 can be placed between the opening 27 and the aerosol substrate 28. Such an air inlet 29 may be comprise a groove extending along the longitudinal axis A.

[0045] The gaseous fluid storage chamber 18 is longitudinally arranged between the power source 14 and the heating chamber 16. A first end 30, said distal end, of the storage chamber 18 comprises a wall 32 that separates the storage chamber 18 from the power source 14. The wall 32 extends for example substantially transversally, without this being limiting. A second end, said proximal end, of the storage chamber 18, longitudinally opposite to the wall 32, borders the interface wall 26.

[0046] The storage chamber 18 is fluidically connected to the heating chamber 16. To that end, a hole can be provided between the storage chamber 18 and the heating chamber 16. In the non-limiting examples of the figures, the interface wall 26 comprises a hole 36 running longitudinally through the interface wall 26. Thus, the hole 36 connects fluidically the heating chamber 16 and the storage chamber 18. A gaseous fluid flow F1 (shown in figures 1, 3 and 5) can therefore exist between the heating chamber 16 and the storage chamber 18.

[0047] When the aerosol substrate 28 is not disposed in the heating chamber 16, the gaseous fluid flowing from the heating chamber 16 to the storage chamber 18 comprises ambient air. When the aerosol substrate 28 is disposed in the heating chamber 16, the gaseous fluid flowing from the heating chamber 16 to the storage chamber 18 comprises a mix of air (in particular, ambient air) and aerosol and/or aerosol precursor from the heating chamber 16, as it will be detailed.

[0048] A device 40 for generating the gaseous fluid flow F1 between the heating chamber 16 and the storage chamber 18 is installed in the storage chamber 18. As it will be detailed below, the device 40 is in particular configured to generate the gaseous fluid flow F1 both in the direction going from the heating chamber 16 to the storage chamber 18, and in the direction going from the storage chamber 18 to the heating chamber 16.

[0049] The device 40 is for example fixed to the wall 32. A longitudinal space existing at each instant between the device 40 and the interface wall 26 forms a storage portion 42 of the gaseous fluid. This storage portion 42 houses the gaseous fluid entering in the storage chamber 18, as it will be detailed. Alternatively, the device 40 is fixed to the interface wall 26.

[0050] The device 40 comprises a deformable member 44. Advantageously, the deformable member 44 is elastically deformable. The deformable member 44 is arranged to move between a first position, in which the storage chamber 18 stores the gaseous fluid, and a second position, in which at least part of the gaseous fluid has flowed out of the storage chamber 18. As it will be detailed, when the deformable member 44 is in the second position, the volume of the storage portion 42 is smaller than in the first position. This is due to a pressure reduction of the gaseous fluid in the storage chamber 18 that occurs when the user U puffs on the aerosol substrate 28.

[0051] To explain this in detail, we now refer to figures 1 to 5.

[0052] In figures 1 to 5, the device 40 comprises a spring 46 and a plunger 48.

[0053] A first end of the spring 46 is fixed to the wall 32 of the storage chamber 18. A second end of the spring 46 is attached to the plunger 48. The second end of the spring 46 is preferably longitudinally opposite to its first end.

[0054] The spring 46 acts as a deformable member 44 that can move between the first and the second positions. In figures 1 and 2, the spring 46 is in the first position, while in figure 4, the spring 46 is in the second position. It can be clearly deduced from these figures that during the passage from the first position to the second position, the spring 46 is longitudinally elongated, while during the passage from the second position to the first position, the spring 46 contracts longitudinally.

[0055] The spring 46 is in particular a spring working in tension when moving from the first position to the second position. By "working in tension" is meant that when the spring 46 is longitudinally elongated, the absolute value of the elastic potential energy of the spring 46 increases. It follows that the absolute value of the elastic potential energy of the spring 46 is higher in the second position than in the first position. As will be detailed, this implies that, in order to move from the first position to the second position, an external force must be applied to the spring 46, while the transition of the spring 46 from the second position to the first position is spontaneous as soon as the external force ceases.

[0056] In the illustrated example, the absolute value of the elastic potential energy of the spring 46 in the first position is advantageously zero. However, the absolute value of the elastic potential energy of the spring 46 in the first position could be different from zero if, for example, the storage chamber 18 was provided with a radial projection against which the device 40, in particular the plunger 48, abuts longitudinally when moving from the second position to the first position before having released all the stored elastic potential energy.

[0057] The plunger 48 has a transversal section substantially equal to a transversal section of the storage chamber 18. Advantageously, the plunger 48 is not mounted tightly in the storage chamber 18. The plunger 48 is thus able to move along the longitudinal direction A integrally with the spring 46 when the latter moves between the first and second positions.

[0058] The plunger 48 forms a wall of the storage portion 42. In particular, the storage portion 42 is longitudinally delimited between the interface wall 26 and a face 49 of the plunger opposite to the face of the plunger 48 to which the spring 46 is attached.

[0059] Figures 1 to 5 show a sequence of positions adopted by the device 40 during use of the aerosol generation system 10.

[0060] In figure 1, the aerosol substrate 28 is not yet disposed in the heating chamber 16. As explained, in this configuration, the gaseous fluid flow F1 that enters in the storage chamber 18 from the heating chamber 16 comprises ambient air. The spring 46 is in the first position.

[0061] The aerosol substrate 28 is then placed in the heating chamber 16, as shown in figure 2. As explained, in the heating chamber 16, the aerosol substrate 28 is heated so that aerosol precursor and/or the aerosol substrate 28 vaporizes. The aerosol containing nicotine, flavors and/or other components of the aerosol substrate 28 as described before is generated.

[0062] When the user U puffs on the aerosol substrate 28, the user U inhales fluids, namely gases and/or aerosols, of the heating chamber 16. A pressure in the heating chamber 16 is then reduced. This causes at least a part of the gaseous fluid stored in the storage chamber 18 to enter the heating chamber 16 through the hole 36. The storage chamber 18 is therefore progressively emptied of gaseous fluid, so that a pressure of gaseous fluid in the storage chamber 18 gradually decreases. The reduction of gaseous fluid pressure in the storage chamber 18 induces a force on the spring 46 that causes its progressive movement of longitudinal extension inside the storage chamber 18 from the first position, as shown in figure 3. The volume of the storage portion 42 is then progressively reduced.

[0063] It should be noted that during the whole longitudinal movement of the spring 46 in the storage chamber 18, regardless of its direction, the spring 46 remains attached to the wall 32 by its first end.

[0064] The gaseous fluid leaving the storage chamber 18 passes longitudinally through the substrate 28, wherein it is mixed with the aerosol generated by heating the aerosol substrate 28. The mix of the gaseous fluid from the storage chamber 18 and the aerosol forms another gaseous fluid flow F2. The gaseous fluid flow F2 reaches the user's mouth for inhalation.

[0065] As shown in figure 4, the longitudinal extension of the spring 46 continues until the user's puff ceases. In some cases, when the user's puff continues and the face 49 of the plunger 48 is already in contact with the interface wall 26, the spring 46 no longer extends longitudinally, but it remains in the position where the plunger 48 contacts the interface wall 26. It should be noted that the face 49 of the plunger 48 may not contact the interface wall 26 when the spring 46 is in the second position.

[0066] The longitudinal position in which the spring 46 is located in the storage chamber 18 when the user's puff finishes corresponds to the second position. Therefore, the second position of the spring 46, as understood herein, depends on the inhalation force of the user's puff. The longitudinal position of the spring 46 in the second position may therefore vary between each puff. For example, in figure 4, the face 49 of the plunger 48 is almost in contact with the interface wall 26 when the spring 46 is in the second position. This means that the user's puff was strong enough to cause almost all the gaseous fluid in the storage chamber 18 to have flowed into the heating chamber 16. Of course, the user's puff could be less strong, in which case the face 49 of the plunger 48 would be further away from the interface wall 26 when the spring 46 is in the second position.

[0067] The plurality of longitudinal positions of the spring 46 comprised between the first position and the second position for each puff are called herein "intermediate positions". One of these intermediate positions is shown in figure 3.

[0068] As said, the absolute value of the elastic potential energy of the spring 46 in the second position is higher than in the first position. Thus, when the user's puff is finished (and so, the pressure reduction of gaseous fluid ceases in the storage chamber 18), the spring 46 moves spontaneously from the second position to the first position in the storage chamber 18, as shown in figure 5. As previously said, the plunger 48 moves integrally with the spring 46. The volume of the storage portion 42 is then progressively increased when the spring 46 moves from the second position to the first position.

[0069] The movement of the spring 46 from the second to the first position creates therefore a suction force that causes a flow F3 of ambient air to travel from the outside of the system 10 to the storage chamber 18. During this travel, the ambient air passes longitudinally through the aerosol substrate 28 disposed in the heating chamber 16. Thus, the ambient air is mixed to the aerosol precursor and/or to the aerosol of the aerosol substrate 28, so that forming the gaseous fluid flow F1 that enters in the storage chamber 18. The mixing of the ambient air with the aerosol precursor and/or the aerosol is possible in particular because, just after the user's puff, the aerosol substrate 28 may be kept at a high temperature. Therefore, the gaseous fluid flow F1 comprises in this case ambient air enriched in aerosol precursor and/or in aerosol from the aerosol substrate 28, as previously said. Since the heating chamber 16 heats the aerosol substrate 28, the temperature of flow F1 entering the storage chamber 18 is higher than the temperature of ambient air.

[0070] In subsequent puffs, the gaseous fluid in the storage chamber 18 and the spring 46 follow the same sequence of events described above with reference to figures 3 to 5. In short, the pressure drop in the heating chamber 16 due to the user's puff causes at least a part of the gaseous fluid in the storage chamber 18 to flow into the heating chamber 16. Once in the heating chamber 16, this gaseous fluid flows longitudinally through the aerosol substrate 28. The gaseous fluid flow F2 is thus generated and inhaled in the user's mouth.

[0071] When flowing through the aerosol substrate 28, the gaseous fluid is further enriched in aerosol precursor and/or in the aerosol generated from the aerosol substrate 28. Therefore, for subsequent puffs, air passes twice through the aerosol substrate 28 to form the inhaled gaseous fluid flow F2. This allows to obtain a gaseous fluid flow F2 more enriched in the components of the aerosol substrate 28, especially in nicotine and flavor, than during the first puff, for which air passes only once through the aerosol substrate 28 to form the inhaled gaseous fluid flow F2.

[0072] In figure 6, the device 40 comprises an elastic diaphragm 50. The elastic diaphragm 50 is fixed to the wall 32. In particular, the radially outer edge of the diaphragm 50 is fixed to the wall 32.

[0073] The elastic diaphragm 50 acts as the deformable member 44 that can move between the first and the second positions. In the first position (not shown), the diaphragm 50 is over its whole surface, or at least over mostly all its surface, in contact with the wall 32. In the second position, shown in figure 6, part of the diaphragm 50 is displaced towards the interface wall 26 by extending longitudinally in the storage chamber 18. During the displacement from the first position to the second position, the radially outer edge of the diaphragm 50 remains fixed to the wall 32. Thus, when moving to the second position, the diaphragm 50 can acquire a substantially parabolic longitudinal cross-section, as shown in figure 6. When the diaphragm 50 is in the second position, the storage portion 42 of the storage chamber 18 is reduced with respect to when the diaphragm 50 is in the first position.

[0074] As in the case of the spring 46, the diaphragm 50 works in tension when moving from the first position to the second position. Passing from the second position to the first position is therefore a spontaneous movement as long as the external force that maintains the diaphragm 50 in the second position ceases.

[0075] The elastic diaphragm 50 is for example made of silicone or polyurethane. More precisely, the elastic diaphragm 50 is made of silicone or polyurethane rubbers. Such materials allow an elongation of the diaphragm 50 comprised between 400% and 700% with respect to the dimensions of the diaphragm 50 in its first position. This facilitates the transition of the diaphragm 50 from the first position to the second position. In addition, these materials are food grade even at high temperatures, for example comprised between 200°C and 300°C. "Food grade" means that the material is either safe for human consumption or to come into direct contact with food products. The diaphragm 50 can therefore be in contact with the gaseous fluid at high temperatures without releasing substances toxic to human inhalation.

[0076] The sequence of positions adopted by the device 40 during use of the aerosol generation system 10 explained before with reference to figures 1 to 5 applies identically or similarly when the device 40 is the elastic diaphragm 50. Therefore, for the sake of concision, it will not be re-explained. It is sufficient to replace in the explanation given above with reference to the sequence of figures 1 to 5 any reference to the "spring" 46 and "piston" 48 by the "diaphragm" 50, and any reference to the "first end" of the spring 46 by the "radially outer edge" of the diaphragm 50.

[0077] Now, a third example of an aerosol generation system 10 shown in figure 7 will be described.

[0078] In this case, the outer case 12 comprises an external wall 52 and an internal wall 54. As shown, the external wall 52 and the internal wall 54 have a U-shaped longitudinal cross-section.

[0079] The internal wall 54 is disposed inside the external wall 52. An annular front wall 56 joins the external wall 52 to the internal wall 54. An inner space 58 is formed between the external wall 52, the internal wall 54 and the annular front wall 56.

[0080] The heating chamber 16 and the storage chamber 18 are comprised in the outer case 12.

[0081] In this case, the heating chamber 16 is transversally delimited by a surface 54-1 of the internal wall 54 that extends longitudinally. The surface 54-1 forms then a lateral wall of the heating chamber 16 that connects the first end 22 and the second end 24 of the heating chamber 16. The interface wall 26 comprising the hole 36 as described above corresponds in this example to a surface 54-2 of the internal wall 54 that extends transversally.

[0082] The rest of the features of the heating chamber 16 described above with reference to figures 1 to 6, and which are not contrary to those described with respect to figure 7, are applicable to the example of figure 7. Therefore, they will not be explained again.

[0083] In this example, the storage chamber 18 occupies the inner space 58 formed between external wall 52, the internal wall 54 and the front wall 56.

[0084] As in figures 1 to 6, the storage chamber 18 is arranged longitudinally after the heating chamber 16, but also surrounds the lateral wall 54-1 of the heating chamber 16. In figure 7, the storage chamber 18 surrounds the whole lateral wall 54-1 of the heating chamber 16, but the storage chamber 18 could also surround only partially the lateral wall 54-1 of the heating chamber 16.

[0085] When the storage chamber 18 surrounds the lateral wall 54-1 of the heating chamber 16, the storage chamber 18 can be used as an insulator of the heating chamber 16 in order to limit heat loss, and to prevent a user U from being burned if they touch the outer casing 12 at the level of the heating chamber 16.

[0086] Arranging the storage chamber 18 so that it can insulate the heating chamber 16 provides a more efficient insulation of this heating chamber 16, since part of the heat leakages from the heating chamber 16 are retained in the gaseous fluid contained in the storage chamber 18. The gaseous fluid in the storage chamber 18 is therefore heated thanks to the heat leakages coming from the heating chamber 16. This allows using cheaper and smaller batteries, as it will be explained below.

[0087] In addition, arranging at least part of the storage chamber 18 around the heating chamber allows obtaining a more compact aerosol generation system 10 in the longitudinal direction A.

[0088] The rest of the features of the storage chamber 18 described above with reference to figures 1 to 6, and which are not contrary to those described with respect to figure 7, are applicable to the example of figure 7. Therefore, they will not be explained again.

[0089] In the non-limiting example of figure 7, the device 40 comprise two diaphragms 60 similar or identical to the diaphragm 50 described above with reference to figure 6. In the following, only the differences between each diaphragm 60 and the diaphragm 50 described above are described. All other features of the diaphragm 50 that are not contrary to those described below with respect to diaphragms 60 are applicable to each diaphragm 60.

[0090] Each diaphragm 60 differs from the diaphragm 50 in that the diaphragm 60 is fixed to the front wall 56 of the casing 12, which is also a front wall of the storage chamber 18. In particular, the radially outer edge of each diaphragm 60 is fixed to the front wall 56. Therefore, in the first position, each diaphragm 60 is over its whole surface, or at least over mostly all its surface, in contact with the front wall 56. In the second position, shown in figure 7, part of each diaphragm 60 is displaced towards the wall 32 by extending longitudinally in the storage chamber 18. During the displacement from the first position to the second position, the radially outer edge of each diaphragm 60 remains fixed to the front wall 56. Thus, when moving to the second position, each diaphragm 60 can acquire a substantially parabolic longitudinal cross-section, as shown in figure 7. When each diaphragm 60 is in the second position, the storage portion 42 of the storage chamber 18 is reduced with respect to when each diaphragm 60 is in the first position.

[0091] Of course, the system 10 of figure 7 could have a single diaphragm 60 or more than two diaphragms 60. Alternatively, the diaphragms 60 could be replaced by one or several device(s) 40 comprising the spring 46 and the plunger 48, as described in figure 1 to 5. A combination of the spring 46, the plunger 48 and the diaphragm 60 may also be employed.

[0092] The sequence of positions adopted by the device 40 during use of the aerosol generation system 10 explained before with reference to figures 1 to 5 applies similarly when the device 40 comprises the elastic diaphragms 60. Therefore, for the sake of concision, it will not be re-explained. It is sufficient to replace in the explanation given above with reference to the sequence of figures 1 to 5 any reference to the "spring" 46 and "piston" 48 by "each diaphragm" 60, any reference to the "first end" of the spring 46 by the "radially outer edge" of each diaphragm 60, any reference to the "wall" 32 by the "front wall" 56, and any reference to the "interface wall" 26 by the "wall" 32.

[0093] In all the embodiments described above, a volume of the storage portion 42 when the deformable member 44 is in the first position is comprised in a range from 30 ml to 60 ml, preferably in a range from 35 ml to 55 ml. The volume of gaseous fluid in the storage chamber 18 when the deformable member is in the first position is therefore comprised in a range from 30 ml to 60 ml, preferably in a range from 35 ml to 55 ml. Such a volume of gaseous fluid, mixed with the aerosol formed in the heating chamber 16, allows for satisfactory puffs for the user U in terms of quantity of fluid inhaled. In particular, such a volume of gaseous fluid is the maximum average value of gaseous fluid that any user can physiologically inhale in a single puff.

[0094] When the air inlet 29 is provided in the heating chamber 16, the volume of the storage portion 42 can be reduced while maintaining satisfactory puffs for the user U in terms of quantity of fluid inhaled. Indeed, the air entering through the air inlet 29 may replace a part of the gaseous fluid coming from the storage chamber 18. As indicated above, the reduced storage chamber volume helps in reducing the size of the system 10. In addition, this reduces the quantity of air to heat in the heating chamber 16, thus reducing energy consumption and increasing the battery duration. Battery energy efficiency is further improved thanks to the higher dilution with ambient air.

[0095] The storage chamber 18 can be configured to heat the gaseous fluid stored therein. In some cases, as explained before with reference to figure 7, the storage chamber 18 can be arranged so that it receives the heat leakages coming from the heating chamber 18. The gaseous fluid is therefore heated. This configuration allows to use a cheaper and smaller battery as no energy coming from the battery is necessary to heat the gaseous fluid in the storage chamber 18.

[0096] In other cases, a heater (not shown) can be provided in the storage chamber 18. Such a heater can be powered by the power source 14.

[0097] Heating the gaseous fluid in the storage chamber 18 allows to ensure that the gaseous fluid that flows from the storage chamber 18 to the heating chamber 16 is at a suitable temperature to be mixed with the vaporized aerosol precursor and/or with the aerosol in the heating chamber 16. Heating the gaseous fluid in the storage chamber 18 further avoids that the gaseous fluid is liquified during the time it is stored in the storage chamber 18.

[0098] As explained before, after the first puff given by the user U after installing the aerosol substrate 28 in the heating chamber 16, the gaseous fluid flow F2 that is inhaled by the user U is formed when ambient air has traveled twice longitudinally in the aerosol substrate 18. This double passage of ambient air through the aerosol substrate 28 that generates the gaseous fluid flow F2 allows to improve the sensorial experience of the user U when taking a puff, namely in terms of taste of the gaseous fluid flow F2 inhaled. In addition, the system 10 is more efficient in terms of energy consumption since, in order to achieve this improved sensorial experience, it is not necessary to increase the time during which the system 10 operates or the temperature at which the aerosol substrate 28 is heated. The cost of using the system 10 is therefore reduced.

[0099] In the case of the first puff, since the aerosol substrate 28 is new, the gaseous fluid flow F2 is sufficiently enriched in aerosol precursor and/or aerosol to provide a satisfactory sensorial experience to the user, even if the gaseous fluid flow F2 is formed after a single passage of ambient air through the aerosol substrate 28.

[0100] Moreover, as already said, when ambient air travels through the aerosol substrate 28 in the heating chamber 16, ambient air is preheated. The efficiency and the quality of each puff are therefore increased.

[0101] Furthermore, ambient air travelling longitudinally through the aerosol substrate 28 travels through the center of the substrate 28, rather than over the outer surface of the substrate, which is generally made of paper. Thus, the paper taste of the inhaled gaseous fluid flow F2 is reduced. In addition, this limits the condensation and dirty that can be formed in the heating chamber's lateral wall.

[0102] It should also be noted that in the system 10 described above, it is not necessary to provide an inlet path for the ambient air to reach the storage chamber 18, and an outlet path for the gaseous fluid flow F2 to reach the user U. As is clear from the above explanations, the same path through the aerosol substrate 28 is employed both to introduce ambient air into the system 10 and to extract the gaseous fluid flow F2.

[0103] Finally, puff drawing resistance increases with the puff depth due to the increasing elastic potential energy of the deformable member 44 when it passes from the first position to the second position. This limits the variability between different puff types or between users, thus ensuring the puff quality and a kind of puff standardization. For example, the puff quality is not degraded when the user puffs fast or when there is an excessive cooldown in the heating chamber 16.

[0104] It should be noted that the present disclosure is not limited to the embodiments described above, only by way of example, but encompasses all variants that may be envisaged by a person skilled in the art in the context of the protection sought. For example, in the embodiment of figures 1 to 5, the spring 46 can be fixed to the interface wall 26 rather than the wall 32 of the storage chamber 18. In this case, the spring 46 is longitudinally compressed when moving from the first position to the second position. Thus, the spring 46 is in particular a spring working in compression when moving from the first position to the second position. By "working in compression" is meant that when the spring 46 is longitudinally compressed, the absolute value of the elastic potential energy of the spring 46 increases. It follows that, as in the example of figures 1 to 5, the absolute value of the elastic potential energy of the spring 46 is higher in the second position than in the first position. The spring 46 moves therefore from the first position to the second position when an external force, in particular the one generated by the user's puff as explained, is applied to the spring 46, and it moves from the second position to the first position when this force ceases. In such a configuration, the storage portion 42 is longitudinally delimited between the interface wall 26 and the face of the plunger 48 to which the spring 46 is attached.

[0105] In an alternative embodiment of the one shown in figure 6, the membrane 50 is attached to the interface wall 26 rather than the wall 32 of the storage chamber 18. In this case, the membrane 50 is longitudinally compressed when moving from the first position to the second position. Thus, the membrane 50 is in particular a membrane working in compression when moving from the first position to the second position. The membrane 50 moves therefore from the first position to the second position when an external force, in particular the one generated by the user's puff as explained, is applied to the membrane 50, and it moves from the second position to the first position when this force ceases.

[0106] In an alternative embodiment of the one shown in figure 7, the entire storage chamber 18 is arranged around the heating chamber 16. That is, no portion of the storage chamber 18 is located longitudinally after the heating chamber 16. In such a case, a conduit may connect the hole 36 with the interior of the storage chamber 18 so that the storage chamber 18 can receive the gaseous fluid flow F1.

Claims

1. An aerosol generation system (10) comprising a power source (14) and an outer casing (12), said outer casing (12) comprising a heating chamber (16) configured to receive an aerosol substrate (28) including an aerosol precursor, and a gaseous fluid storage chamber (18) fluidically connected to the heating chamber (16), said gaseous fluid being a mix of aerosol and/or aerosol precursor from the heating chamber (16) and air, the aerosol generation system further comprising a device (40) for generating a gaseous fluid flow between the heating chamber (16) and the storage chamber (18).

2. The aerosol generation system (10) according to claim 1, wherein the device comprises a deformable member (44) installed in the storage chamber (18), the deformable member (44) being arranged to move between a first position, in which the storage chamber (18) stores the gaseous fluid, and a second position, in which at least part of said gaseous fluid has flowed out of the storage chamber (18).

3. The aerosol generation system (10) according to claim 2, wherein the deformable member (44) is configured to move from the first position to the second position in response to a pressure reduction of the gaseous fluid in the storage chamber (18), and to move from the second position to the first position when the pressure reduction of the gaseous fluid in the storage chamber (18) ceases.

4. The aerosol generation system (10) according to any of claims 2 or 3, wherein the storage chamber (18) comprises a storage portion (42) in which said gaseous fluid is stored, a volume of said storage portion (42) being smaller in the second position of the deformable member (44) than in the first position.

5. The aerosol generation system (10) according to claim 4, wherein the volume of said storage portion (42) when the deformable member (44) is in the first position is comprised in a range from 30 ml to 60 ml, preferably in a range from 35 ml to 55 ml.

6. The aerosol generation system (10) according to any of claims 4 or 5, wherein the deformable member (44) comprises a spring (46) having a first end fixed to a wall (32) of the storage chamber (18) and a second end attached to a plunger (48), the plunger (48) forming a wall of said storage portion (42).

7. The aerosol generation system (10) according to any of claims 1 to 5, wherein the deformable member (44) comprises an elastic diaphragm (50, 60) fixed to a wall (32, 56) of the storage chamber (18).

8. The aerosol generation system (10) according to claim 7, wherein the elastic diaphragm (50, 60) is made of silicone or polyurethane.

9. The aerosol generation system (10) according to any of the preceding claims, wherein a gaseous fluid hole (36) is provided between the heating chamber (16) and the storage chamber (18).

10. The aerosol generation system (10) according to claim 9, wherein the heating chamber (16) is separated from the storage chamber (18) by an interface wall (26), the gaseous fluid hole (36) being provided through said interface wall (26).

11. The aerosol generation system (10) according to any of the preceding claims, wherein the heating chamber (16) comprises a cavity (20) provided with an opening (27) to receive the aerosol substrate (28), the heating chamber (20) further comprising an air inlet (29) such that air can flow from the outside of the aerosol generation system (10) to said cavity (20).

12. The aerosol generation system (10) according to any of the preceding claims, the aerosol generation system (10) extending along a longitudinal axis (A), wherein the heating chamber (16) and the storage chamber (18) are arranged one after the other along said longitudinal axis (A).

13. The aerosol generation system (10) according to claim 12, wherein the heating chamber (16) extends longitudinally between a first end (22) and a second end (24), the heating chamber (16) further comprising a lateral wall (54-1) connecting said first and second ends (22, 24), wherein the storage chamber (18) at least partially surrounds said lateral wall (54-1).

14. The aerosol generation system (10) according to any of claims 1 to 11, wherein the heating chamber (16) extends along a longitudinal axis (A) between a first end (22) and a second end (24), the heating chamber (16) further comprising a lateral wall (54-1) connecting said first and second ends (22, 24), wherein the storage chamber (18) at least partially surrounds said lateral wall (54-1).

15. The aerosol generation system (10) according to any of the preceding claims, wherein the storage chamber (18) is configured to heat said gaseous fluid stored in the storage chamber (18).

[Fig. 1]

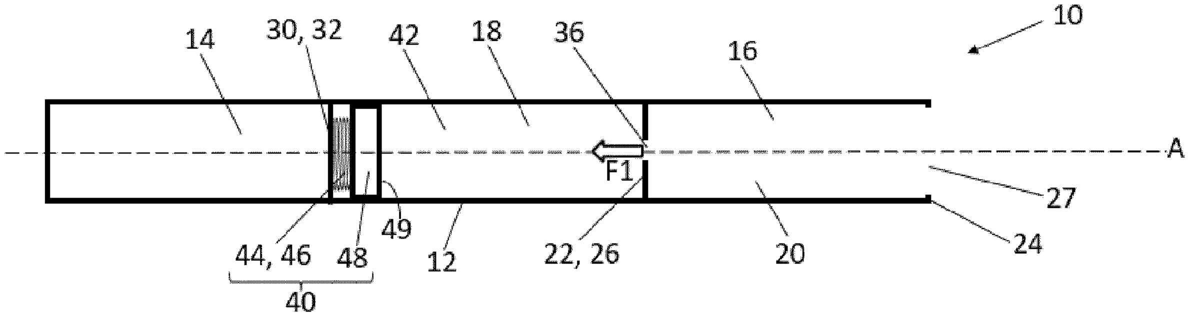

Fig. 1

[Fig. 2]

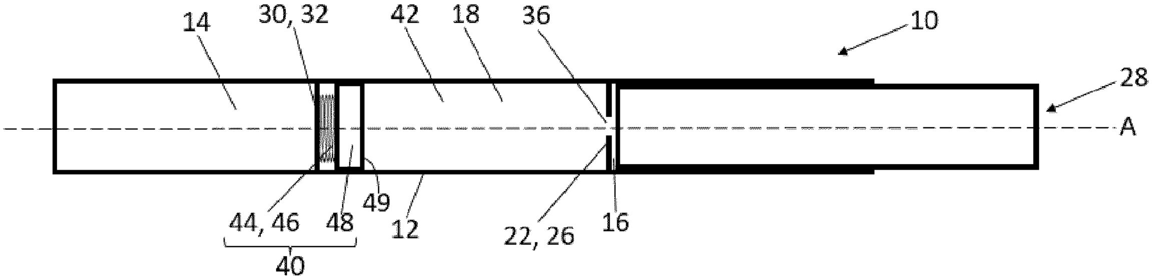

Fig. 2

[Fig. 3]

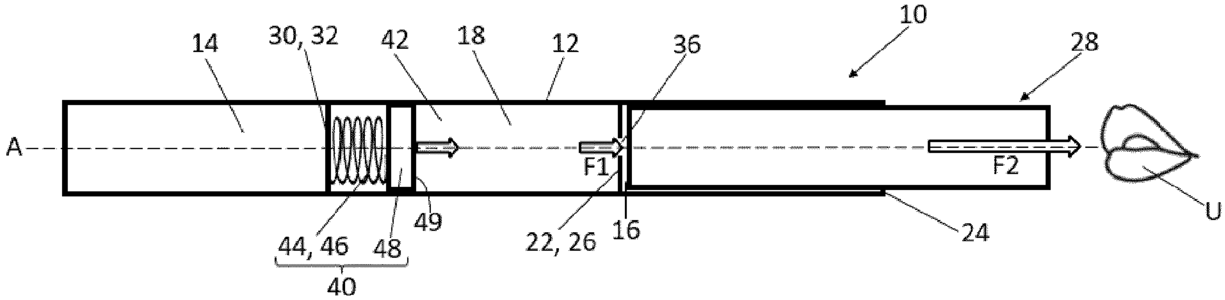

Fig. 3

[Fig. 4]

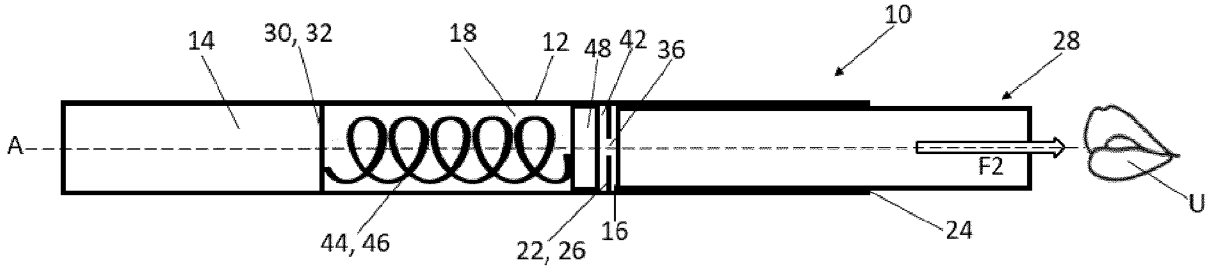

Fig. 4

[Fig. 5]

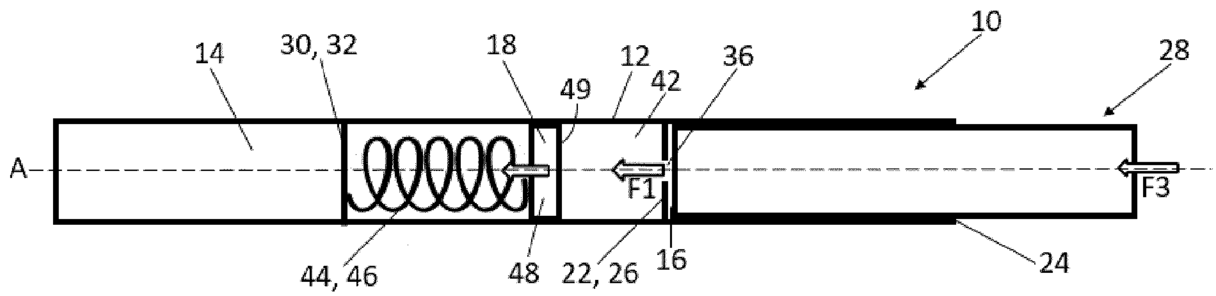

Fig. 5

[Fig. 6]

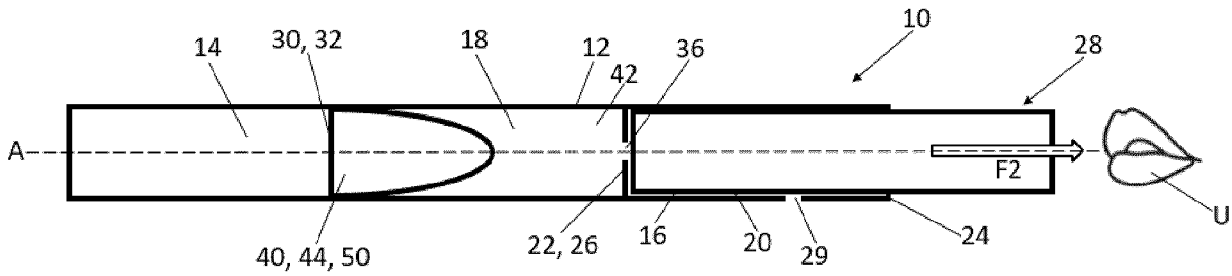

Fig. 6

[Fig. 7]

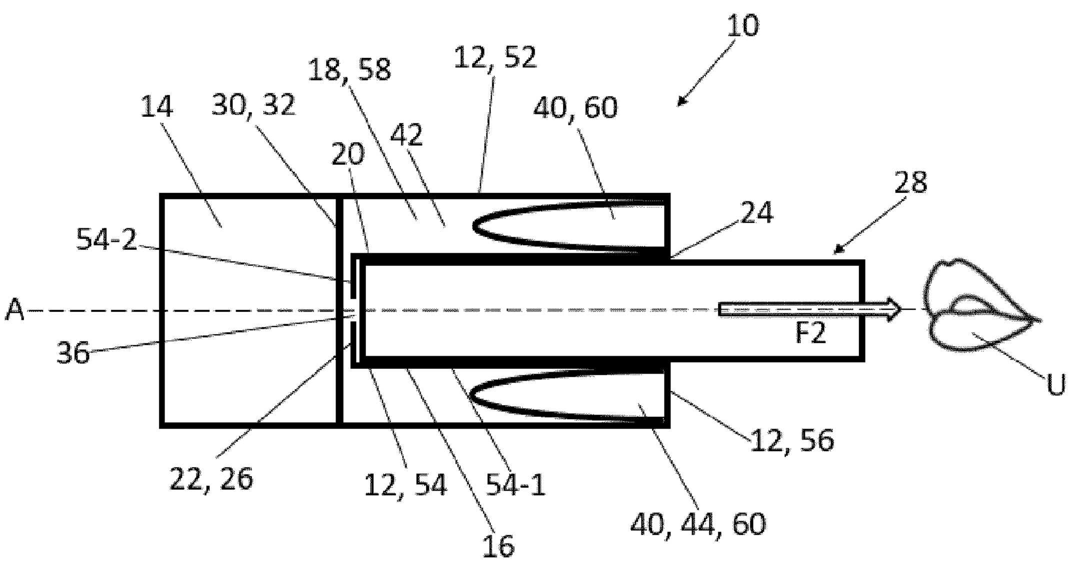

Fig. 7

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EUROPEAN SEARCH REPORT

Application Number
EP 23 15 5399

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	WO 2021/110854 A1 (JT INT SA [CH]) 10 June 2021 (2021-06-10) * page 2, line 419 * * page 7, line 14 - page 8, line 29 * * page 9, line 15 - page 10, line 31 * * figures * -----	1-15	INV. A24F40/48 ADD. A24F40/20
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A24F

The present search report has been drawn up for all claims

1

Place of search	Date of completion of the search	Examiner
Munich	3 July 2023	Kock, Søren

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